Last month we presented an introduction to Slope Soaring that gave the generalities of what the sport is all about and some examples of models suited for this activity. This month we get down to specifics with this nifty little ship that can take full advantage of even the lightest winds yet still deliver aerobatic performance.

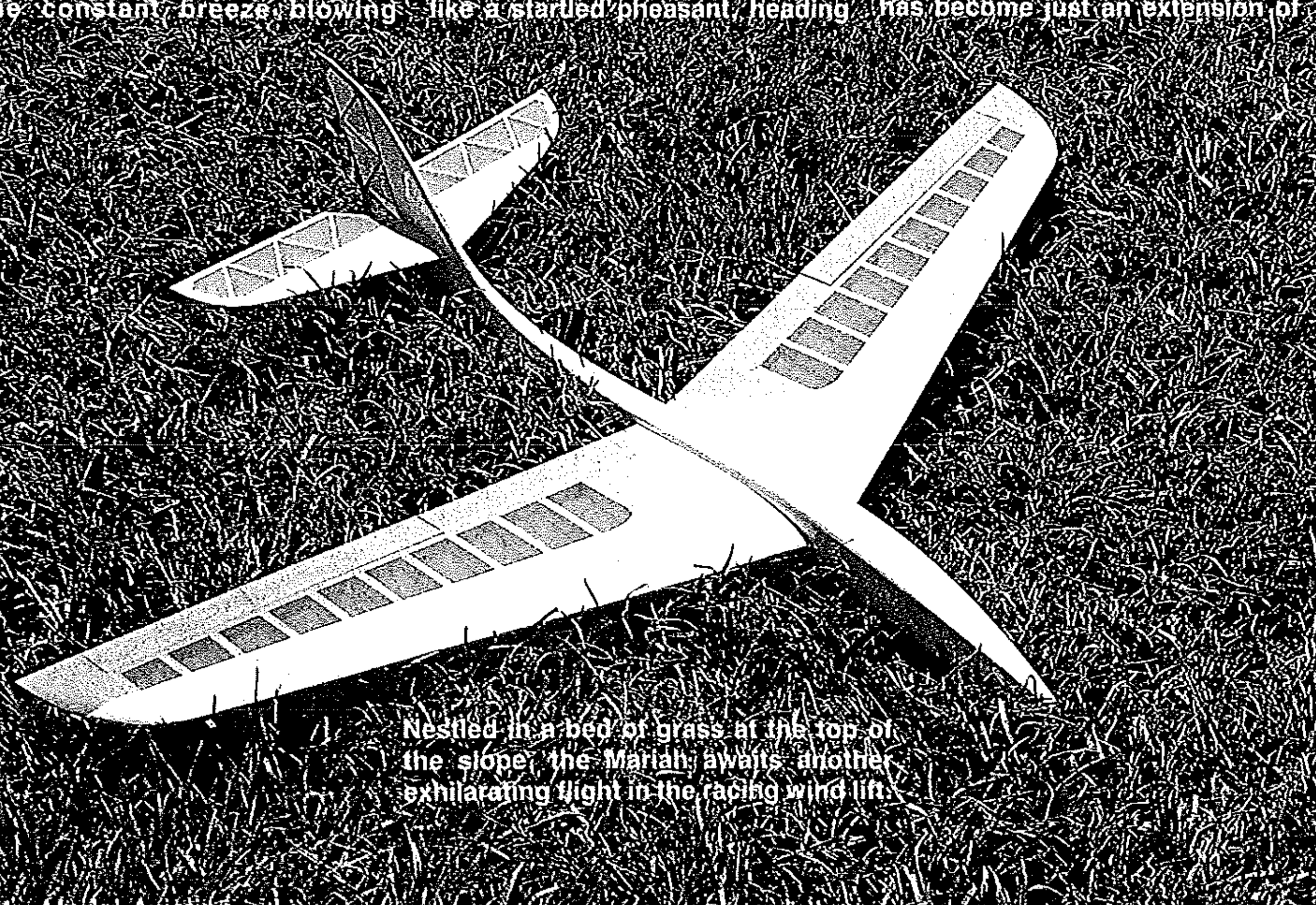
MARIAH

Mark Triebes

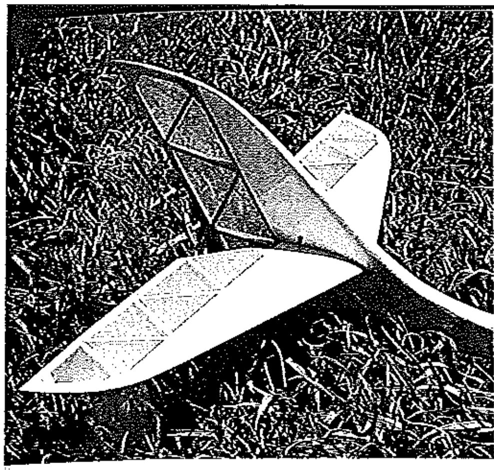
STANDING ON THE CREST of the slope, I try to absorb the conditions and the surroundings. As I look down the hill onto the clean white sand of the beach below, I begin to feel the pure essence of the flight to come. The waves gently glide into shore one after another, disturbed only by an occasional sea bird. The rhythm of the crashing waves mingles with the constant breeze, blowing through the trees and shrubs to create a sound which is at once enticingly relaxing and, in a way, very exciting.

An intense sun warms me, and the cool westerly wind is as refreshing as a swim in the sea beneath me would be. It all feels perfect. The small Sailplane seems to quiver in my hands as I prepare to set it free. It springs away like a startled pheasant, heading onward and upward into the insistent wind. Gazing up in admiration, I marvel at how perfectly this airplane suits its environment.

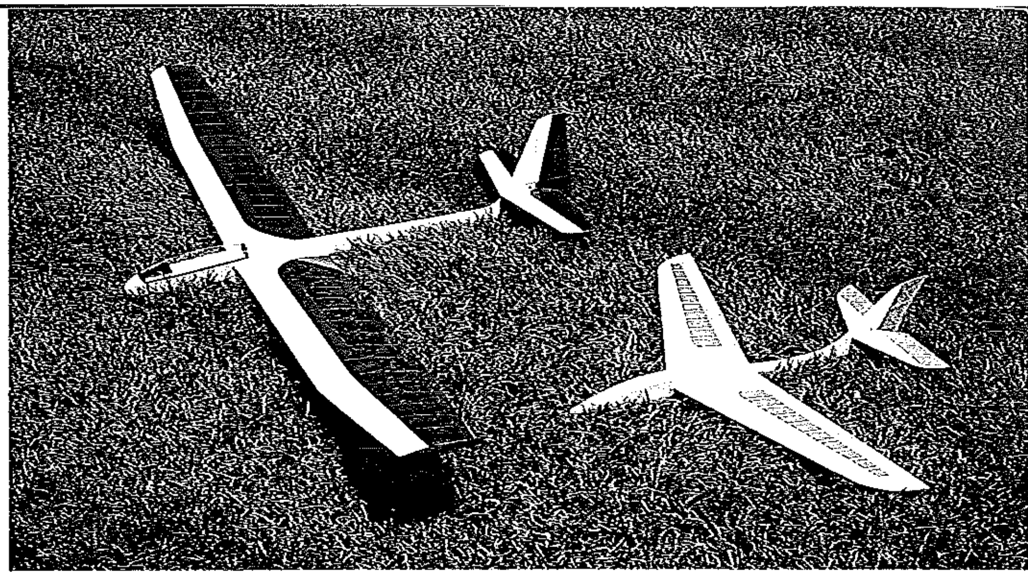
As the Sailplane gracefully circles, rolls, and loops her way up and down the ridge, I'm transported by the sensation of being out there over the waves with her. It's as if, in flight, the aircraft has become just an extension of



