ABOUT THE AUTHOR

Dan Santich is well-known in the modeling world for his designs and contest participation. His first design to appear in RCM was the Rapier in the April 1970 issue. The August issue of that same year contained an article of his entitled "Hints, Kinks, and How-To's for Goodyear Racing", and his FAI Pattern ship, the Cardinal, was featured in the February 1972 issue of American Aircraft Modeler.

Following his retirement from the Air Force he was employed by Top Flite Models as their Chief Designer. His efforts there resulted in the P-47 Thunderbolt and the Freshman Trainer.

Now living in North Carolina with his wife and two boys, he is employed by Ingersoll-Rand as a design engineer and belongs to the Winston-Salem R/C Club.

MAGNUM 40

Designed By : Dan B. Santich

TYPE AIRCRAFT
Sport
WINGSPAN
56 Inches
WING CHORD
9 ¾ Inches
TOTAL WING AREA
546 Square Inches
WING LOCATION
Shoulder Wing
AIRFOIL
Double Reflex, Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
None
OVERALL FUSELAGE LENGTH
42 Inches
RADIO COMPARTMENT AREA
(L) 9 ¾" x (W) 2 ¾" x (H) 2"
STABILIZER SPAN
18 Inches
STABILIZER CHORD
6 ½" (Avg.)
STABILIZER AREA
112 Square Inches
STABILIZER AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
6 ¼ Inches
VERTICAL FIN WIDTH (incl. rudder)
6 ½" (Avg.)
REC. ENGINE SIZE
.40 Cubic Inch
FUEL TANK SIZE
8 Ounces
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready-To-Fly	64 Ounces
Wing Loading	17 Oz/Sq. Ft.

What's in a name? One of the most difficult tasks for me, I find, is picking a name for my designs. Take the Top Flite Freshman. When I designed that airplane I nearly went bananas trying to decide on a name. Obviously I wanted one that was at least somewhat descriptive. From the time I first drew a line on paper I was thinking about what I was going to name it. I wrote down every name that came to me, even if I was eating lunch or driving to work. Of course, once the design becomes popular we use the name without account for the literal meaning because what was an adjective is now a noun. It is the modeler who ultimately decides the fate of a design, regardless of the name. I think the "Ugly Stick" is a good example. That airplane could have been named "Chicken Squash" and it would still be the same excellent design. So perhaps the name is not all that important, at least to the modeler anyway.

It is a known fact that the majority of R/C modelers are sport fliers who could care less about contests. Just give them a half decent day, a place to fly, some fuel, and the sky belongs to them. Unfortunately, however, the kind of airplane that fits the needs of these modelers is not that abundant in the hobby shop. Why? For one thing some kit makers believe that only contest winning models sell. This is certainly true to a degree but what happens when the plane stops winning? Or when there is a change in rules that necessitates a design change or even abandonment of the existing design? They gather dust on the hobby shop shelf, usually. But the good sport model will sell on and on. Unfortunately, only a few manufacturers recognize this and even fewer supply the sport modeler with the creativity necessary to capture their interest. I think the sport modeler is the most under-rated, least heard, and most taken for granted individual in the entire realm of modeling. And yet he makes up over 80% of our modeling population!

When I design an airplane it is usually because I can't find exactly what I want in the hobby shop. Being basically lazy, I would really prefer punching out die-cut parts and gluing ready-made pieces together. But no sooner do I design one up for myself then everyone who sees the model wants one also. This is great for the ego, but a heck of a lot of work. But it is a labor of love (and little money!) and I have always enjoyed sharing my ideas. It is a great kick to go to any flying field in the country and see a model of my design being enjoyed by someone I don't even know. The satisfaction derived is hard to describe. And so I now offer to you a model called the "Magnum 40."

The Magnum 40 is a terrific "hot dogger". But don't let that scare you because it is also a pussy cat, being very docile and responsive in slow flight. It is an excellent airplane for fun flys, sport pylon racing, or just plain fun flying. The wing being a 15% airfoil with 546 square inches area carrying 4 pounds around with a .40 size engine on the nose, amounts to an airplane capable of just about anything.

