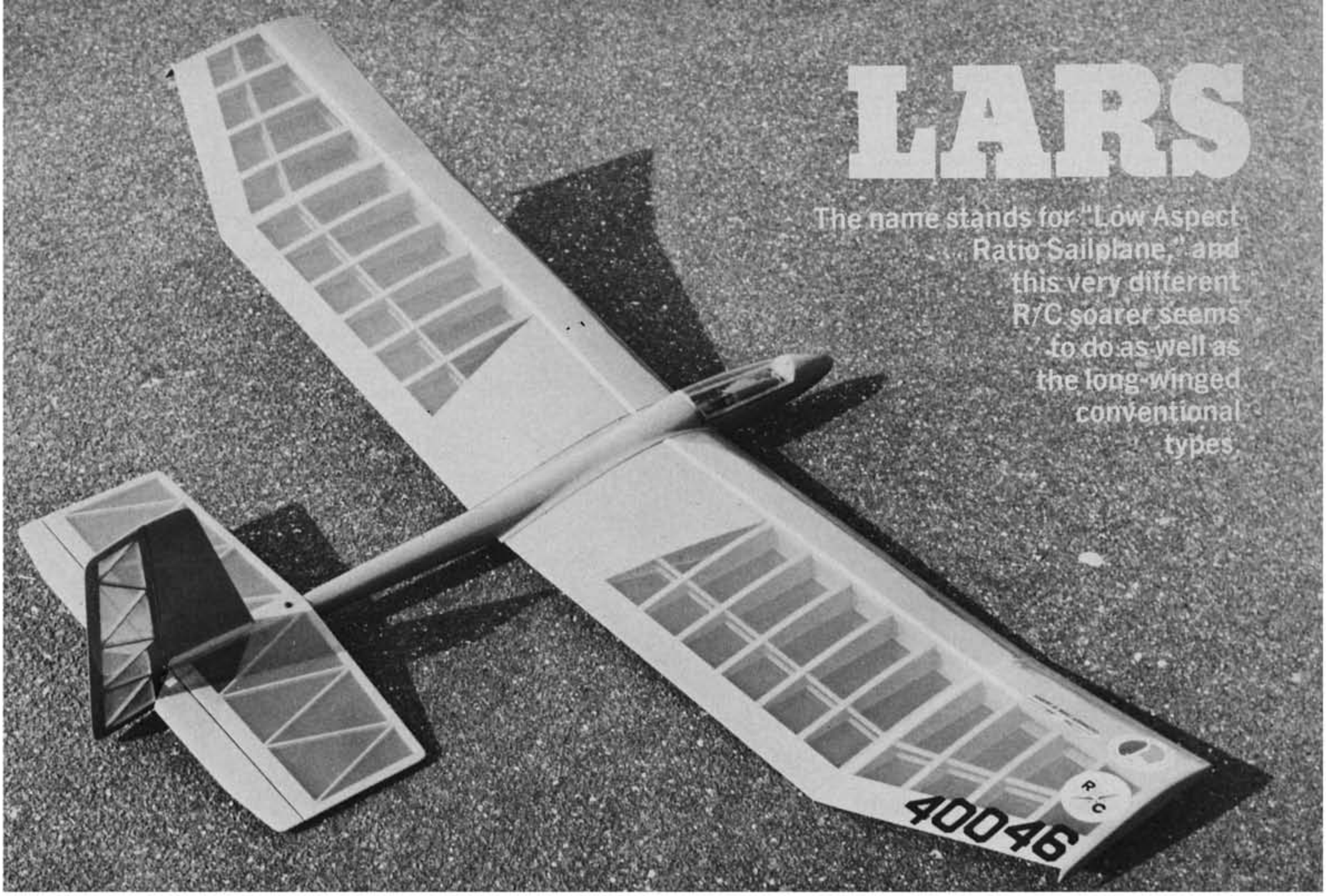
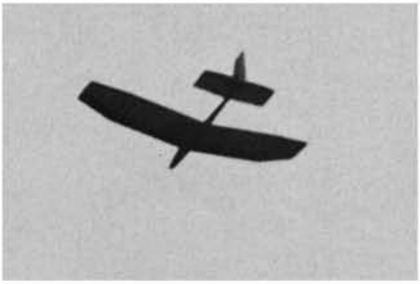
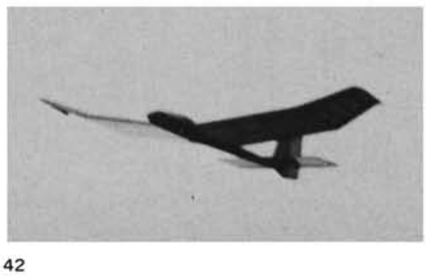


LARS

The name stands for "Low Aspect Ratio Sailplane," and this very different R/C soarer seems to do as well as the long-winged conventional types.