Nestled in a bed of grass at the top of the slope, the Mariah awaits another exhilarating flight in the racing wind lift.



A full-flying stabilator provides the Mariah with highly responsive pitch control—something very much required for slope flying.



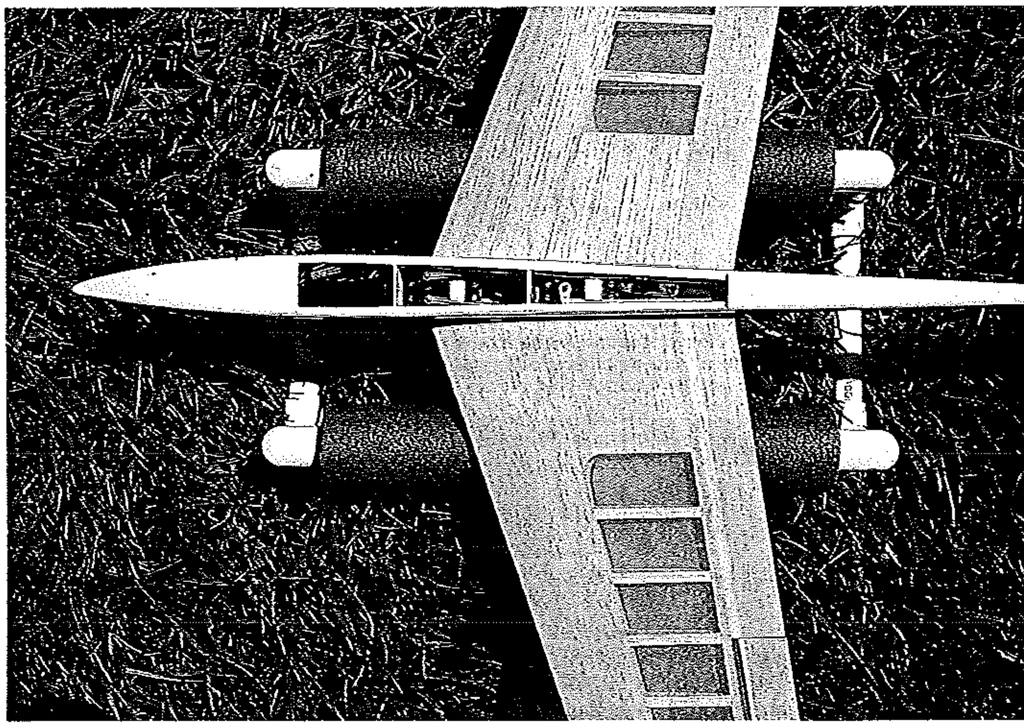
Placed next to a standard-size Sailplane, the Mariah's small size really becomes evident. With a span of just over 40 in. and weighing less than 1 lb., the Mariah is unique among Sailplanes.

myself. What started life as a mere bundle of sticks and sheeting now seems to be virtually a part of me. It's a heady illusion, and I surrender to it gladly. The sense of freedom that it brings is like no other, and I realize that through no other act can I achieve such a feeling.

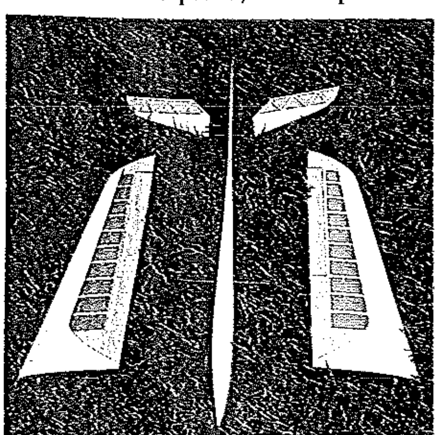
While the idyllic scene I've just pictured has been experienced by many Sailplane fliers, it's relatively rare that every detail falls so perfectly into place. Most Sailplanes require at least moderate winds in order to fly. How many times have you taken your ship to the slopes, only to find that you have to wait an hour or two for the wind to really start blowing—or that the wind never blows more than about five or 10 knots? I've encountered both these conditions on many occasions, and have either resorted to flying a "floater" or not flown at all.

Floaters can be relatively amusing, but I can only stand so much S-turning back and forth. What I wanted was some type of Sailplane that was highly maneuverable and aerobatic, but that could also fly in very light winds. I wanted a ship with the fun quotient not dependent on a gale force. Obviously, such a plane would have to be be small, lightweight, and agile.

Guided by those basic criteria, I eventually evolved a design that I was happy with. I called it the Mariah. With a wingspan of approximately 40 in. and a weight coming to less than one pound, this Sailplane was exactly what I was looking for.

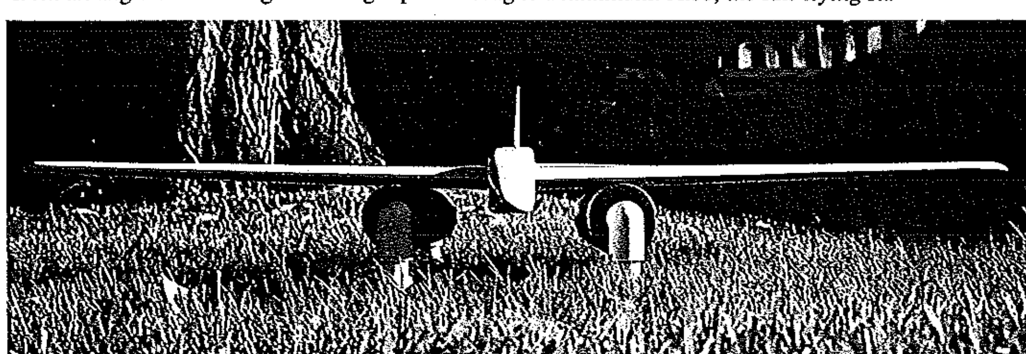


Although the fuselage of this Sailplane is very small, there is generous room for most of today's smaller radio systems. The author uses a standard Futaba receiver, S-20 servos, and a 225 mAh battery pack. The stand shown here is made from PVC pipe and foam tubing.

