1/2A Astrostar

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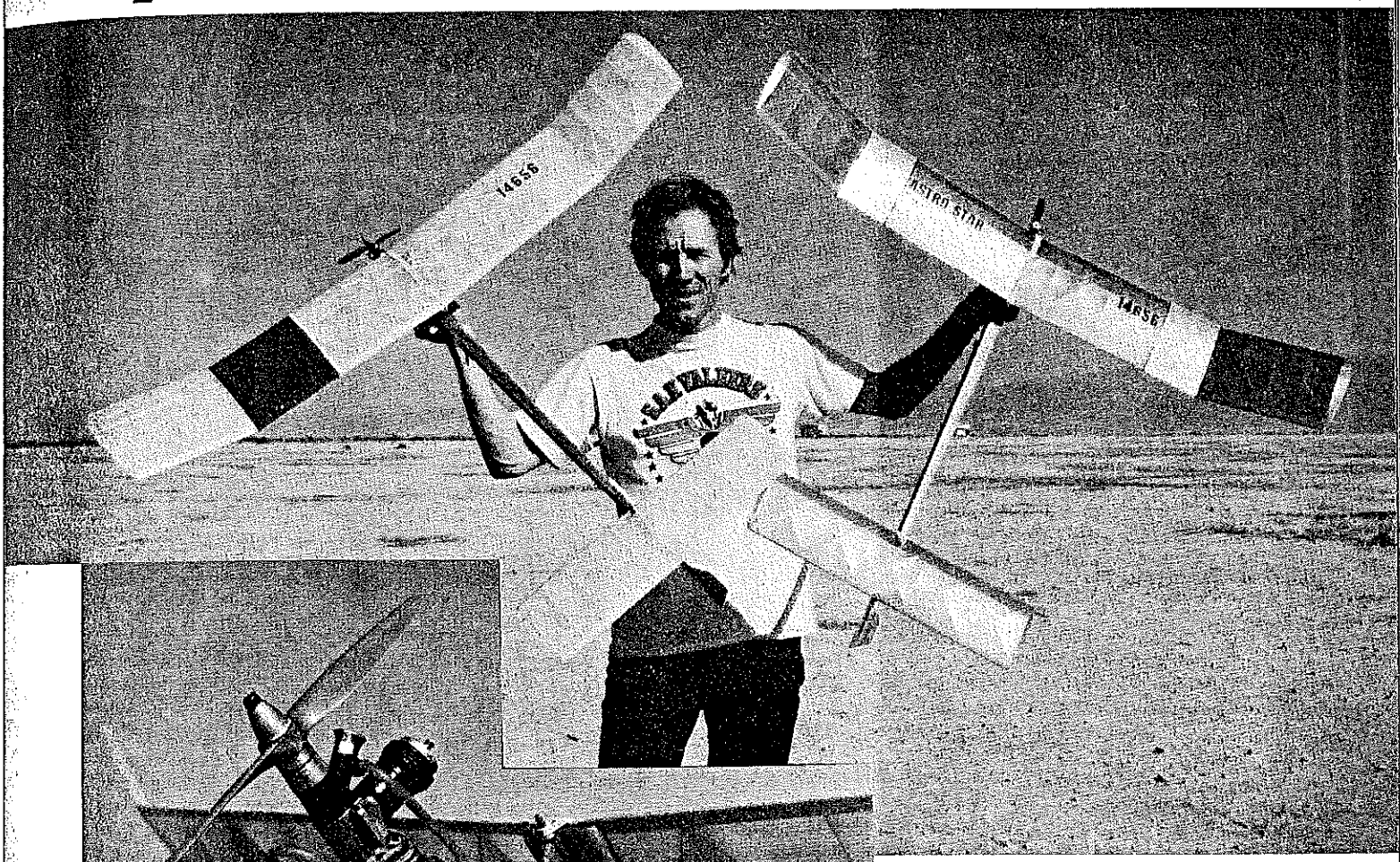
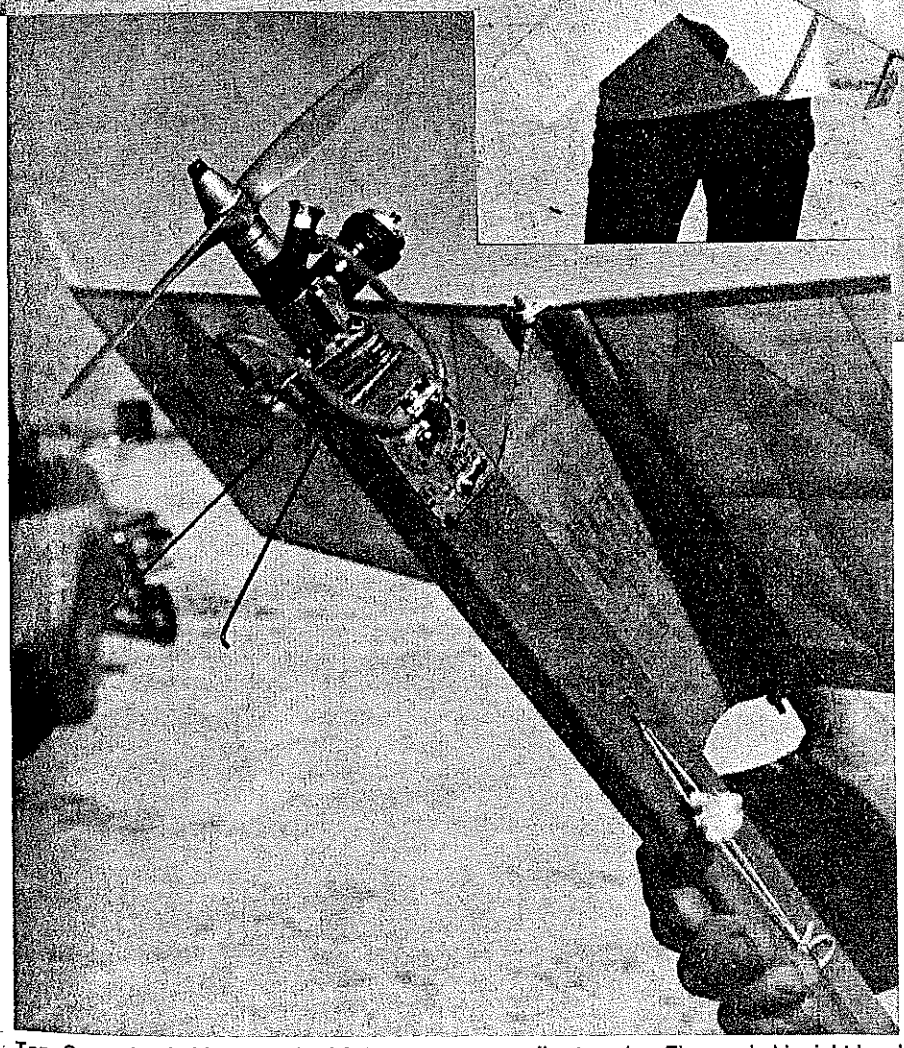


