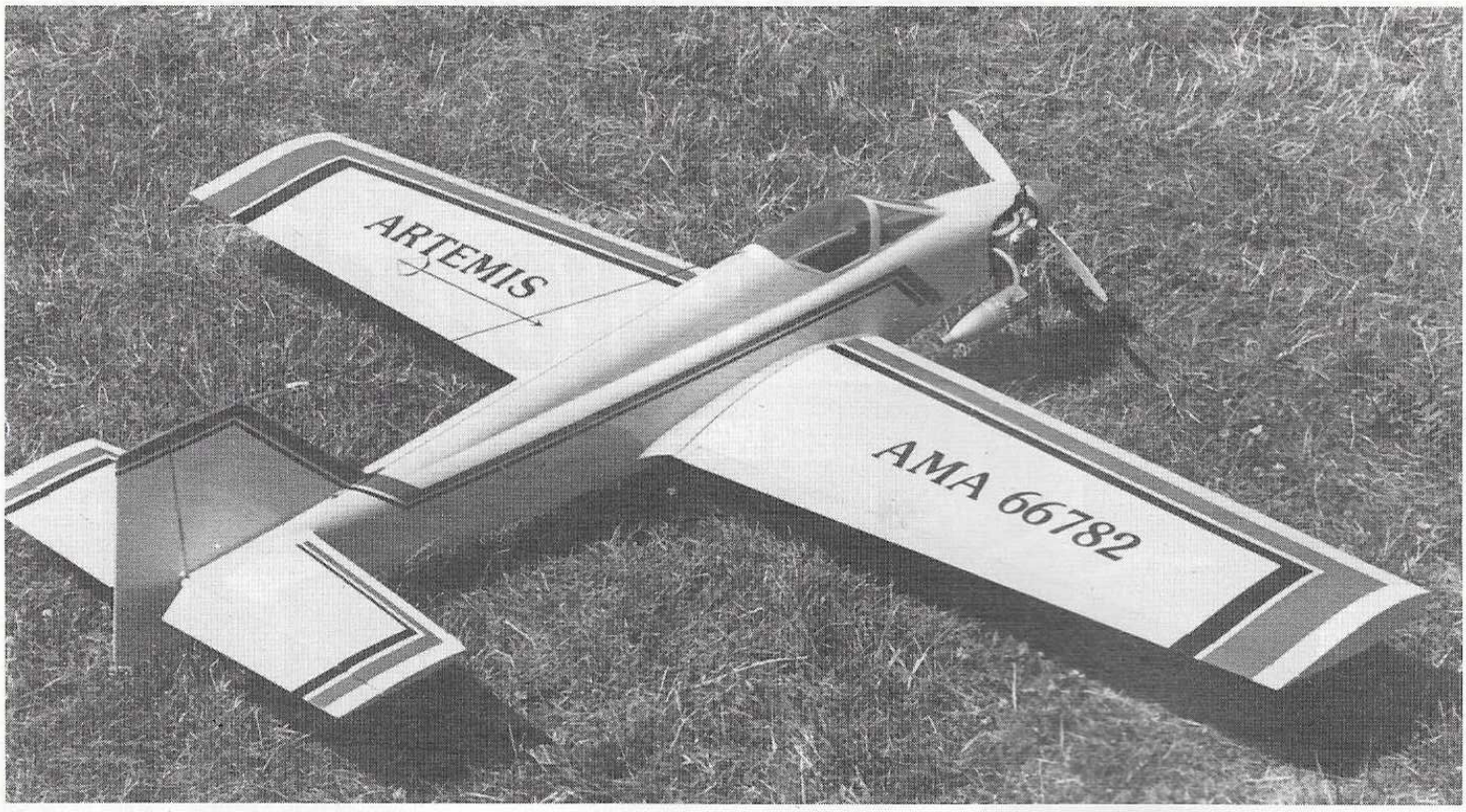


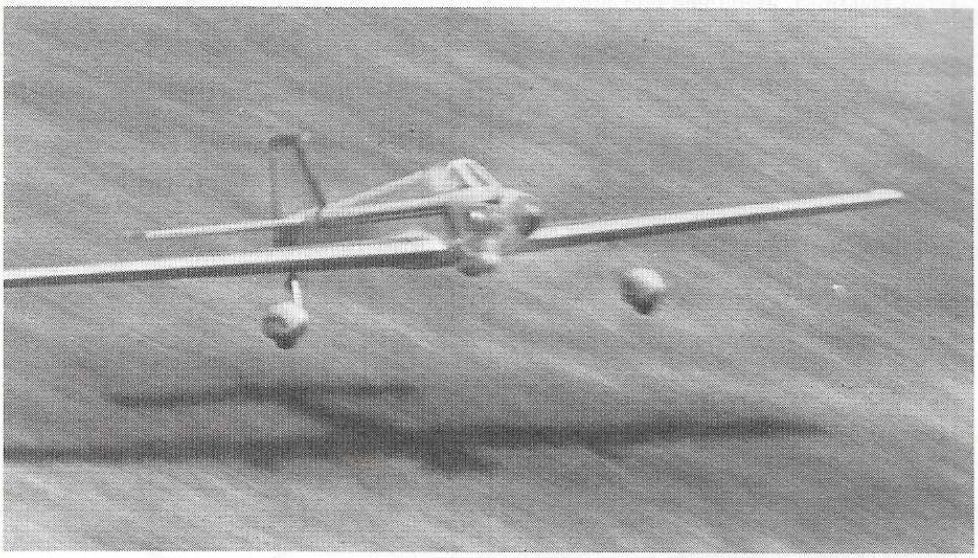
PHOTOGRAPHY: RICK ALLISON

Artemis

By Rick Allison

Artemis. Daughter of Zeus and Leto, sister of Apollo, goddess of the moon and of the hunt, mistress of wild beasts, slayer of Orion, and an archer of no mean accomplishment. Also, alas, a professional virgin...a fact which probably accounts for her relative obscurity. No love interest, you see, so not much of a story. Well, hopefully the tale of *this Artemis* won't be quite as ho-hum as that of her ancient namesake. In fact, if you've got a lonely pair of thumbs who are looking for a little airborne romance, you could do worse than to introduce them to this little sweetheart. There is a catch, though. You have to build her first.

Time for a little background before we rush into the nuts and bolts stuff. *Artemis* was conceived as a proof of concept vehicle. For us non-engineers, that means: "Let's see if the dang thing works before we spend the real money." The concept I thought needed proof was this: could a laminar flow airfoil find true happiness married to a pattern type airframe? The source of inspiration was a copy of Martin Simons' excellent book *Model Aircraft Aerodynamics*, available from your local hobby dealer or Model & Allied Publications, Argus Books Ltd., 14 St. James Road, Watford, Herts, U.K., whichever is easiest (not to mention Carstens Book Hangar; listed as #3218 for 14.95). Personally, I'd try my dealer first! No kidding, this is a great reference. Even if, like me, you tend to grit your teeth at the math, the pictures and diagrams are pretty plain.