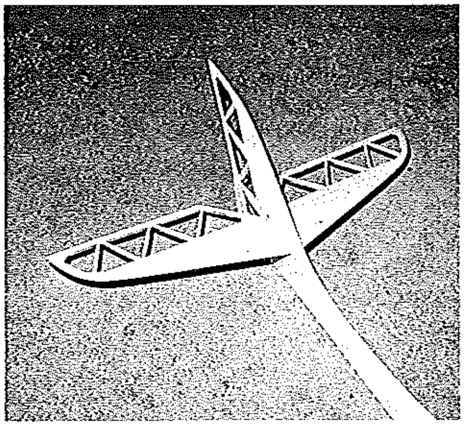


When disassembled, the Sailplane will fit into the smallest of cars for transporting to your favorite flying site. The use of ball-links on the aileron bellcranks and servo arms enables quick and easy assembly at the field.

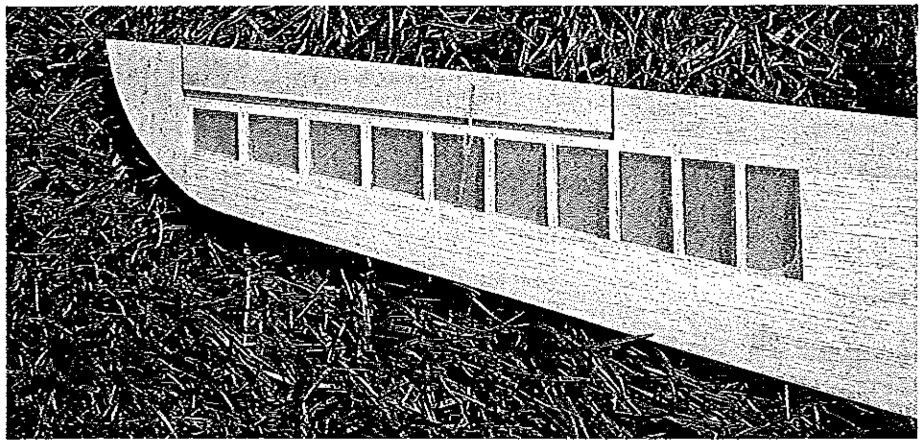
Creating a design that would perform as I intended took a great deal of consideration, and it shows in the Mariah. The clean, smooth lines of this Sailplane are evident from all angles. Achieving the in-flight penetration I wanted called for an aerodynamically clean design with very low drag. The ailerons are built so that no protruding control horns are used, and covering the gap with either Mylar or MonoKote reduces drag to a minimum. Also, the full-flying sta-



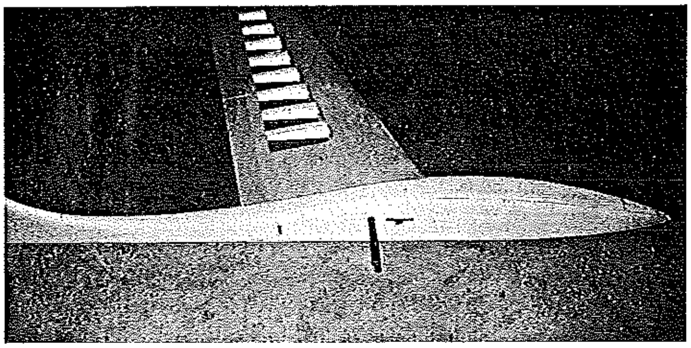
An aerodynamically clean design allows the Mariah to perform as it does. The minimal drag enables it to penetrate well in the wide variety of wind conditions typical of Slope Soaring.



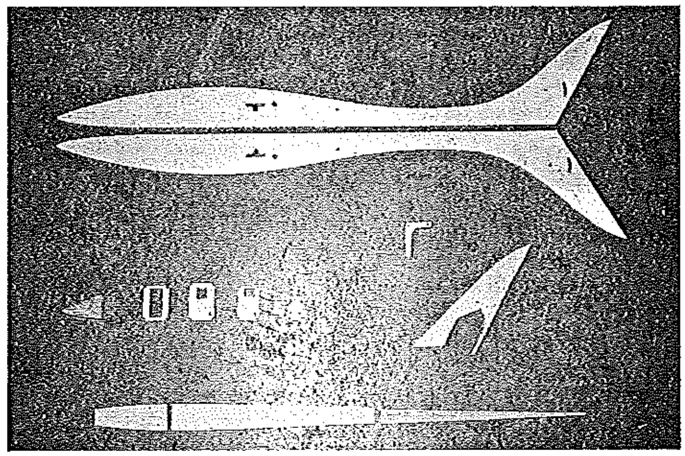
Test fit the stabilator and the wings to be sure they rest flush against the fuselage sides before applying your favorite covering.

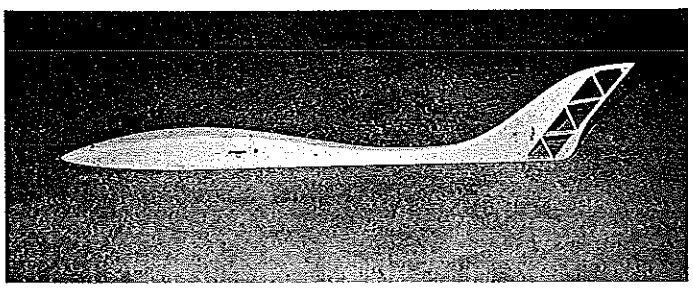


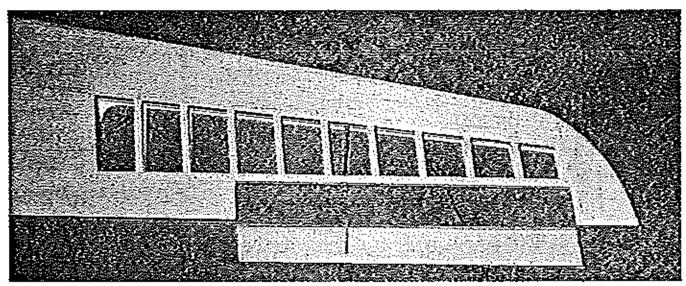
The details of the wing rod box. Note the aileron bellcrank/pushrod assembly. Be sure that the bellcrank is at 90° in relation to the ribs so there is no binding in the control movements.



Above: Details of the wing rod, wing pin, and the aileron bellcrank slot. The notch in the slot is for the bellcrank ball-link. Right: Fuselage sides, formers, and stabilator bellcrank are made from 1/8-in. Lite Ply, and the fuselage bottom and rudder pieces are 1/8-in. balsa.