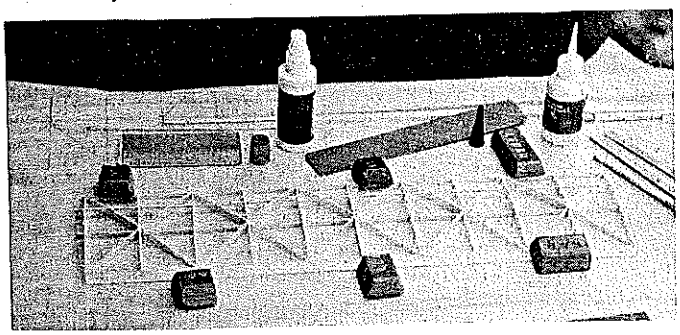


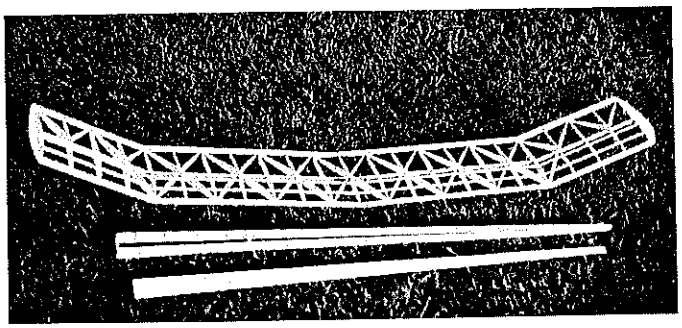
Top: Our author holds up a pair of Astrostars to cover all categories. The one in his right hand weighs 7 oz. and is used for Cat. 1 and 2, whereas the other one weighs 6.2 oz. and is used for Cat. 3 exclusively. Above: The DT fuse mounts on the side of the fuselage, and the author's name and address are printed on the pylon in case the model is lost. The prop is held on with a socket-head screw (available from Ace RC) to ensure positive retention on the Tee Dee engine.

A model design is generally considered to be successful when it proves itself on the contest circuit as this one has. More than that, this design recently received the distinguished honor of being named the NFFS small gas model of the year for 1988.

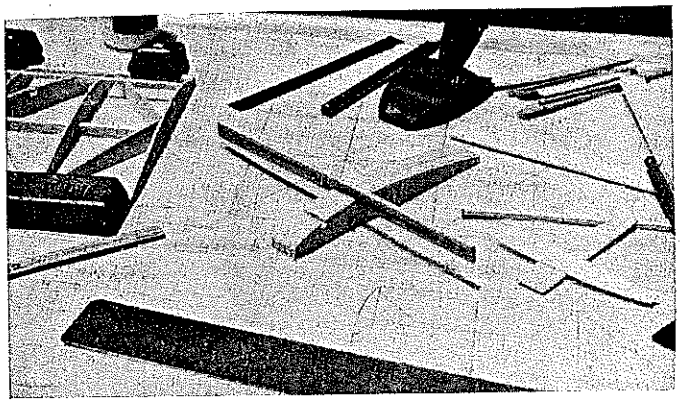
■Terry Thorkildsen

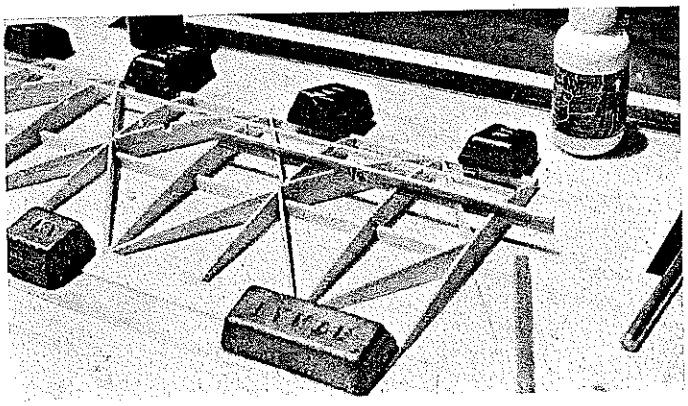
Photos by the author and Ralph Prey





Left: The stab under construction. Terry uses lead weights to hold the leading and trailing edges in place until things are glued together. Right: The geodetic structure of the wing accounts for its excellent strength. In the foreground are the fuselage sides prior to completion.





Left: The spar notches are cut and the ribs are lightly sanded while they are all still stacked together to ensure they will be uniform. Right: The diagonal ribs are placed in position, glued with CyA, and then the notches for the spars are cut. A tool (shown here on the right end of the wing) made from a piece of ⅛ x ⅜ spruce with medium-grit sandpaper glued to one edge is used to sand the notches to the appropriate depth.

THIS AIRCRAFT was designed in 1985 based on an earlier model of mine called the Jupiter. The Jupiter was fairly successful, having placed 4th at the 1984 Reno Nats and 3rd in ½A Open at the 1984 U.S. Free Flight Champs at Taft. The Jupiter had nice lines with elliptical tips, but it didn't have the consistency I wanted.

From that starting point, I refined the design and came up with the Astrostar. With the Astrostar I went to a constant-chord wing of 317 sq. in., placed the rudder in the rear, and used a smaller stabilizer.

