719

ARIA

Why think twice about going Electric when you can have crackerjack RC performance on a shoestring?

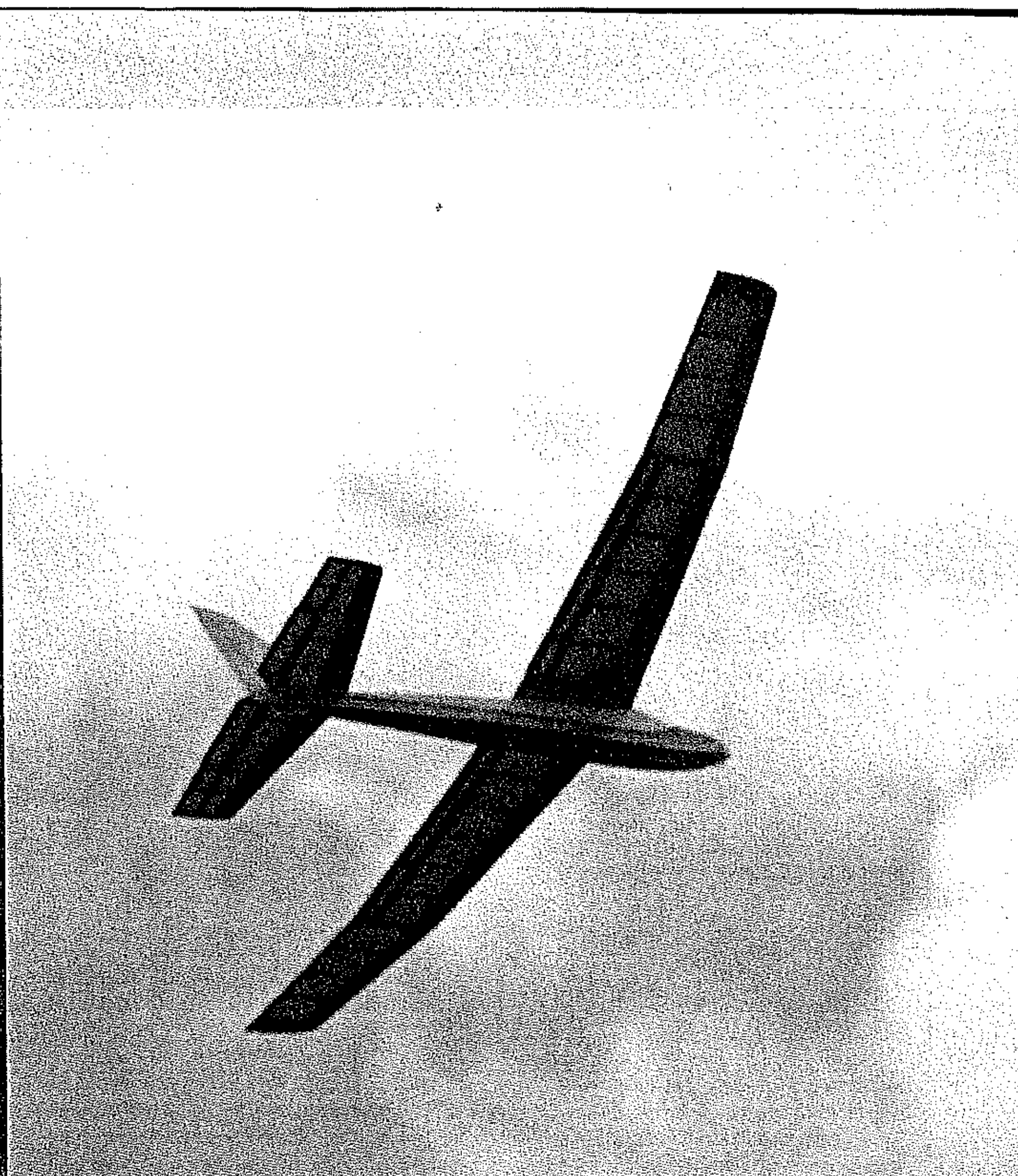
■Bill Winter

WHAT MOST of us want in an Electric model is the most for our money—long and high flights, more maneuverability, good pilot feel, great handling, smooth responses, an affinity for soaring, windy-weather capability, easy approaches and landings (with none of the awkwardness of Sailplane types). Not only do we want all this, but we want it all in one airplane.

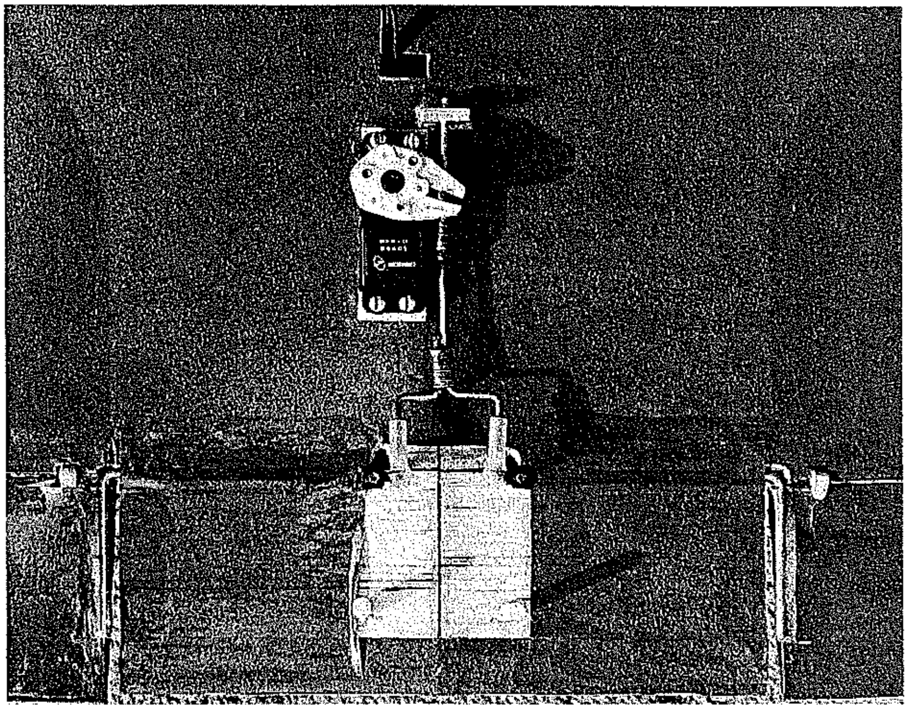
In his delightful *Old Buzzard's Soaring Book* (available from Pony X Press, 5 Monticello Drive, Albuquerque, New Mexico 87123), Dave Thornburg warns us never to accept compromise in design. If we do, we'll end up with a model that does everything very well, but nothing superbly (Dave is into Soaring competition).

Doing everything very well, of course, is exactly what we expect of a performance/ sport model. Still, Dave Thornburg's caveat galvanized my thinking, and an exciting design philosophy began to emerge. It was like having a block of marble but only half-seeing the sculpture hidden inside.

