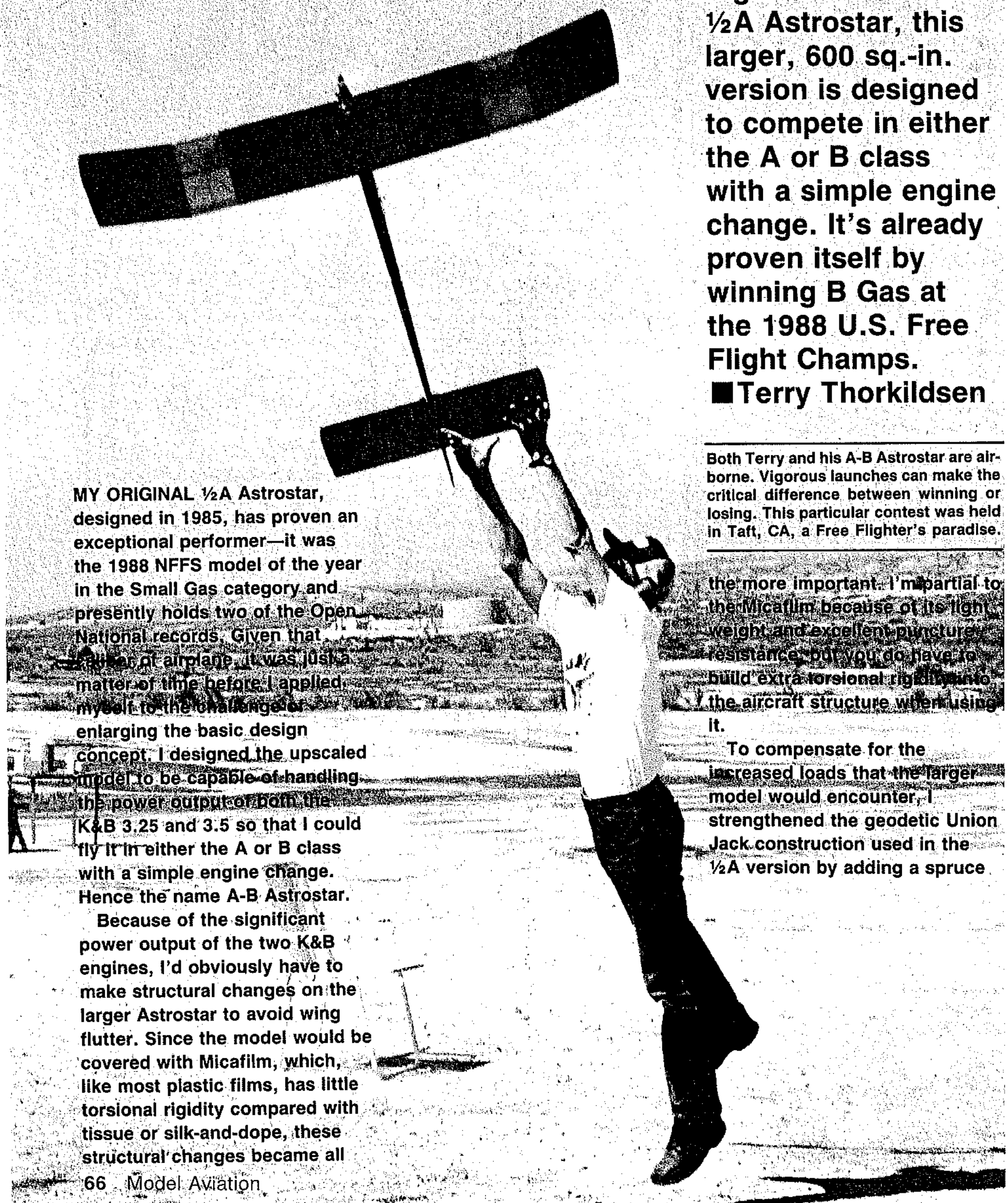
A-B Astrostar

Big brother to the ½A Astrostar, this larger, 600 sq.-in. version is designed to compete in either the A or B class with a simple engine change. It's already proven itself by winning B Gas at the 1988 U.S. Free Flight Champs.

■Terry Thorkildsen

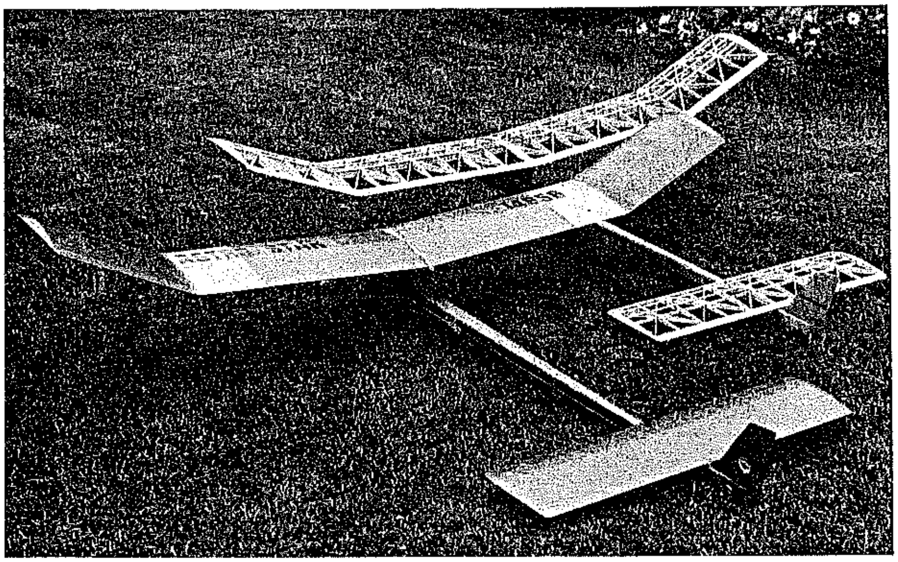


Both Terry and his A-B Astrostar are airborne. Vigorous launches can make the critical difference between winning or losing. This particular contest was held in Taft, CA, a Free Flighter's paradise.

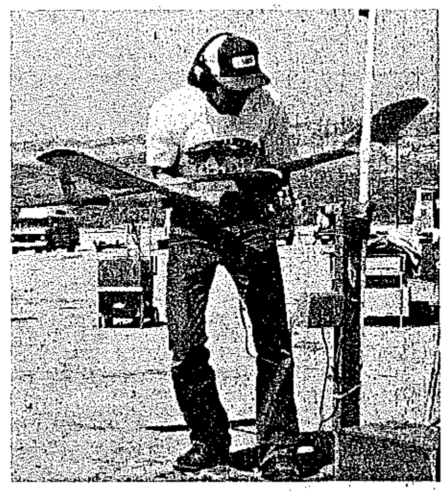
MY ORIGINAL ½A Astrostar, designed in 1985, has proven an exceptional performer—it was the 1988 NFFS model of the year in the Small Gas category and presently holds two of the Open National records. Given that caliber of airplane, it was just a matter of time before I applied myself to the challenge of enlarging the basic design concept. I designed the upscaled model to be capable of handling the power output of both the K&B 3.25 and 3.5 so that I could fly it in either the A or B class with a simple engine change. Hence the name A-B Astrostar.