As is evident from the plans, the construction is quite straightforward. The model can be built by a novice with good chances for favorable results.

The size of the model was selected based on the fact that most of my flying is at Taft under Cat. 1 conditions with 5-min. maxes. Smaller models can get pretty tough to see when they get specked out in a booming thermal. However, the model has been successfully flown in all categories and will typically weigh in at 6.5 to 7.0 oz. with no fuel. I feel that this size of model works well for all categories. It will handle the full power of a hot TeeDee with no wasted gyrations.

The only change needed for Cat. 3 flying is to build lighter. A real light one will weigh 6.2 oz., and this is the weight of the one that held the Cat. 3 record in 1987. To achieve this weight takes careful selection of all the components. Don't give anything a free ride. A simple thing like an engine mount can cost you 0.25 or 0.5 oz., which is why I always back-mount my TeeDees. Careful selection of wood, finishes, and glues is required to come in at the lighter weight, but one can be built in the 6.5- to 7.0-oz. range quite easily.

To help keep the weight down, I use Micafilm covering exclusively. It has the added benefit of being fuel proof and puncture resistant. The major disadvantage is that Micafilm doesn't have as much torsional rigidity as tissue and dope. This problem is eliminated with Union Jack geodetic construction which offers a strong, warp-free structure so that overall rigidity is retained. A real benefit of Micafilm is that early morning dampness doesn't loosen the covering. You can rack up those maxes in the thick morning air. Behaved covering is really an advantage for those one-flight, unlimited-duration dawn events that some west coast contests feature.

The airfoil used for this model is similar to the Ramrod's but thinner so that it isn't so draggy in the climb. The flat-bottomed section is 9.3% thick with its high point at 35%. This yields a faster climb than you get with an undercambered wing, and on a lightly loaded model like this one, you don't give up that much in the glide. The stab section is thinned to 7.3%, which is necessary to avoid overpowering the wing at high speeds and going over the top. Turbulator spars offer both rigidity and a more consistent airfoil in the critical front section, where it is most effective.

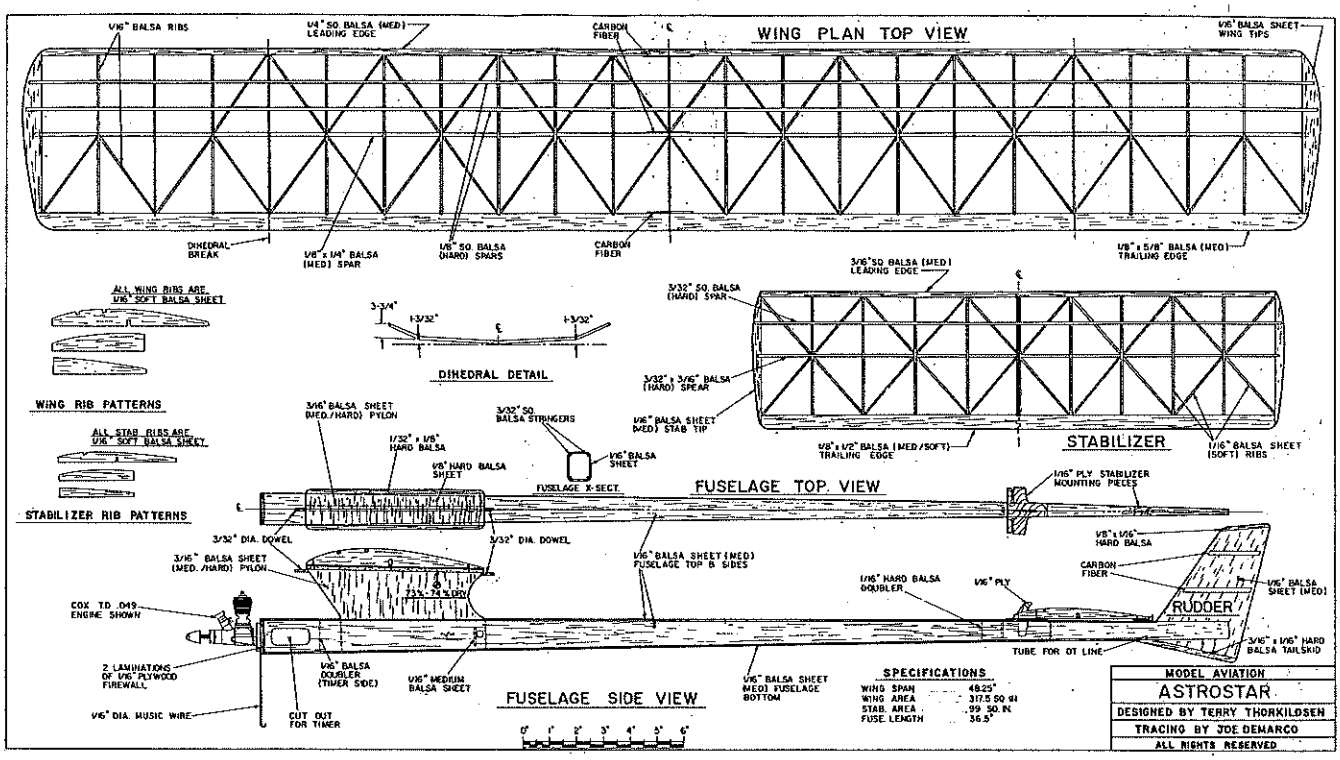
The model uses carbon fiber to reinforce the center dihedral break and also on the rudder for stiffness. The wings are built flat except for a small amount of washin (about 3/32 in.) on the right main panel. No washout is used in the tips, and I don't recommend any for a fast moving model. (I prefer to use washout only on Rubber and Nordic models.)

