# ★ALL STAR★



BY ROMEY BUKOLT

*THIS EYE-CATCHING 34" SPAN MODEL IS A MINIATURE COMPOSITE OF THE EAA HOME BUILT BIPLANES. USING TWO ACE FOAM WINGS, IT IS DESIGNED FOR TWO OR THREE CHANNELS AND A .10 ENGINE. EASY TO BUILD AND EASIER TO FLY, PROTOTYPES HAVE BEEN FLOWN WITH ENGINES FROM .049's TO .15's.*

The Biplane nut knows who he is! Anything that flies turns him on. If it has two wings he goes into an inverted spin. Even a Dragonfly will attract a second glance.

I'm one.

Way back in the Summer of '42 and the adjacent years, I spent many hours out at the local "Air Patch" watching an old barnstormer named Felix Gauthier, clad in a leather jacket, helmet with goggles, and riding jodphurs, trace lazy aerobatics all over the sky in an orange and black open cockpit Waco biplane. I was only seven then, but the memory of the sights, sounds, and smell are all still vivid in my mind as I re-live them frequently, particularly when I come across a Biplane photo. World I's, vintage mail planes, early WW II military trainers, and the currently popular small homebuilt two wingers all cause that same subtle nudge of adrenalin.

For a number of years now I've collected the various air periodicals, and always looked forward, especially, to the Air Progress Homebuilt Annual, containing the latest creations of these imaginative, energetic modelers whose eyes and appetites grew beyond the limits of the 36" balsa sheet. Then, last Summer I had the priceless, unforgettable pleasure of attending the Experimental Aircraft Association Fly-In at Oshkosh, Wisconsin, truly one of the most outstanding aviation spectacles in the world. There, on one field, at one time, a collection of the finest homebuilt and restored vintage aircraft were to be seen, touched, heard and watched as they stood, parked in endless rows, along the runway as hundreds more flew an endless chain of Touch and Go's from dawn 'til dusk. There, is where one could see Biplanes! Literally hundreds of them graced the field. Some were over fifty years old and still flying, while others were chromed and polished and brand spankin' new.

The typical homebuilt is sort of like a scale model of a model, like 72" = 1'0" scale. They build them nearly the same and they look and fly just like their slightly smaller counterparts. I say "slightly" because that's just about the size of them. These Pitts Specials, Smith Miniplane's, Baby Great Lakes, and many others are hardly larger than an R/C model. One can stand along the wing and rest his hand on the cowl while touching the wing tip, but they fly. Boy, do they fly! Precision aerobatics you wouldn't believe! If your euphoria is biplanes, then this EAA event is your "fix."

I've been building R/C models for the last seven years and have wanted to build a biplane ever since I first became interested in the hobby, however it seemed that the only scale-like realistic looking biplane kit available was the Andrews Aeromaster whose size and price were a little out of my reach. Many times I'd think up a design but always seemed to run up against some sort of phobia that said, for all the effort required to build up two wings, getting the alignment just right, with proper incidences, balance point, etc., I'd probably demolish the aircraft before I could trim it out, anyway. So, whenever my T'winger urge came up, I would draw a few sketches and doodle around with the design ideas and gimmicks until the feeling wore off, or I became buried under a confused muddle of unknown design factors.

Last Summer I finally broke through this "barrier" by using the "cheap and dirty" attitude – throw something together quick and easy with whatever is handy and if it turns out to be a "bummer", no great loss! So, naturally, the quickest way to a finished biplane is to start with foam wings. A couple of Ace Mini-Foam wings were gathering dust within an arms reach of me so I started with them. Using Chuck Cunningham's design parameters (RCM 3/69), I developed the correct fuselage and tail dimensions.

Probably one of my main psychological hang-ups about biplanes was always the cabane strut mess. I never was much good at wire bending and soldering. For a landing gear one can get by with a mediocre job, I suppose, but building a platform for a wing to be in proper alignment with another wing, seemed to be just a little more than I thought I could handle. Then, the idea of the plywood cabane struts struck me (nothing new, Ken Willard used it in his "Classmate" design, years ago). I decided to construct that area first so that if the idea didn't work I could abandon the whole project without expending too much effort. How's that for a positive attitude? Well, as it turned out, the cabane strut assembly came together with no effort at all. From that point on, construction of the remainder of the plane was no different than any single low winged aircraft. Since I got this far, I decided to go beyond the "cheap and dirty" boxy design I originally envisioned and, instead, lean more towards a scale-like image. Thus, the All Star homebuilt type sport biplane was created. Of course I still had no idea what I'd be up against in trying to get the airplane trimmed in its initial flights before it would plant itself in the sod or, for that matter, whether it would fly at all. Here again, my fears were eventually proved to be unfounded. Construction continued easily and the model was completed in a surprisingly short time.

