ARADO Ar96V

By TOM HOULE . . . Originally intended as a trim and balance test bed for a later six-foot version, this 18-inch, rubber powered scale model of a German trainer has proved a worthy flier on its own merits.

• My motive for selecting the Arado Ar96V as a 1/2-inch scale subject is somewhat unique. Dave Gibson, a long time modeling friend, formerly of Wisconsin, now living in Canton, Ohio, had challenged me to design and build a six-foot span rubber powered scale model. Bill Winter, in an editorial years ago, described the flying of such models at dusk. He described the eerie sensation of a Nieuport silhouetted by the moon as it ghosted along . . . only the prop ticking over made any noise at all. Bill, in his way, turned us both on. We knew that six to eight-foot gassies were popular in the early '40s. But rubber scale with six-foot span?

As we all know that Bill Winter never lies, the gauntlet was thrown down. "Could it be done?" sez Dave. "You bet," sez me! But before I tore into that much balsa, I thought I had better select a subject and try it out in 1/2-inch scale first. Many trim and balance problems could thus be checked out.

After searching for a long time and being heckled for delaying the challenge, I ran across Kenneth Munson's little book *Fighters of the World 1919 to 1939*. In it I found the Arado 96V prototype. Its lines and moments jumped off the page. It had the required longish nose arm and also had a respectable tail arm. The swept back wing plan would allow an aft balance point. And it was aerodynamically clean and slim with retractable gear. It seemed that with a slightly enlarged stab and fin, I would have it.

The two-view in the book was blown up to 1/2-inch scale (18 inch span) and a plan was drawn. However, before I describe the construction let me tell you a bit more about the aircraft from an historical standpoint.

The Arado 96 entered German service in 1939. By 1940, it had become a standard German trainer type. The first prototype designated Ar96V1 (civil license D-1RUU) was designed and first flown in 1936. It was followed by the V2, which had modifications to the internal cabin enclosure.

These two prototypes formed the basis for the production model Ar96A-1. This version was powered with a 240 hp Argus AS 10C powerplant. Underpowered as it was, it still possessed excellent flight qualities. The conversion to a 350 hp engine in the V3 prototype proved that only additional power was required.

Two additional increases in hp were implemented before production ceased. Production units eventually evolved into the B-1 pilot trainer, the B-2 gunnery trainer, and the B-5 (similar to the B-2 except for the addition of radio equipment).

Interestingly enough a much developed model, the Ar 396, was produced after the war in France by SIPA and in Czechoslovakia.

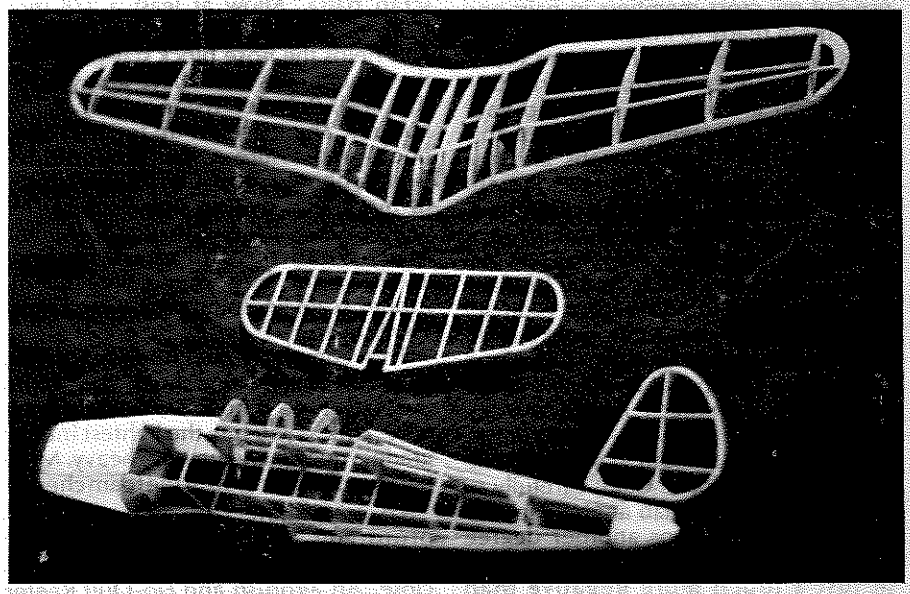
My model is built, marked, and colored as it appeared in K. Munson's book; the Ar96V prototype (probably V2) as it appeared in civilian markings in 1936. The overall color is Cub yellow. License numbers are black. The broad fin stripe is red and the swastika is black against a white circle background.