The Magnum 40 has the greatest speed differential capability of anything I have ever flown. It is a real kick to literally burn up the sky with high speed passes, snaps, loops, rolls, pylon turns, etc., and then to throttle back and tool around at almost a walking pace. With a little breeze it will actually "fly" backwards! It will loop tighter than a control-line model and square maneuvers are hard to believe!

Have I got you interested yet?

HARDWARE REQUIRED

Hinges	Du-Bro H-15
Horns (4)	Goldberg
Clevis (4)	Goldberg
Aileron Bellcranks (2)	Goldberg
Landing Gear 12"	Prather
Wheels, 2¼" dia.	Kraft
Tailwheel, 7/8" dia.	Perfect
Tailwheel bracket	Goldberg
Exit Guides (4)	Klett
Windscreen	Sig .030 butyrate
Blind nuts, 6/32 (5)	Sig
Allen head screws, 6/32 (10)	Sig
Engine mount	Sig Large or CB RR 40
Blind nuts, 4/40 (4)	Sig
Allen head screws, 4/40 (4)	Sig
Fuel tank, 8 oz.	Pylon Brand
Fuel line, medium 1'	Sullivan
Spinner, 2¼"	CB
Thread	
Throttle Cable, 18"	Du-Bro
Pinking Tape, 2 x 24"	Sig
Tube, 1/4" I.D.	K & S
Large servo grommet	
Covering Material 2½ rolls	Solarfilm

BILL OF MATERIALS

Construction

2 — 1½" x 2" x 10"	balsa
1 — 1/2" x 3" x 8½"	balsa
2 — 3/16" x 3" x 48"	balsa
5 — 3/16" x 3" x 36"	balsa
2 — 1/2" x 1/2" x 36"	balsa
8 — 1/4" x 3/8" x 36"	balsa
1 — 1/4" x 1½" x 2¾"	balsa
3 — 1/8" x 4" x 36"	balsa
3 — 3/32" x 3" x 36"	balsa
7 — 1/16" x 3" x 36"	balsa
2 — 3/8" x 1½" x 36"	balsa
	aileron stock
1 — 1/4" x 6" x 6"	plywood
1 — 1/8" x 6" x 12"	plywood
1 — 1/32" x 2" x 2"	plywood
1 — 3/32" x 3" x 6"	plywood
1 — 3/8" x 3/8" x 12"	hardwood
	servo rails
1 — 3/32"	piano wire
1 — 1/16"	piano wire

The performance capability of this airplane and its unusually good flying characteristics are, for the most part, due to the airfoil. I have been experimenting for years with variations of this airfoil. I have used it on pattern ships, gliders, pylon racers, and even propellers. In fact the P-47 Thunderbolt that I designed for Top Flite has it partially and by now the flying qualities of that airplane are almost legendary.

you in figures why something won't work and then someone like me comes along and blows their minds. What I think we have here is the "Coke Bottle" theory found on most jet fighters, except where, in that case, the reflex was applied to the fuselage, this is on the top surface of the wing. It was found that by reflexing the fuselage at various stations, the drag was reduced considerably which allowed a much greater speed potential.

attack that generates the most lift in any airfoil. Unlike their full scale brothers, our models are almost always in a continuous change of attitudes and angles of attack. The double reflex airfoil can handle these conditions better than a standard symmetrical, because it will hold the airflow laminar (parallel) beyond the two-thirds point of the wing chord. This happens because as the air reaches the high point it suddenly

MAGNUM 40

A hot-dogger and a pussycat - - - the Magnum .40 is both. It'll do just about everything in the book, but is completely docile and responsive in slow flight. For fun-flys, sport pylon, or just plain flying pleasure - - - the sky is all yours with the Magnum 40.

By Dan B. Santich

Actually the airfoil having a reflex top section is nothing new. Birds have had it for some time now! But when an acceptable method becomes the "norm" we tend to resist any changes, especially if it is somewhat radical or counter to our understanding.