The prototype was equipped with a Max .10 engine and three channels of an MRC – 710 radio for rudder, elevator, and throttle control. With all the flying surfaces looking reasonably square with each other and the center of gravity located as per Chuck Cunningham's suggestion, the plane was fueled up, started, and cautiously taxied around the grass field. It handled surprisingly well on the ground, so, with tongue in cheek, I turned the plane into the wind and faced the moment of truth. With a gradual increase of throttle, the model began picking up speed and, in about 20 feet, the tail lifted off the ground with no help from the transmitter. This brief moment is one of the main reasons nearly every model I build is a "tail dragger". It's a scale-like maneuver you just can't get out of a hot pattern ship.

The takeoff roll was smooth and straight. Remembering too well how I destroyed another aircraft on its maiden takeoff by too eagerly feeding in up stick pressure before the model gained sufficient flying speed, I decided to hold off as long as possible before applying only a slight touch of up-elevator. The plane continued across the field with its tail in the air for another 100 feet, then broke ground, lifting slowly into the blue. A cautious application of left rudder put the plane into a large gentle left turn. This told me that the aircraft was not overly sensitive to the rudder control, and a light pressure on the elevator control showed me the plane was not overly sensitive to the elevator control, either.

With this load off my mind, I was able to make a few necessary in-flight trim adjustments and suddenly "discovered" myself flying my own biplane instead of just thinking about it. What a pleasure! The balance of the flight was pure fun. I found that the plane was docile and smooth in flight with no apparent bad faults. After a few gentle maneuvers, I throttled the engine down until the airplane could



**"Stunning" Tricia Bukolt, professional fashion model of Madison and Milwaukee, Wisconsin poses with the All Star, an all-star performer.**

no longer sustain flying speed and then eased in up-stick pressure until the plane was mushing along sort of like a lightly tossed folded paper dart. It continued to hold this attitude and showed no tendency to fall off on one wing or the other. The stall characteristics were excellent. You could fly this plane all over the sky at about half throttle and make slow lazy passes in a most scale-like fashion.

The landings are slow, easy, smooth, soft, and whatever other adjectives one can use to describe just about the prettiest thing you ever saw on the flying field. The landing roll continued smooth and straight, on grass yet, with no tendency to ground loop or nose over.

After a full Summer of flight testing with a wide range of equipment and trim variables, I can safely say that **nothing** is critical in affecting the performance of the All Star. It has been flown with engines ranging from the TD .049 to the Max .15. Wing loadings from 16 to a heavy 23½ oz./sq. ft. were tried. Incidences were varied on each wing from 0° to 3° without any adverse reactions. The center of gravity was shifted ½" either way from the ideal position without impairing performance. A variety of propellers and fuels were tried. None of these experiments put the aircraft in any marginal performance attitude. Therefore, the model should be easy to build, easy to trim, easy to fly, no matter what kind of builder you are and regardless of what kind of equipment and control you prefer. The plane is small, but don't brush it off as an over equipped R/O job. With a Max .15, it is a real live one. It loops, spins, flies inverted, rolls, all with the greatest of ease. Touch and Go's are effortless. In short, it is an All Star performer.

## CONSTRUCTION

**Fuselage:**

Begin by placing each of the nose, battery, and servo doublers on the fuselage sides. Check each for proper matching and location. Before cementing the servo doubler, plan your servo installation and make the necessary servo rail cutouts in the doubler. If you intend to use a heavier engine such as an Enya .09 or Max .15, the battery pack could very likely end up under the cockpit. Also, the pushrods must clear the bottom of F-3, so keep these factors in mind when positioning your servos.

