Good things come in small packages, Dana Fletcher seems to be telling us, and the smaller sailplane does seem the prettier—you can see it all at once! It flies nicely, too.

tiny sailplane -- the AR-25

A well-engineered, fascinating machine for those mini airborne systems. ■ Dave Jones

THE AR-25 was designed to be a novel entry in a contest devoted to models with a span of less than 72 inches and a wing loading greater than seven ounces per square foot. I had formerly designed several all-wing models for slope soaring to a similar wing loading and a size near two square feet of wing area. This gave me a good indication of how much a model of this type would weigh. Also, I had built an A-1 model of high aspect ratio which I wanted to emulate.

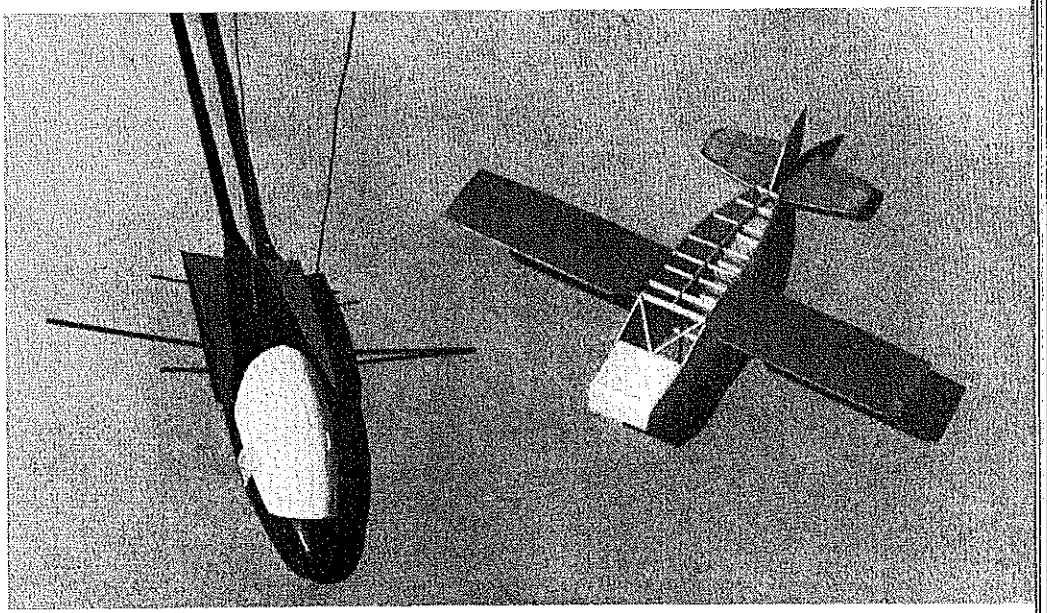
I set down some design goals. These included a geometric aspect ratio of 20. A weight of 12½ ounces was judged to be attainable. This left me with a wing area of 259 sq. in. This model follows general layout and construction methods of much larger models. I also intended to add winglets, a type of tip fin, to bring the theoretical aspect ratio to 25—hence the name AR-25. AR-25a incorporates several minor changes judged to improve durability.