Because of the significant power output of the two K&B engines, I'd obviously have to make structural changes on the larger Astrostar to avoid wing flutter. Since the model would be covered with Micafilm, which, like most plastic films, has little torsional rigidity compared with tissue or silk-and-dope, these structural changes became all the more important. I'm partial to the Micafilm because of its light weight and excellent puncture resistance, but you do have to build extra torsional rigidity into the aircraft structure when using it.

To compensate for the increased loads that the larger model would encounter, I strengthened the geodetic Union Jack construction used in the ½A version by adding a spruce



Two identical Astrostars, one finished, the other in bare bones displaying the geodetic structure. This provides the torsional rigidity required for the flight speeds the model encounters.

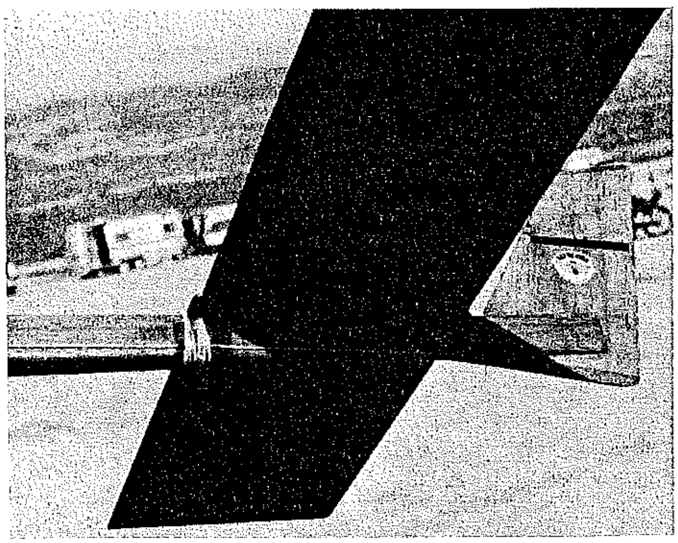


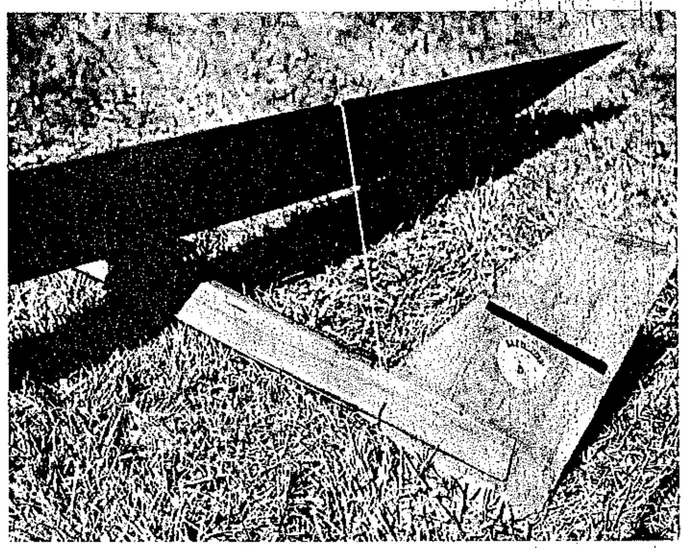
The author starting his A-B Astrostar safely from behind. Ear protection is almost mandatory when firing up these unmuffled engines.

main spar and shear webbing. I also moved the heavier main portion of the wing structure forward to where the spars and shear webbing would be structurally most effective, prevent wing flutter, and save weight.

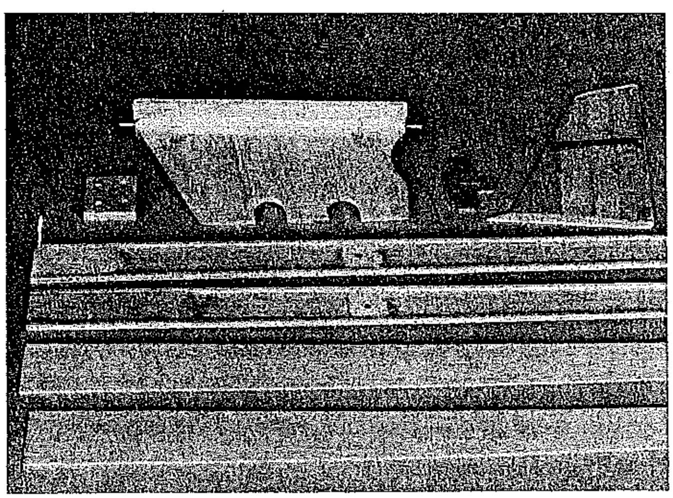
To demonstrate to yourself how forward weight improves stability, try putting a paper clip on a piece of paper, and rotate it in either direction. You'll notice that it's stable only when the paper clip is on the leading edge.

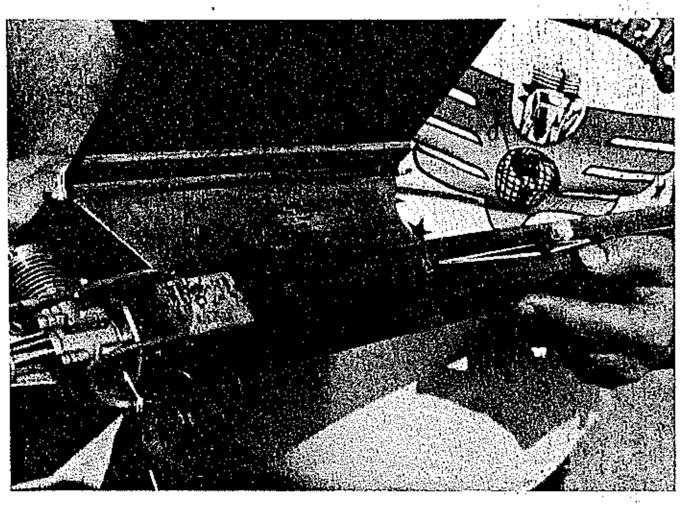
The spars and shear webbing form the load-bearing I-beam structure of the wing. Locating it forward at the widest part of the