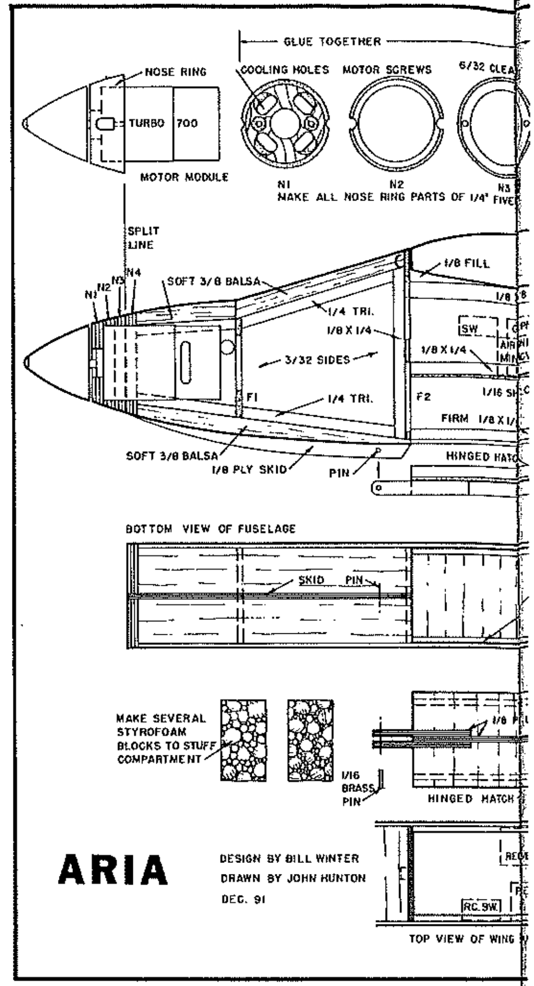
Jim Martin of Hobby Lobby provided the mallet and chisel. Watching a videotape of his 96-in.-span, 72-oz. Graduate Electric Sailplane (direct drive, eight 1,200-mAh cells, 10 x 6 Scimitar folding propeller), I was struck by its spectacular performance. For a high-aspect-ratio glider, the Graduate is extraordinary. I called Martin. He admitted that he had a sleeper in the new, low-cost 8- to 12-cell Graupner Speed 700 Turbo motor. Not surprisingly, that convinced me to design my new Electric around the



Opposite page: Dick Dean launches Aria for its first flight. Transition-free launch showed perfectly matched velocity and angle. Above: Aria on a flyby. Right: Aria at rest. The model's proportions and lines remind coauthor John Hunton of a Spitfire. Bernie Stuecker photos.



Underside of the wing shows flap actuation mechanism. Linear action moves both flaps at an equal rate. With Aria's high ratio, lift-to-drag the wing flaps' high drag helps make short landings possible.

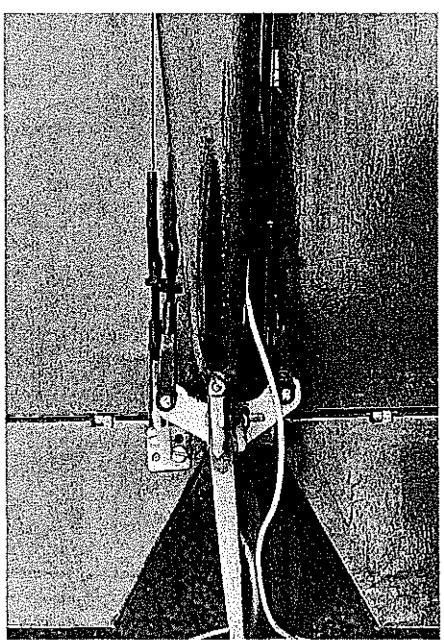


Graupner motor. Expecting great things, I called the model Aria.

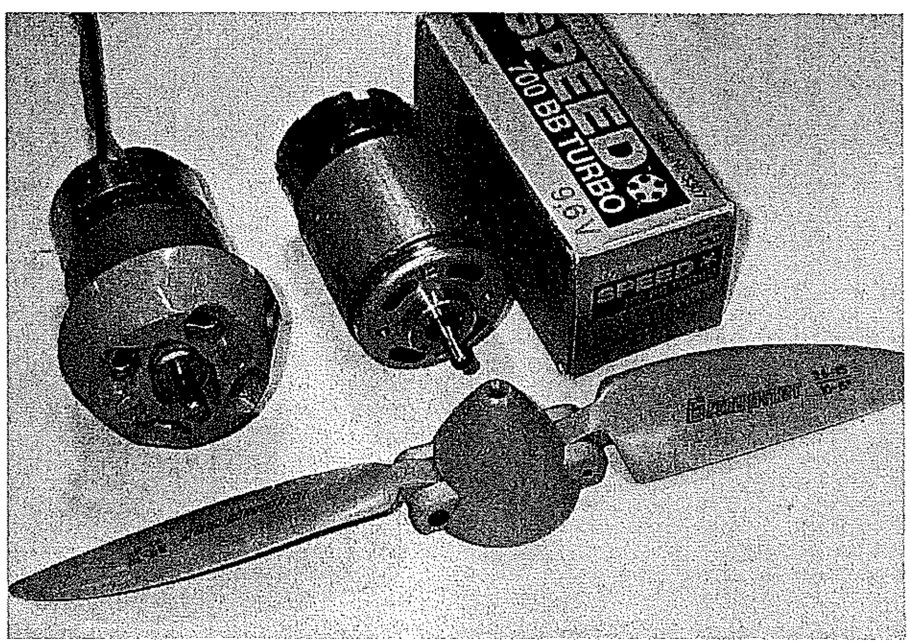
The Graupner Speed 700 Turbo 9.6-volt motor has three distinguishing features: 1) brute size (2 5/8-in. length, 1 11/16-in. diameter, 11.3 oz.); 2) direct-drive performance on a 10 x 6 Scimitar folding propeller; and 3) low cost, at $22.70 for the motor alone or $48.70 for the motor plus prop. Those prices do not include the batteries, on/off switch, or controller (used in Aria). A motor with ball bearings and an internal cooling fan, available for $39.40, has even more power.

Getting this kind of low-cost performance on fewer cells easily justifies the motor's extra weight—about the same as an Astro 25 cobalt. We tested the Speed 700 Turbo on only eight cells. While direct comparisons with other systems are difficult, we found that, in Aria, the Graupner performs comparably to motors ranging from a geared FAI cobalt 05 turning a 12 x 8 propeller on seven cells to a direct-drive FAI cobalt 15 with 12 cells. The FAI cobalt 15 does have somewhat more thrust than the Speed 700 Turbo (but still less than the Speed 700 Turbo BB); however, there are variables in props, drains, run times, and number of cells.