Construction

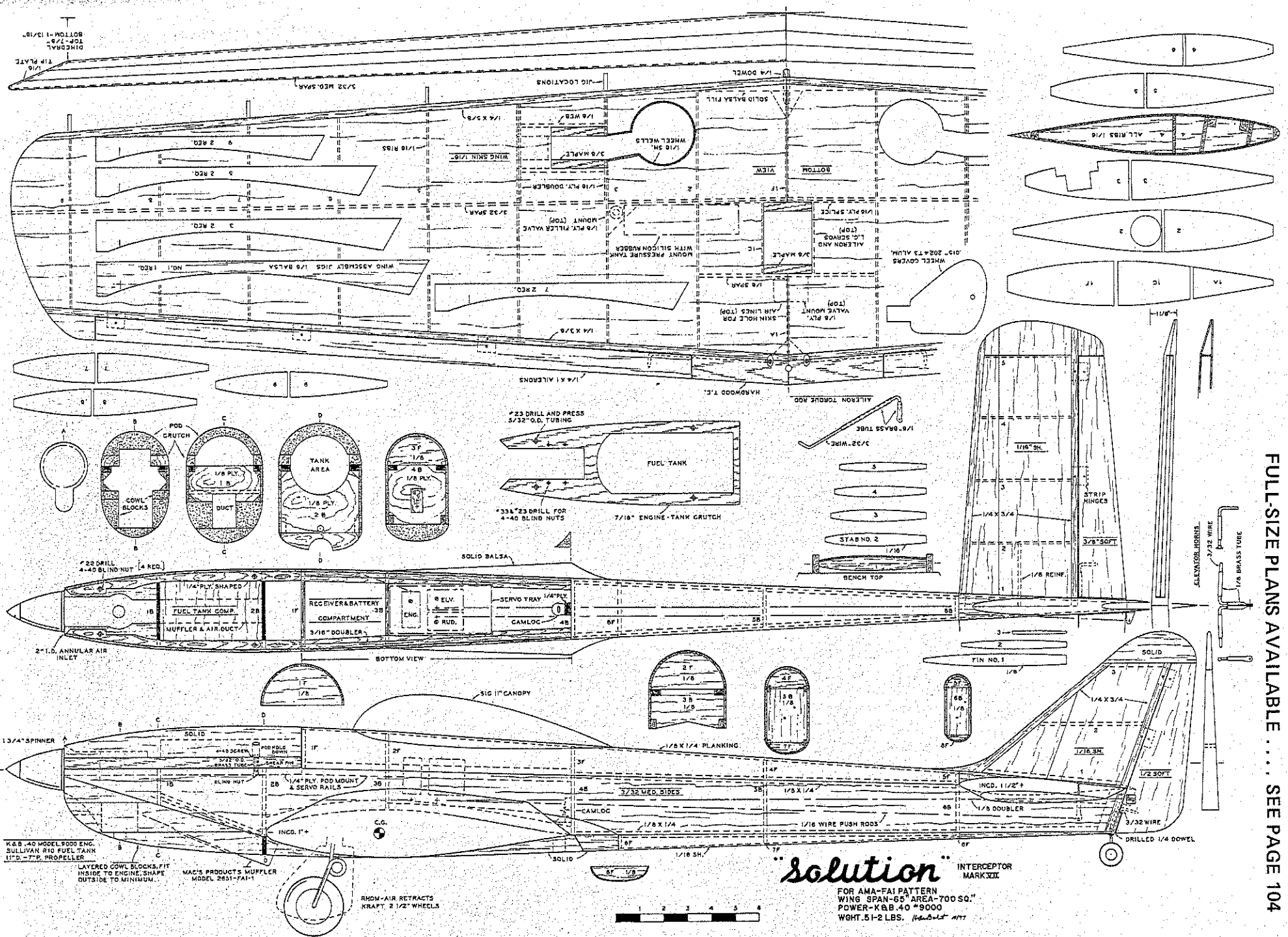
Wing: The wing is an unusually simple structure built complete in halves on the board. The only difficult task is cutting the ribs because they are small. They are cut by the template and stack method. A single, slender bolt held the stack together while I shaped the ribs. An extra rib is cut for the second rib station. The root and tip ribs are copied directly from the templates and are not cut in the stack. Ribs through the 12th station have notches for the spar caps, which are 1/16 × ⅛ spruce. The spruce upper spar cap should be reduced in thickness to zero at its end. It is poor practice to have a *sudden* change in the load carrying material cross section. The ⅛ sq. spruce leading edge is shaped to a near triangular shape after assembly of the wing. The leading edge should be the glue line between the lower sheeting and the spruce upper shape (see wing section drawing.) This gives a reasonably strong leading edge that resists dents.

The spar webs are cut from 1/16 sheet. These are installed with the grain vertical. They run mold line to mold line, with the bottom resting on the building board and the top trimmed even with the upper sheeting. The web also closes out the semicircle of sheeting at the root, giving it increased integrity.

Take care in choosing the balsa sheet for the wing covers. Use the best sheet for the top. For the wing trailing edge, use a straight piece of triangular stock. A curved



Although the pod's length is less than the span of the Cougar Peanut at its right, it preserves the niceties of modern sailplane design—the airborne system is just smaller, not different.