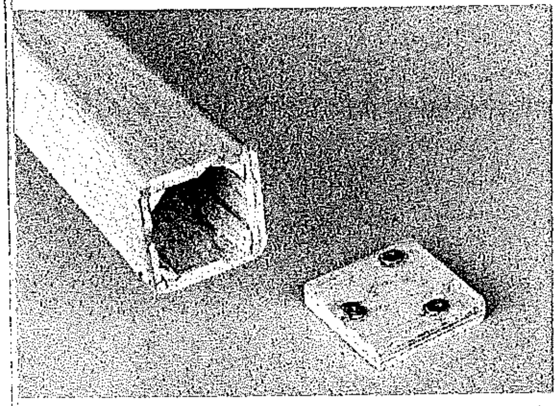


Left: The black stripe on the rudder is a strip of reinforcing carbon fiber. There's one on each side to provide rigidity. The plans show other critical stress points in the model's structure where it's used. Note the rubberbands retaining and tensioning the stabilizer's leading edge, and the DT limit line (nonstretch Dacron line) passing through a guide tube under the rubberbands. Right: The stabilizer in its DT'd position.



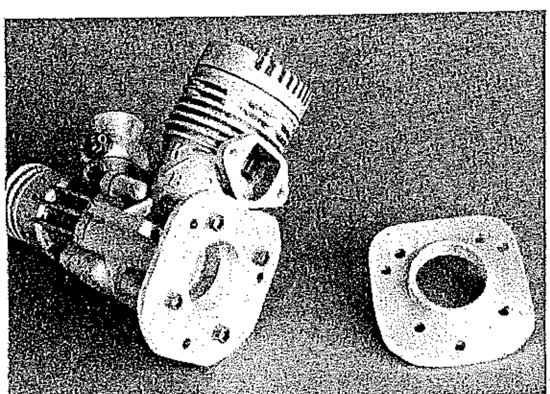


Left: The finished rudder, pylon, and fuselage subassemblies. Note the doublers in the forward end of the fuselage and around the DT tube hole for extra strength. Right: The DT timer is mounted on a Dr. Scholl's pad to help reduce vibration, and a baby pacifier is used to feed fuel to the Schnuerle engine. The side-mounted DT mechanism makes it easy to check the all-important fuse length just prior to launching the model.

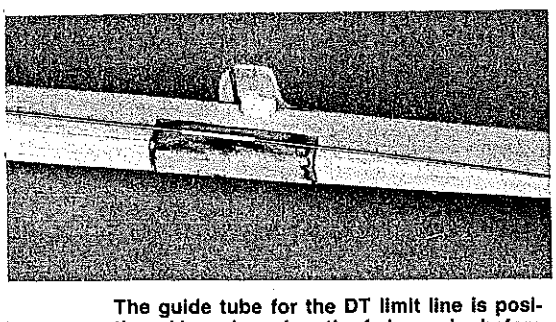


The reinforcing doublers can be seen in this photo of the nose section. Blind nuts with wax forced into the threads are installed in the firewall before it's glued in place and further reinforced with glass cloth and resin.

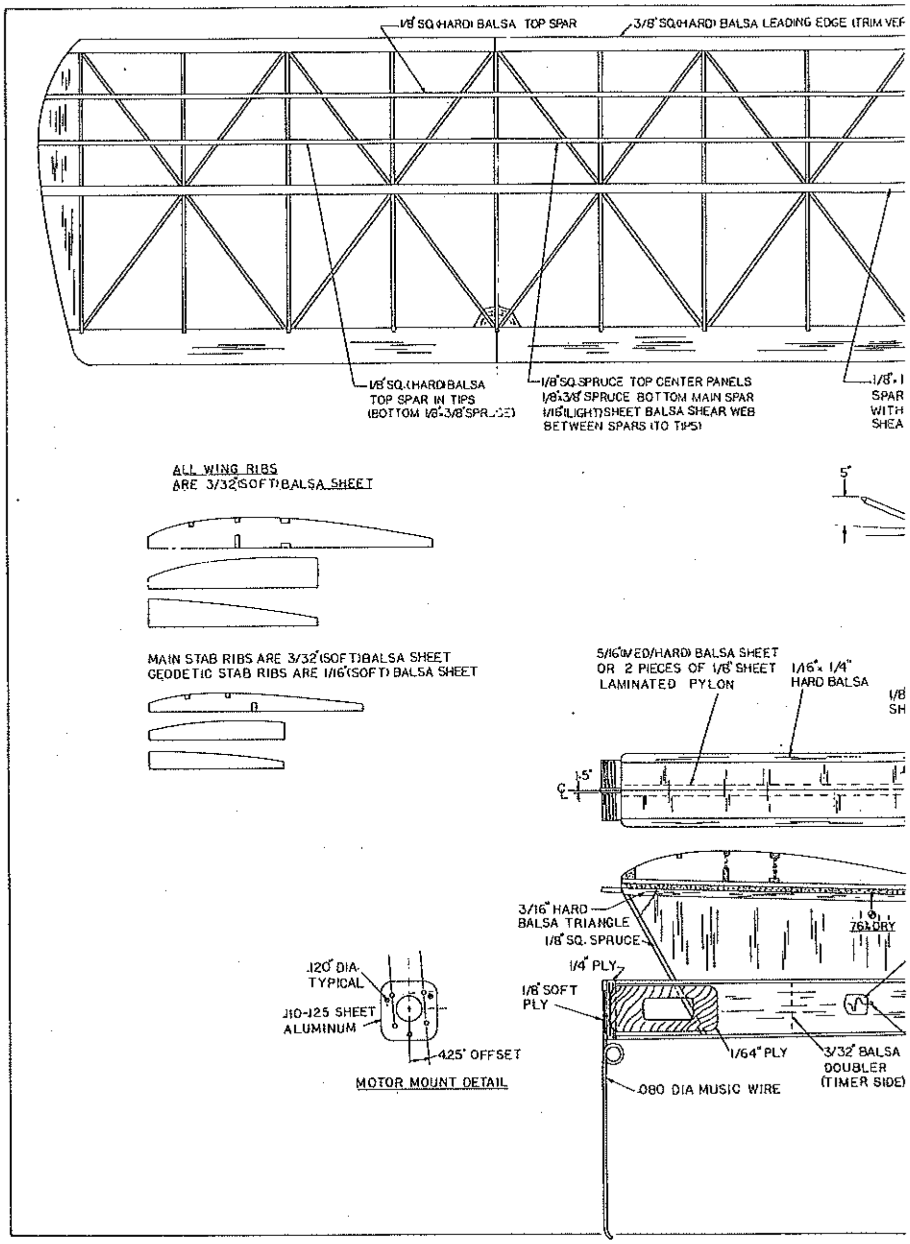
The exhaust deflectors behind the engine are fashioned from an aluminum can and prevent hot gases from burning the fuselage.