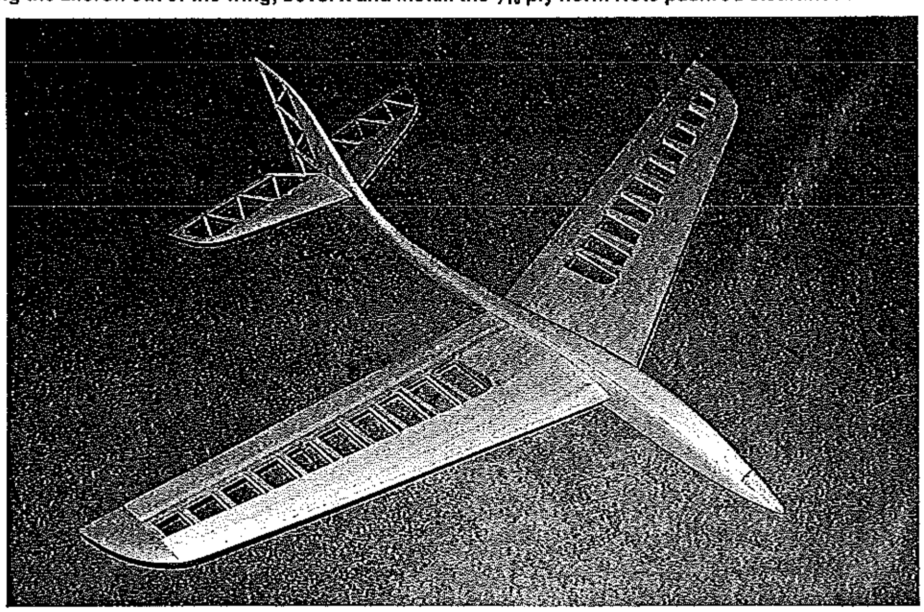


Left: The completed fuselage ready for final sanding and covering. The hatch is located on the bottom of the fuselage and allows complete access to the radio at all times. Right: After cutting the aileron out of the wing, bevel it and install the 1/16 ply horn. Note pushrod clearance hole.

bilator is a virtually drag-free and very effective control surface. The generous ailerons in combination with the full-flying stabilator produce a very responsive Sailplane, one that's perfect for slope flying.

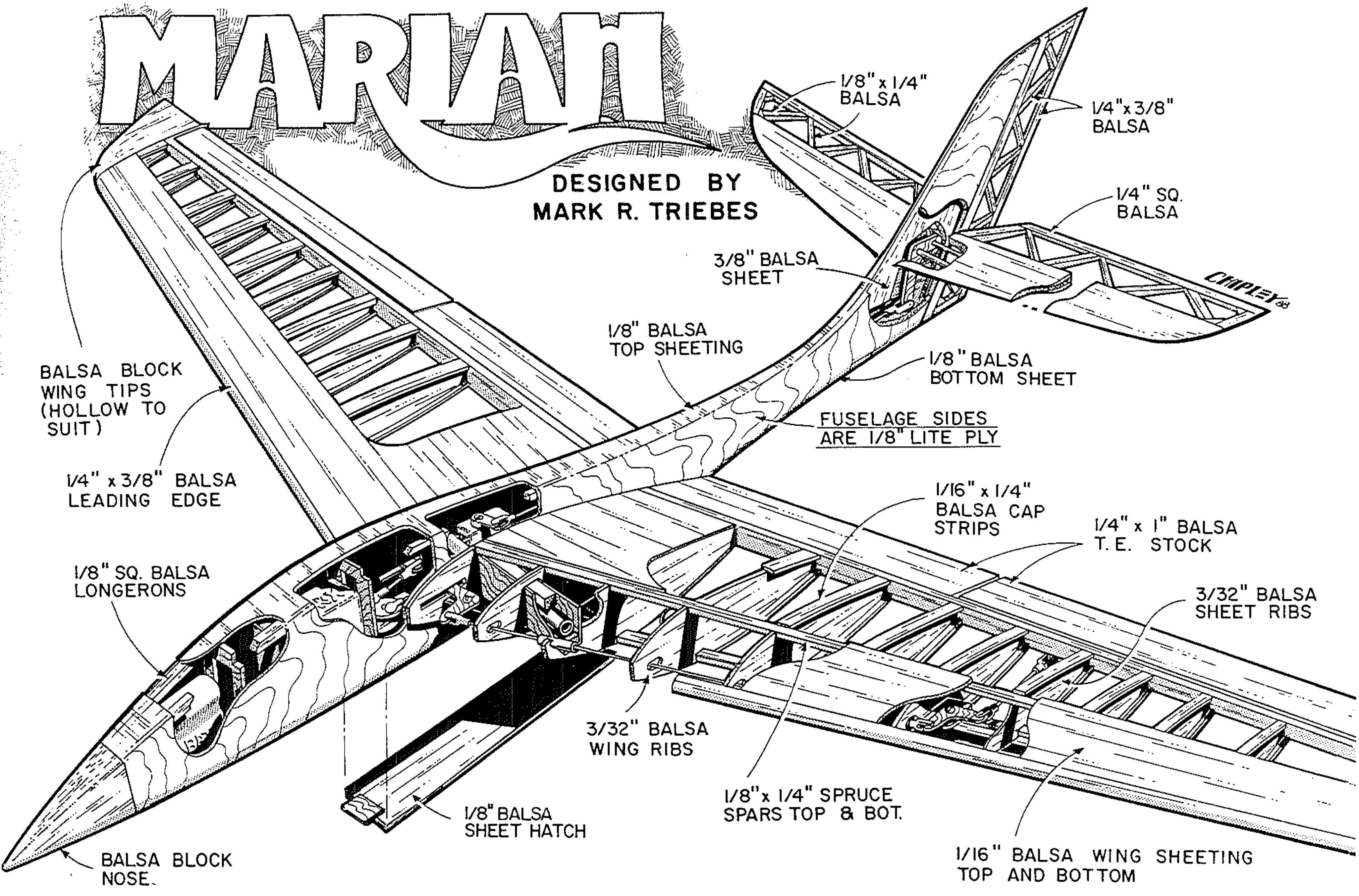
I've experimented with many different types of airfoils, and for the Mariah I chose the Eppler 205 because of its great versatility. This airfoil provides high lift at low speeds, but still allows you to attain as much speed as desired. Aside from their obvious good looks, the swept wings were chosen for the stability that they afford.

If you've ever found yourself wishing for a Sailplane that you can fly off the slopes whether the winds are light or strong, a plane that'll get your pulse racing as it loops, soars, and dips in the calmest of skies, then the Mariah is for you. When the winds increase, just add a little ballast, and this versatile Sailplane will perform with the best of 'em.