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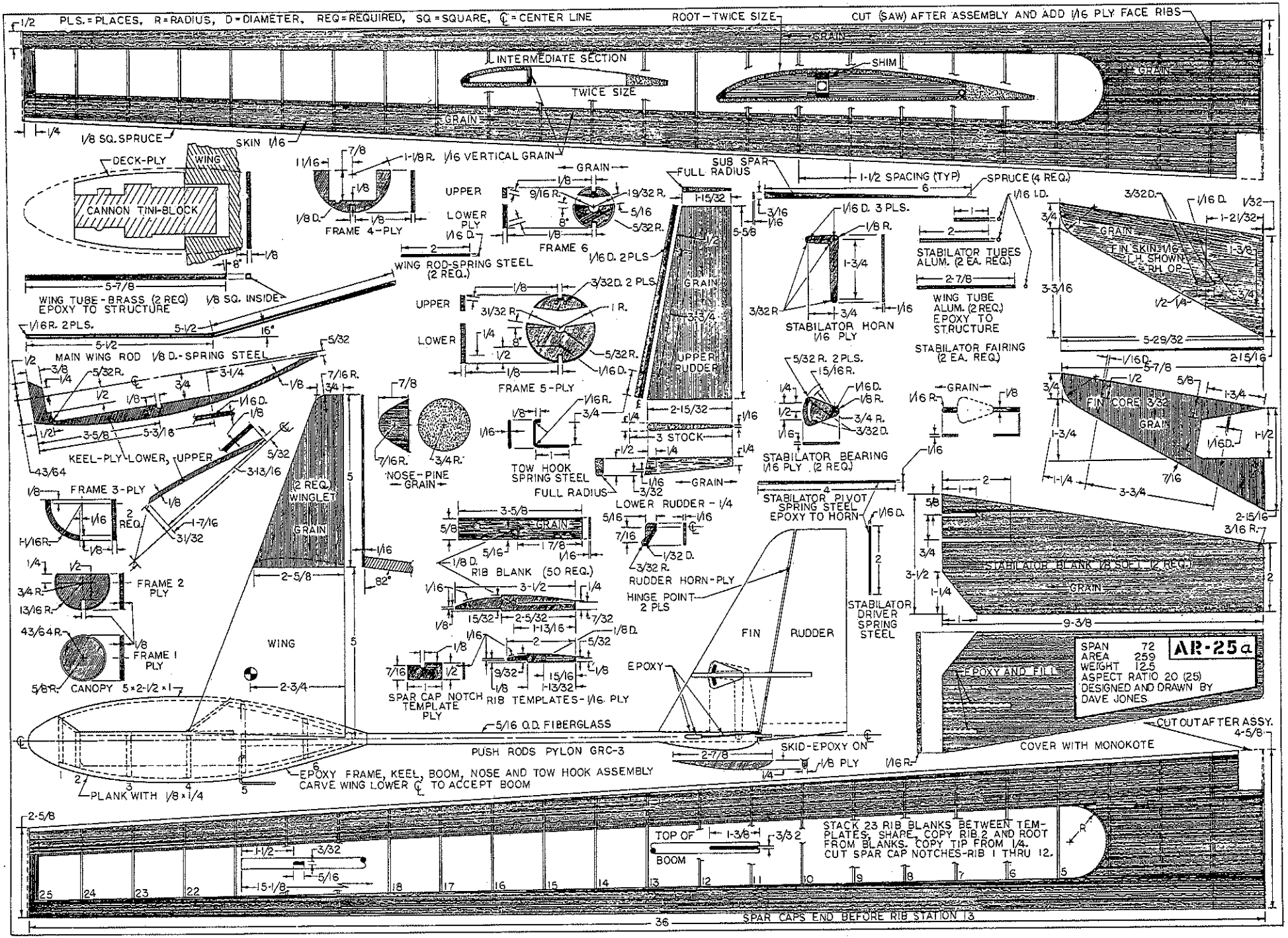