The K&B 3.5 engine is back-mounted using a homemade unit cut from a flat piece of ⅛-in. sheet aluminum. The plans fully detail the construction of this lightweight mount.



The guide tube for the DT limit line is positioned by using a length of piano wire before gluing it on. A piece of 1/64 ply reinforcement is wrapped around the fuselage to help carry the rubberband loads. Note the small reinforcing gusset under the stabilizer platform.



ribs creates a larger and stronger I-beam.

If you've reached an intermediate level of building skill, don't be intimidated by the geodetic construction. Construction of the A-B Astrostar is fairly straightforward, and following the plans and instructions should produce very favorable results.

The model is 600 sq. in. and weighs 20 to 23 oz., a size-to-weight ratio that has worked out quite effectively. Most of my flying is at Taft, CA under Category One or Two conditions, but I also enjoy flying the Astrostar at Category Three flying sites. Because of its size and the construction techniques used, the aircraft stays in trim no matter what the field or weather conditions. The Micafilm covering won't go limp in dampness. I've flown the model without worries under slight drizzle conditions, as well as on those usually-damp early morning unlimited flights that are popular on the West Coast.

The model is built sufficiently light that I don't have to make any changes for Category Three flying. I would suggest that you build it to the recommended weight for best results. To help make that task a little easier I have listed the recommended sheet stock weights for the various areas of the model. Following these recommendations will give you an all-up weight similar to mine.

It's important that *nothing* be given a free ride when building a competitive Free Flight model. A standard aluminum engine mount, for example, can cost you as much as .75 oz. Included on the plans are details for a lightweight aluminum back mount for your engine. It's easy to make and *saves weight*!

With a model of this size you don't have to go to the extremes that you would in building a ½A ship, but it's still a good idea to use care in selection of wood, finishes and glues in order to be as competitive as possible. That's one reason I use lightweight Micafilm as a covering. It's also fuelproof and resists puncturing. As already explained, the Union Jack geodetic construction together with the spruce spar and shea

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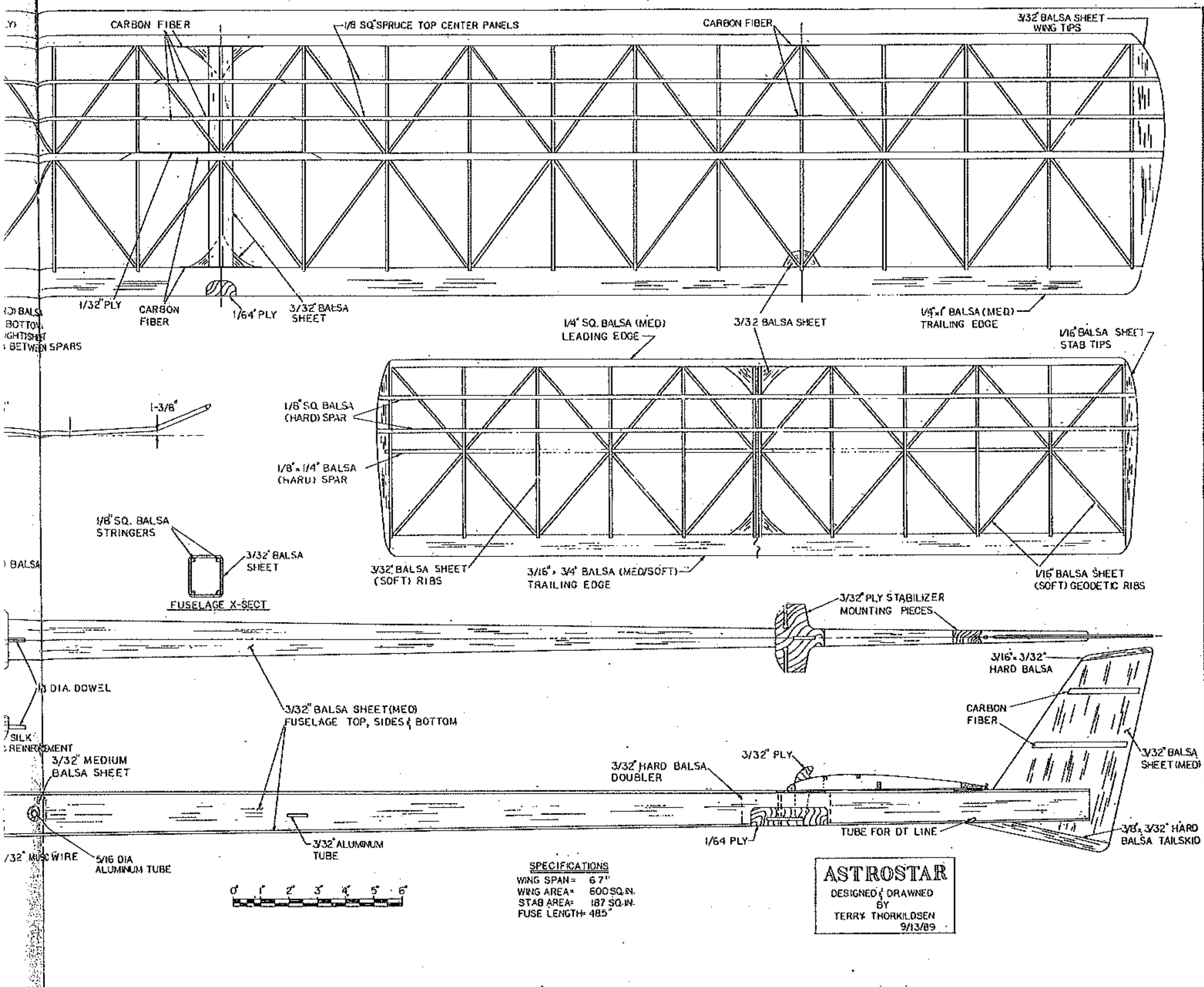
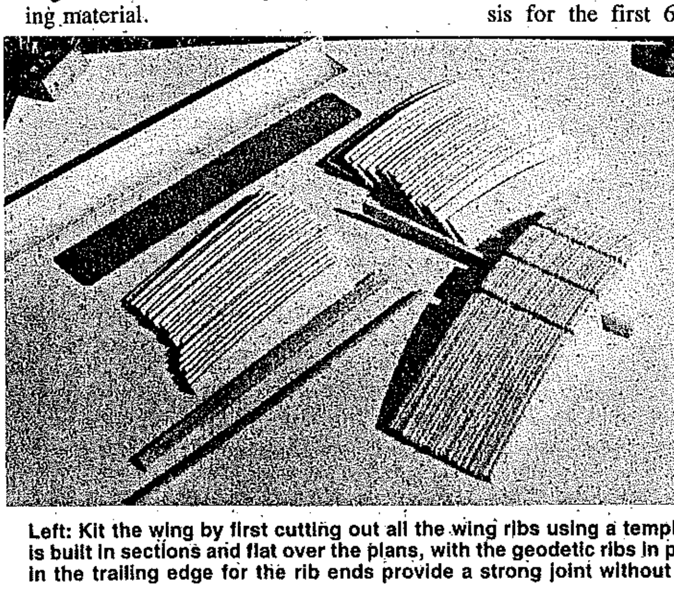
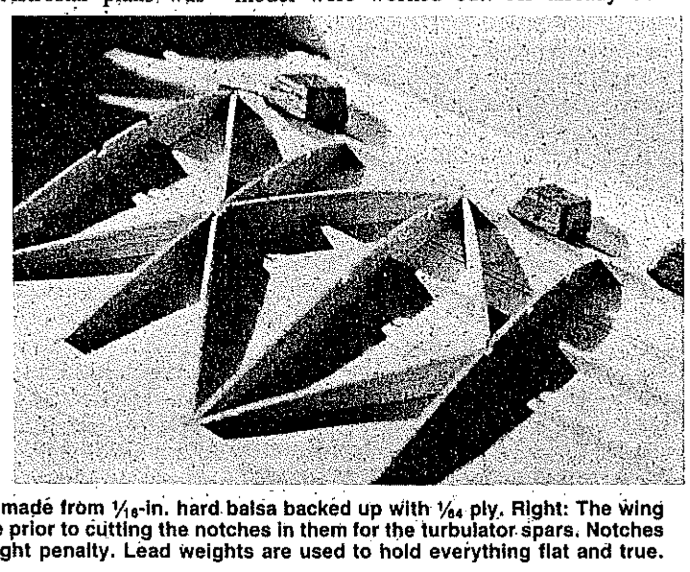