Photos: Dick Sarpolus





by Dick Sarpolus

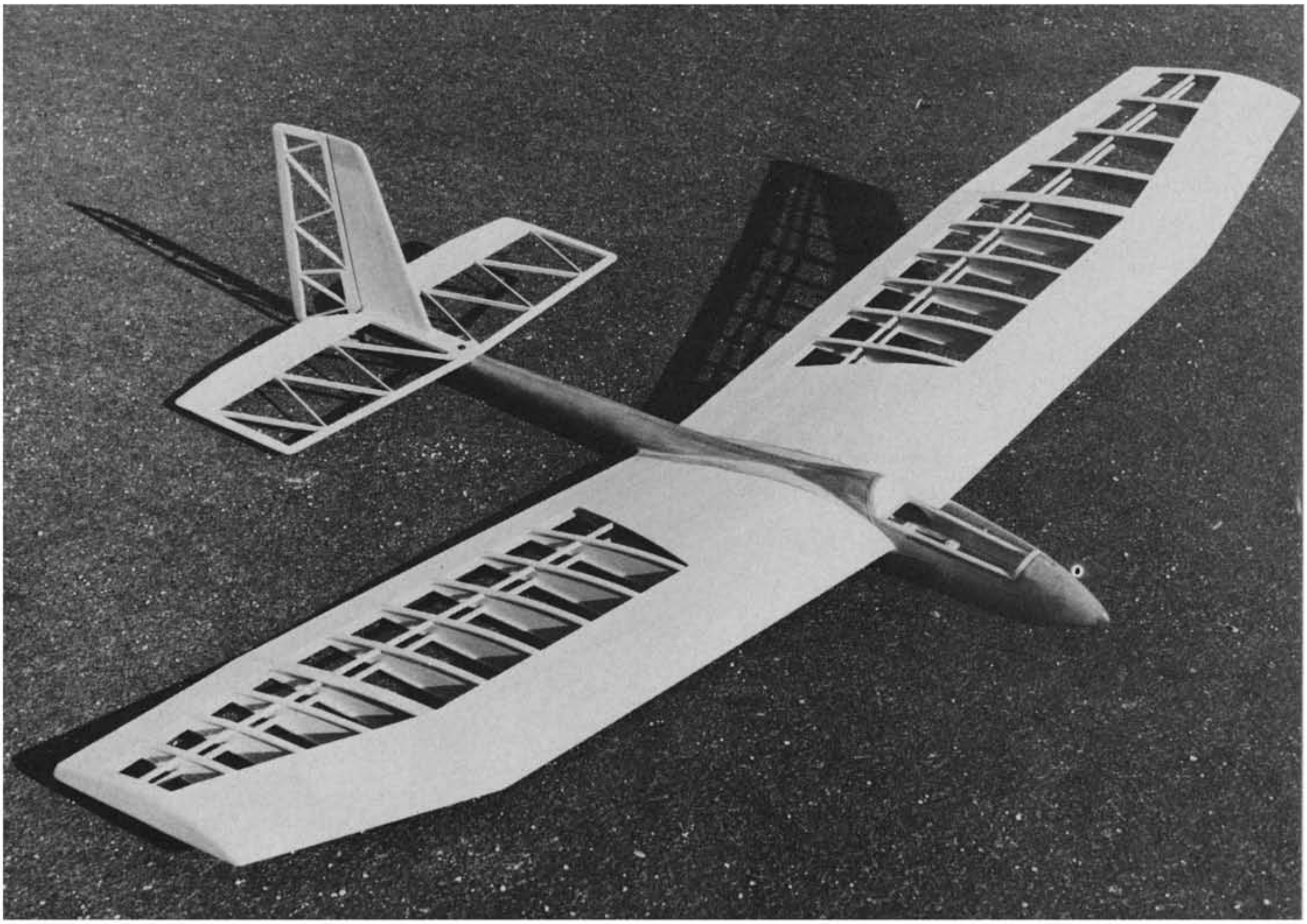
The name "LARS" stands for Low Aspect Ratio Sailplane. The first question usually asked about this model is—why did you use a low aspect ratio wing on a thermal soarer when everyone knows high aspect ratio wings are more efficient, therefore better? That's why we designed and built it—we weren't convinced that high aspect ratio wings really were better for our size aircraft. It is true that most R/C sailplanes use high aspect ratio wing designs; usually limited only by structural considerations. These long, slender wings even seem to "look right" when the sailplanes are circling gracefully in the thermals beneath the clouds. Full scale sailplanes incorporate even higher aspect ratios than our models can duplicate. Lower ratios are used on slope soarers, racers, pattern aircraft, etc. So why try a thermal soarer with a low aspect ratio wing?