The completed airframe before final sanding. The more time spent finishing and sanding, the better it will look when finished. Our author recommends MonoKote for its easy application

Construction is fairly straightforward and


MARIAH
DESIGNED BY
MARK R. TRIEBES
1/8" x 1/4" BALSA
1/4" x 3/8" BALSA
1/4" SQ. BALSA
3/8" BALSA SHEET
1/8" BALSA TOP SHEETING
1/8" BALSA BOTTOM SHEET
FUSELAGE SIDES ARE 1/8" LITE PLY
BALSA BLOCK WING TIPS (HOLLOW TO SUIT)
1/4" x 3/8" BALSA LEADING EDGE
1/16" x 1/4" BALSA CAP STRIPS
1/4" x 1" BALSA T. E. STOCK
1/8" SQ. BALSA LONGERONS
3/32" BALSA SHEET RIBS
3/32" BALSA WING RIBS
1/8" x 1/4" SPRUCE SPARS TOP & BOT.
1/8" BALSA SHEET HATCH
BALSA BLOCK NOSE.
1/16" BALSA WING SHEETING TOP AND BOTTOM

simple. The fuselage is built with Lite Ply and balsa, and the tail feathers are constructed entirely of balsa. The wings are built up with leading edge sheeting and have a very simple, clean aileron setup. Covering is easily accomplished with MonoKote.

For most builders, the entire project will take very little time. As an old hand at scratch-building, though, I've discovered a number of things that I'd like to pass on to you. These hints should help you to complete the Mariah as rapidly and efficiently as possible.

First, be sure to use a clear plastic sheeting, such as plastic wrap or MonoKote backing, over the plans. This not only preserves the plans but ensures a cleanly constructed model. Second, when choosing an adhesive, use a white glue such as Titebond for the majority of the work, and a good epoxy where specified in the directions. Third, be sure to use Lite Ply for the fuselage sides, stabilator roots, and inner wing ribs; spruce for the wing spars; and good contest-grade balsa for the remainder of the Sailplane. Fourth, make sure you label all of the parts, especially the wing ribs and fuselage formers, so that there will be no confusion during construction. Fifth and most important, read this article and study the plans, *before* you start to build, to familiarize yourself with the Mariah's design and the construction sequence involved.

Ribs. Cut a plywood root rib and tip rib, using these as templates to sand and shape blanks placed between them. This is the most efficient method of constructing ribs. Cutting them out one at a time is not only very tedious and time-consuming, but also doesn't allow you to construct a really true wing. Any irregularities in the shape of the airfoil will detract from the appearance and performance of the finished model.

Making the root and tip templates is the most important part of this procedure. Using 1/8-in. plywood, make two sets of both the root and the tip rib. Take care that you cut and sand all four to perfection, which will ensure that a true wing is constructed.

The ribs themselves are made of medium-weight 3/32 balsa in 1-in. strips. Using the plan as a guide, cut the strips to the proper lengths. Remember to label all the ribs, and be sure to make two of each. You now have two sets of rib blanks that are of the proper length, but unshaped.

Lay each rib blank in place on the plans. Mark the location of the bottom spar, then cut out the 1/8 x 1/4-in. spar notch in each. Place all of the ribs blanks and the templates on a spare piece of spar stock.

Sand the rib blanks to the proper shape. This can be a very tedious step, unless you use a few techniques to make it easier. First, use Scotch and/or masking tape to help hold the ribs together. It is much easier than pins in that you can sand right through the tape when necessary. Second, instead of relying on arm power for the entire job, begin by using a power drill with a flexible sanding disk to get the shape close to what you want. At first this technique will seem a little awkward, but you should get used to it rather quickly. Once you've finished with the power drill, hand sanding the ribs down to their final shape should take only a few minutes. It is important that you achieve a straight line across the top of the ribs when they're viewed from the front and rear—any bowing of this line will result in a misshapen wing.

Remove the ribs from the spar stock, and mark and cut the notch for the top spar using the plans. Drill 1/8-in. holes in ribs W-2 through W-8 for the aileron linkage, again using the plans for reference.

Wing. Either of two methods works equally well here: building the wing with cap strips as shown in the plans, or constructing it fully sheeted. I chose to use cap strips purely on the grounds that I like the finished look better, and because of the minute weight difference. Your choice can be based strictly on personal preference. Construction differences between the two procedures will be noted where appropriate.

You may have heard it countless times, but it's worth repeating: Be sure to make a both a right and a left wing. Even the best and most experienced builders have been known to make either two lefts or two rights.

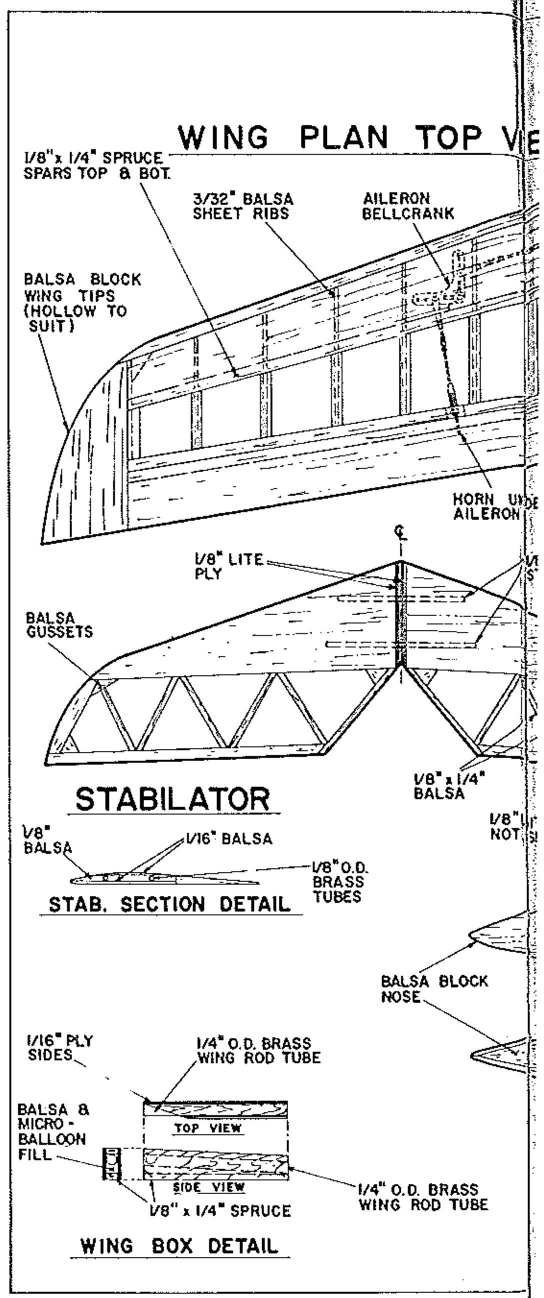
Cut the 1/4 x 1-in. balsa trailing edge to length, and securely pin it in place on the plans. At this point be sure to cover the plan with plastic wrap or MonoKote backing, if you haven't already done so. Cut the first of two 1/4 x 3/8-in. balsa strips to length, and glue it to the trailing edge. Cut the second balsa strip, but glue it to the trailing edge only up to where the aileron begins. Spot glue it (a drop of glue every 2 in. or so) along the length of the aileron.