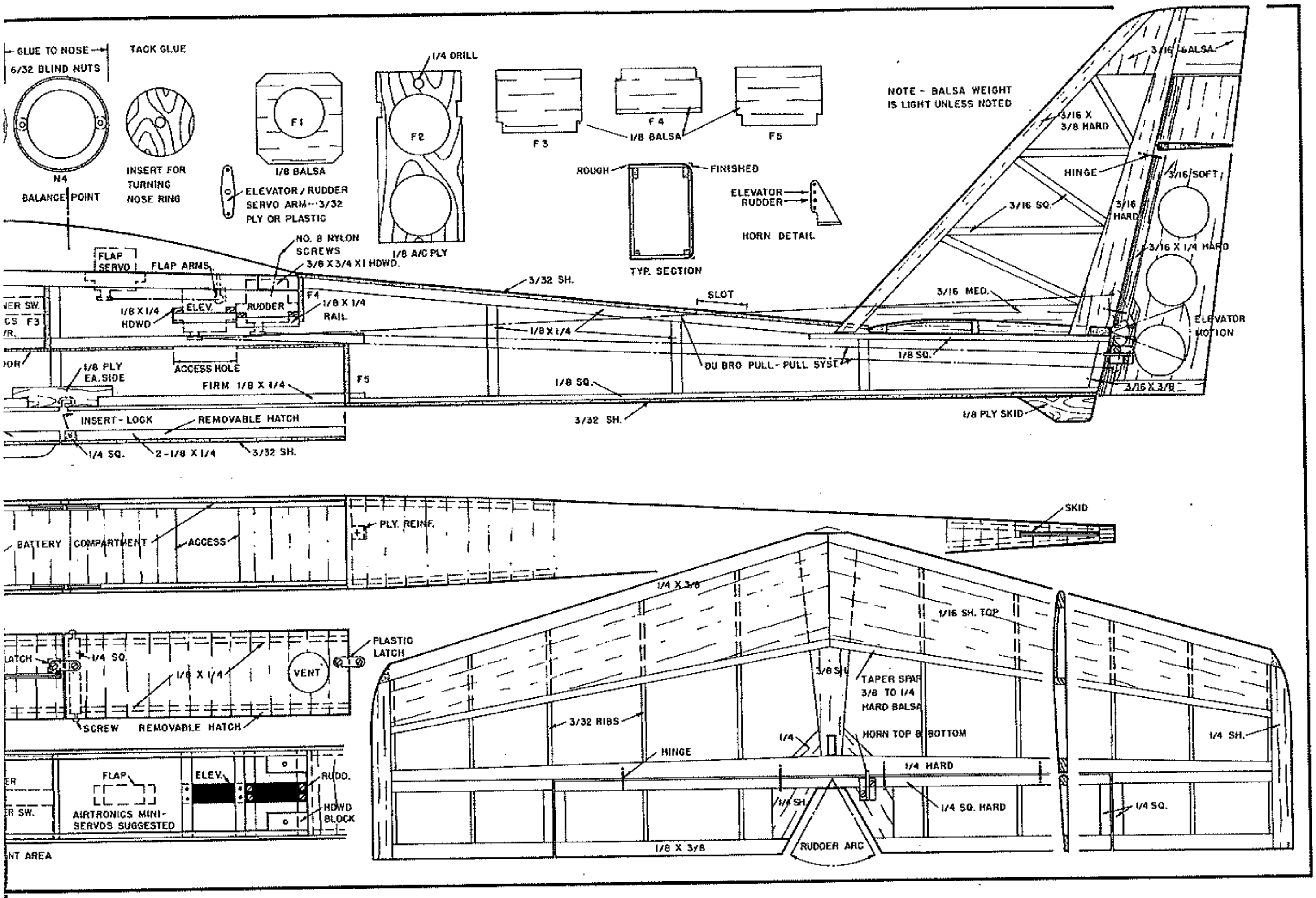
John Hunton and I are working on a big-wing version of Aria (to be published in a



Rudder horn setup with lightweight pull-pull control cables. System is incomparably smooth and eliminates all blowback.



The Graupner Speed 700 Turbo motor is mounted in the nose ring; the ball bearing version rests beside its box. Aria was designed specifically for this new, low-cost motor. The Propeller is a Graupner 10 x 6 Scimitar folder.



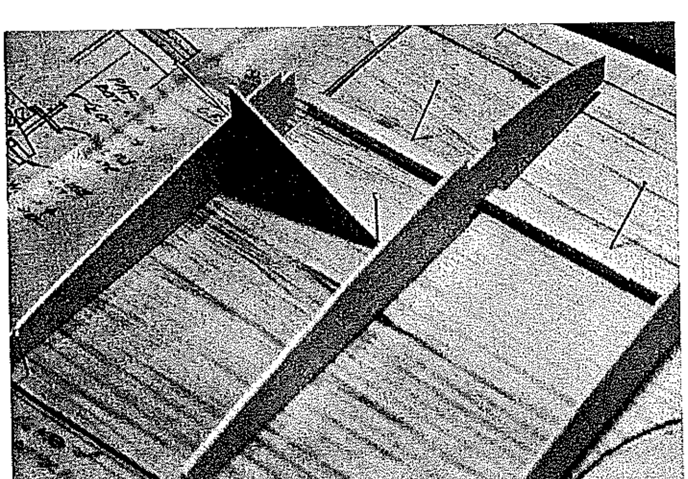
future issue of *Model Aviation*) that will use both eight and 10 cells. The accompanying comparative guide for motor performance is intended to be used as a rough frame of reference for the Speed 700 Turbo motors.

Sailplane-style designs are great for majestic soaring, but I prefer planes that give you more mobility and grace in tight maneuvering near the ground while still maintaining good soaring capability. Hobby Lobby's Graduate design has a high-aspect-ratio wing with a 96-in. span and about 650 sq. in. of area. My Heron (published in the March 1987 *Model Aviation*), with a 540-sq.-in. wing area, a 15 x 12 prop geared at 3.3:1, and landing gear and cabin, was a 20-minute plane on eight cells.

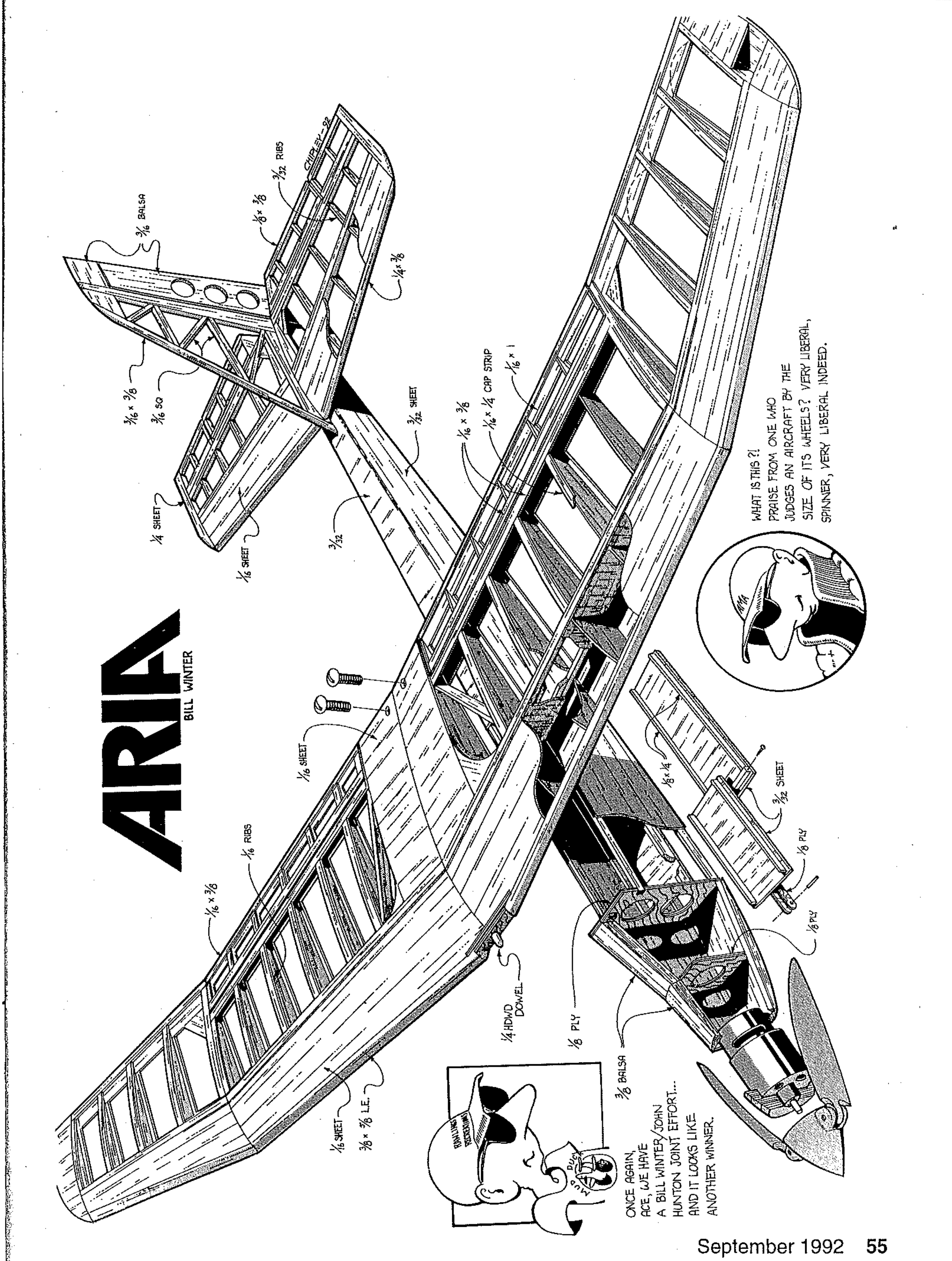
For Aria, I decided on 590 squares, but at a lower aspect ratio of 8.5:1. This produces a wingspan of only 69 inches. (Eppler recommends a minimum aspect ratio of 7:1 for Two-Meter models.) Aria is 12 ounces lighter than the Graduate's gross weight of 72 ounces despite the addition of flaps and a fourth servo. The flaps ensure easy landings on Gas-model runways and let you pull the model out of boomers with a 60° dive without speeding it up to dangerous levels.