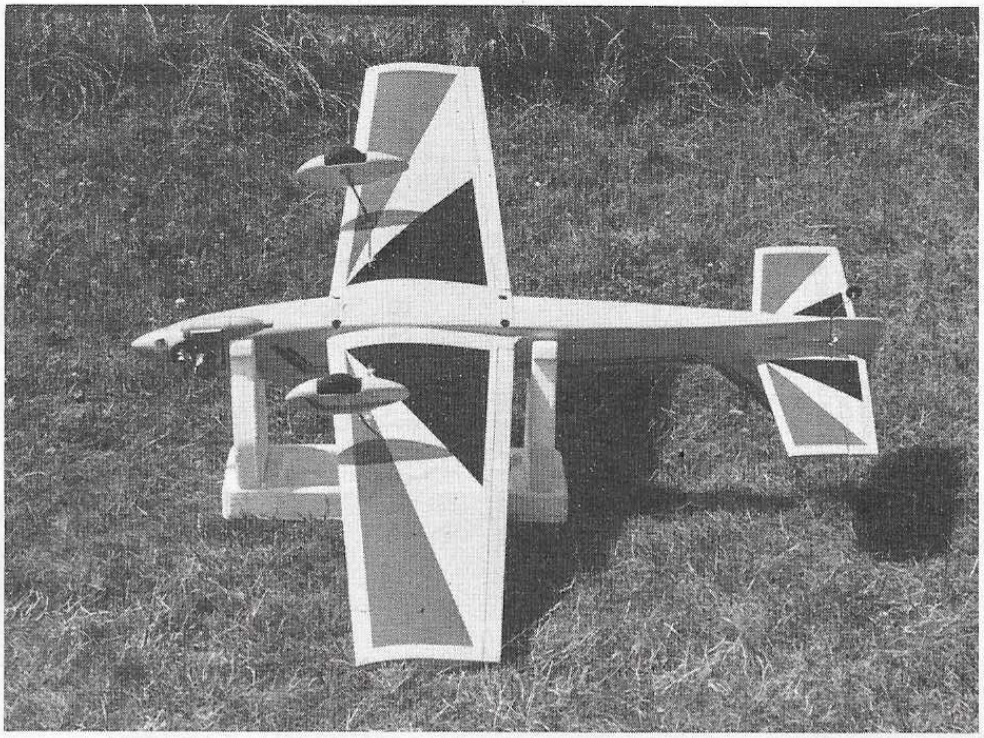
Leaping off to another date with the sky, the author's *Artemis* has proven itself more than a sleek sport aircraft. It was originally an "understudy" that made it in the "big time" of Sportsman pattern.

Mr. Simons got me started by offering the opinion that as the Reynolds number falls, the chances of preserving laminar flow go up, and that, because of the lower Reynolds numbers involved, and the higher relative viscosity of the boundary layer due to scale effect, the standard of precision (wing smoothness) required to maintain laminar flow is *less* for models than for full-sized aircraft!

Now, without getting terribly technical, and hopefully without starting a controversy, I'm going to go way out on this limb and say that the *theoretical* advantages of laminar flow have been well known since around WW II; i.e., lower profile drag over a broader speed range, and therefore, overall, a more efficient wing. Obviously, there are limits. You don't see indoor rubber stuff floating around on laminar flow wings, and the larger, slower ships which operate over a narrow speed

range don't need them either. What really convinced me to sit down at the drafting board was Simons' assertion that with the so-called "thick" sections of, say, 15 to 18%, these advantages should be even larger, and that such a wing would be less affected by slight inaccuracies of flying, and less slowed down in steep turns. Steep turns are high lift, high G-load situations, such as are found in aerobatics. After reading that, I became convinced that the whole thing was worth a closer look. A brief search of the literature revealed that if anyone else was playing with the idea, they weren't exactly shouting it from the rooftops. I decided to go ahead anyway.

The section chosen was a "stand-off" scale version of the NACA 64 2 015 airfoil, with a leading edge radius of 1.59%. This is one of the famous NACA "SERIES-6" profiles, derivatives of which were used on the P-51 *Mustang*. I figured that if it was good enough for North American Aviation and Chuck Yeager, it was good enough for me. "Stand-off" scale because I only plotted about every other point. I'm sure that anyone who has performed this tedious task will understand and forgive - or, at least understand. A .40-.45 sized airframe was selected for the best of all possible reasons - I already had several suitable engines lying around. I



With the help of Martin Simon's excellent book on model aerodynamics, the author chose a laminar flow wing and a higher than normal aspect ratio. It looks short coupled, but the pitch stability is great.

The ancient Artemis of Greek lore was a noted archer. This sprightly R/C namesake takes aim on both competition and fun!

was trying for a simple, fast building, conventional geared sport pattern ship for "turnaround" practice. I like a little higher aspect ratio wing planform than is common practice, so effectively speaking, the airplane looks a little short coupled. Don't let it worry you; pitch stability is great, and the major trim problem was slowing the roll rate down to something reasonable.