I would not rate this project as one for first model beginners, but if you have built a few stick-and-tissue kits there should not be any problems. Just don't get carried away with your glue. Most balsa wood joints will break before even a poor glue joint will let go. And please do not use R/C hard balsa. If in doubt, use the softer stuff. There is enough structural volume to enable the use of soft wood.

Let's start with the fin and stabilizer. Both require the soaking, laminating, and molding of two 1/32 x 1/16 strips around 1/16 balsa sheet forms. There has been much said about this process. Suffice it to say that the molded pieces should dry overnight before they are removed from their respective molds. Both the stabilizer and fin use 1/16 sq., except for the molded pieces. Pin them to the plan over clear plastic wrap and assemble in standard fashion. When dry, clean up the glue in the corners, lightly sand, and set them aside.

Now to the wings. They can be built as shown on the plans, in which case they will be plenty strong, or you can use the cracked rib method developed by the F.A.C. and others. It's faster and I think, every bit as strong, not to mention a weight saving. So try it. Just don't forget to make a 1/16 sheet internal spar, which should be located where the top 1/16 sq. spar is shown. Taper it per the front view, allowing for the 1/16 sq. ribs top and bottom.

The wing builds up in conventional fashion. Be sure to shape the 3/32 x 3/16 T.E. before attaching to the wing. If you elect to build the wheels-up version as I did, then use 1/32 sheet for rib #4, not 1/16 as the plan specifies. If you build the wheels-extended version, then the stuts are epoxied to these 1/16 ribs. The



The Arado Ar96V all framed up, ready to cover.

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license letters, aileron, flap and trim tab outlines are drawn in ghost lines. The license letters appear both top and bottom. Block up one wing 2-1/4 inches with the other securely pinned to the plan. This will give you the correct dihedral angle. Glue and let sit overnight.

The fuselage (what I like to build best) is a basic box with top and bottom stringers plus bond paper and foam forward of the wing. Sort of sounds like a craft project, doesn't it, what with foam, paper, and stringers? Start by laying out the two 1/16 sq. fuselage sides. Build them both over the plan, one on top of the other, separated by a piece of plastic wrap. That way they come out the same.

When the sides are thoroughly dry, separate them and erect the sides upright over the top or plan view. I always pre-cut my cross-members in pairs and have them ready to install once the two sides are in position. Install the cross-members and square up the structure. While you are waiting, clean up your finished wing assembly. It's probably loaded with little glue webs and the leading edge needs to be rounded off.

The addition of the formers rounds out the basic structure. Add the 1/32 x 1/16 top and bottom stringers and the foam cheek cowl blocks to the fuselage front sides. I use foam from ordinary meat trays plus whatever blocks I can pick up in the local hobby shop. Sand lightly with fine paper and it will shape beautifully. For much handled areas, coat the foam with Tite-Bond or Sig-Bond to form a smooth, hard shell. The tail cone is also foam. Cut it carefully to ensure the correct stab angle. The stab could be set perhaps another degree negative but not positive! I had to warp in just a touch more negative than shown. Coat the cone with a light film of Tite-Bond.

Cover the fuselage front, top, and bottom with white bond paper. Due to the top curvature, you may have to use two pieces. I did. If you can vacu-form the canopy, fine. It is ready to install. Be sure to install it before the tissue. That way it looks like it fits rather than being stuck on as an afterthought. If you don't have vacuum forming capability, then do what I did. Make two 1/32 sheet bulkheads from the front view to match the cockpit profile. Then flat wrap .003 acetate over each canopy section. A pattern is shown for the odd-shaped rear glass. You could also laminate these bulkheads from 1/32 x 1/16 strip over a form. Finish off the canopy with strips of bond paper covered with yellow tissue to simulate the canopy framing.

Prepare the nose block from a piece of scrap balsa. Allow at least a 1/8 inch deep nose plug to fit into the fuselage. This helps the nose block stay put when the rubber runs out. I have always used the Peck-Polymer nylon plastic thrust buttons. These are set up for 1/32 prop hooks and assure a low friction drive from rubber to prop. Cough up a couple of bucks and mail to Bob Peck for his latest catalog. It is well worth the money. Many wondrous things are in there awaiting the beginner's pleasure in rubber scale (including the 6-inch prop you'll need).