The center of gravity (CG) is positioned at 73-74% (without fuel), and the pylon is located last, after the model is completely assembled, to achieve this. The pylon is then glued to the bottom of the fuselage. This produces an exceptionally strong joint and gives extra rigidity to the pylon. Recently, I have been adding a small piece of 1/16-sq. spruce to the front of the pylon to avoid the nicks and stress cracks that seem to develop there with time.

The fuselage uses 3/32-sq. balsa stringers in the four corners, full length, which provide an exceptional strength-to-weight ratio. With this technique you can build the fuselage with no bulkheads, but I usually add one at the tail in front of the stab and a half one near the dethermalizer (DT) tube to provide the necessary strength when you may have to force in a tight fuse. The fuselage is doped with nitrate, followed by a couple coats of thinned clear K&B Super Poxy. I add aniline dye to the nitrate dope for a vivid translucent coloring effect. With use of Super Poxy and Micafilm, your model won't pick up weight as it becomes a contest veteran.

The Astrostar uses a rear rudder to provide a more consistent power pattern. With this rudder location, keying the stab is not as critical, and the model definitely seems to groove better. With a rear rudder some models have an undesired tendency to weathervane. The height and size of the rudder determine this. Use of a 3.5% (of the wing area) rudder in the configuration shown avoids this problem.

Keying your wing so that it will always be mounted in the same position is very im-



Full-Size Plans Available . . . See Page 188

portant for consistent flying. I use dowels at the center dihedral break for drag-free keying. These also offer the advantage of popping out of the slot if you hit a hard obstruction. The front of the stab is also keyed to prevent a flat spin if the stab gets cocked when the model DTs.

The Astrostar's CG location of 73-74% of the wing chord (dry) works out well for this model's stab size. As most seasoned fliers know, tail-heavy models go over the top, and nose-heavy models are too loopy. The nose-heavy effect can appear as a loop on a side and is hard to distinguish sometimes.

Knowing the affects of CG location can provide a useful means of fine tuning between power and glide that can't be accomplished with incidence corrections alone. I know that variable-incidence-tailplanes (VIT) can accomplish the same thing, but I like the simplicity of no gadgets, and this makes a straightforward model with which anyone can have success. Personally, I fly such a variety of events that I like a model with no devices to trip me up in the heat of battle when it is least expected. A properly trimmed Astrostar will roll out at the top of the power run with no loss of altitude, anyway.

I fly the Astrostar right-right, but it can be trimmed right-left if you desire. I prefer the right-right pattern, but I never fight a model that wants to glide to the left. You should check the amount of washin to make sure it isn't forcing the model to glide left.