webbing produce a strong, warp-free structure with substantial inherent rigidity, offsetting the low torsional rigidity of the covering material.

The airfoils, moment arms, and stabilizer percentages on this scaled-up Astrostar are identical to the ½A version. In fact the basis for the first 600 Astrostar plans was made by using a Xerox machine that could blow drawings up or down at will, after which the structural changes for the larger model were worked out. As already de-





Left: Kit the wing by first cutting out all the wing ribs using a template made from 1/16-in. hard balsa backed up with 1/64 ply. Right: The wing is built in sections and flat over the plans, with the geodetic ribs in place prior to cutting the notches in them for the turbulator spars. Notches in the trailing edge for the rib ends provide a strong joint without weight penalty. Lead weights are used to hold everything flat and true.

ter more easily in a thermal. A glide circle of 25 to 35 seconds is recommended for the Astrostar.

Although the model uses no downthrust, 1.5% of left thrust, as shown on the plans, is added to eliminate an initial bank to the right. As the model picks up speed in the later power stages, thrust adjustments lose their effectiveness, while rudder and rudder tab increase in importance. Also, it's imperative that all flying surfaces be warp free to eliminate trim changes with differences in speed.

I've scaled up the Astrostar to an 850-sq.-in. size as well, but still get my biggest kicks flying the 600-sq.-in. version coupled with a K&B 3.25 or 3.5 engine—probably a direct function of the raw power of those Schnuerles. The A-B variant is truly my favorite of the Astrostars.

Construction. For best performance it's important to build your Astrostar to an approximate weight of 20 to 23 ounces as indicated. This won't be difficult to achieve if you use the recommended weights for wood, eschew heavier covering materials, and are careful to keep the finishing light. Be especially wary of excessive weight in the stabilizer. Simple laws of physics tell us that it will take a lot more weight in the nose to compensate for a tail-heavy model.

Just as important as building a model that's strong and lightweight is building a model that's warp free. I build all my airplanes on a special plank that has been trued up to provide a flat surface. A straight, well-crafted model performs more consistently over a range of speeds.

Wing. Build all the panels flat except for the right main panel, which should have about 3/32 in. of washin at the outer dihedral break. All wood in the wing should be straight and true. Use lightweight 3/32 sheet balsa, B or C grain if possible, for all the ribs. Density should be in the range of about 4.4 to 5.2 lb./cu. ft. If you have access to a gram scale, a 3 x 36-in. sheet should weigh 11.5 to 13.5 grams. Cut out all the ribs prior to beginning construction.

A neat rib template can be made by cutting a rib outline from hard balsa, then backing it with 1/64 plywood which is sanded down till it matches the rib shape. For uniformity, make both bottom spar notches while the ribs are still stacked together after being cut out. You can also make the notches in the main ribs for all the top spars at this point, but the geodetic ribs are not notched until later.

Build each panel separately, beginning by laying down the bottom spars and the leading and trailing edges. Use medium-weight balsa for the leading and trailing edges. I always cut a notch in the trailing edge where the rib is installed to help compensate for differences in the ribs and to provide more gluing surface. The leading edge is made from 3/8-in.-sq. stock, slightly trimmed down in the vertical dimension to match the