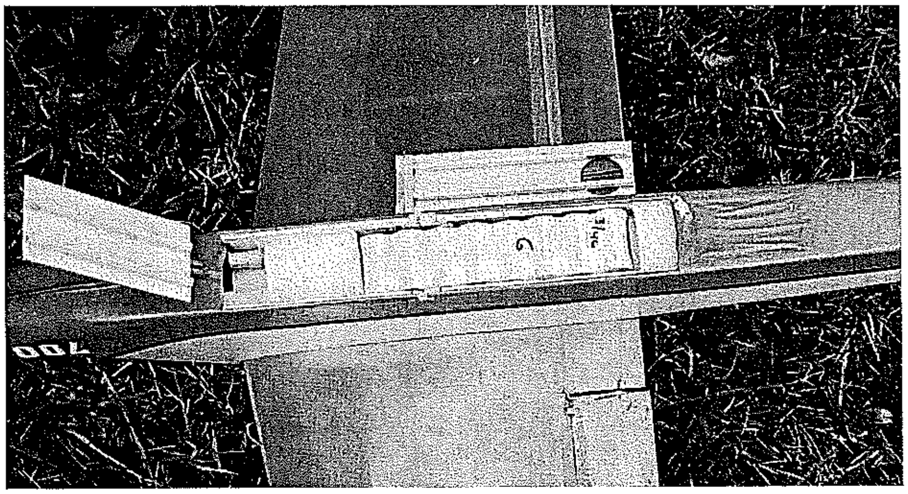
Following Thornburg's recommendation, I used a touch of polyhedral. If you don't like poly, you just have too much of it. The right amount makes for lovely turn and bank traits, even with rudder and elevator controls only (equivalent to ailerons, in this case). A speed controller is not really

Continued on page 56

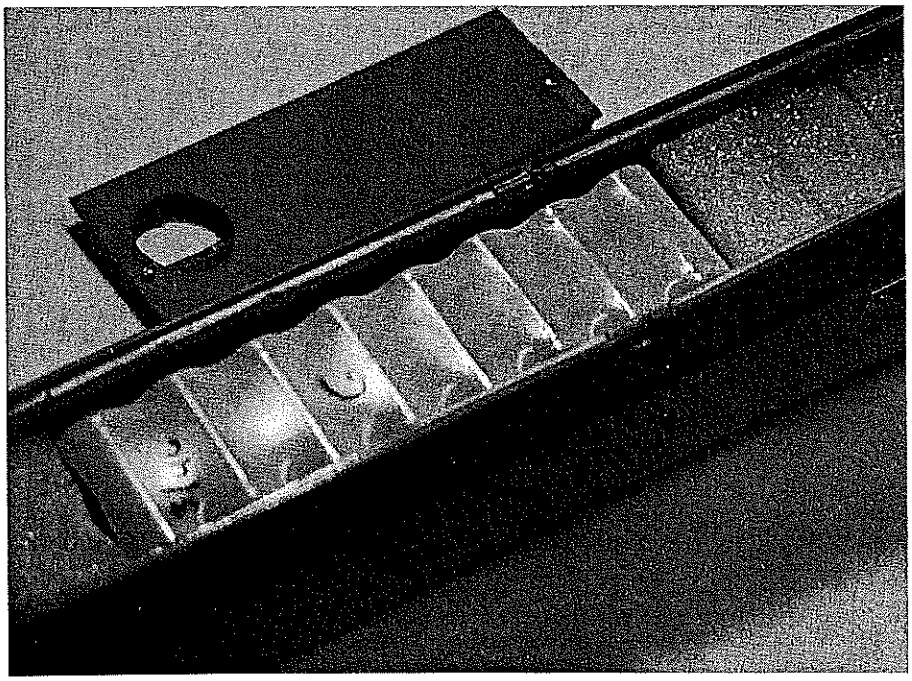


Wing construction shown in it's initial stage. Note the dihedral rib tilt gauge pinned in place in the photo at left.