The model uses no downthrust, but a slight amount of left thrust is sometimes added to eliminate an initial bank to the right. Thrust adjustments lose their effectiveness in the latter power stages of the climb when the model picks up speed.

The Astrostar has been scaled up for other sizes. A 600 sq. in. version is used for A/B Gas with a K&B 3.25 or 3.5, and an 840 sq. in. size is being built for C/D. The ½A version has been flown over a longer time period and, as a result, has more wins to its credit. If ½A is an event at a contest I attend, I usually fly it first.

It is imperative that all flying surfaces be warp-free to eliminate trim changes with differences in speed. I can't overemphasize the importance of a honking TeeDee, so select your best one or order one from Kustom Kraftsmanship and fuel it with 50-70% nitro. I know the Astrostar will reward you with the performance to match.

Construction. For best performance it is important to build your Astrostar between 6.2 and 7.2 ounces. To achieve this, take care in selecting your wood and covering materials. Just as important as building a strong, light model is to build one that is free of warps. I build all my models on a special plank that has been trued up to provide a flat surface. Building the model without warps will result in more consistent flight characteristics that don't change as a function of speed.

Wing. All panels are built flat except for the right main panel which should have

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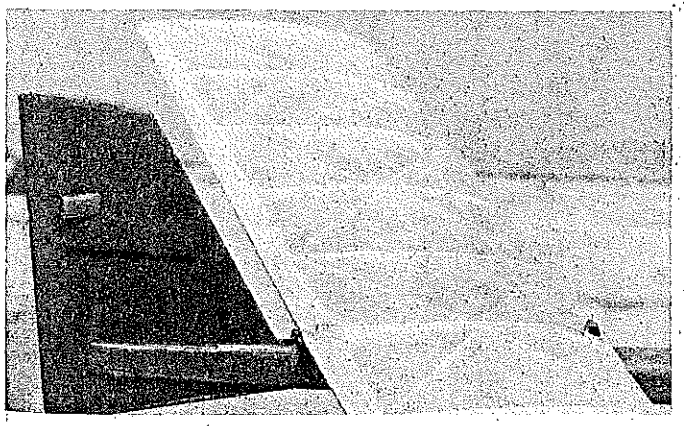

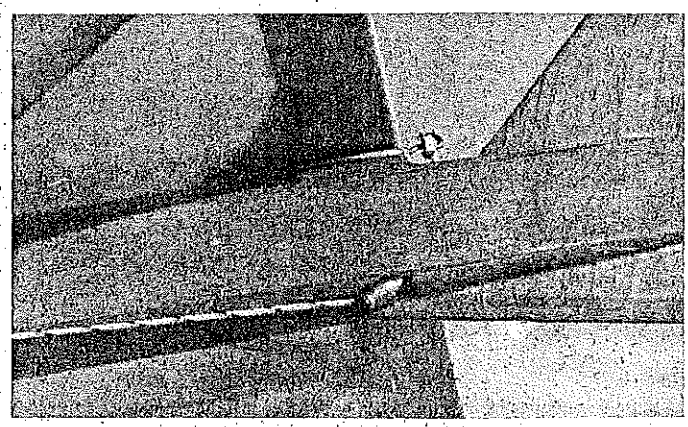

Left: The DT wire on the back of the stab is bent into an S pattern where it attaches to the trailing edge and then has a piece of silk CyAed over it for a strong, durable bond. Right: Terry uses Dacron for the DT line because it doesn't stretch the way monofilament fishing line can. Don't use card stock or a piece of matchbook for the stab shim, since the thickness will vary with humidity. Use balsa-capped thin ply instead.

about 3/32 in. of washin at the outer dihedral break. I use carbon fiber for my center dihedral breaks, but if you don't have any, you can substitute 1/32 plywood. Use light 1/16 sheet balsa, preferably C-grain if possible, for all ribs. Use medium balsa for your leading edges (LE) and trailing edges (TE) and the main spar. The top spars should be hard. All wood used in the wing should be straight and true.