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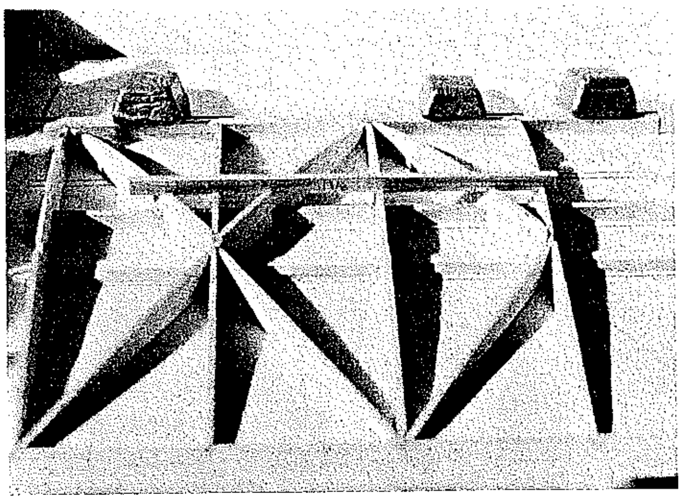
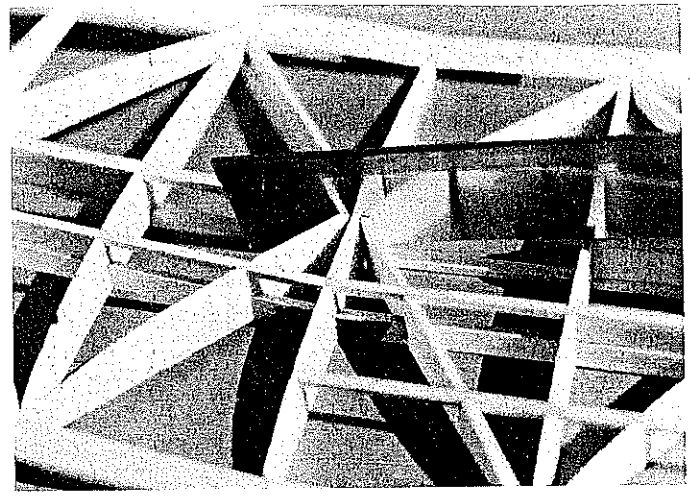
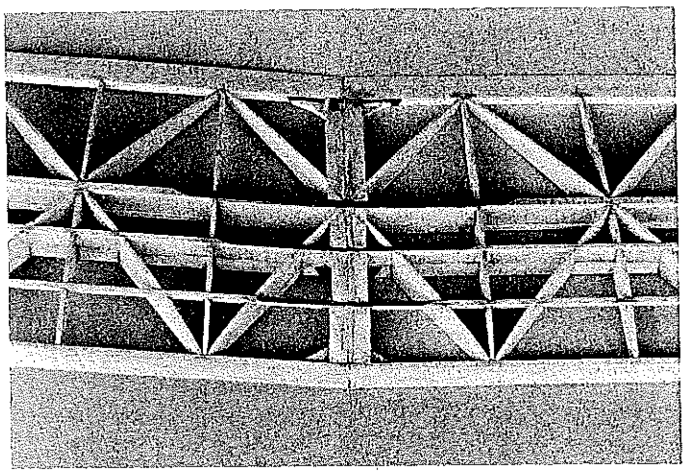
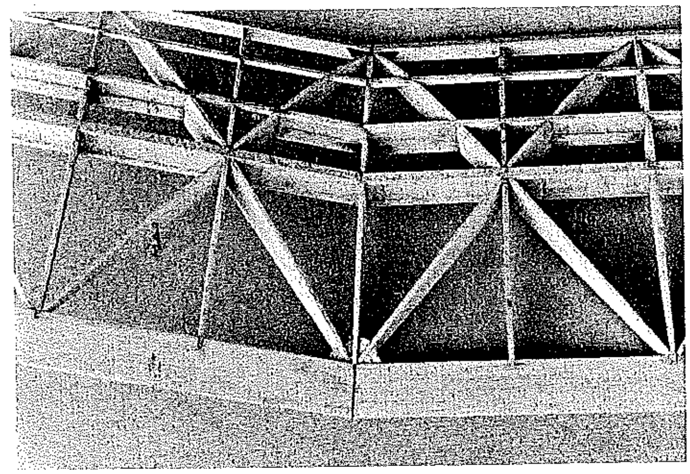




Left: A straightedge and X-Acto knife are used to cut the notches in the geodetic ribs. The notches are then sanded to the correct depth with the tool seen in the photo. It's simply a piece of 1/8 x 3/8-in. spruce with a strip of sandpaper glued to its narrow edge. Right: After gluing the center dihedral joint in place, a Zona saw is used to carefully cut a slot in the center rib. A full-depth 1/32-in. plywood center brace is then glued against one side of the 1/8 x 1/4-in. hard center spars to provide a tough center wing section. Strips of carbon fiber reinforcements are visible.





Left: The completed wing center section. Note the spruce main spar, shear webbing, and strips of carbon fiber on top of the spars to absorb the shock of DT landings. Right: The completed polyhedral break of the left wing. Again, notice the carbon fiber reinforcing and gussets.

scribed, the wing in particular was strengthened and redesigned for greater stability and resistance to flutter.

The model uses carbon fiber to reinforce all dihedral breaks; the center dihedral break is backed up with 1/32 plywood as well. Notice that carbon fiber is also used on the top spars at the center to protect against the shock of DT (dethermalized) landings, and on the rudder for stiffening. I strongly recommend that you stick with the carbon fiber to beef up your model in the appropriate places, and stay away from boron. The potential health risk of handling boron can't possibly justify its usage in a competitive Gas model of this type.

The wing is built flat except for a small amount—about 3/32 in.—of washin on the right main panel. This washin should be built in, not warped in later. The Union Jack geodetic construction will help lock the built-in warp in place. The faster the model flies, the less washin is needed, but since there are no auto surfaces, washin shouldn't be eliminated entirely. No washout is used in the tips. I don't recommend any for a fast-moving model, since its effect changes as a function of speed.

The center-of-gravity (CG) is positioned at 76% without fuel. To ensure that the CG is correct, the pylon location on the *bottom* of the fuselage is established and the pylon glued on after the model is completely assembled. This produces an exceptionally strong joint and gives the pylon extra rigidity. I add a piece of 1/8-in.-sq. spruce to the front of the pylon to avoid the nicks and stress cracks that seem to develop with time.

The fuselage uses 1/8-in.-sq. balsa stringers running full length in all four corners, which provides an exceptional strength-to-weight ratio. This technique eliminates the need for bulkheads, but I add one at the tail in front of the stabilizer and a half-bulkhead at the DT (dethermalizer) tube, making it easier to establish the correct fuselage width prior to gluing on the top and bottom. The half-bulkhead also gives the DT tube the necessary rigidity in case a tight DT fuse should have to be forced through.

The finished fuselage is doped with nitrate followed by a couple of thinned-out coats of clear K&B Super Poxy. Aniline dye is added to the nitrate dope for a vivid, translucent coloring effect. Since the Super Poxy and Micafilm prevent fuel soaking, the Astrostar won't become one of those models that gain weight the longer they're flown.

Using a rear rudder gives the airplane a more consistent power pattern. The stabilizer alignment becomes less critical, and the model definitely seems to groove better.

A properly aligned wing, on the other hand, is critical to consistent flying. To convince yourself of this, simply cock your wing, and, viewing the model from the front, watch the changes in washout and washin as you rotate it. I align with dowels at the center dihedral breaks for drag-free flying. These dowels also offer the advantage of popping out of the slot if you hit a hard obstruction. The front of the stabilizer is also aligned to prevent a flat spin if the stab becomes cocked when the model dethermalizes.

I fly the Astrostar right-right, but it can be trimmed right-left if desired. While I prefer the right-right pattern, I never fight a model that shows an inclination to glide leftward other than to check it for warps.