If it would work, such a plane could have several advantages over conventional sailplanes: The wing, having a shorter span, would be stronger and able to withstand heavy winch launches and higher winds. The model would be easier to transport with shorter, wider wing panels. A large amount of wing area could be used in a short span for lighter wing loading and hopefully better performance. We had been successful R/C soarers with lower than usual aspect ratios, and Free-Flight models tend to have lower aspect ratio wings. A friend of ours argued convincingly for low aspect ratios, drawing on his experience with hand launched glider design. The potential benefits seemed to justify an attempt at a low aspect ratio design.

We laid out a six foot span wing, to use standard 36" balsa. Polyhedral was used for better turning capability with 24" center panels and 12" tip panels. The center panels have a 15" chord with tip panels tapering to 10". Figuring on a 75" span (including fuselage width as is normally done) wing area is 1065 square inches. Aspect ratio, span squared divided by area, is 5.3 to 1. This seemed like a good place to start; anything lower appeared impractical for stability considerations. The airfoil drawn up was a flat bottom, 10% thick section. Wing construction is conventional built up practice; spruce spars, vertical grain spar webbing, planked leading and trailing edges, capstrips. Wings have tubes in the center-section to slide on a 1/4" dia. steel rod built into the fuselage.

Horizontal stabilizer area is 230 square inches, 22% of the wing area. Vertical fin/rudder area is 90 square inches, 8.5% of the wing area. A fibreglass fuselage was used as we had access to a basic fuselage that could be easily modified to our desired configuration. The tail surfaces are simple structures; the tail assembly attaches to the fuselage with two nylon bolts.