One of my initial rationalizations for the project was that if she turned out well, I could use her as a back-up ship for my annual Pattern adventures. Well, I got just a little more than I bargained for. Due to attrition, *Artemis'* sixth hop was an official flight at a sanctioned meet. Two days later, I wound up a tight third in Sportsman, just a skinny half point out of second. Now, I'm no hotshot just yet, but this airplane tracks well enough to work for Union Pacific. I believe Elmer Fudd could have done nearly as well - and I haven't bothered to fix my old number one airplane yet. I just might build up another one of these instead. Care to join me?

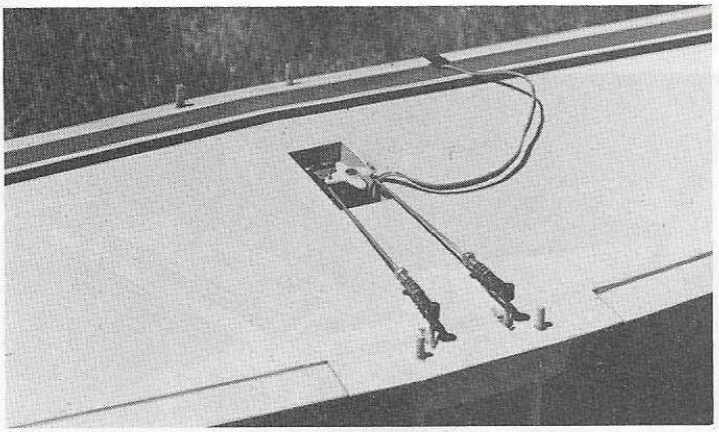
Construction

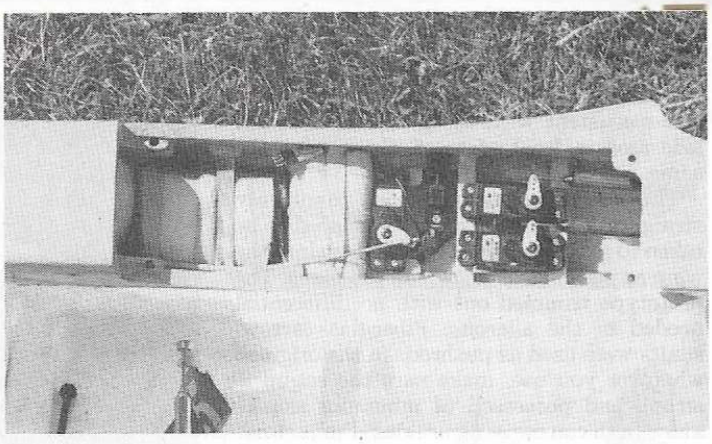
Most of the airplane is conventional, and a careful reading of the plans will enable most fairly experienced builders to cruise right through. There is one sort of sticky spot, however, which I'll try to deal with in detail.

Make a full kit of parts. Now send it to *me* and make another one for yourself. Just kidding. The plans specify 1/8 inch hard balsa for the fuselage sides. If this isn't available, or if you plan to do without the wing fillet (which adds a great deal of strength), use 1/8 inch light poplar. When cutting the fuse sides, leave the belly pan sides attached to the wing saddles. If the parts aren't straight and don't fit quite right, go to the bathroom mirror and complain to the guy who cut them. This is a lot easier than calling some kit manufacturer long distance.