After the doublers are installed, cement the firewall, F-2, and F-4, to one side making sure that each is perpendicular to the fuselage side. I'd recommend using epoxy, at least on the firewall. As a matter of fact, one set of small tubes of Devcon 5-Minute epoxy will be adequate to assemble the entire plane, including the foam wings which must use epoxy, and because it sets up so fast, there's no waiting for parts to dry before proceeding with the next step.

Install the two servo rails and the second fuselage side, taking care to make sure that both sides are parallel and square with each other.

Pull the tail ends of the fuselage together and sandwich a 3/32" x 1/4" filler in-between. When joining the tail, check for proper alignment by setting one straight edge across the fuselage at the cockpit and another across the fuselage at the stabilizer cutout. Then, while sighting down the center line of the fuselage, adjust the tail glue joint so that the straight edges are parallel.

Mount former F-6 at the front edge of the stabilizer cutout and former F-5 half way between F-4 and F-6. Add spacers, cut from 3/32" x 1/4" stock, directly below F-5 and F-6 along the bottom of the fuselage.

Everyone uses their own pet techniques in building, but if you follow this suggested sequence in constructing the front end of the fuselage you might save a little time, trouble, and extra effort. The objective is to get a good fitting well aligned removable hatch-cabane strut unit.

1) Glue the small hatch mount block with the 3/16" hole, to the top back side of the firewall.

2) Cut the hatch block to the proper dimensions, 3" x 9" x ¾" high at the front and 1¼" high at the rear.

3) Lay out the saw cut lines on the hatch surface for the cabane struts, per the location shown in the top view of the plan. Note that the two lines converge a bit towards the front. This is because the top surface is inclined and they must converge if the cabane struts are to be parallel to the longitudinal axis of the fuselage.

4) Cut the two cabane strut slots 1/16" wide and at 60° angle with the bottom surface. This can easily be done on a Dremel saw or even a saber saw with a tilting head.

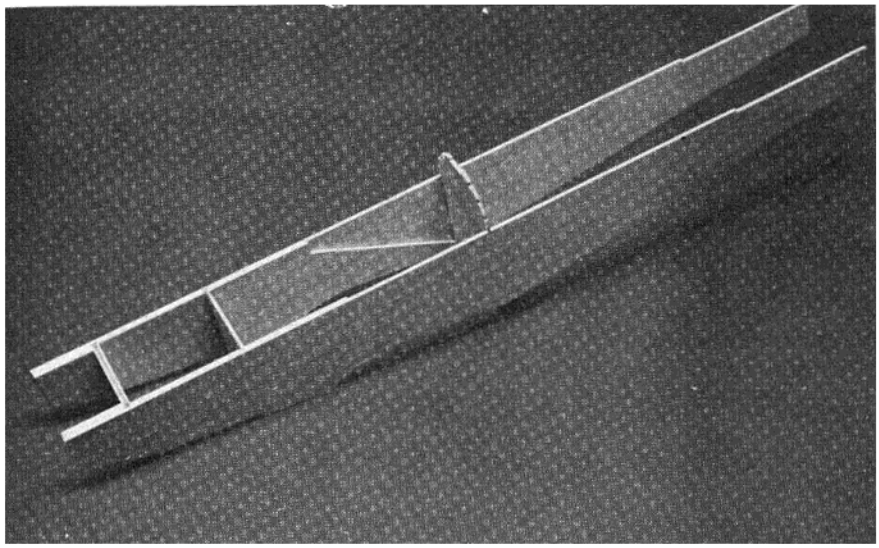
5) After you've drilled the ¼" hole in the F-3 former, use the former as a template to locate the hole position for the retainer dowel at the rear of the hatch block. Position the former so that there is 3/32" space between the top of the hatch block and the top of the former to allow for the cockpit coaming that will cover the top edge of F-3. Mark the hole location and drill a ¼" hole ¾" deep into the end of the block.

6) Now, before shaping the hatch block, insert the ¼" dowel so that ¼" of the dowel sticks out. Slide the F-3 former onto the dowel and carefully fit the assembly to the fuselage. When you are satisfied with the fit, and while the former is still on the block, apply cement to the bottom side edges of the former and install, using the hatch block as a holding fixture. Tape the assembly to the fuselage until dry. This procedure will guarantee a good fit between the fuselage and the hatch.