If you're building a fully sheeted wing, cut 1/16 balsa for the bottom sheeting, and glue in place. If you're using the cap strip method, cut the root sheeting, the leading edge sheeting, and the cap strips, and attach them with glue. For both fully sheeted and cap stripped wings, be sure to leave about 1/8 in. of extra sheeting beyond where the leading edge begins; you'll sand off any excess after attaching the ribs and top sheeting. Cut the 1/8 x 1/4-in. spruce spar to length, and glue it in position on the sheeting.

Once all this is dry, build the wing rod box. Epoxy is the appropriate adhesive for this step. Be sure to fill in the space around the wing rod with scrap balsa and microballoons so that the brass wing tube is held securely. Once the entire box has had a chance to dry, glue it in place on the bottom sheeting.

Before permanently attaching the ribs, be sure to block up the leading edge of the sheeting so that it will fit flush against the bottom of the ribs. A piece of trailing edge stock does this very well. Glue ribs W-1 through W-13 in place. Cut the top spar to length, and glue it in position over the ribs.

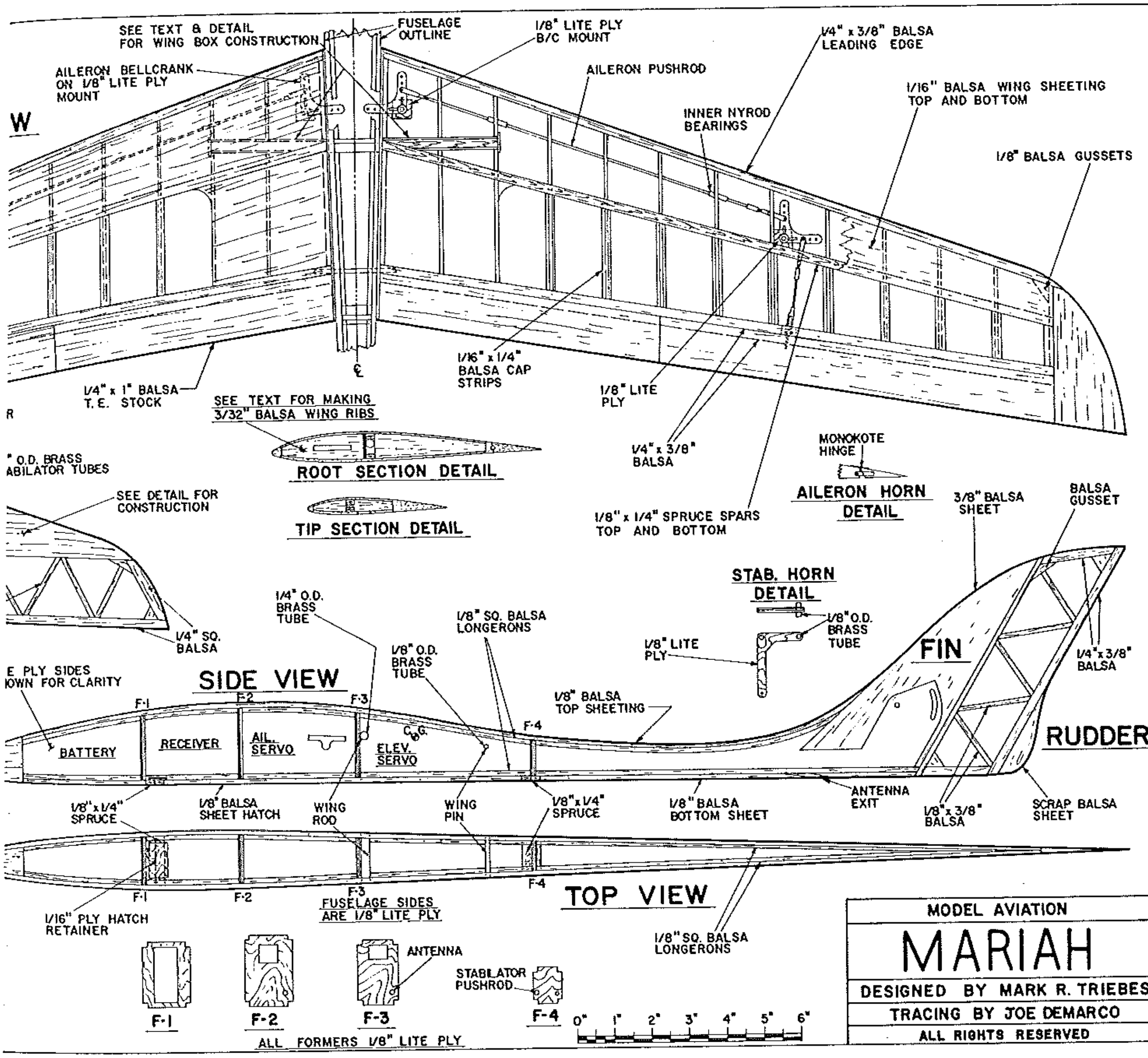
Since the aileron pushrods and bellcranks need to be properly aligned for unrestricted control movement, take extra care in constructing, assembling, and adjusting them.



Using the plan as a guide for the four pushrods (two in each wing), cut the 1/16-in. music wire into the proper lengths. Solder a threaded coupler onto one end of the long rod, then install it in the wing. Solder another coupler onto the other end of the rod.

Cut 1/8-in. Lite Ply to size to make the bellcrank platforms. Mount the bellcranks, and glue both platforms in place on the bottom sheeting. Attach nylon clevises to each end of the long pushrod, and connect to the bellcranks as shown in the plans. Check for any binding. When everything fits perfectly, adjust the pushrod so that the root bellcrank is at 90° in relation to W-1, and the outer bellcrank is also square in relation to the ribs. Make the smaller pushrod in the same manner. The exact length of this pushrod will be determined once the aileron is cut out and the horn has been glued in place. Cut and glue on the top sheeting and, if you're using them, the cap strips as shown in the plan. Allow the entire structure to dry thoroughly

Full-Size Plans Available . . . See Page 164



before sanding the wing.

Be very careful to avoid making any flat spots or irregularities when sanding the wing to the desired shape. To simplify the procedure, I suggest that you make a very long, flat sanding block (i.e., 24 x 4 in.). A sanding block of this size reduces the probability of error.

Sand down the two ¼ x ⅜-in. strips to the proper airfoil shape. Sand the tip of the wing flat, cut the balsa wing tip to the proper shape, and glue it onto the wing, making sure to just spot glue it at the aileron. Sand off the excess sheeting at the leading edge, and glue the ¼ x ⅜-in. balsa leading edge into place. Sand the root of the wing flat, and glue on the 1/16 plywood root rib.