The geodetic ribs should be put in place prior to adding the top spars. You can then notch them for the exact location for the spars. This can be done by using a piece of sandpaper glued to the edge of a 1/8 x 3/8-in. piece of spruce about 10 in. long. This tool can then be used to sand down the notches to the correct depth. A straightedge and an X-Acto knife can also be used.

The stabilizer is built similar to the wing, but is built lighter to avoid having a tail-heavy model.

Fuselage. Select medium to medium light 1/16 sheet balsa. The 3/32 stringers in the corners are added to the sides first. Glue the bulkhead for the DT tube in position, along with the one in front of the stab. Temporarily glue a bulkhead at the firewall location to help in alignment for the next step.

Lay a piece for the top, cut slightly oversize, down on flat surface. Put thick Hot Stuff (Super T) on the top side stringers, and then carefully place it on top of the top sheet. Glue the bottom on in a similar manner. This type of construction will give you a strong, straight fuselage.

The pylon is not added until the model is completed to get the correct CG location of 73-74% with no fuel. The pylon is then glued to the bottom to provide a strong joint with no bulkheads.

Covering. I use Micafilm since it offers a weight advantage and is fuel proof and very puncture resistant. To use Micafilm you must first apply an adhesive to the framework. I use thinned Balsarite on the ribs and spars and 3M 77 spray adhesive on the LE and TE. The 3M 77 offers the advantage of staying tacky long enough for you to place the Micafilm in position before you iron down the edges.

Cover the bottom side first. The top portion of the covering should overlap the bottom by about 1/8 in. Use Balsarite or thin Hot Stuff to seal the overlap joint. Use an iron to tighten the covering.

If you don't want to bother with Micafilm, then Japanese tissue will work just fine. Use three to four coats of thinned nitrate dope, followed by one to two coats of fuel proofer (or butyrate dope) if you cover with tissue.

Flying. Let your finishes cure for a week or so, and take out any warps that might have developed. Make sure the wing is keyed.

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date of 2/24/47. The accompanying three-view was taken from these plans, and the Goldberg influence is quite evident in this early, ignition-powered prototype of the soon-to-be-famous Zeek series.

As you can see, this model was quite small at 277 sq. in. of wing area and a reported weight of a little over 19 oz. Being designed around the Bantam and Arden .19 engines, the models were obviously quite frisky under power. The ignition system was mounted on a flat piece of 3/16-in. plywood bracketed off the back of the firewall. The firewall was held to the front of the fuselage with a pair of bicycle spokes which were anchored to the inside of the fuselage at about the level of the engine thrust line.

The ignition flight timer was mounted on top of the fuselage just aft of the pylon, and leads to it were soldered to the anchored ends of the bicycle spokes, while solder lugs clamped between the spokes' screw-nuts and the firewall were used to make connections thereto. Dethermalizer systems were incorporated as well, and these were usually actuated by Hillcrest or modified Austin pneumatic timers.

Viable full-sized plans can be made from the three-view sketch accompanying this article by enlarging the sketch to the appropriate dimensions. Note that a different degree of enlargement will be required for the wing and stab ribs, since they are drawn to a different scale. Copier machines which have enlarging capabilities can handle the chore, but the best bet is to take the project to a graphics reproduction shop which specializes in architectural or engineering services. *(Look for them in the* Yellow Pages *under headings like "Copying and Duplicating Service" and "Photo Copying." RMcM)* Other pertinent information required to construct an original Zeek is as follows:

The wing incorporates center spars, and is built in the same manner as a Zipper, Sailplane, or the subsequent A/B Zeek that was eventually kitted. That is, the leading and trailing edges—plus the contoured tip parts—are pinned down to the plan. Then the ribs are loosely assembled to the spars in midair by running the spars through them before each such "stack" is fitted into the outline of its appropriate panel section on the plans. The false ribs are added last. A bill of materials for the wing parts consists of the following:

The center section ribs are of 1/8-in. sheet balsa, including the two false ribs. The ribs for the remaining panels are cut from 1/16 sheet. The leading edge is 3/16 x 1/4 in., and the two front spars are 1/8 x 3/8 in., except at the tips where they are reduced to 1/8 x 1/4. The rear spar is 1/8-in. sq. The TE is 1/4 x 3/4-in. tapered stock, and the contoured tip parts are from 1/4-in. sheet.