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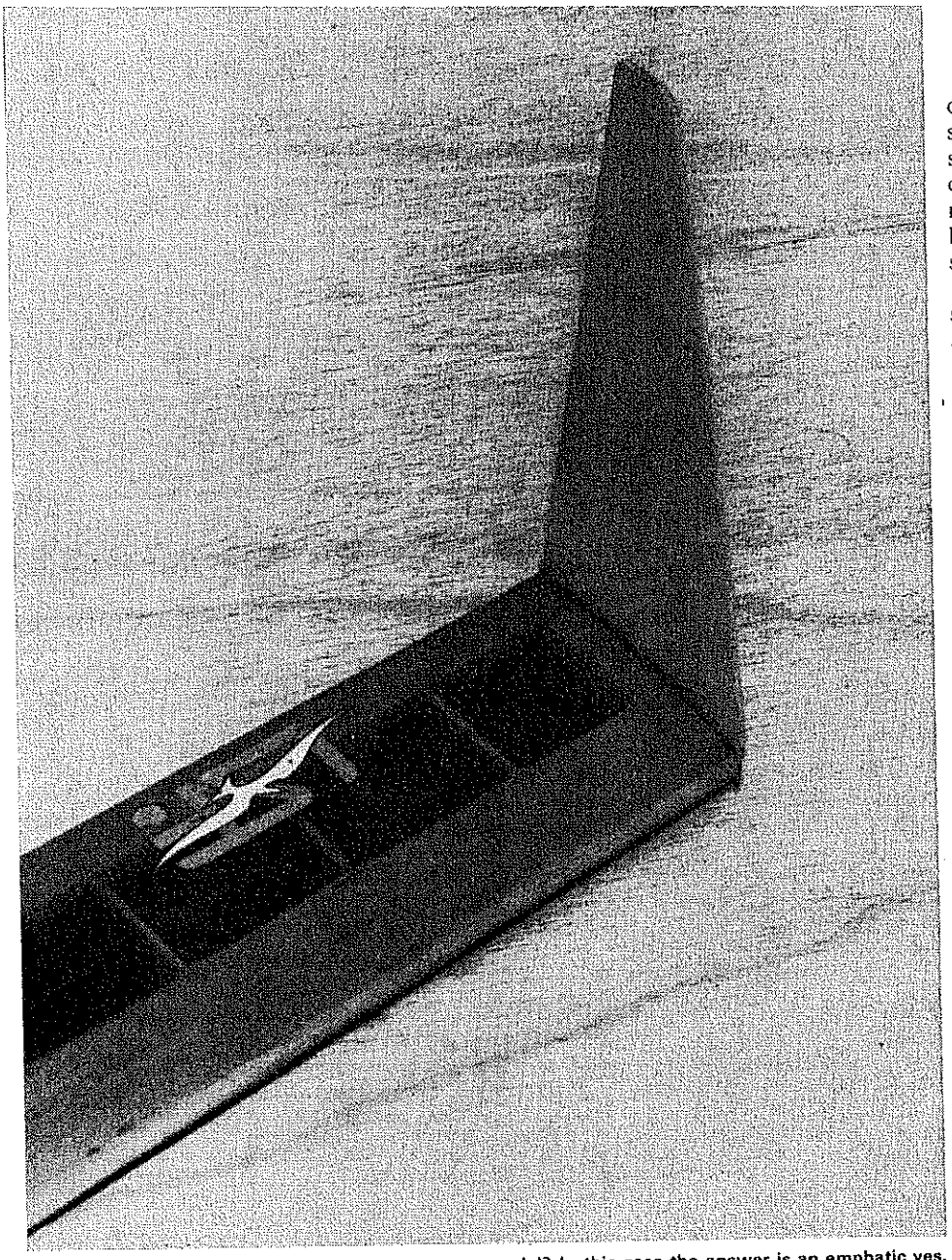
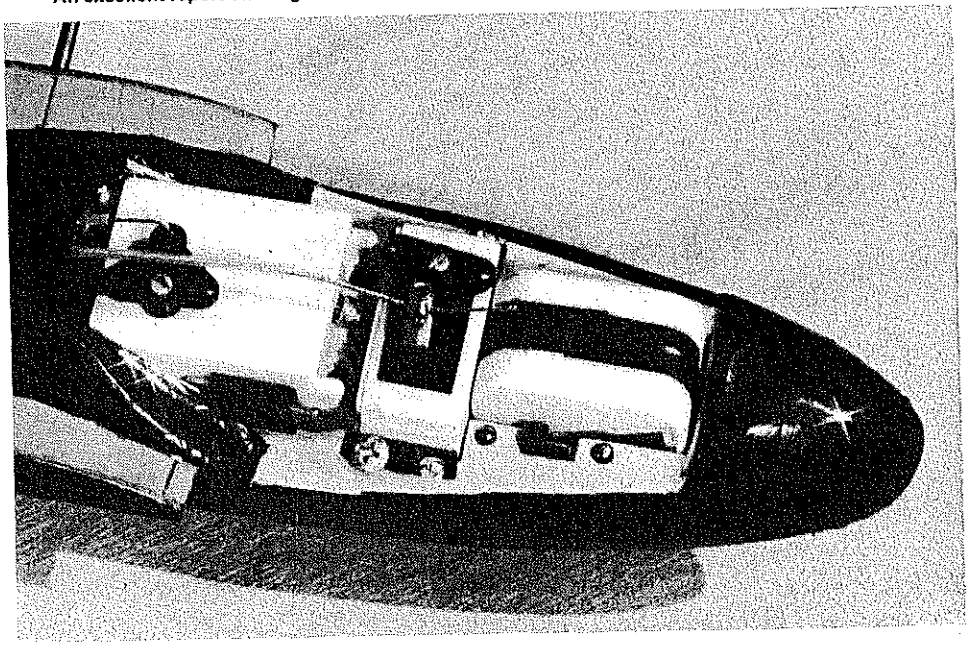