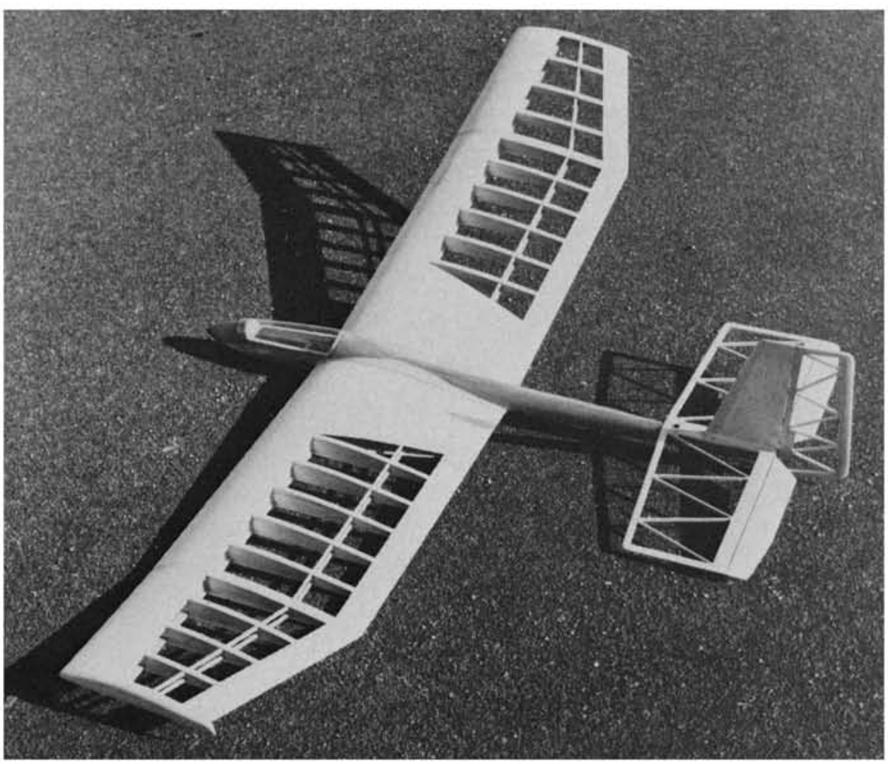
We anticipated a total weight of 3.5



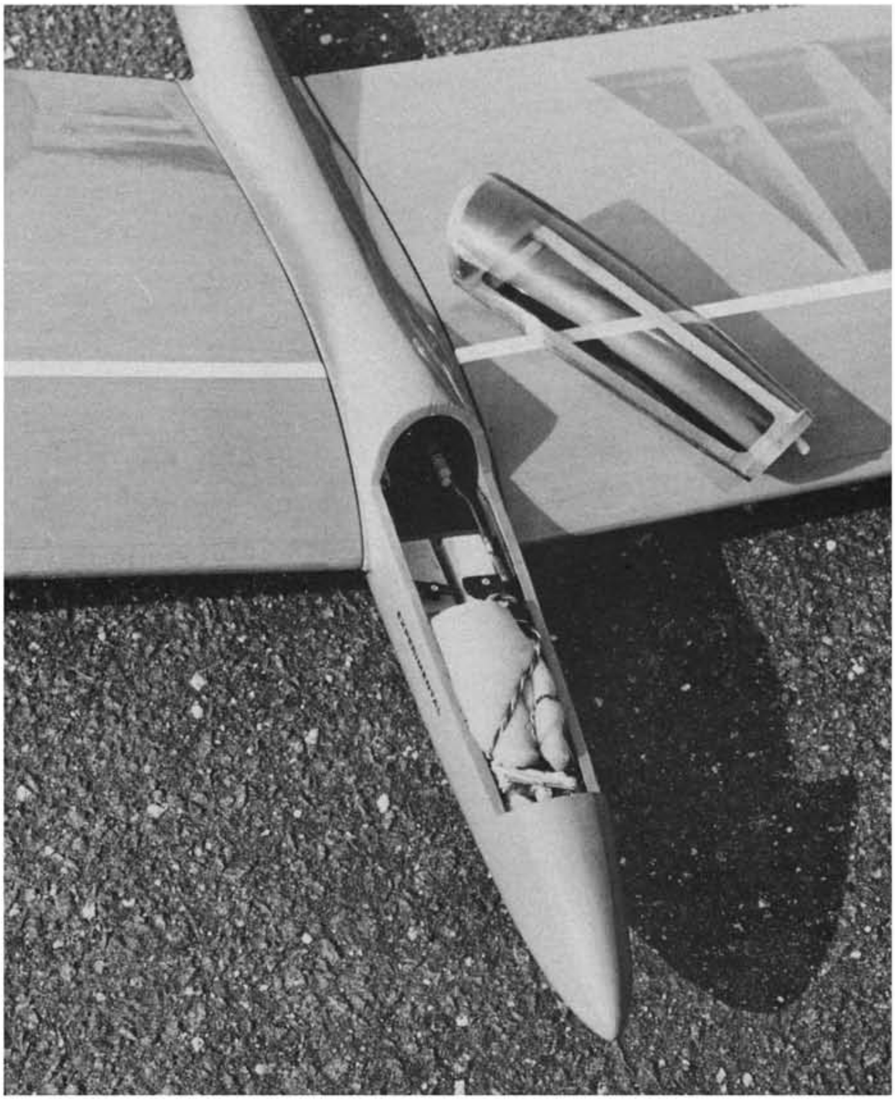
pounds, for a wing loading of 7.5 ounces per square foot. Due to heavy wood used in the wing and too much plywood with polyester putty used to fair in the fuselage wing roots, the prototype weighs 4.5 pounds, for a loading of 9.7 ounces per square foot. This is heavier than desired, but still is a loading suitable for soaring and should serve to check the feasibility of the low aspect ratio design. By being more careful about the weight, we feel 3.5 pounds is attainable. The plane could then be ballasted to find its most effective flying weight.

We would recommend to any soaring enthusiast Eric Lister's "Sailplane Designer's Handbook." It is available direct from the author at 953 Klockner Rd., Trenton, N.J. 08619, and is filled with valuable understandable design information for R/C soarers. Lister's comments on chord size versus performance were not favorable for the LARS; however he felt chord size had a less significant effect on performance as larger wing areas were used. We felt that with 1065 square inches, the 15" chord should perform quite adequately.