It's a good idea to time the glide circle to make sure it isn't too small or too large. A large glide will rack up better time in dead air but will cause the model to fly out of thermals, whereas a smaller circle will cen-

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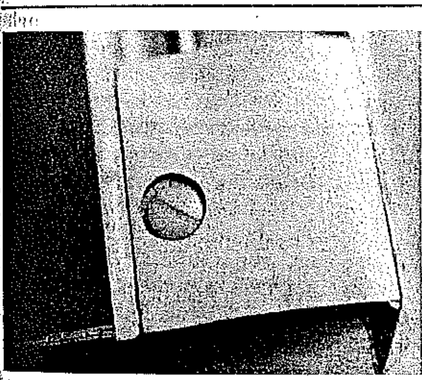

Thin plywood enclosing the nose of the outermost outboard wing rib bay serves as a container for lead shot used to adjust the tip weight for optimum slow-flight performance. A nylon screw plugs the access hole.

engine and the amount of tip weight you decide to use.

Kids/Haught

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make them feel they had an investment in their work, though, than to cover costs; and kids without funds were never turned away. Those who couldn't pay were given little jobs to work off the cost of their models. Imagine not having to mow my lawn for a whole year!

As the models got more expensive for me, I found that buying balsa in bulk helped. Bundles of balsa became the rule, and fellow modelers who'd heard about our group were quick to help. Some sent stacks of balsa and left them in my car, others mailed rolls of tissue paper at no charge. Thanks, Greg!

The owner of a hobby shop in St. Cloud that I visited on a business trip gave us a box of old Cox .049s, props, and wheels. That was a gold mine. It helped the kids who couldn't afford an engine get into Control Line flying.

The big project for the spring was a series of Control Line Top Fun models. So far, 12 have been finished and flown. After 20 flights, the pilots earn Ace status and receive an AMA medal. They then get to choose a model of their own to build.

Of the 17 kids who started on that day last fall, 15 have stuck it out. They're already skilled modelers and Control Line and Free Flight fliers. Much to my surprise, the two girls in our club are still with us and enjoy it as much as the boys.

Our game plan now is to get accustomed to flying with two pilots in the circle, leading up to Mouse Racing and, by the fall, ½A Combat. *All* of us have had a wonderful time and learned a lot.

For others who think they might be willing to tackle a project of this sort, let me offer some pointers. Plan on having fun. Don't be too intent on making it mainly a learning experience; try to keep it loose and fun. Discipline is important—the kids need to learn to respect you and the tools and materials they're working with. Keep it affordable. Keep the projects and objectives simple and reasonable. Try to assemble a file of potential projects well ahead of time. Use the natural leaders and faster builders as helpers.

Make up a workbox for each modeler. Use a shoebox or the like, and fill it with a knife, emery board, pins, glue, etc.

Share the fun. If you have a similarly inclined modeling friend, do it together. Meeting at a regular time and place is essential. Most important, relax, have fun—and remember what you're giving these kids!

I'd be glad to answer any questions that you might have (Dave Haught, 302 West Main, Ceylon, MN 56121). Good luck, and keep 'em building!

Astrostar/Thorkildsen

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ribs. The ⅛ x ⅜-in. main bottom spar is spruce; the other bottom spar is ⅛ x ¼-in. hard balsa.

Install the main ribs, except at the dihedral breaks. Fit and glue the ⅛ x ¼-in. balsa top center spar. Install the geodetic ribs, sanding the ends as required for a good fit.

Notch the geodetic ribs for the top turbulator spars, but don't install these spars at this point (you'd need to cut the front geodetic ribs in half to do so). I cut these notches with a straightedge and an X-Acto knife, using the main ribs as a guide. The notches are sanded to the correct depth using a piece of sandpaper glued to the edge of a 1/8 x 3/8 x 10-in.-long piece of spruce.

Glue the wing panels together, taking care to establish the correct dihedral and keep everything straight and true, with the 3/32-in. washin on the right panel only. Glue in the main ribs, followed by the geodetic ribs, at the dihedral breaks.

After all the ribs are installed, add the 1/8-in.-sq. turbulator spars, which are spruce for the center panels and hard balsa in the outer tips. Be sure, again, that the wood is straight and true.

After gluing in all the spars, install the shear webbing between them. Use very lightweight 1/16 balsa, and extend the shear webbing all the way out to the tips, except between the spruce main spar in the last rib bay. Notice that it does run all the way out to the tips on the balsa main spar. To make the webbing most effective, try to center the pieces between the spars, especially those measuring 1/8 x 1/4 in. The grain should run vertical. I find it best to cut out a number of the webbing pieces in 3-in. widths from the sheet stock after measuring the gap between the spars.

Use .007-in. carbon fiber to back up all the dihedral breaks at the main spruce spar and the leading edge. The trailing edge uses carbon fiber at the center dihedral break only. A full-depth 1/32 plywood center brace is glued against one side of the 1/8 x 1/4-in. hard center spars to reinforce the center section. To install the center brace, saw through the main rib with a Zona saw. It's well worth the effort for the extra strength it provides.

At the center dihedral break, the upper surfaces of the top spars are covered with carbon fiber to protect against DT landings, and 1/16 planking is installed to withstand abuse from the rubberbands.

Add the 3/32 sheet angle tips along with the gussets at the dihedral breaks to complete the wing.

Stabilizer. Construction is similar to that used for the wing, but the stabilizer is built lighter to avoid a tail-heavy model. The main ribs are made from lightweight 3/32 balsa sheet having the same density as the balsa used for the wing. The geodetic ribs are made from lightweight 1/16 sheet. A sheet of 1/16 x 3 x 36-in. balsa should weigh about 8 to 9 grams. Use hard, straight balsa for all the spars.

As with the wing, it's important to install all the front geodetic ribs before adding the front 1/8-in. turbulator spars.

Notice that two of the center ribs are separated by a small gap to allow room for the front 3/32 plywood key. I usually add a piece of carbon fiber down one side of the plywood key to help guard against breakage.

Add the DT wire at the rear of the stabilizer, bending it into an S shape where it's glued to the trailing edge. Cover the wire with a small piece of silk for reinforcement.

Fuselage. Select medium to medium-light 3/32 balsa sheet. To avoid splicing the body, use a piece of 3 x 48-in. stock; it should weigh around 23-24 grams.

Install the 1/8-in. balsa stringers that run full length in all four corners, then add the 3/32 balsa reinforcement between the corner stringers at the front on the timer side. I also add doublers on either side where the DT aluminum tube is inserted. At the front, I usually extend the balsa doubler back 5 in. on the timer side and about 2 to 3 in. on the far side.

Install the bulkhead for the DT tube, then fit and glue the bulkhead in front of the stabilizer. Temporarily glue a bulkhead at the firewall location to assist in establishing the correct alignment for the next step.