I am a "rule of thumb" designer and admittedly ignorant to the laws of aerodynamics. But what works, works, and that is what really counts. The theorists can sit around all day and show

In this case, by reflexing the top surface of the wing, what we have done is increased the distance the air must travel from leading edge to trailing edge. This amounts to an increase in lift without a corresponding drag increase. Since air has no directional grain it could care less what attitude we are in when we pass through it (not counting ground effect). It is when we change direction within that body of air that things happen. It is the initial change in angle of

encounters a "down hill rush" to meet the air at the trailing edge. As it accelerates down hill the air on the surface forms a layer of super tight microscopic bubbles which rotate in the direction of the main air flow and form a powerful low pressure area within the reflex zone, holding the main air flow laminar even under conditions of extreme and abrupt changes in angle of attack.

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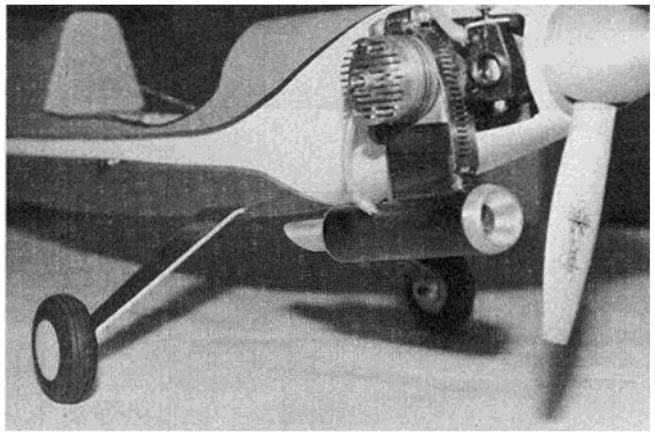
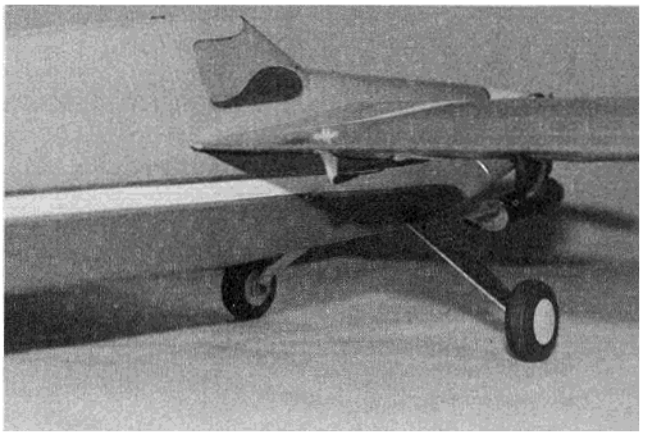
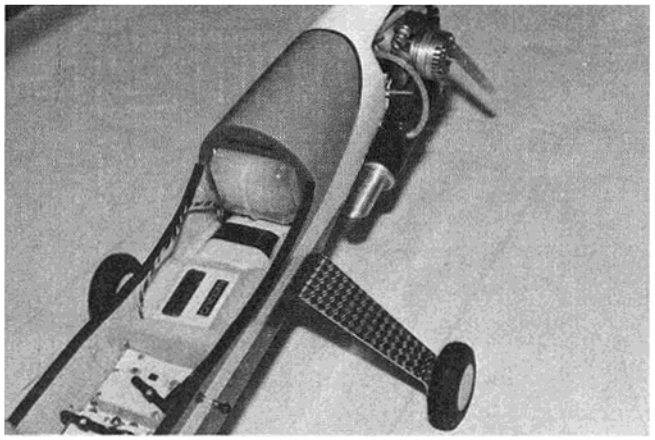