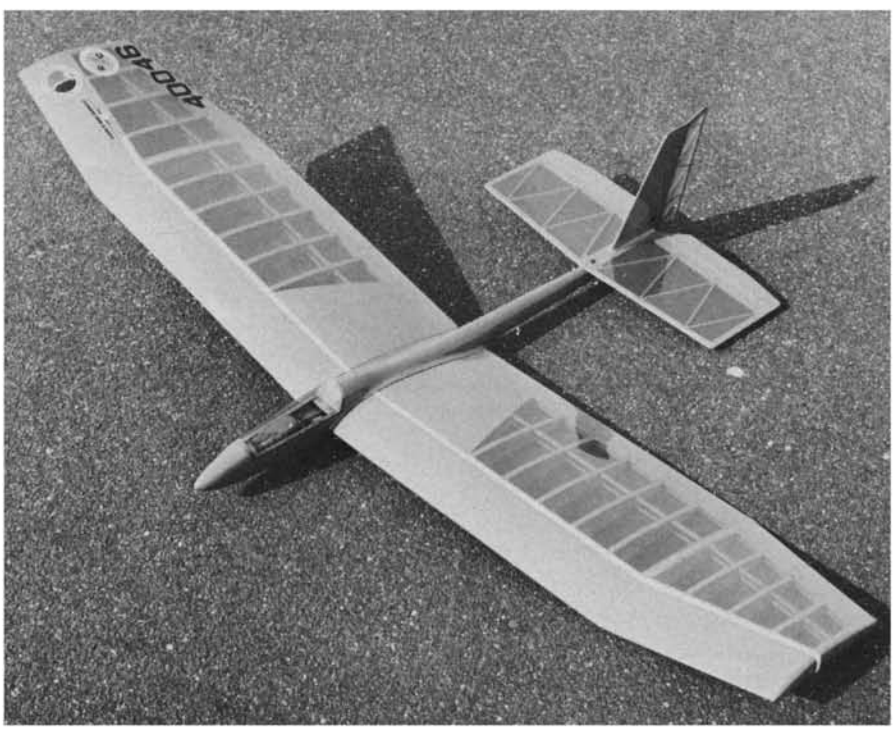
First launches were made on a weak hi-start with the towhook fairly far forward for safety. The first flights were something of an anticlimax as they were completely uneventful. Turn response was adequate, elevator was too sensitive, so we cut down on its travel. In general it performed like



The "Low Aspect Ratio Sailplane" has wings that should be much easier to build than conventional ships because of their wide chord; some sheeting over those great big ribs is all it takes to make it work.



The radio installation in the "LARS" is simple and straightforward with plenty of room in the nose for everything you need and a removable canopy to make it all accessible. Get used to fat wings, they work.



a conventional design sailplane would be expected to. It's forward speed seemed a little high, but this is a characteristic we don't mind.

On subsequent flights we moved the towhook rearward to get better launches. Good, high launches are easy to get; the model climbs straight ahead, is stable, and gets the maximum altitude possible. Extreme elevator sensitivity which had us worried for a while turned out to be an erratic servo. Although we have not flown it in competition yet, or in really decent thermal conditions, it seems to be at least equal to a conventional sailplane of the same wing area. We are looking forward to more flying, but can say at this point that it has exhibited no bad characteristics and appears to be a practical, good performing sailplane. We don't believe we have settled anything regarding optimum wing aspect ratios, but it has been an interesting project.

Construction Notes

Wings first; the airfoil is flat bottomed so the wing panels can be built directly over the plans. Lay out and glue the bottom leading edge sheeting, center-section and trailing edge sheeting, leading edge, capstrips and bottom spars. The ribs may then be located and glued in place. The three root ribs are plywood to support the wing junction tubes; they can be made from light poplar plywood if available. The vertical grain spar webs must be added before the top spar is put in place. Leading edge, center-section and trailing edge sheeting is added, also the top capstrips. At the polyhedral joint, a vertical slot is cut in the two ribs there to allow the plywood reinforcement to be glued in place. The tip plates are added and sanded to shape.