7) While the block is taped in place, turn the fuselage over and, through the hole in the small hatch mount block, mark the spot where the hatch mounting screw will come through the block.

8) Next, install the cockpit floor, followed by the two cockpit coaming pieces. This can be easily done if the hatch block is removed first. Once the coaming pieces are secured to the top edge of the fuselage, they can be moistened, bent, cemented and taped in place over the edge of the F-3 former.

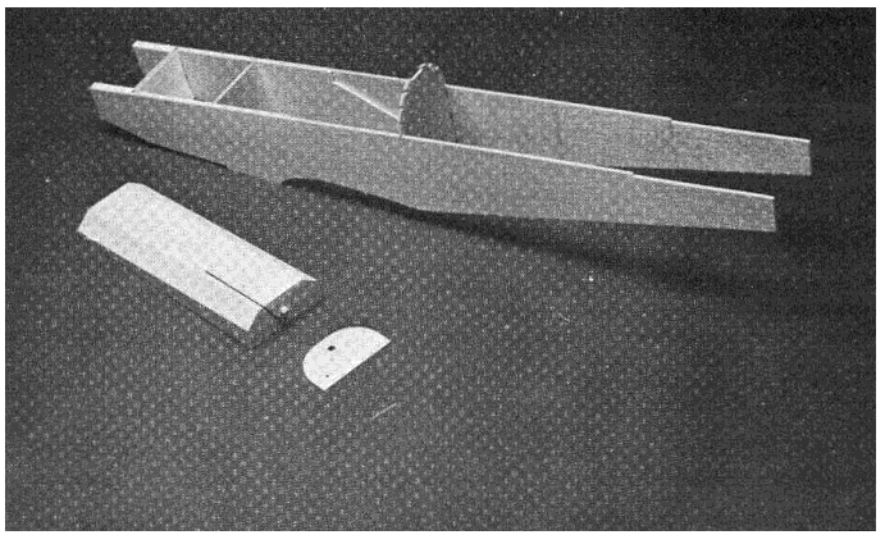
9) Fit and glue the ¼" shim blocks to the bottom of the fuselage, and add the ¼" cowl face piece. When all this is dry, replace the hatch. Now the fuse-



lage is ready for carving and sanding to its finished shape. Note, that the cabane struts are not installed until after the hatch is shaped and sanded.

Install the stabilizer, carefully checking its alignment with the fuselage. After gluing the rudder post to the fin, add the fin to the tail assembly, again, checking its alignment with the stabilizer and fuselage. The turtle deck spine is added next, followed by the six 1/8" stringers. The fuselage is sheeted cross grain with 1/16" balsa. The headrest is added

**Fuselage assembly with doublers, firewall, F-2, and F-4 in place.**

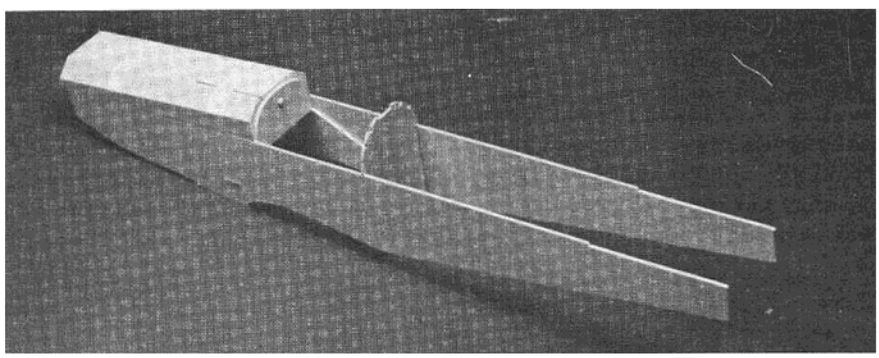


after the turtle deck is covered with the covering of your choice. I personally prefer Quick-N-Easy Products Topcote because it can be painted.

At this stage, the fuselage is ready for its initial coats of finish. Note that the cabane struts, wing dowels, landing gear and L.G. support plate are still off. I prefer to minimize the obstructions while applying the numerous undercoats that require a lot of sanding.