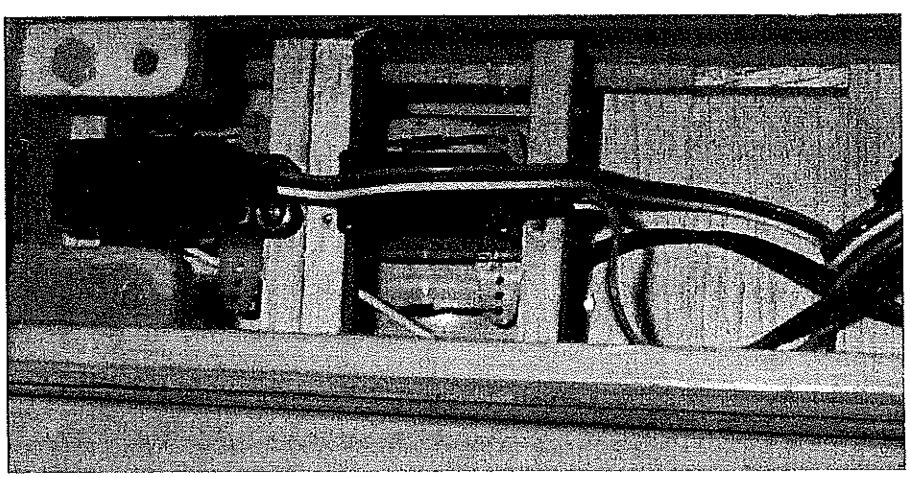

ARIA
BILL WINTER
CHIPLEY - 92
3/32 RIBS
1/8 × 3/8
3/16 BALSA
1/4 × 3/8
3/16 × 3/8
3/16 SQ
3/32 SHEET
1/4 SHEET
1/16 SHEET
3/32
1/16 × 3/8
1/16 × 1/4 CAP STRIP
1/16 × 1
1/16 SHEET
1/16 RIBS
1/16 × 3/8
1/8 × 1/4
3/32 SHEET
1/8 PLY
1/8 PLY
1/4 HDWD DOWEL
1/8 PLY
3/8 BALSA
1/16 SHEET
3/8 × 3/8 L.E.
WHAT IS THIS ?! PRAISE FROM ONE WHO JUDGES AN AIRCRAFT BY THE SIZE OF ITS WHEELS? VERY LIBERAL, SPINNER, VERY LIBERAL INDEED.
ONCE AGAIN, ACE, WE HAVE A BILL WINTER/JOHN HUNTON JOINT EFFORT... AND IT LOOKS LIKE ANOTHER WINNER.



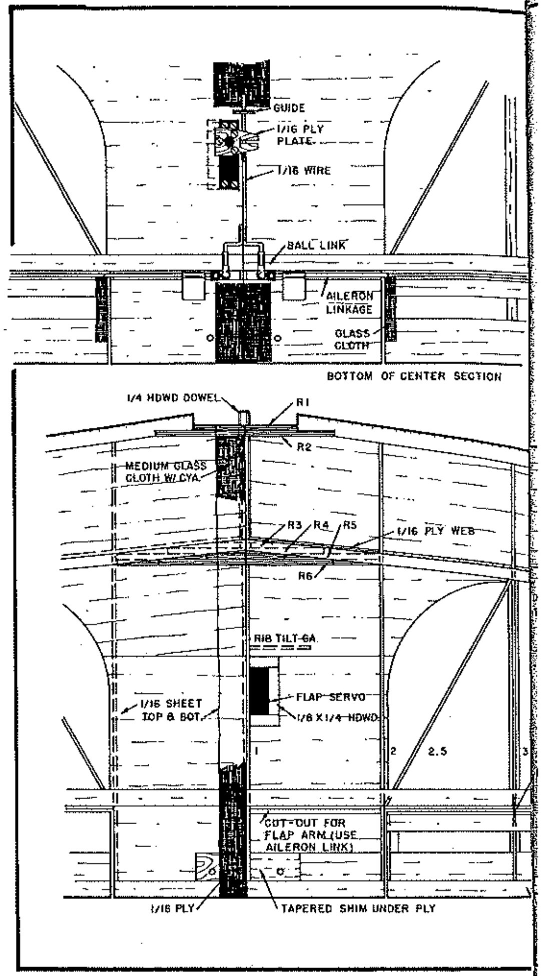
The two-part battery compartment is extremely long, hence requires side-to-side bracing. The forward hatch is hinged to the landing skid; the rear portion is removable.



Eight-cell battery pack nestles in Styrofoam packing. Be sure the foam fits loosely to allow good ventilation. Note the cooling air exit hole in the removable hatch section.



Peering down into the fuselage for a look at the elevator and rudder servos. Both use Du-Bro pull-pull cables for their light weight and control accuracy.



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required, and Hobby Lobby's RC 25 motor switch has a BEC (battery eliminator circuit) and a good brake to speed up prop folding.

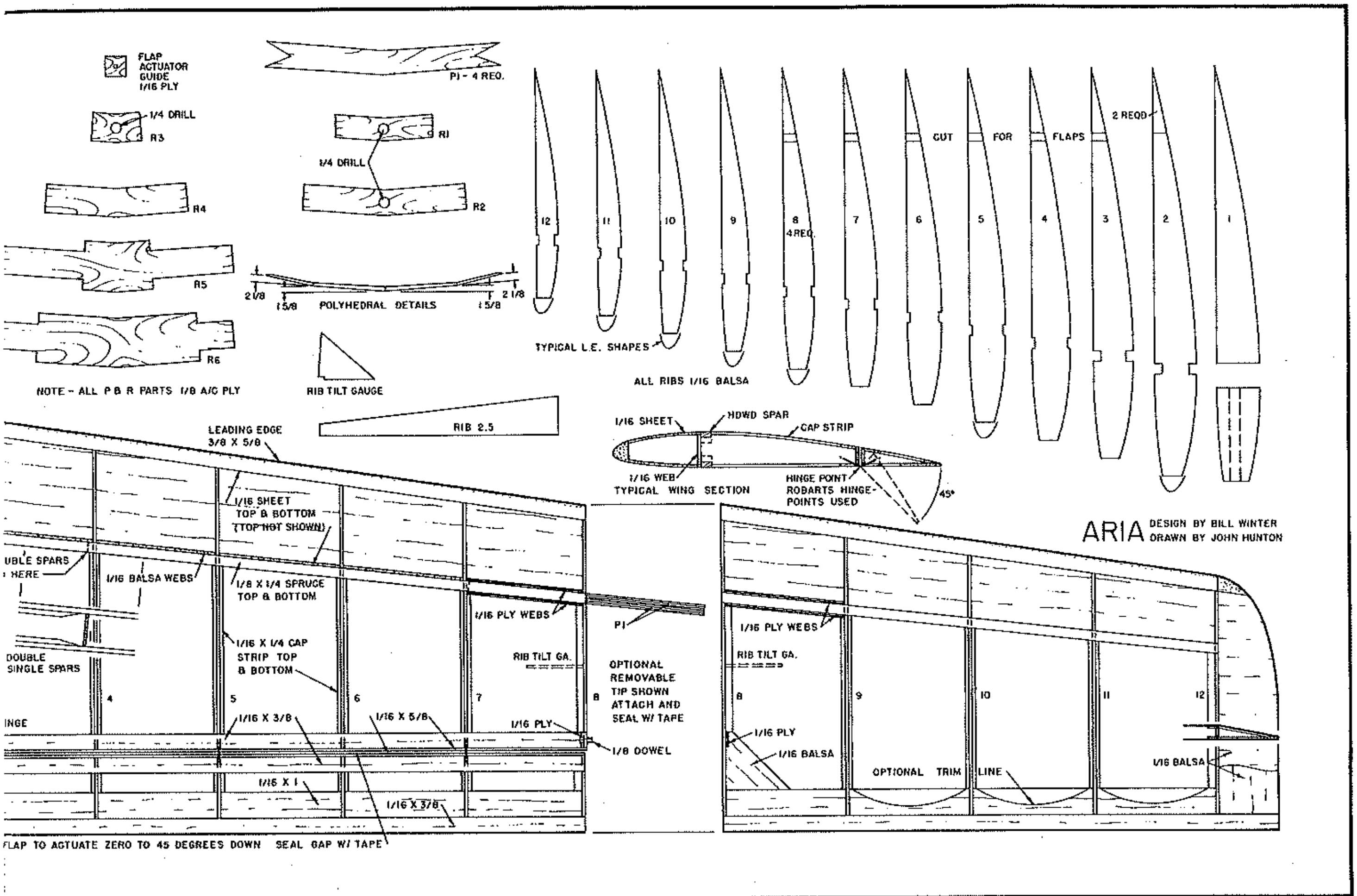
The airfoil is my own, at just over 9% thick. Leading edge sweep is used for efficiency. *(John Hunton's note: The swept wing adds big benefits of increased aerodynamic and structural stability.)* The vertical stabilizer area is sufficient for even the longer-span version. The wing is covered with light, tough Coverite Micafilm.