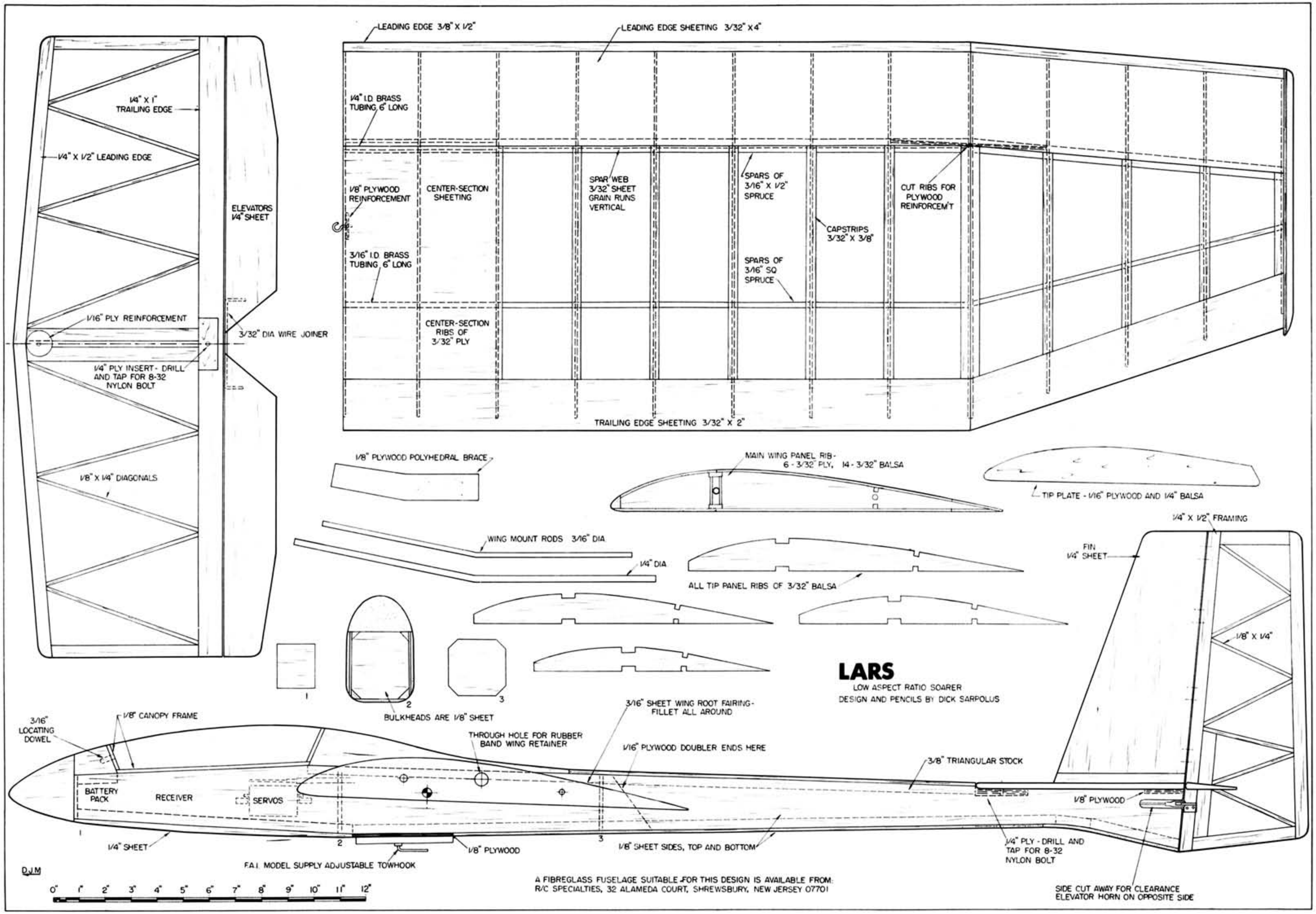
The wing junction rods, 1/4" and 3/16", are cut and bent to shape. They will be installed permanently into the fuselage.

The tail surfaces are built up over the plans. The attachment method is via two nylon bolts, the front one passing through the stab and threading into a plywood fuselage mount, and the rear one going through a plywood mount in the fuselage and threading into the stab. The fin is epoxied into the stab.

The prototype had a fibreglass fuselage, but the plans show an equally good easily built up wooden version. 1/8" sides, top and bottom, 3/8" triangle stock in the corners to permit rounding off, plywood doublers in the nose section. Round the corners well for best appearance. Make the wing root fairings, drill holes for the wing mounting rods, but don't glue the fairings in place until you sandwich them in with the wings lining them up. When the wings are checked for alignment, epoxy the fairings and the wing mounting rods in place. The fairings can be filleted to the fuselage with Epoxolite. A canopy can be made using flat sheet plastic or a carved block may be used.

To finish the model we used automotive primer and butyrate dope on the fuselage and covered the wings and tail surfaces with transparent color MonoKote.

Test flying should be done cautiously, as with any new model. See you in the thermals with a Low Aspect Ratio Sailplane!



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