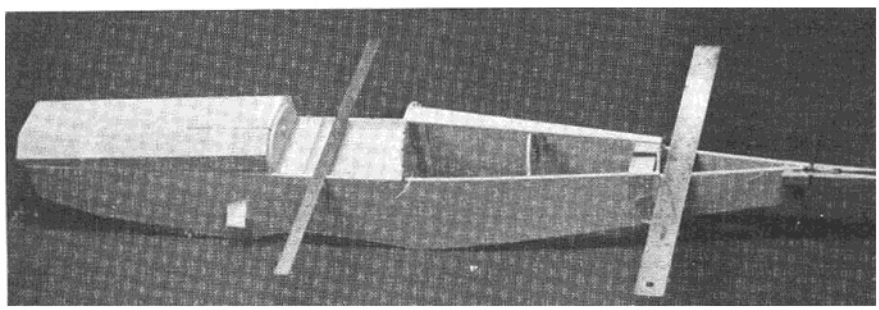
When the fuselage is ready for its

**Hatch block and F-3 former ready for installation.**



color coats, the cabane struts can be installed. If the bottom edges of the struts are flush with the bottom surface of the hatch block, the correct top wing alignment will be automatic. Bend the 1/16" music wire top wing saddle per the top and side views of the drawing and secure it to the

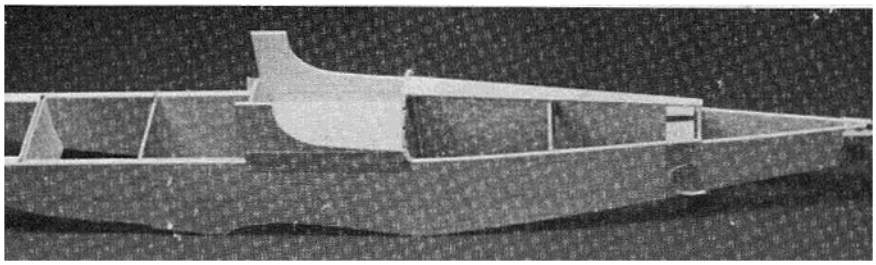
**F-3 is cemented in place using the hatch block as a fixture.**



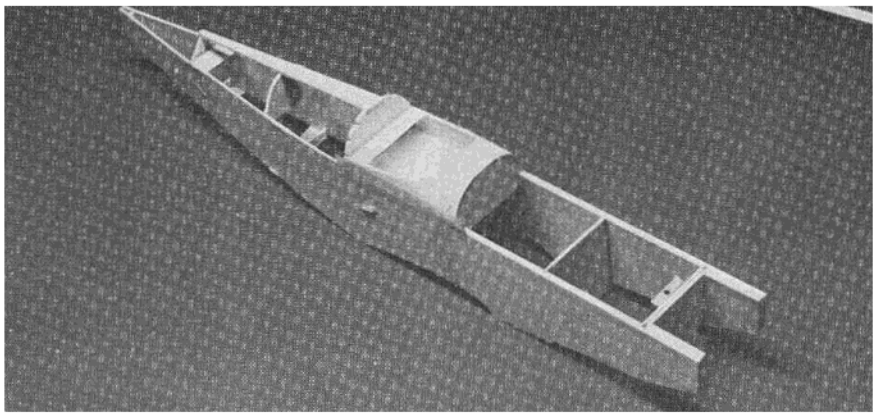
plywood cabane struts with carpet thread and epoxy.

Bend the 3/32" main landing gear wire to the shape shown on the drawing and slide into the slot ahead of F-2, then add the landing gear

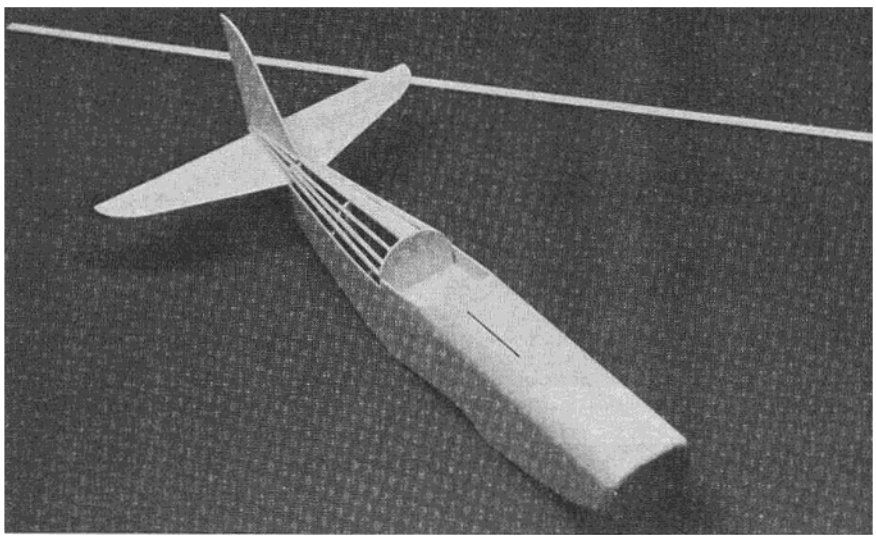
**Use two straight edges to align fuselage when joining tail.**