The wing is now ready for final shaping and sanding. Your long sanding block will help to achieve a smooth, evenly contoured result.

Cut out the aileron as per the plans, and sand the proper bevel on it to allow for control movement. Carefully drill the ¼-in. hole in the wing trailing edge for the pushrod. Make the control horn, and temporarily slide it into the cut made in the aileron. Place the aileron in position, adjust the small pushrod so that both bellcrank and aileron are at neutral settings, and glue the horn in place.

Fuselage. Cut the two sides from ⅛-in. Lite Ply. Once again, don't forget to make both a right and a left side. Mark the location of the wing, the stabilator bearing hole, and the rear wire slot as shown in the plans. Using a third root rib, precisely mark and drill the fuselage sides.

Spot glue or tape the rib in place on the fuselage side, and drill the wing rod hole and wing pin hole. Mark the location of the aileron bellcrank slot, remove the rib from the fuselage side, and cut the slot. Drill the stabilator bearing hole, and cut the rear wire slot.

Cut the ⅛ x ⅛-in. longerons to length, and glue them in place. These longerons must be beveled at the tail so that the fuselage sides will fit flush together.

Make the stabilator control horn out of ⅛-in. Lite Ply. Drill the pushrod clevis hole, bearing hole, and rear wire hole. Cut two pieces of ⅛-in.-O.D. brass tubing to ⅜-in. lengths. Epoxy one of these tubes into the rear wire hole. While the epoxy is drying, insert a length of 3/32 music wire into the tube to make sure that the tube is perpendicular to the control horn. Any misalignment in the control horn will result in a crooked and/or ill-fitting stabilator. Make the stabilator pushrod.

Cut formers F-1, F-2, F-3, and F-4 out of ⅛-in. Lite Ply. Glue formers F-2 and F-4 in place between the two fuselage sides. Do this over the top view on the plans to be sure that the fuselage is aligned correctly. Cut the brass wing rod tube to length, and slide it into place. Now glue in former F-3 so that it is flush against the brass tube. Allow to dry thoroughly.

Be sure to properly position the 1/8-in. balsa rudder piece and the stabilator control horn with pushrod before gluing the tail sides together. Glue the sides together over the plans to be sure of proper alignment. Make the balsa nose block, then glue former F-1 and the nose block in place between the two sides. Epoxy the brass wing rod tube in place.

Drill the wing pin holes into each wing. Cut the 7/32-in. music wire wing rod to length, and plug it into one of the wings. Place the wing on the fuselage, and align the wing pin hole in the fuselage with that in the wing root rib. Using a long, 1/8-in. drill, slide the wing rod through both wing pin holes in the fuselage, and drill 3/8 in. into the wing. Repeat this procedure for the other wing.

Cut the 1/8-in.-O.D. brass wing pin tube to length, and glue it into place in the fuselage. Cut two 3/8-in. tubing lengths for gluing into place in each wing. Cut 1/8-in. balsa sheeting; glue it into place across the top of the fuselage back to former F-4.

Cut a length of inner Nyrod tubing to hold the antenna. Cut the rear bottom sheeting to size. Drill a 1/8-in. hole diagonally through the sheeting for the antenna tube exit (the plans show the desired position for the hole), then glue the sheeting in place. Slide the antenna tube through this hole and the hole in former F-4. Use epoxy to hold the antenna tube in place, and glue on the remainder of the top sheeting.

Cut the hatch from 1/8-in. balsa. Cut 1/4 in. off each end, then glue on the 1/8 x 1/4-in. spruce pieces. Cut the hatch retainer tongue from 1/16 plywood, and glue it onto the balsa hatch as shown in the plans. Cut to length the 1/8 x 1/4-in. spruce hatch retainer piece, and glue it onto the bottom of the fuselage along with the 1/8 x 1/4-in. spruce piece at the rear end of the hatch.

Trial fit the hatch, and sand it until the fit is just snug. If the hatch fits too closely at this point, then it probably will not fit once it and the fuselage have been covered. When you're satisfied that it fits properly, spot glue the hatch in place.

Cut the forward bottom sheeting from 1/8-in. balsa, and glue in place. Do not begin sanding the fuselage until after constructing and attaching the vertical fin.

Vertical fin. If you have fully sheeted your wings, you will probably not want an open-frame tail section. Instead, construct the entire vertical fin with 3/8-in. balsa sheet. This won't add too much weight to the tail (both my prototypes came out nose-heavy, believe it or not). If you have fully sheeted wings and still want to build the open-frame vertical fin, that's fine, too. For those of you who used cap strips on your wings, I highly recommend that you build the open-frame version.

Using 1/4 x 3/8-in. balsa stock, cut to length and glue together the fin border pieces. Cut to length the inner structure from 1/8 x 3/8-in.

stock, and attach with glue. Be sure to add gussets where specified on the plan. After the structure has dried, glue it in place on the fuselage.

There really aren't any shortcuts or tricks to expedite sanding the fuselage. Just use a lot of old-fashioned elbow grease until the fuselage has the desired smooth, rounded look and feel. When finished sanding, cut the hatch out of the fuselage (you spot glued it in earlier). There are at least a dozen different ways of securing the hatch to the fuselage, ranging from simply using Scotch tape to a complicated hook-and-rubberband setup. I recommend using some type of hold-down technique, and keeping it as simple as possible. Carl Goldberg Models, Inc. makes an angled hold-down that would work very well. I'll leave the decision up to you.

Stabilator. As with the vertical fin, building the stabilator with the open frame will probably not be your choice if you have fully sheeted your wings. If this is the case, use 1/4-in. balsa sheet for the rear portion of the stabilator.

Construct the front portion of the stabilator with 1/8-in. balsa sandwiched between 1/16 balsa. Cut the two 1/8-in. balsa pieces, making sure that they are exactly 1/8 in. wide. Cut two slots in each of them; the slots must be perpendicular to the root. Cut four pieces from 1/16 balsa, and glue a 1/8-in. piece onto one of the 1/16 pieces. Cut the 1/8-in.-O.D. brass tube pieces to length, and epoxy in place in the two slots. Make sure to cut the two tubes 1/8 in. longer than the slots; you'll need this extra length to extend through the stabilator root rib.

Glue another 1/16 piece on top of the structure. Pin this in place on the plan, and build the frame structure of the stabilator. Cut out two stabilator root ribs from 1/8-in. Lite Ply. Drill the 1/8-in. bearing and rear wire holes. Glue the root ribs in place on the stabilators. After the entire stabilator structure has dried, sand it to final shape.

Finishing and covering. Once the major construction is completed, fine-sand all the surfaces. Do this with your large sanding block and some fine sandpaper (i.e., 150-or 220-grit). When the fuselage has been sanded to the smooth, rounded appearance you want, trial fit the wing and stabilator to be sure that all contiguous surfaces fit flush. The goal is to keep gaps to the utmost minimum for a truly aerodynamically clean Sailplane.