The airfoil is proportionally the same from the root as far out as the polyhedral break, at which point it loses its Phillips entry. This transition provides washout, yet the builder still enjoys the simplicity of construction offered by flat-bottom ribs.

Aria responds smoothly and obediently to light stick pressures. The generous stabilizer area gives near-overkill stability and aids in riding "on the step." While maneuverability near the ground is definitely Aria's greatest strength, we were pleased at how easy it is to control the model at the limits of vision. There's no need to baby this airplane, taking it out only on calm days; we've flown it in 20- to 30-mph winds and found that it penetrates efficiently. In all, performance has surpassed everyone's expectations except my own.

The BEC shuts down at 3½ to four

FULL-SIZE PLANS AVAILABLE. SEE PAGE 186

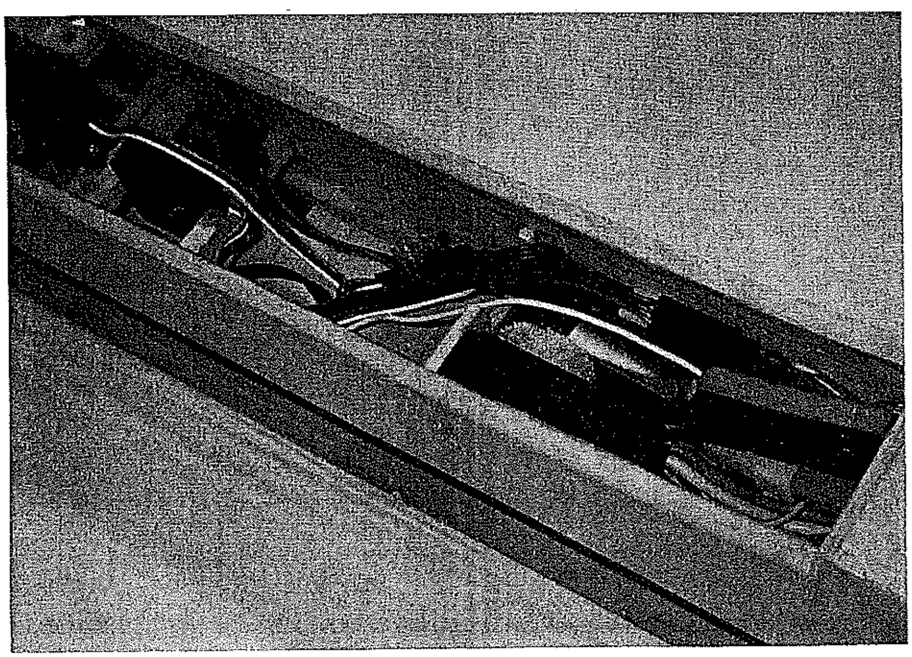


> **RC Aria**
>
> **Type:** RC sport Electric
> **Wingspan:** 69 inches
> **Recommended Motor:** Graupner Speed 700 Turbo 9.6-volt
> **Recommended Battery:** Eight Ni-Cd cells, 800 to 1,700 mAh (as desired)
> **Recommended Radio Control:** Four-channel (rudder, elevator, flaps, motor control); mini-receiver and 3 mini-servos
> **Recommended Motor Control:** Graupner 25 motor switch with BEC, or Airtronics MA-16 motor speed control
> **Expected Flying Weight:** 60 ounces
> **Type of Construction:** Built-up
> **Type of Covering/Finish Recommended:** Micafilm; paint finish (such as Coverite's 21st Century Space Age Paint) on nose ring only

minutes of continuous maximum power (with the model at flyspeck height), so for the optional/interchangeable 99-in.-span wing, 10 cells is a breathtaking possibility without too much loss in power-on time. With the 1.2-mAh battery pack, you won't get unlimited soaring after BEC shutdown. (We end our flights 15 minutes after powering off.) Smaller cells on BEC could be even more critical if the servos were used repeatedly.

For protracted soaring, use an independent battery pack of 250 mAh on the standard Aria and as high as 500 mAh on the long-wing version. The battery compartment can handle 1.4s, 1.5s, and even 1.7s, which will boost power and glide times. (Folks interested in one peak climb may opt for smaller 800- or 900-mAh cells to save weight.)

Continued on page 59



Sermos connectors link the motor and switch. These connectors have low loss. The on/off switch is a Graupner 25 with BEC. Mini-receiver is an Airtronics four-channel unit.

Aria
Continued from page 57

also variable flaps and throttle, all on a four-channel system. We used the Airtronics Vanguard RC system with miniservos and 1991 receiver, adding a Graupner 25 on/off motor controller. The excellent Airtronics MA-16 controller is recommended if variable power is desired. These systems are compatible with the low-cost philosophy of the Aria design.

John Hunton goes into greater detail about setting up and using the Graupner 25 switch later in this article.

A cable control system is used for elevator and rudder because it's simple and lightweight. Cable controls also give the pilot excellent feel and feedback.

Aria also has motor downthrust to smooth the transition between power and glide. Though it's hidden because the motor is aligned with the fuselage, this downthrust is created by the positive angle of the wing and stabilizer with respect to the motor and the fuselage. This arrangement also seems to help reduce drag in glide and to improve controllability. Be sure to maintain these angular differences accurately as shown on the plan.

I strongly recommended that you work out flight test procedures to make those first flights as productive and successful as possible. Refer to the sidebar for the method we used.

Hunton and I decided to provide a long-wing and/or option with a 99-in. wingspan and 840 sq. in. of wing area. That's almost 200 additional squares, yet gross weight is still well under that of the Graduate. We used polyhedral in this version, too. The plan for the wing, together with comments on performance differences, will appear in a future issue of *Model Aviation.*

Now let's get on with the construction with these notes by... ■John Hunton

IN ARIA, Bill Winter has combined European and American practice with a model that requires higher velocities than typical floaters. Experiment with your Aria to find the best velocity for highest lift-to-drag ratio or best sink rate.

Using the Airtronics Vanguard four-channel system for Electrics, we set up our prototype this way:

- Right stick:
  Side-side: rudder
  Fore-aft: elevator
- Left stick:
  Side-side: no function
  Fore-aft: flap (Low throttle is flaps extended; high throttle is flaps up. Motor on/off on throttle trim.)

Launch: Keep the flaps down for throttle safety. Turn on the motor power and RC system switches. For self-launch, go to half-up elevator trim to improve the transition to climb. Go to high throttle (flaps will be almost up), then high-throttle trim (flaps go full-up) to turn the motor on.

Launch into the wind. Don't let the model zoom up and stall. Make a smooth transition from launch to climb. Bleed off the trim as climb is established (approximately 20°, depending on wind and temperature). If the model is climbing cleanly, go with that climb angle. Don't force a nose-high angle that appears slow and draggy; you'd sacrifice some altitude and shorten the motor run.