The stabilizer spars are on the bottom, so its construction is a bit easier. All ribs are from 1/16 sheet. The LE is again 3/16 x 1/4, as per the wing. The front spar is 1/8 x 1/4, and the rear one is 1/8 sq. Contoured outline parts are 3/16 sheet. Finally, the vertical fin is cut from 1/8 sheet to complete the stab unit.

The fuselage construction also seems to have been a simplified facsimile of the unique Zipper/Sailplane fuselage configuration. The three 3/16-in.-sq. side longerons are pinned in place on the plans, and 3/16-sq. uprights are cemented across the tops of the longerons at each station. When the sides are removed from the plans, they are in turn spaced apart with appropriate lengths of 3/16-sq. strips until the fuselage box is completed. Also, each rectangular-shaped station has its center filled with an appropriately sized piece of 1/8 sheet stock. This surely makes for a sturdy fuselage to carry the weight of the ignition paraphernalia. The sheeted areas up front use 1/8-in. stock. Finally, the pylon is of 1/4-in. sheet, with the wing platform of 1/8-in. material.

Should the design strike your fancy, you should now know enough about the model to build an original 1947 Zeek for the NosGas Ignition event.

In the wake of the contest successes of the 277-sq.-in., ignition-engine-powered Zeek, there were additional sizes built by Lew (and others) of 435 sq. in. for .29 engines, 575 sq. in. for the Bunch .45s, and even a one-of-a-kind colossus of 1,500 sq. in. powered by a McCoy .60. As far as is known, all of the versions of the ignition-powered Zeeks incorporated undercambered airfoils and are not to be confused with the flat-bottom-airfoil versions of similar sizes which came later. Should any of our readers retain original plans of these versions, it is hoped that they will be brought to light again as soon as possible to be enjoyed by all Zeek lovers.

Many thanks to Carl Stokes and Lew Mahieu himself for getting this story kicked off. There's more to come!

Well, it's time to sign off again, and I want to give a "Good night!" to the AMA Nats Committee (wherever they might be hiding) before the parting cry of . . .

See ya downwind!

Astrostar/Thorkildsen

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First, hand glide the model. Adjust as necessary with incidence until you have a nice floating glide. Double check your CG location if major corrections in incidence are required.

Use a baby pacifier pressure fuel tank for a consistent engine run, and set the timer for 2-3 seconds. The model should climb steeply with a slight right turn. Correct any adverse turn tendencies with rudder tab (trailing edge stock) glued to the rear of the rudder. Slowly lengthen your engine run until you are up to the full limit. Properly trimmed, the model will make a couple of turns in 12 seconds, followed by a smooth transition to a floating glide.

Enjoy flying your Astrostar. I'm sure it will bring you as much pleasure as my Astrostars have given me.

Product sources:

Bradley Model Products, 1337 Pine Sap Ct., Orlando, FL 32825.

Jack's Models, 4036 W. 173rd Pl., Torrance, CA 90504.

Kustom Kraftsmanship, Box 3010, Fallbrook, CA 92028.

MRL, 25108 Marguerite Pkwy. B-160, Mission Viejo, CA 92692.

CLWC General/Johnson

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pleasant, the food good, and the stopover in Gander, Newfoundland enjoyable. In Gander the flight crew changed to a more conservative group, but we'd already taken over the airplane so they found it difficult to regain control.

We landed at the International Airport in Moscow where we went through immigration and customs. The immigration officer kept half your visa, looked you over closely, and waved you through. Same deal with customs—they X-rayed only those things that the machine would accommodate.

The aero club awaited us with a number of buses and cars, which somehow managed to transport fliers and boxes to another airport an hour's drive across Moscow. More waiting—then, not knowing for sure whether the boxes had been loaded, the final trek to Kiev. Fortunately, the models made it with us, but it took two trips with the vans to get everyone and everything to the hotel, which was another hour away.

Although our officials and the press were housed in the hotel, the team was quartered in bungalows located behind the hotel and