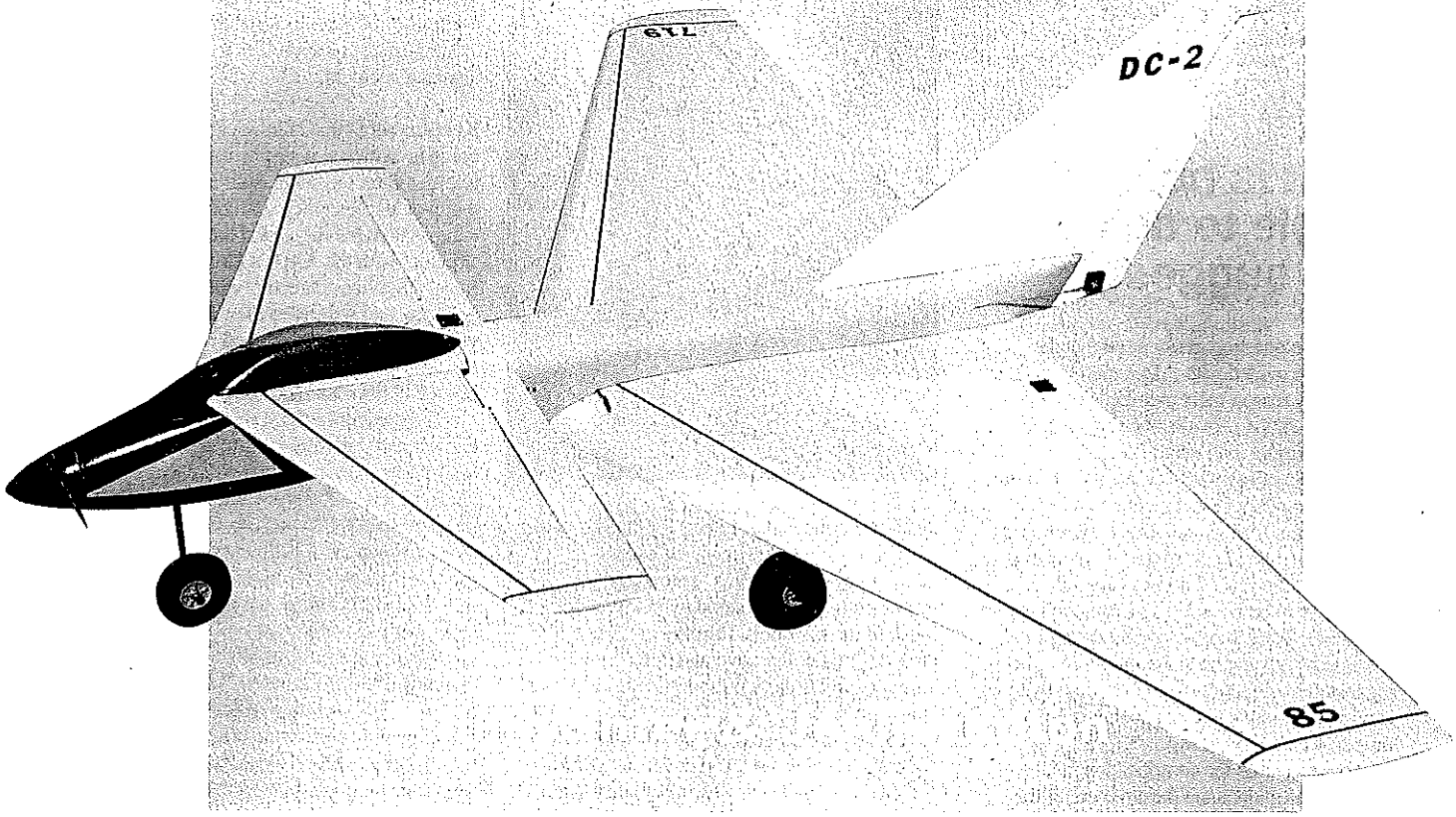
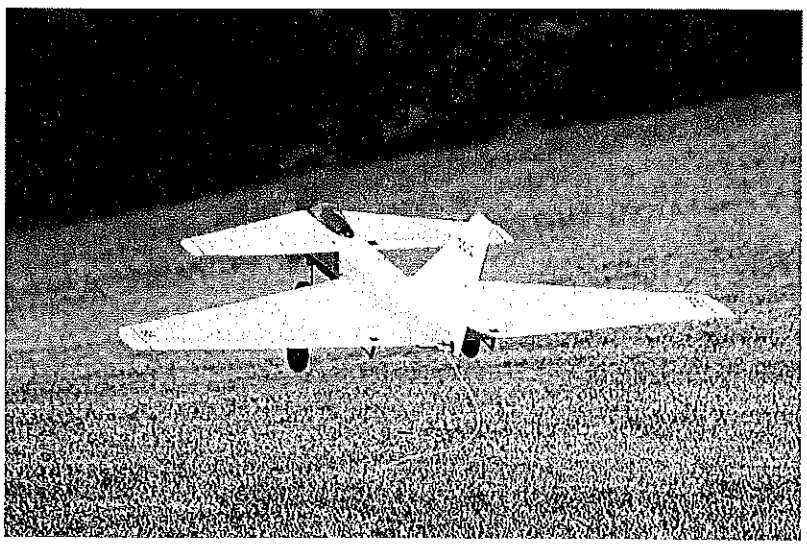
856