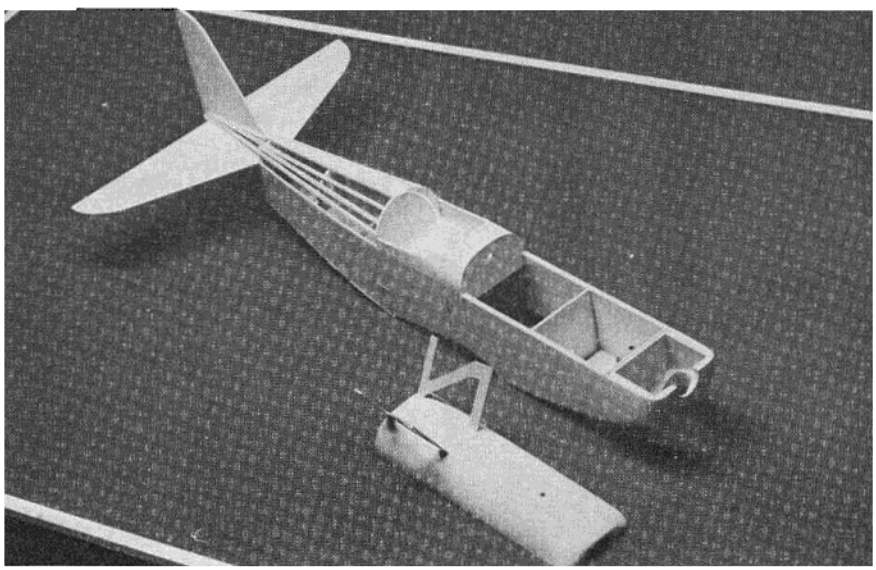
**Add the cockpit floor and coaming. Moisten coaming before wrapping over F-3.**



**Cockpit coaming is installed before hatch block is carved.**



**Front end is shaped and sanded before cabane struts are installed.**



**Hatch removed to show spacious radio compartment.**

support plate.

Install the 1/8" bottom wing hold dowels.

With the main landing gear wire in place, bend the 1/16" wire rear landing gear support strut to fit and rubber band it to the leading edge wing dowel to act as a holding fixture while the two wires are soldered together at the axle. Install the strut webs between the landing gear strut wires, using epoxy and fiberglass cloth or covering material.

Now, mount the steerable tail wheel, holding the nylon bearing tube in place with epoxy and fiberglass or cotton tape. Make the necessary engine and equipment cutouts and complete the finishing of the fuselage assembly. When cementing the two elevators to the 1/8" dowel be sure that they are in line with each other.

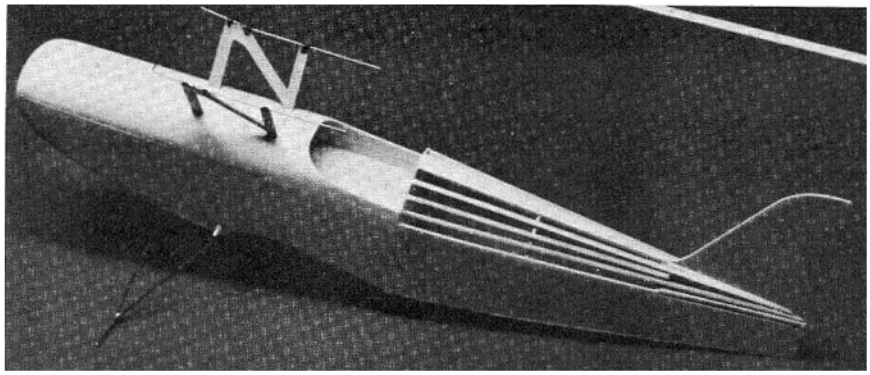
**Wing Construction:**

Complete instructions for joining the foam wing halves and for finishing are included with each set of Ace Tapered Mini-Foam wings.