Do winglets really improve performance on a model? In this case the answer is an emphatic yes. An excellent report on winglets in full scale appeared in Meuser's column in August 1977.



Installation of the Cannon Tini Brick is a bit snug but presents no problems. Other mini systems may be substituted, ACE and Kraft being likely examples.

one can sometimes be straightened by sanding on one side to help relieve the stresses in the wood. The wing ribs may be capped, but it is an extra job I don't deem necessary on this model. The wing under load will act just like a full-size fiberglass sailplane, and bow in a graceful curve.

The winglets I used were hard 1/16 sheet balsa. The leading edge was rounded and the trailing edge square. They may have an airfoil shape and also have camber. This is supposed to reduce the tip vortices to some extent. The curved surface of the winglet is to be toward the center of the wing, as though the wing was bent up. Don't change the size or shape of the winglets as they are tied to the dihedral and rudder/fin areas. Mine have no finish; however, a couple of coats of dope would be good protection. Try to keep the winglets light, regardless of which type you use.

The main joiner tube is square brass with an inside hole suitable for ⅛ diameter piano wire. A spruce sub-spar is added to the root so that the tube is parallel to the trailing edge of the wing. The rear tube is 1/16-inside-diameter aluminum. Epoxy together the tubes, spar caps, and fillers. When all of the glues are set, cut the wing between the two ribs at station 2. I used a Dremel. This gives you an absolute match between the parts. Add plywood end ribs of either 1/32 or 1/16 thickness to each part. Shape the root of each panel to accommodate the eight degrees of dihedral. Slip each part of the wing on the main rod. Epoxy the root joint. Add the 1/16 rear wing rods which are offset slightly to fit tightly in their tubes.

Fin: Shape the fin core and skins, the stabilator bearing, and the stabilator fairing and horn. Fit the hinge points to the core. Place the core and horn between the skins, making sure the horn is free to pivot on the stabilator pivot, and that the stabilator driver is clear to move in its groove. Glue together. Keep flat until dry, and then shape.

Body: Cut the bottom of the wing center assembly to admit the tail boom. Add frames 5 and 6 to the wing/boom. Add the upper and lower keels. Now the frames 1, 2, and 4 are added. At this point the deck must be designed. If you are using a Cannon Tini-Block, the deck shown is good. If you are using another system, you are on your own with the deck.

After the deck is added, install frame 3. During the installation of the deck you will note that the inner part of the wing leading edge must be removed. Note that it is easier to assemble the tow hook on the keel before it is added to frame 5. Shape canted frames between frames 1 and 2, and 4 and 5. The rear canted frame is partially removed after the planking is complete to install the equipment. Thread two Pylon GRC-3 tubes back through the boom from the pod. The rudder tube exits