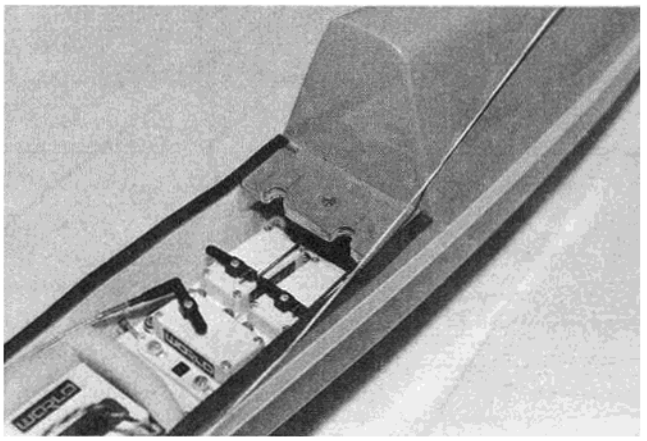
Completed nose section showing side mounted K & B .40 with Semco muffler.



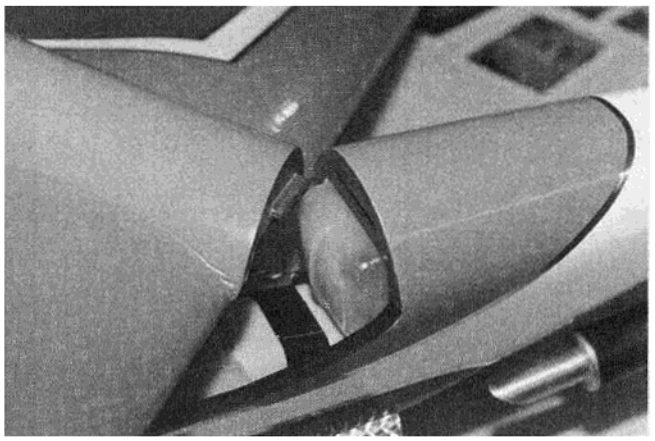
Landing gear position lends itself to good ground handling.



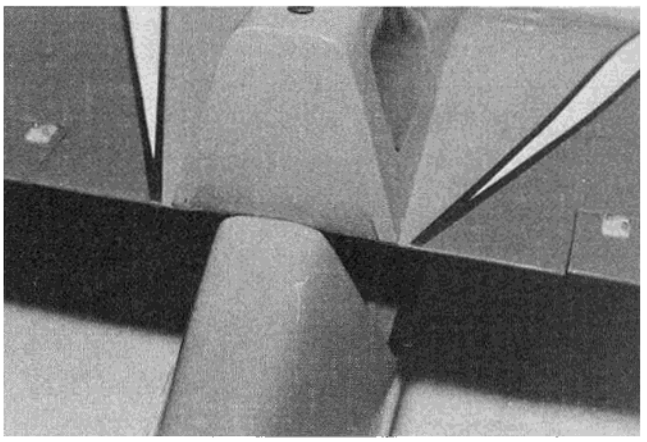
Forward view of radio compartment.



Servo installation is tight but sufficient.



Plywood tongue fits into slot in forward bulkhead.



This is how you get the wing off and on. Don't forget the notch.

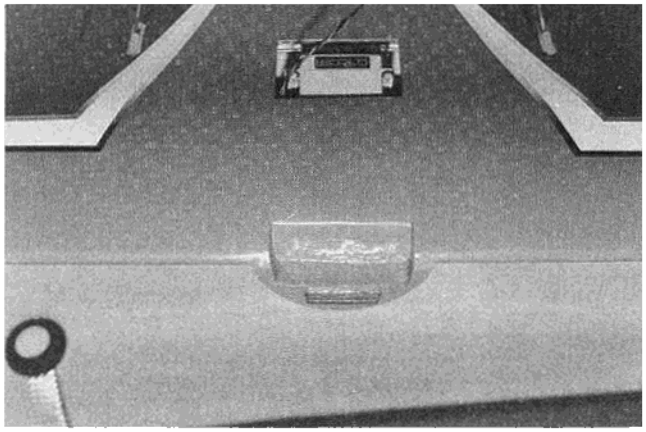
Does this sound reasonable? Who knows. But like I said, it works and I can promise that if you build this model you are in for one of the most enjoyable experiences of your modeling life.