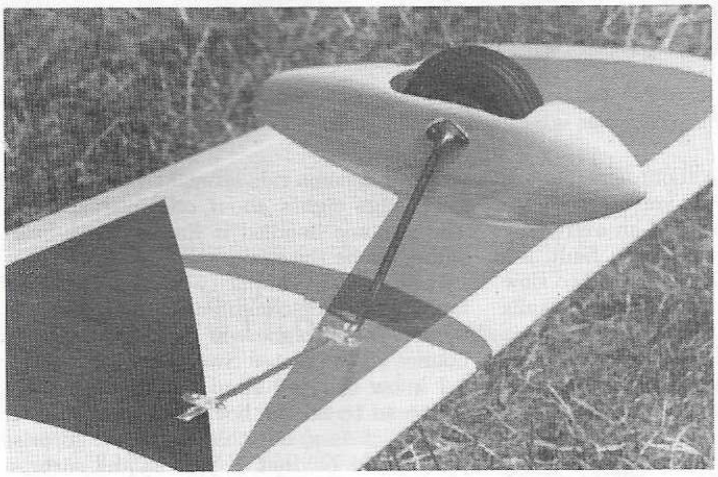
The prototype was designed to use the O.S. .45 FSR. If you plan to use another engine, now is the time to assemble engine and mount, take the measurements, and plan your installation. This is also a great time to locate and drill all the holes in your firewall. If you want to use a tuned pipe (the original is *very* fast without one), either make the gear legs longer for a bit more ground clearance, or use a rear exhaust engine and run the pipe down the side. The latter would be my choice.

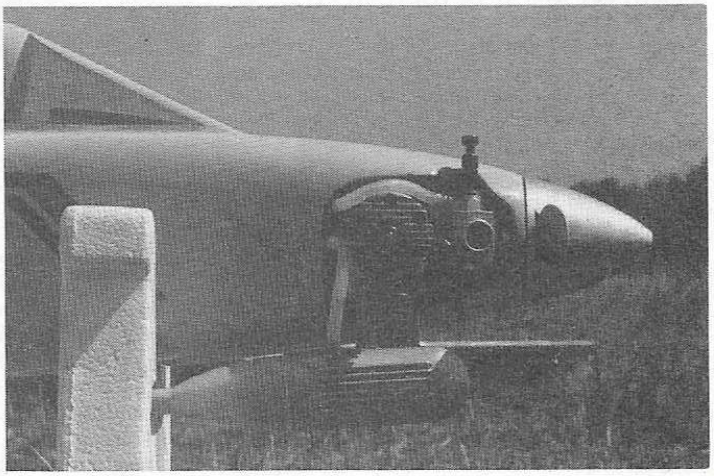
Many of the components are foam—wing, stab cores and the turtle deck. Helps to ease the building chores and get you to the field a little quicker. The clear plastic canopy is from Sig's *Kougar*.





When installing the aileron servo and its linkage, be sure to recess the servo in the wing as deeply as possible (**above left**). No contortions required to muscle in the radio (**above right**), there's plenty of room. Wheel pants add a little class (**below left**), not to mention subtracting some drag. An O.S. .45FSR, without pipe, provided plenty of power (**below right**). If you use a pipe, a rear exhaust engine might be better.





The wing and stab cores are cut in the conventional manner. The stab tip templates are a bit thin, so being careful is the order of the day. With a soldering gun and a copper wire cutter, open up the wells for the gear blocks in the wing cores. I'm going to curry favor with the Editor, and reveal that there is a fine explanation of how to do this in "Project Pattern", August '84 FLYING MODELS. A good source for *Artemis* foam wing and stab cores is: Par Troy Sound, Sussex County Mall, Rt. 206, Newton, NJ 07860. A complete set of cores are available for $25.00 plus $3.00 shipping and handling.

The turtledeck core is our sticky spot. Start with a block of foam 21 inches long, 3 inches wide, and 3 1/2 inches high. With a fine line marker pen, put centerlines on top and on both ends. Cut two "A" templates with entry and exit extensions long enough to clear the foam; that is, more than 3 inches in total height. Make a diagonal cut lengthwise through the block, corresponding to the side planview of the deck. You should have a pyramidal shaped block 21 inches long, 2 1/4 inches high at the big end, 1/4 inch high at the little end, and 3 inches wide. This is the core block. Grab some 3 inch nails, and nail two blocks, core and bed, back together along the marked centerlines. Attach an "A" template at each end, taking care to align the top and end centerlines properly. (That's right, I said the "A" templates. The "B" template shown is nothing more than a guide for marking the rear "A" template to make placement a little easier). Now cut the core. Leave the core nailed to the bed.