Cut the top piece slightly oversize, and lay it on a flat surface. Apply thick Hot Stuff (Super T or the equivalent) cyanoacrylate (CyA) glue on the top side stringers, then carefully attach them to the top sheet. Glue on the bottom in a similar manner. This method creates a strong, straight fuselage.

Cut out the rudder from medium-weight 3/32 sheet, making sure that the grain is oriented correctly. I usually apply a strip of carbon fiber on each side of the bare rudder before installing it to ensure that it's nice and rigid. The rudder is installed between the two sides at the rear of the fuselage. Sight down the fuselage to make certain that no rudder offset is accidentally glued in during this operation. *Continued on page 196*

Astrostar/Thorkildsen

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Run a 3/32 balsa doubler between the stringers at both the top and bottom of the inside front fuselage, extending them back about 2.5 in. Install blind nuts in the back of the firewall, being sure to place candle wax in them to keep glue out of the threads.

Glue the firewall in place using thick CyA, then sand it to blend in with the fuselage. Glue a piece of 1/64 plywood on the timer side, and wrap another piece around the fuselage under the stabilizer platform for durability. Reinforce the firewall with 0.5-oz. glass cloth, extending it back about one inch. When gluing the stabilizer platform in place, I usually induce a little right stabilizer tilt since I always glide my Astrostars to the right.

The pylon is constructed from two sheets of 1/8-in. medium-hard balsa, laminated, with the grain offset slightly, to give a total thickness of 1/4 in. I also reinforce the area where the wing platform is glued to the pylon with 3/16 triangles for extra strength. Silk is added at the front and rear corners of the pylon to prevent stress cracks.

In order to establish the correct center-of-gravity location of 76% with no fuel, the pylon is not installed until after the rest of the model has been completed. Once the CG is accurate, the pylon is glued to the bottom for a strong joint with no bulkheads. Trial fit the pylon into position before gluing it in place, and sight down the fuselage from the rear to make sure it's in good alignment. To ensure accuracy, I generally mark the pylon location at the front center of the fuselage, using a long straightedge.

Covering. When using Micafilm, one must first apply glue to the framework. I use thinned Balsarite on the ribs and spars and 3M 77 spray adhesive on the leading and trailing edges. The 3M 77 offers the advantage of staying tacky long enough for the Micafilm to be placed in position before the edges are ironed down. It's important to lay the covering over the framework as smoothly and tightly as possible. Get it as close to wrinkle-free as you can.

Cover the bottom side of the wing first. The top portion of the covering should overlap the bottom by about 1/8 in. Seal the overlap joint with Balsarite or thin CyA. Use a iron to tighten the covering, first at a me dium setting, and then going over the enti panel at the hottest setting. It's important t get the covering as tight as possible. G over the finished panel with the iron onc more to make sure the material is fastene to each rib and spar. This helps make th wing as rigid as possible and avoid win flutter.

If you don't want to bother with Mica film, silk will work just fine. Some mode ers prefer to double cover with Japanese tis sue. Both silk and tissue offer quite a bit c strength and excellent torsional rigidity With either of these coverings, paint o three to four coats of thinned nitrate dope followed by one to two coats of fuel-proofe or butyrate dope. On silk, use a throwawa foam brush from the local paint store to ap ply the dope, as it will fill faster with less overall weight.

Flying. Allow your finish to cure for a week or so before checking for warps and removing any that may have developed. Make sure the wing is properly aligned. Test glide the model, adjusting the incidence as necessary until a nice, floating glide is achieved. Double-check the CG location if major corrections in incidence are required.

Locating the CG at 76% without fuel works out well for a model with this stabilizer size. It prevents the Astrostar from going over the top, as will a tail-heavy model, and prevents the excessive looping sometimes seen in a nose-heavy aircraft. An astutely chosen CG location can be an effective means of fine tuning the power and glide phases of the flight, which can't be accomplished by incidence corrections alone. Don't be afraid to put in a Lite Ply spacer behind the engine or to add tail weight if necessary to move the CG to its correct position.

Use a pacifier pressure fuel tank for a consistent engine run, and set the timer for 2.5-3 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 the engine run until the full limit is reached. Properly trimmed, the model will make a couple of turns in 12 seconds, with a smooth transition to a floating glide.

Once your model is properly trimmed and ready for contest flying, I would recommend making your first three or four flights as early in the day as possible, when the air is nice and thick. Pay attention to the rest of the models, and when the thermal activity looks promising enough, begin your flyoff flights. Picking good air is an acquired skill, but watching the other fliers who seem to win a lot can speed up the learning process.

But then, so can flying this versatile, dependable, and stable Free Flight model. I'm sure the A-B Astrostar will bring you as much pleasure as mine has given me.

Product Sources

- Bradley Model Products, 1337 Pine Sap Ct., Orlando, FL 32825.
- Jack's Models, 7178 Aumsville Hwy., Salem, OR 97301.
- Kustom Kraftsmanship, Box 3010, Fallbrook, CA 92028.
- MRL, 25108 Marguerite Pkwy., B-160, Mission Viejo, CA 92692.

Curtiss XF13C/Schuette

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on the bottom of the fuselage for rubberbands is positioned forward of the tail hook so that there is tension on the rubberband with the hook down. (Use small rubberbands.)

Insert the tail hook through the doublers, and solder a washer to it on the opposite side of the fuselage.

Apply a drop of medium CyA in the tail hook doubler stop-holes in the doublers to harden them. Screw a 4-40 bolt through these holes. The screw enters from the tail hook side, passes through the fuselage, and ends flush with the outside edge of the doubler on the other side.

Use #2 x 3/8-in. screws to mount the fuel tank to the fuselage.

Mount the main landing gear, then lock it in place with 1/8-in. nylon landing gear straps and 4-40 bolts and nuts.

Use Glenn Lee 1 1/2-in.-dia. racing wheels or a similar type. Solder the inside washer onto the landing gear axle, and slip on the wheel. Put a small piece of sandpaper, a little larger than the washers used, over the landing gear wire, and solder the outside washer onto the wire. Remove the sandpaper from between the washer and wheel. Repeat for the other wheel.

To help smooth out the throttle response during low-speed flight, the throttle arm is lengthened so that full movement of the bellcrank is required to fully open and close the carburetor. Remove the throttle arm from the carburetor. Cut a 3/4-in.-long piece of 5/32 brass tubing, and flatten it to fit over the throttle arm. Sand or file off any anodizing on the throttle arm where the extension will be soldered. Place the flattened tubing over the throttle arm, and continue flattening until it's tight against the throttle arm. Solder the throttle arm extension in place, then