CONSTRUCTION

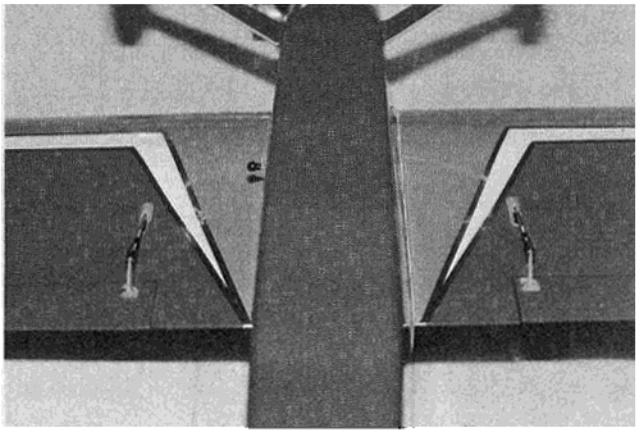
I have located the individual parts on the lower portion of the plans to facilitate construction without having to dismember them completely, something which I personally hate to do. Included with the article is a complete list of building materials as well as necessary hardware. The proper selection of balsa is essential and this is where you have the advantage over a kit. In a kit you take what they give you. Here you can get just what you want. Be picky because after all it is your money. Titebond glue is recommended for all joints with the exception of the wing capstrips (Pain). Since the reflex of the airfoil will want to let the capstrip lift up, I suggest you use Hot Stuff or Jet Glue.

Fuselage: We will start with the fuselage for a good reason. It is the mount for the wing and it will be much easier to line up when we get to that point.

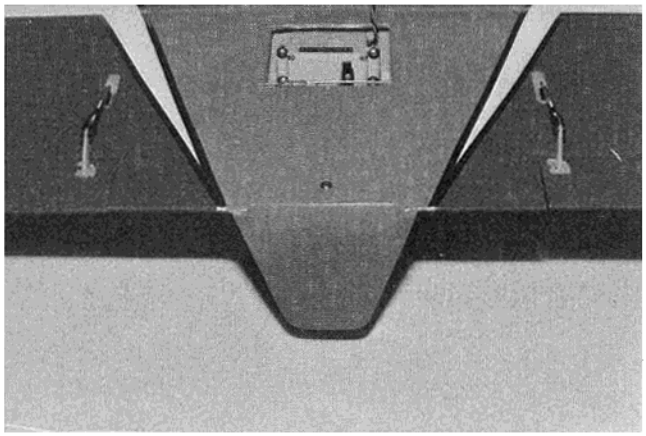
Cut out all parts identified on the plans for the fuselage. When you cut the 3/16" balsa sides be sure to allow 1/8" to the width and 1/4" to the overall length. This is because the plans are flat and do not account for the curvature or slant. Mark the bulkhead locations of F-4 and F-7 on



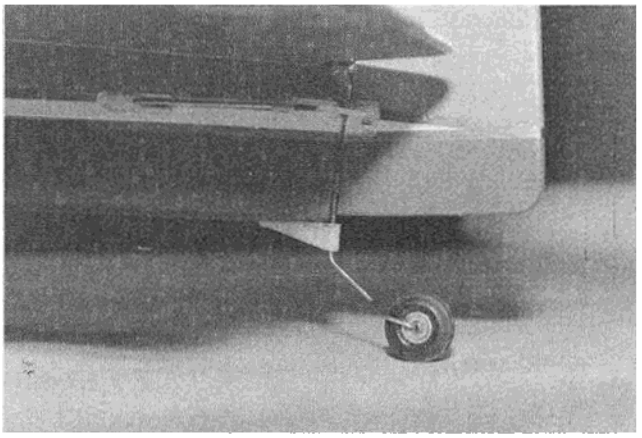
Cut-out in leading edge of wing allows clearance for fuel tank.