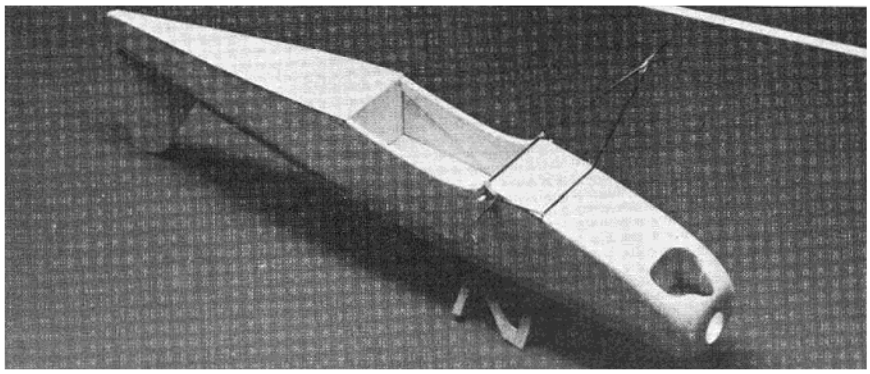
Using a straightedge and X-Acto knife, cut 3/16" off the trailing edge of each wing panel. Be careful to hold the knife at the correct angle so that when the ¾" trailing edge stock is epoxied onto the wing the top surface of the wing will be in line with the top surface of the trailing edge.

Sand the center faces of the wings to the correct dihedral angle using the technique described in the instructions included with the wings.

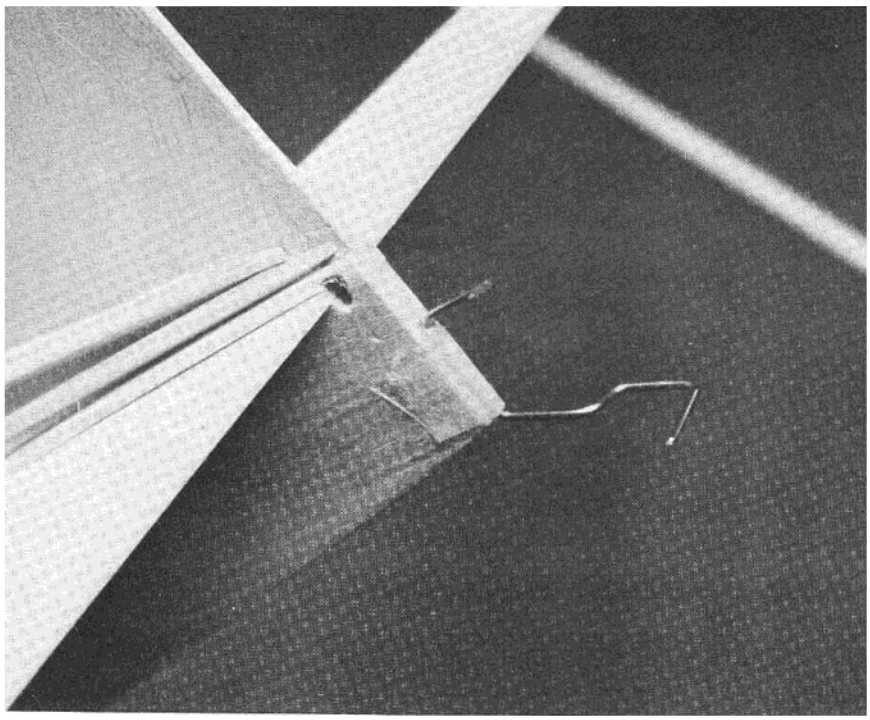
Cut the tips off at a 45° angle per the front view in the drawing. These raked tips definitely affect and improve the roll characteristics of the



**Wire landing gear and top wing saddle are added prior to painting.**



**Underside view showing cutout for inverted O.S. Max .15.**



**Close-up of steerable tail wheel installation.**

aircraft. The top wing span should be 34" and the bottom, 32" span. Note, that the top wing has a 3° dihedral under each wing and that the bottom wing has a 5½° dihedral under each wing. After the wing assembly is complete, cut out the recesses at the center trailing edge of each wing.