Climb: Establish the climb into the wind. Trim out the model, and stay off the controls as much as possible; every control input increases drag. If a turn is necessary, make it wide. Work the model into the wind so you can thermal later. When you've climbed to a comfortable altitude, shut the motor down. Keep track of the motor-on time so you know how much power you have left.

Glide: With power off, Aria will transition to a relatively fast, wind-penetrating glide. For best thermaling, the glide must be slowed somewhat, but not excessively. For a simple glide transition, just add partial flaps; no trim change will be necessary, and the model will glide very well in this configuration.

For the best sink ratio in glide, however, go to quarter-flaps (approximately 15°) and add *up* trim to slow the model down. If the plane appears to be flying too near its stalling speed, reduce *up* trim or *down* flap, and establish a smooth glide that is comfortably above stall velocity. To power up again, don't forget to go to full-up flaps, then to high throttle trim. (With our arrangement, the power won't come on with partial flaps deployed.)

Fly into the wind. When you see the model rock or rise, establish a 30° bank to circle. You may be in lift, so let the circle come with the wind. If you get hooked into a boomer and want to come down quickly, go to full flaps. Aria will dive at approximately 45° with the flaps full-down. If the boomer is really strong, add full *down* elevator trim. Aria will go into a 60° dive, without danger of overspeed, flutter, or overstress, but a smooth pullout is essential. Yanking it out could pull too many Gs.

Landing: Make a conventional, powerlike approach with the motor off. The goal is to have sufficient power reserve for a go-around or two. Be sure to remove any *up* trim so the model won't slow down too much. Once you're in position on final, put on full flaps for drag.

If you're grossly too high coming over the end of the runway, just rack it up and make a 360° turn; that will drop you down 10 to 20 feet. Otherwise, just fly the model down to the runway (known as controlled rate of descent in full-scale aviation); with the flaps deployed, speed won't build up excessively. Don't try to stall it in (many people try this and, without flaps, end up overshooting). For a glider or Electric model landing, always fly the model onto the ground; ground contact equals drag, and grass especially will slow you down quickly. Stay on rudder until the model stops.

(Editor's note: Flight results with the more powerful Speed 700 Turbo ball-bearing motor using various numbers of cells will appear in a later issue. Plans for the long-wing specialized Soaring version of Aria—same airframe otherwise—will be presented along with flight evaluation.)

Construction is basically typical, featuring a semi D-tube wing and box-beam fuselage. Having no ailerons to build or to rig simplifies the work considerably. Because the flaps are actuated from inside the fuselage, they're relatively easy to contend with.

For the long-wing version (to appear in a subsequent issue of this magazine), the absence of ailerons facilitates the removal of the wing's tip panels. Our method for removing these tip panels is probably the most unusual aspect of the construction, since most long-span models have the structural break at the center of the span.

The theory behind our system is to leave the structural joint that must bear the greatest load (the wing's center joint) undisturbed. That will result in lighter weight structure. The joints where the tip panels attach bear a much smaller load, so a lesser weight penalty is incurred by making these joints the ones where the wing is taken apart.

You can order balsawood in bulk from several sources. We use Lone Star. Order selected lightweight wood for all applications except the fuselage longerons and empennage spars—for which you'll need medium-hard balsa—and the spruce wing spars. After years of building with CyA (cyanoacrylate glue), I have developed an allergy to it. My nose runs for several hours after using CyA. Switching to Hot Stuff UFO has solved this problem. If you have allergy problems, try the UFO. The curing rate seems—mercifully—slightly slower, and it is easy to use.

Empennage: I like to build the smaller parts first. It gives me more room for building the larger parts.

Continued on page 140

Ken Morris brought many years' worth of models and pieces to give to everyone. Numbers were drawn, and each kid picked an item he wanted. Several were reassembling plastic models and flying old rubberband-powered models before their parents arrived to take them home.

A bag of goodies containing EAA magazines and information, maps, modeling information, flashlights, a brochure about learning to fly, and wings from Delta Airlines was given to each kid before he left.

Judging from the comments on the evaluation forms, the kids had a good time. Thirteen expressed that they wanted to become pilots and others wanted longer or more flights. The flying was the most popular activity, so we'll have to do it again sometime this summer.

Our participants were Curtis Bailey, Jennifer Biggs, Joshua Brod, Andrew Eilan, Justin Eilan, Scott Farris, Chris Frantz, Ian Gillis, Dominic Kelly, Michael Lamb, Vernon Mitchell, Walter Mitchell, Jared Muegge, Brandon Pointer, Nathan Quintero, Shane Randell, Mosé Richards, Robert West, Esteban Worrell, and Stephanie Worrell.

I really appreciate the help from the 22-plus members in EAA Chapter 34 who helped make this AAD possible. ✈

Aria/Hunton & Winter

Continued from page 59

Build the fin with a medium-hard balsa spar and front rudder reinforcement. Use lightweight balsa for the rudder, and take the time to cut the lightening holes. Use medium-hard balsa for the horizontal stabilizer rear spar and the elevator front spar.

Build the horizontal stabilizer, but leave off the 1/4 x 3/8-in. leading edge piece. Add the top sheeting. Then lift the stab off the plan and sand the front of the sheeting and ribs so that they are flat. This ensures a good joint with the 1/4 x 3/8-in. leading edge member, which is added at this point.

Finish these parts with fine sandpaper mounted on a flat block large enough to span at least three ribs. Sand the elevators and rudder to a straight taper.

Fuselage: Cut all nose ring and motor mounting parts (N1 through N4) from 1/4-in. aircraft plywood. Align these parts carefully for assembly.

A convenient way of shaping the nose is to first make a temporary jig to hold the assembled nose ring in your drill press, then spin the ring and shape the nose with sandpaper.

Coat the motor with lipstick before fitting it into the nose cone. Slip the motor in and out, and remove wood where it's marked with the lipstick. Refit until the motor is solidly seated. Install blind nuts in the rear ring (N4). This rear ring will be glued to the fuselage. Bolt the entire assembly (N1 through N4) together without the motor for fitting to the fuselage for final shaping. The parts N1 through N3 will be glued together. Do not glue N4 to this assembly!

Cut the sheet balsa sides to dimension, pin them down, and add the longerons and uprights. Join the sides from the rear forward. Be sure to install the square plywood former. Install the nose ring (N4). Rough out and install the nose blocks. Add the top and bottom sheeting, leaving space for the battery hatch.

Build the battery hatch, and tack glue it in place. Install the wing-screw mount blocks. Give the fuselage a final sanding, rounding off the edges except at the wing and stabilizer mounts. Sand the nose blocks to final shape.

To ensure accurate location of the balance point, it's best not to position the battery pack until the model has been completed.

Wing: The plan shows an optional removable wing tip. If you build the tip permanently attached, apply light glass cloth over the sheeted leading edge for extra strength.

Build the wing panels as straight and true as you can. The airfoil has been designed by Bill Winter to provide critical washout at the tips yet still be built flat on the board.

A typical wing panel (minus the tip section) can be built as follows: Pin down the lower spar, and install the bottom center and leading edge sheeting. Install the ribs, using shims to force the leading edge sheeting tight against the front portion of the ribs. Add the trailing edge parts. Glue the center section joiner parts in place in this panel. Wait for all the glue to set, then lift the panel off the plan.