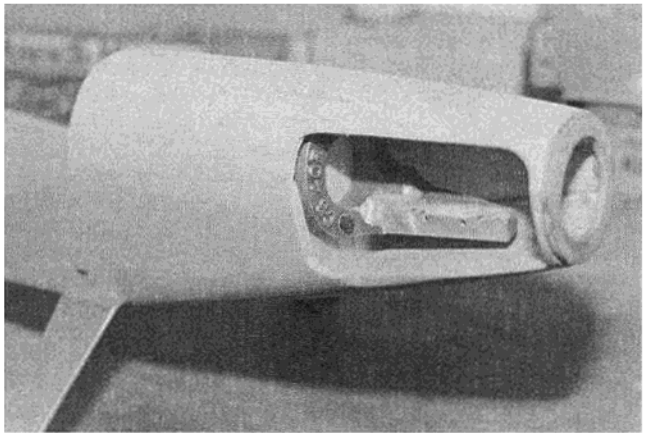
Bottom view of fuselage with wing in place.



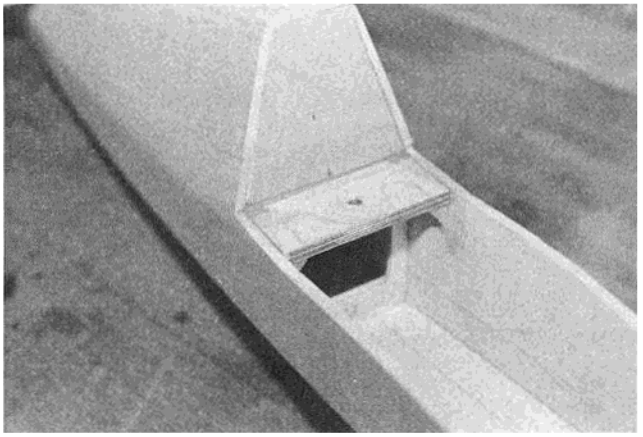
Close-up of notch in rear of wing for removal.



Angle tailwheel back for better ground tracking.



Nose section showing CB aluminum mount installed.

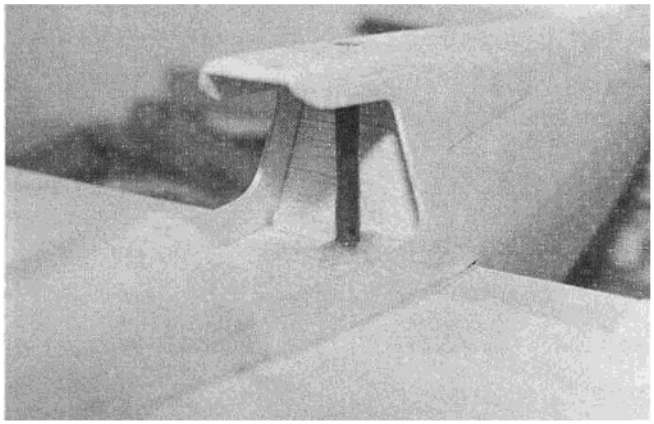


View of rear wing hold-down plate.

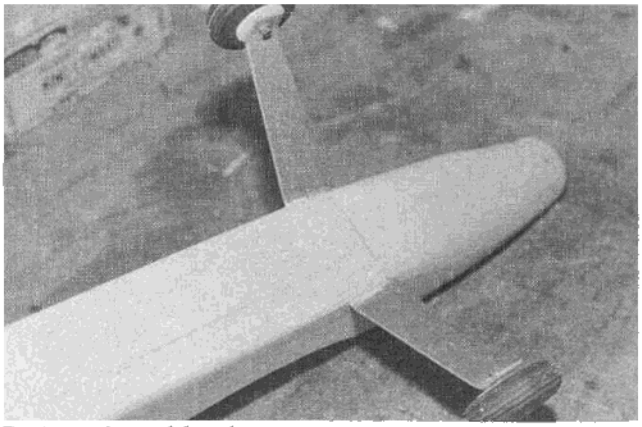
one fuselage side and glue them in place. Make sure they are vertical by checking them with a triangle. Glue on the opposite side making sure it is even and parallel. When dry, line up on a centerline and glue F-8 and the tail end together. Drill the holes for your aluminum engine mount in bulkhead F-3 and glue it in place, holding the sides with rubber bands. Glue F-2 in place, notch the 1/2" x 3" x 8½" nose block for F-3 and glue in place. Mount the dural landing gear to F-5 and glue to the inside of the fuselage. Add the 1/8" bottom sheet all the way back and glue F-9 in place. Add the triangle aileron stock to the top of F-5 for strength. Also glue triangle aileron stock to the rear of F-3 and the triangle braces to the front side. Glue F-2 to nose and, when dry, glue the 1/8" balsa sheet to the top. Glue F-1 to the front end and cut out the center of F-2