**N-Struts:**

Assemble the two N-Struts over the plan but do not add the 1/8" dowel pins yet. Mount the wings on the fuselage with #32 rubber bands. The top wing is attached by wrapping the rubber bands around the 1/16" wire saddle at the leading edge, looping the rubber bands through themselves, then over the wing to the wire extending beyond the trailing edge. Check overall wing alignment with the fuselage and with each other. Now, locate and position the N-Struts in their proper place between the wings. Some custom fitting may be required by shortening some of the ends of the struts until they all mate with the wings.

Mark the dowel pin hole locations in the wings and, while the struts are still wedged between the wings, poke holes into the foam using a 1/8" dowel sharpened to a point. Align the dowel to the correct angle parallel to the strut leg as you press the dowel into the wing. Be careful so you don't push it all the way through.

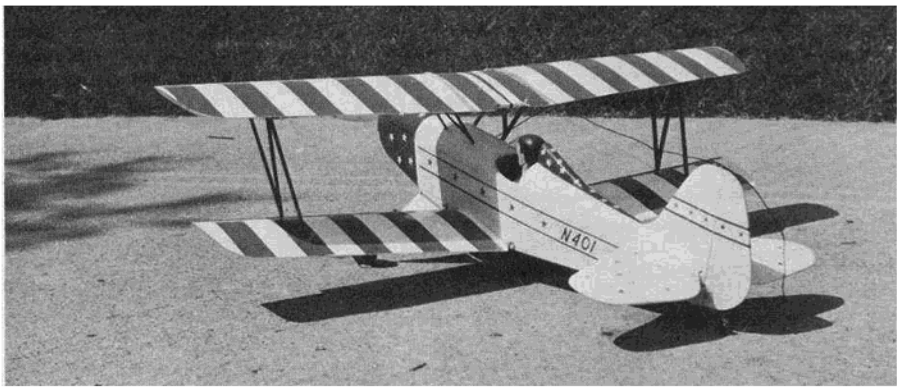
Cement the 1" dowel pins to the struts with epoxy.

Installation of the struts simply requires inserting them first in the bottom wing, then aligning and setting the top wing in place and with care press the top wing down on the dowels before securing it to the cabane struts with rubber bands. Do not cement the N-Struts to either wing.

That pretty much sums up the construction of the All Star. The windshield and pilot (2" scale Williams pilot would be just right) are added along with the engine and equipment. To add a little scale realism, wing wires can be easily installed by using elastic thread, available in any variety store. Cut four lengths approximately 18" to 20" long, tie loops on the ends and loop over the N-Strut dowel pins while installing the struts.

When installing control horns, use Carl Goldberg horns mounted so that the horn will cover the portion of the rudder where the tail wheel tiller is inserted. The horn will greatly increase the strength where it would otherwise be quite weak.

When installing the tank, it may be




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necessary to gouge out the hatch a bit to provide proper clearance. If you choose to mount the engine inverted, this won't be necessary.

The balance point should be located under the top wing, directly over the leading edge of the bottom wing. As I said before, it might be necessary to place the battery pack under the cockpit, in which case adequate protection should be provided for the receiver and servos so that they aren't destroyed by the battery in case of a crash.

Flying:

The performance of this aircraft was pretty well summed up at the beginning of this article, and I only wish to add a few suggestions.

You'll find that this airplane is very stable, smooth, and easy to handle. Its low power and power-off glide is soft and slow, yet good positive control is maintained. This aircraft is particularly well suited for the new breed of two channel systems such as the Ace Digital Commander. Powered with a Max .10 engine and with rudder and elevator control, the All Star will do inside and outside loops, fly inverted, spin, roll and any combination of these with ease, even in the hands of the novice flyer.

If you wish to fly the plane Rudder Only, follow the excellent suggestions contained in the new 1972 Ace Catalog and Manual for proper trimming.

The All Star is a small plane, but don't underestimate its performance. You'll have all the big .60 pattern ship flyers crowding around you after your first flight. □