This completes the fuselage. If you have not shaped the cheek cowl foam blocks yet, do it now. *Do not use balsa here.* Unless you buy the lightest indoor grade, you will end up nose heavy. Mine balanced perfectly with the foam cheeks.

To match the Cub yellow of the prototype, I located a tissue in our neighborhood stationary store that was close. An airbrush and Flo-Quil Reefer Yellow would be even better. Work with whichever you have. The entire plane is covered with this tissue, except for the strip of tissue on the fin between the upper and lower cross-members. For this I used red tissue with an opaque white enamel circle painted on per the plans. Prior to applying the red tissue, I pressed on a black swastika cut from Zip-a-tone flat black film. The advantage of this stuff, available from art stores, is that it can be positioned directly over the plan and the swastika pattern lightly traced onto the film. It is then easily removed from its waxed backing and burnished with a smooth blunt tool onto the circle.

The effect is striking when the bright red strip with its white circle and black swastika are placed on the yellow fin. The license letters are cut from the same film and pressed in place with the tissue held over the plans. By cutting generous sized tissue pieces, one can position the licensed tissue on the wings and fuselage where they are supposed to be. I used thinned white glue to attach all tissue.

Shrink the tissue with a light and fine atomized water mist. None of my sub-assemblies warped to any extent in spite of not pinning anything down. Note that the wings are covered before they are glued to the fuselage. Once the covering is taut, glue the wings in, checking to ensure that the dihedral is symmetrical and the wing incidence angle is correct. Do not let the leading edge be any lower than shown. If anything, it could be raised perhaps 1/64 to reduce rocket-like flight tendencies. More on that later.

With the wings in place, fill in the front and rear fuselage saddle openings with 1/16 sheet in front, and bond paper for the two aft openings. If the landing gear struts were installed, add the 7/8-inch diameter balsa wheels and 1/32 wheel covers. The struts, incidentally, are 1/32 music wire and are formed per the front view.

Before you rush off to your favorite gym or outdoor flying site, take a few minutes to let the one coat of thinned dope dry, and check for any warps, particularly in the wings. Warps in the wings will definitely mess up your intended flight plan. And *do not dope* the foam areas. Tissue must be applied to the foam with thinned Tite-Bond or white glue. Dope will dissolve your beautiful carving. Thin with water and after the tissue is dry, brush on a second thin coat to harden the shell.

The prototype flew well with a Peck-Polymer 6-inch plastic prop and a 14 inch loop of 1/8 indoors and a similar loop of 3/16 SIG rubber outdoors. The balance point may look like it is too far back, but I can assure you it isn't. The long tail arm aids in providing more stabilizer power than you might think. The lengthy nose arm also eliminates any clay ballast on the nose.

A bit of downthrust is built into the plans for outdoor flying. If you use this, you may want to wash in both tips on your model, or add a touch of up elevator. Or you can build in zero downthrust and leave the stabilizer alone. I prefer the former because it allows more power for outdoor flying. This combo will enable slower flight, but the balance point must be moved forward, so take your choice. The settings shown on the plans represent a good starting point for indoor or outdoor.

My model weighed 19 grams all up with 6 inch plastic prop, nose block, and one coat of thinned dope. The rubber is not included in this weight. First flights were rocket-like. Indoors, even with a long loop of 3/16, it was just too fast. I attribute this speed to a clean airframe, too much thrust, and close to a 0°-0° wing/stab setting. Very little turn was possible due to the smallness of the gym and high flight speeds.

A switch to a 1/8 loop and a touch of up elevator cured the problem. It flies nice and slow with this setup, and the balance point shown. Outdoors, a loop of 3/16 will take it up at a steep angle. Without having to worry about indoor tight radius turns, it is a joy to watch the Arado climb outdoors like a happy student on his first solo.

The bright yellow covering also aids visibility and locating the model. All in all, the Arado 96 is both a different and quite successful flier. I am now looking at the possibility of a 36-inch schoolyard scale R/C version. It should be even better than its 18-inch little brother. As for the six-foot span project, it has been put on the back burner pending the location of a winder strong enough to handle up to 32 strands of 1/4-inch rubber. Funny how things work out. •