Sheet all the cores, using whatever method you like. Epoxy is the strongest and lightest; contact cement (Robart 007 works well) is the easiest. Your choice, I'm no glue snob. Just don't sheet in warps. Use a *flat* surface. If using epoxy, again, refer to the September '84 issue of this magazine and use the method described in "Project Pattern". Perfectly straight is almost good enough. Perfectly straighter is better. Open the skins over the wells and install the gear blocks. Bend the main gear from 5/32 inch music wire and check the fit in the blocks.

Add the leading edges, trailing edges, and tips to both the wing and stab panels, mark centerlines on everything, and sand to shape. While it isn't shown on the plans, I protected my squared-off tips with 1/64 inch ply plates. This is probably a good idea; bench rash is easy to come by. Assemble the wing and stab panels, per the plans, and fiberglass the center joints. I like to pre-drill my dowel hard points. Note that these extend below the bottom surface of the wing. Measure carefully and install them, again, à la "Project Pattern". This time, you need the January '85 issue.

Next on the agenda, we have the ailerons and elevators. Cut these from the indicated stock sizes, custom fit, and hinge. Out near the tips of both the wing edge of the panel properly faired into the leading edge of the control surface. Protect the trailing edge with masking tape and work carefully. Ailerons, in particular, which protrude above or below the wing do nasty stuff to your trim. This is a good time to build up the fin and rudder from firm 1/4 inch balsa. If you want to use another tail wheel arrangement, fine, but if you use the one on the plans, don't forget the pine insert in the rudder for the tail wheel tiller.

The fuselage is your basic slab sided box. Inset the front wing hold down blocks into the 1/16 inch ply doublers; it makes a much stronger joint. Prepare the fuse sides by adding the 1/4 inch triangular stock to the bottom inside edges from F-2 to the tailpost position. Using a triangle, fit and glue the firewall, F-2, and F-3 into position on one fuse side. Add the other side, the rear wing hold down block, and the triangular stock bracing. Invert the assembly, hanging the firewall off the end of the board, and draw the tail together. You should do this over that long straight line that innumerable people before me have told you to draw on your building board. The idea is to not build a bananna. Fit the remaining formers. After the basic structure is complete, the top longerons are added, along with the top and chin blocks. Mark the position of the turtledeck on the top longerons as a guide to shaping. Using a razor saw, free the belly pan sides from the fuse, exposing the wing saddle. Set the wing accurately in the saddle and drill through the holes in the dowel hard points into the hold down blocks. Tap the blocks and sticking a sheet of waxed paper between the saddle and the wing, use the fillet bases as spacers. Bolt the wing in place and proceed to build up the belly pan. Unbolt the wing and sheet the bottom of the fuse pan. Drill back down from the top of the wing to locate and open the bolt wells. It is now time to carve and sand to your heart's content. The cowl is built up from 3/8 inch soft blocks.

Add the tail feathers. Think straight. If you don't own an incidence meter, you should. It's doggone hard to build an airplane without one. Set the stab at 0 degrees relative to the wing and thrust line.