Get ready to build the opposite wing panel by aligning the previously built one with the new panel's plan. Prop up the end of the completed panel to the proper dihedral, and begin building the second panel firmly against the first. Glue the center joiner in place, and continue building.

When the second panel has been completed to the same extent as the first, add the top spar and sheeting. Use thick (slow-setting) CyA to adhere the sheeting to the ribs. Note that the sheeting does not overlap the top spar. The spar is the outermost structural member for the sake of greater structural efficiency.

When the glue on this second panel has set firmly, lift it up from the plan and pin the first panel down. Add the top spar and sheeting to the first panel.

When the glue is firmly set, take the wing up and sand the front of the leading edge sheeting and ribs with a flat sanding block. Pin the wing down again, and add the 3/8 x 5/8-in. leading edge piece. This method of construction is similar to that used on a foam-core wing.

Install the spar web pieces. Add the wing tip panels and associated joint details.

Add the diagonal braces (ribs 2.5). Sand the wing panels with fine-grit paper on a block that spans at least three ribs. Apply fine glass cloth over the center section joint (top and bottom).

The flap actuation detailing, while tedious, is necessary for achieving linear action and ensuring that the flaps move at the same rate. Hinge the flaps at the bottom.

Final assembly: Mate the wing to the fuselage before mounting the empennage. Apply strips of tape to the wing at the joint, coat the tape with lipstick, and trial fit the wing. Cut away the fuselage where the lipstick shows. Repeat this process until the lipstick marks the fuselage saddle uniformly. This is the method used by gunsmiths for letting-in gun barrels to stocks.

After the wing is seated, install the empennage, using the wing for reference level. The stabilizer must not lean to either side. Sight this carefully so that the stabilizer does not line up with the dihedral in either the left or right wing. It should be level. Add the nose and tail skid parts after the model has been covered.

Covering: Clean all parts with a careful vacuuming. Check for bumps and "wows."

We used Coverite's Micafilm on the short-wing prototype. Micafilm is light because it has no adhesive. We used Coverite's Balsa Rite on the structure where we wanted the film to adhere. These materials are very easy to work with and give a good result, although they have needed some retightening to compensate for atmospheric changes. The long-span wing will be covered with Coverite's new 21st Century Film. This space age film is applied differently (read the instructions carefully) but seems completely stable, since it hasn't needed to be retightened under any conditions. We'll report on it in greater detail in the future article about the long-wing Aria.

Finishing: Those of you who like to apply finishes have only one opportunity with this aircraft: the plywood motor mount. For the prototype, the nose ring was simply primed with gray automotive primer to more or less match the Graupner propeller. Later, I tried out Coverite's 21st Century Space Age Paint spray finishes. The primer fills the wood pores quickly and provides a good, solid base for the final finish. The color coat builds well and can be reapplied quickly. This finishing system looks like a good one.

RC gear installation: We used the Airtronics Vanguard RC system, a four-channel set packaged for Electric use with a new 1991 narrow-band receiver and two miniservos, but substituted a Graupner

continued on page 144

Aria/Hunton & Winter

Continued from page 141

Power Switch 25 on/off motor controller since it came with the motor to be tested. A battery eliminator circuit (BEC) is included for light weight. These systems fit the low-cost philosophy of this design.

An excellent feature is available with this (or similar) combinations that allows you to include both flap and motor control on the throttle stick. This puts all your velocity controls on the same control stick. Low throttle control and low trim provides motor-off and full flaps. Full throttle and low trim provides motor-off with the flaps almost full-up.

Full throttle with high trim provides full motor power and the flaps full-up. Adjust the controller to actuate motor-on at high throttle midway on the trim. That way you can go to flaps up, operate the motor on throttle trim, and use variable flaps on the throttle stick. Refer to the previous Launch, Climb, Glide, and Landing portions of this article for more about how to use these functions in flight. This arrangement also provides a safety feature—the motor cannot be turned on unless the throttle stick is fully advanced.

For lightweight and responsive controls, use the Du-Bro pull-pull cable kit for both elevator and rudder.

Motor wiring: If you use the recommended Graupner 25 motor on/off switch, check the included wiring diagram for compatibility with your receiver. The receiver lead must be modified by installing a compatible connector with pin positions changed as diagrammed.

For eight-cell operation, install a 25-amp fuse on one lead between the motor and power switch. For 10 or 12 cells, use a 30-amp fuse.

We use the Dual Rapid Charger by Model Flight Accessories (available from Hobby Lobby), which recharges a fully spent eight-cell pack in about 30 minutes. Stop charging when the rate (on high rate) gets down to about an amp, or if the battery begins to feel just slightly warm. If you have three battery packs, this will give you one in the air, one cooling, and one charging. That will allow for continuous flight operations. Be very careful not to overcharge your batteries, since this can be very dangerous and can create a fire hazard.

If you're using 10- or 12-cell motor batteries, get dual five- or six-cell flight packs. The Model Flight Accessories charger has variable charge rates, so it will handle these also.

Bill Winter brought 65 years of modeling experience to his latest creation. Aria can help you make a happy crossing from the world of glow power to the realm of silent flight. ✈

RC Giants/de Vries

Continued from page 65

your model. Modeler's Choice paint has a 15-minute tack time and can be taped for a second color in eight hours. It can be sanded in 10 hours and is completely cured in 72. If you want an outstanding paint job on your Giant Scale model, contact Modeler's Choice at 665 Barbara Place, Mandeville, LA 70448; telephone: (504) 624-4804.

Roger Taylor, president of the QSAA, wrote to announce the 1992 fly-in schedule. The dates are October 15th through 18th. The static display (15 October) will be located at the Nevada Palace (a new venue—in Las Vegas, Nevada, of course), as will be the awards banquet on the 17th. Rog noted that the earlier than usual time schedule was chosen to accommodate other RC events in the Vegas area.

There are radio cradles, and then there are *radio cradles.* It takes real genius to develop one that is simple as well as utilitarian.

A.J. Products has come up with one that supports an RC transmitter in both vertical and horizontal positions on the ground while you're cranking your Giant bird. There are, of course, other devices that fulfill the same purpose. But Andy and Jeff (of A.J.) have included a capability in their plastic-covered, bent-steel-wire device that makes their cradle unique. A couple of integral hooks, together with your transmitter neck strap, turn the cradle into an almost weightless (two-ounce) transmitter tray. You can have fingertip control without having to hang onto the transmitter box to stabilize it.

These radio cradles are available for $9.95 plus postage and handling from A.J. Products, P.O. Box 54025, Cincinnati, OH 45254-0025. Need more information? Contact Andy Fehienbach at (523) 271-8429.

Remember—flying safely is the name of the game!

RC Slope Soaring/Byers

Continued from page 71

works and how to install it in a wing or control surface of any type.

First, the hinge system applies an extremely simple principle. It is a fitting of plastic with two holes cast in it (See Figures 2 and 3). The first hole is the bearing hole, and the second is a relief hole. Between these two holes the modeler must use a razor blade or X-Acto knife to cut a small slit. This slit allows the hinge to open when a .0625 or .0425 (the hinges come in two sizes) piano wire hinge bearing is inserted or removed. The control surface then pivots on the piano wire hinge bearing, and the hinge is epoxied into a small box or opening in the wing.

The clamping effect of the plastic on the piano wire holds the control surface