Cut the 3/16" top rear section to shape, and glue in place. Mount horizontal stab, check alignment, and glue. Add the 3/16" fillets to the top of the stab and then glue the 3/16" fuselage top rear section in place. When dry, glue the 3/16" vertical fin in place and check alignment. Cut out the right side of the nose for your engine, allowing clearance for muffler.

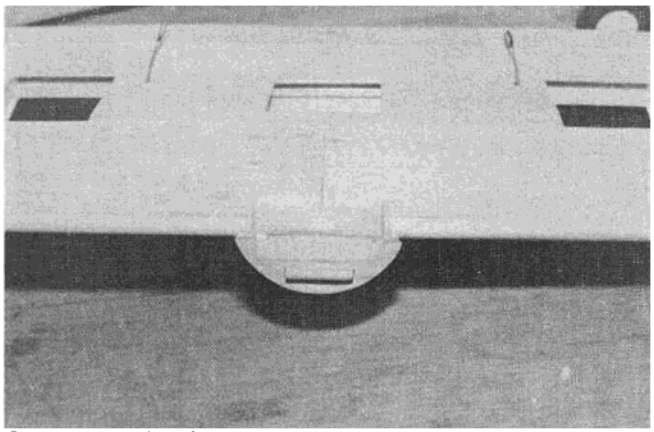
Wing: Cut out all wing parts from the plans. To make the ribs quicker, cut yourself a master pattern from thin



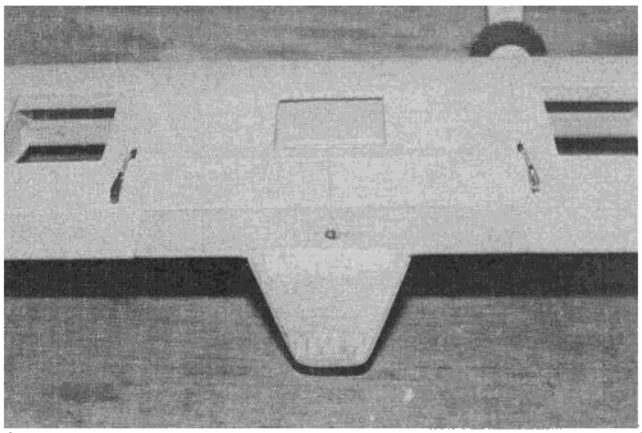
Guide tube for wing hold-down screw.



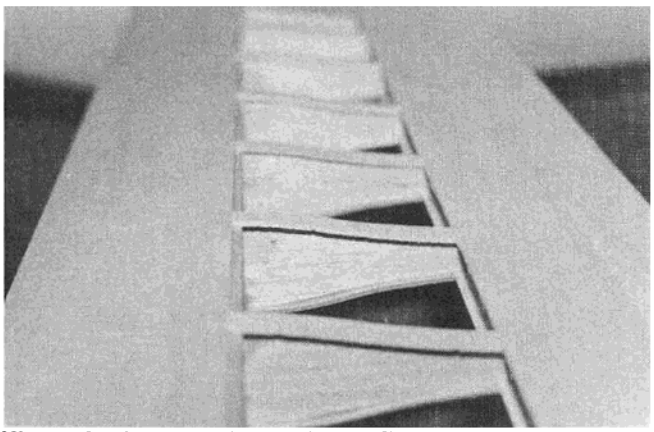
Bottom view of fuselage.