When sanding the leading edge of the wing, be sure to leave it adequately rounded and not too sharp. A sharp leading edge doesn't bring faster speeds—only faster stalls. To help prevent tip stalling, the leading edge should also be more rounded (less sharp) at the tip than it is at the root. Leave the tip flat on the bottom, and sand in a gentle curve going from W-13 to the edge of the tip.

Any type of iron-on covering will work well on the Mariah, but I suggest that MonoKote be used. MonoKote is very lightweight, strong, and just about the easiest of the coverings to put on. The color scheme is up to you, but I recommend a transparent color over the open frame areas and an opaque one over the sheeted areas and fuselage.

Hinge the ailerons with either a 1/2-in. strip of MonoKote or a clear Mylar. It's a good idea to also cover the gap on the bottom side of the aileron with a strip of MonoKote or Mylar. Be sure to attach this strip only to the wing, and not to the aileron itself.

Radio installation. Although this is a very small Sailplane, there is still a generous amount of room for the radio. I used a standard Futaba receiver with S-20 servos and a 225 mAh battery pack. Mount the stabilator servo as far forward as possible (right up next to the wing rod tube). Also mount the aileron servo as far forward as possible between formers F-2 and F-3. Use ball links on both the servo arms and the aileron bellcranks to provide plenty of unrestricted control movement. When installing the battery in the nose of the Sailplane, first put in some foam rubber to pad the battery pack.

Flying. Now comes the reward for all your hard work—taking the Mariah to the slopes and letting her try her wings. The center-of-gravity (CG) shown on the plan has proven the most workable balance point for me, and I suggest at least using it as your start-

Continued on page 128

an altitude of about 200 ft., I realized that I had absolutely no control whatsoever! The model went into a left-hand spiral dive, and the resulting impact into the macadam runway drove the OS .30's crankshaft out through the rear crankcase cover and turned the model into a yellow Coverite bag of balsawood. Also, the G.I. Joe pilot lost his head—but lived to fly again!

Other than having stripped gears in all of the servos, the radio functioned flawlessly after the crash. So, my theory about the loss of control was that I had partially disconnected the receiver battery pack when I stuffed it rearward in my attempt to shift the CG. At that time I didn't bother to tape my radio connectors, and engine vibration took care of the rest of the disconnection. So I never did find out whether a rearward CG shift would have improved the J-3's spin entries, but I did learn to secure my connectors with tape on future models.

To fly alone or not to fly alone? A number of readers sent letters which commented on the "Plane bites man" story in my March 1988 column. This concerned an incident in which a modeler was struck and seriously injured by his own plane. His advice (and also mine) was: "Never fly alone."

Apparently there are a lot of you out there who don't subscribe to this advice. Most seem to feel that, because there is no one but you at the flying site, you won't suffer an injury or loss of model because of someone else's mistake. Similarly, a mistake by you does not jeopardize someone else's safety.

While this may all be true, being hit by a model is not a frequent cause of injury. Feeding your fingers through your own model's prop *is* a common cause of injury. Driving a car with one hand is not easy, and may be impossible if the other hand is being used to stop a flow of blood!

Flying untested Scale models. A recent letter from Del Rykert (Batavia, NY) expressed concern about the numerous occasions wherein he has seen modelers enter a Scale contest with a model that hadn't been tested for airworthiness.

Del asked for my opinion on how to prevent such a flagrant violation of safety. Unfortunately, I didn't have a simple solution to offer.

Del thinks that Scale modelers are reluctant to test fly a new model prior to entering a contest because they want to "save it for static judging." If such is the case, he suggests that the solution may be to reverse the current order of judging such that we fly first and have static judging last.

As I stated in my response to Del, I don't have a good feel for how prevalent this problem is. That's why I'm mentioning it here and asking for input from Scale modelers. Do we have a real safety problem with untested models being flown at Scale contests? If so, what is your solution?

Mariah/Triebes

Continued from page 33

ing point. You may wish to adjust the balance to fit your own flying style as you become accustomed to the Mariah.

This Sailplane likes to fly fast and smooth. The Mariah has full aerobatic capabilities and is an extremely stable aircraft at all speeds. The swept wing keeps the plane highly stable during slow flight, and it slows down very well for landing without the need for spoilers or flaps.

When all is said and done, the most important thing is to have fun—and some of the most exhilarating slope flying I've experienced has been with this little Sailplane. The Mariah may be the best Soarer I've ever flown; she's definitely right up there in the first rank. Try her yourself and you're bound to agree.

Radio Technique/Myers

Continued from page 36

can be accurate enough to find the transmitters that are outside the AMA frequency tolerances. When it comes to measuring power levels, it really isn't good enough for installing the Gold and Silver stickers (paragraph 3.2.2 of the AMA Guidelines requires a spectrum analyzer be used for that purpose). I think the ICOM is good enough to reveal illegal crystal swapping—and that is all a Contest Director really wants to know about.

RC Giant Scale/de Vries

Continued from page 41

is bewildering. Some are more efficient than others—they convert the same amount of gas or glow fuel into more power per cubic inch. Thus, in some installations, we may be able to get away with a "smaller engine," just because it is more efficient than others in its displacement range. Then too, not all hobby shops or distributors carry all of the available engines. Your engine choice may depend more on availability or cost as factors than on other considerations.

The proper propeller can make or break a specific engine. A great prop, from the efficiency viewpoint, may turn a competent engine into a raging tiger!

Flight altitude is included in our list of engine choice factors primarily because it's a BIG one amongst us here in the Rocky Mountains. Just because we fly at altitudes of 5,000 to 7,000 ft. above sea level, we know we're going to lose 20% of our engines' power before the props are spun. Conversely, if you fly at sea level, *your* engine is going to put out its full power.

Since we're concerned with scale outlines, often the engine we choose is determined by our desire to keep it within the confines of the cowling. Not the best of criteria, a lot of us don't like a bunch of ironmongery disrupting the scale lines of our models. Hence, we're inclined to choose a physically smaller engine than one that might be more appropriate from a power-required viewpoint.

Finally, there is often the consideration of brand loyalty. If we've been successful with the product of a particular manufacturer, we're inclined to buy another of their engines. Nothing wrong with this criterion—as long as your favorite manufacturer produces a *range* of power plants. And—you can choose one that is suitable for your model.

Engine choice is a very personal thing. You can listen to the pronouncements of the experts—they're frequently right! You can follow the recommendations of the model's designer—after all, he's *flown* his model with a specific engine size. But, when push comes to shove, *you'll* have to decide which engine to use. And you'll have to do it early in the building sequence. It'll take a lot of thought and consideration!

A final note that may be of interest to those of you who are the movers and shakers in AMA clubs or IMAA chapters. Jim Jennings (Jennings Trophy Sales, P.O. Box 1121, Hendersonville,