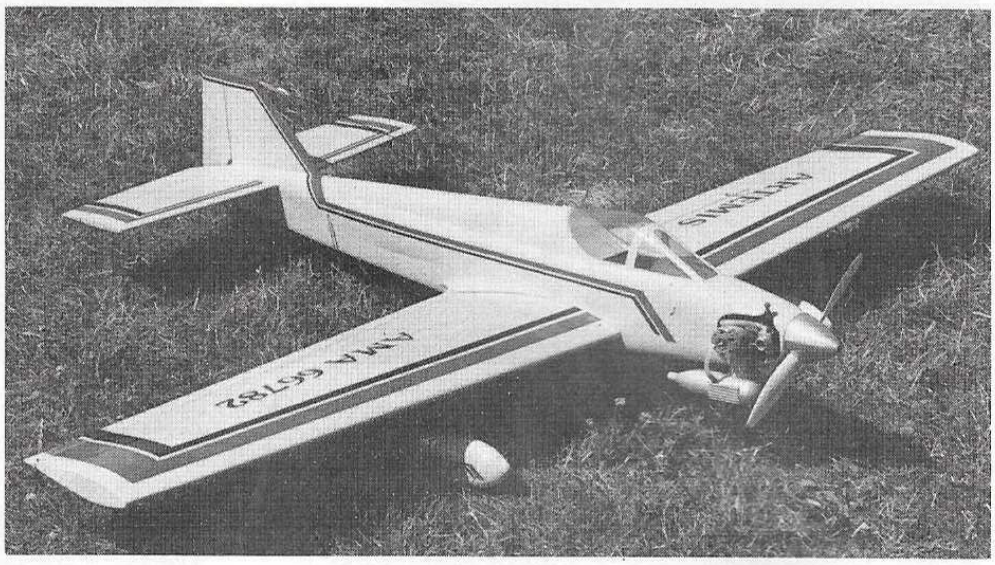
Add the turtledeck and filler blocks; preshaping the latter before gluing in place is a little easier. The fillets are a micro-balloons epoxy slurry over 1/32 inch ply bases.

The *Kougar* canopy is available from Sig. I just happened to have one, so I used it. An alternative would be to carve and hollow one

out of balsa. Just keep the general shape and size consistent with the plans, so that the side area in front of the C.G. remains the same.

The radio installation is absolutely straight forward though pains do need to be taken to set the aileron servo as deep into the wing as possible, as shown on the plans. The prototype trimmed out with no differential needed in the ailerons. Fiberglass arrowshafts were used as pushrods in the original; whatever you use, make sure the set-up is strong and possessed of minimum slop. I know faith can move mountains; I'm just not sure about it keeping the elevators connected to the servo during a hard outside square corner!

I leave the choice of finish to you. I used Hobbypoxy over K&B resin, and the ready to fly weight came in at 5.7 pounds. A Mono-Koted version should come in close to five pounds; if you are planning on a .40 instead of a .45, I'd also plan on the plastic film.



Ready for some "airborne romance", the *Artemis* waits for some daring pilot to lovingly guide her through the pattern. Knife edge flight, in particular, is outstanding and all have fallen for her aerial charms.

Flying

Set the control surface deflections per the plans. If you have a dual rate radio, set low rate up at about ⅔rd travel on aileron and half travel on elevator. Balance the wing statically, check the C.G. and bolt on something like a 10-6 prop. None of these recommendations are cast in concrete, but they do give you a decent baseline.

The wide gear makes for excellent tracking, and a little right rudder is all you need to grab the centerline. On grass, use a little back pressure during initial roll to keep the tail wheel nailed down until the rudder is flying, then ease her off.

I could wax very poetic about here, but the bottom line is that this is a very smooth airplane with no bad habits and an extremely wide flight envelope. If she has a fault, it's the fact that you have to plan ahead to slow down, because the airframe is so clean. Stalls are gentle and predictable, and the aircraft is very docile in slow flight. She has been flown by a fair number of pilots of varying skill levels from intermediate to expert, and they all land smiling. Knife edge performance in particular is outstanding; a climbing knife edge can be held as long as you care to do it. One Expert Class pattern jock who talked his way into a demo ride spent half a tank doing knife edge eights about one mistake high. The airplane handled it fine, but my heart will never be the same.

Landings are simplicity itself . . . set up a landing attitude coming over the fence, hold it, and the airplane will fly neatly to a no bounce three pointer. Sweetness.

I know that .40 sized taildraggers aren't supposed to be the hot set-up in the lower pattern classes, but this one could surprise you. Could be that it just might surprise some other folks too, and don't you just love to sneak up on people?