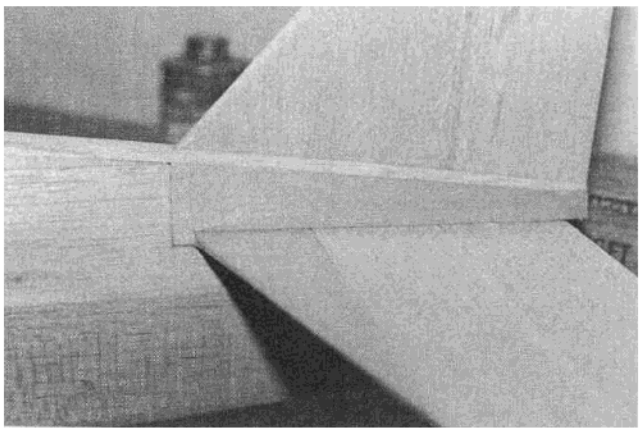
Cut-out in wing leading edge before covering.



Completed wing viewed from bottom, sanded and ready for covering.



View of wing panel showing reflex. Note cross grain capstrips.



Close-up showing fin and stab installed.

aluminum. This will speed up the task and they will be closer to each others shape. Pin the top 1/4" x 3/8" spar to your table and mount the ribs, supporting them at the back with a 1/2" x 1/2" balsa strip. Notch the leading and trailing edges with an X-Acto saw for your ribs and glue in place. Add the top 1/4" x 3/8" spars and sheet the leading and trailing edges. Glue ply brace W-I to spars. Glue W-I3's in place in the notches of W-11 and insert the connecting 1/16" piano wire. Mount the aileron bellcranks and threaded pushrod wire. Sheet the remaining center section and add the capstrips. Note the grain direction. Make cut-out for servo.

Turn the wing over and complete the top sheeting and capstrips. Add the 1½" trailing edge and glue W-8 in place. Drill hole for screw and check alignment. Add wing tips. Check the wing fit on the fuselage and align with the stab. Cut notch out of the front portion of the wing and glue W-4 and W-5's in place. With the wing on the fuselage, slip ply tongue W-3 into slot of F-4 and glue W-3 to the top of W-4 and where it touches the wing at the rear. When dry, remove the wing and glue W-2 to the front, making sure to angle it back slightly (see plans).

Glue W-6 and W-7 to the top of the wing and add the 1/8" balsa top section. Glue W-15 on top and drill a hole for the 1/4" ID tube. This tube is for access to

the 6/32" wing screw so do not omit. Insert the tube over the hole in W-8 and glue in place. The rubber grommet is to keep the Allen head screw from falling out when the wing is removed and the hole in the grommet allows access to it with an Allen wrench. Cut notch as shown on the plans in the trailing edge behind the cockpit. This will give clearance for wing removal. Add any cockpit detail at this time.

Covering: Sand down the entire model and finish as you desire. I have found it very difficult to achieve a lighter, prettier airplane than I can get with Solarfilm. It also will get you into the air faster! I prefer Solarfilm over other brands for 3 reasons: (1) cost, (2) it is easier to work with and to stretch around the wing tips, and (3) it is less brittle. I have seen the "High Price Spread" shatter like glass but never Solarfilm.

Remember that the more you sand it, the better it will look. I start with 200 grit and end up actually polishing the wood with 800 grit. I then vacuum off all the balsa dust just before covering. On a multiple color scheme such as I have done, cut your pieces to shape first. When joining these pieces on the airplane, overlap the joint about 1/4" and seal this seam completely. When you shrink it out with your heat gun, be careful not to concentrate the heat on a seam. When you have it all shrunk out, finish it off with striping tape. Cut out the butyrate windscreen and glue it in place with Hot Stuff or Jet. Mount your wheels, tank, radio, etc., and you are ready for a flying experience you will not soon forget.

Flying: Check your C.G. location, proper control direction, and set your throttle. Control travel is a matter of personal preference but for "hot dogging" you will want more than the norm. You will quickly learn that this airplane is capable of the wildest maneuvers imaginable, but it is also honest and predictable. I hope you enjoy it. □

From RCModeler Nov. 1978