Passenger



Delta canard has unusual look, feel



Good stall stability and plenty of lifting area ensures good takeoff success—even on short, bumpy fields.

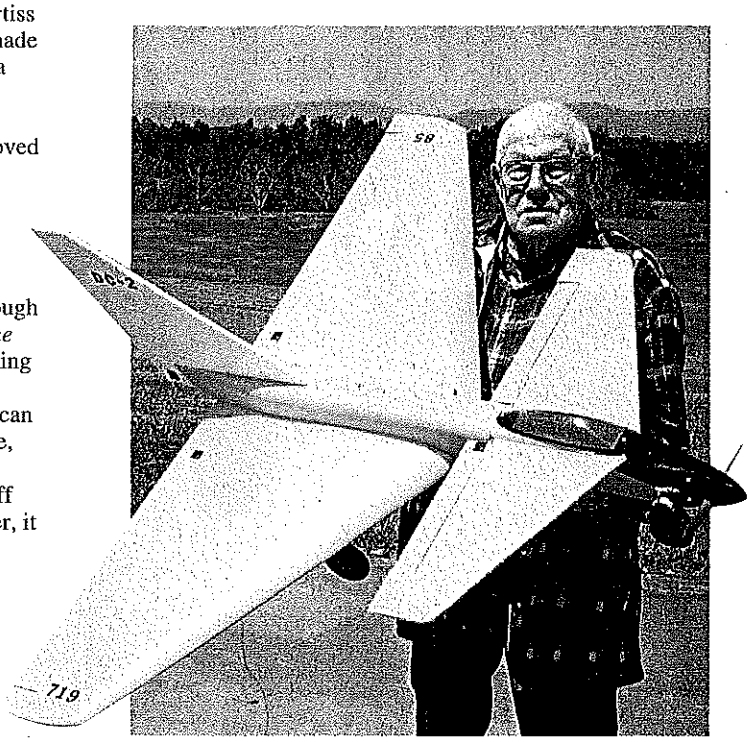
THE NAMESAKE of the Ascender is the World War II Curtiss canard experimental fighter—an exciting design that never made it to production. Understanding of tail-first design has come a long way since the unique Curtiss fighter, with the XB-70 Valkyrie, the SAAB jet fighters, and Rutan's work.

The QED model design (March 1996 *Model Aviation*) proved that the canard configuration had much to offer in stability without giving up anything in performance.

Bill Winter's first delta canard, the Javelin (September 1997 *RC Modeler*), was developed for me and the way I like to fly—*fast*. In becoming familiar with the superb low-speed characteristics of a delta-wing-plus-canard configuration through the Javelin, Bill designed a second delta canard for the way *he* flies: a model that has sport-type speed and good, solid handling characteristics.

The Ascender surpassed his goals. It has a great look and can zip with the other .40 models, yet hang in the air into a breeze, and even thermal at idle.

With a higher aspect ratio than the Javelin, and squared-off tips, the Ascender may bend the definition of a delta; however, it maintains the "slotted" effect between the foreplane and the mainplane, and with its 30° swept wing, its extraordinary stability, and coordinated smooth response to control inputs around all three axes, we think the delta-canard description may still be applicable.



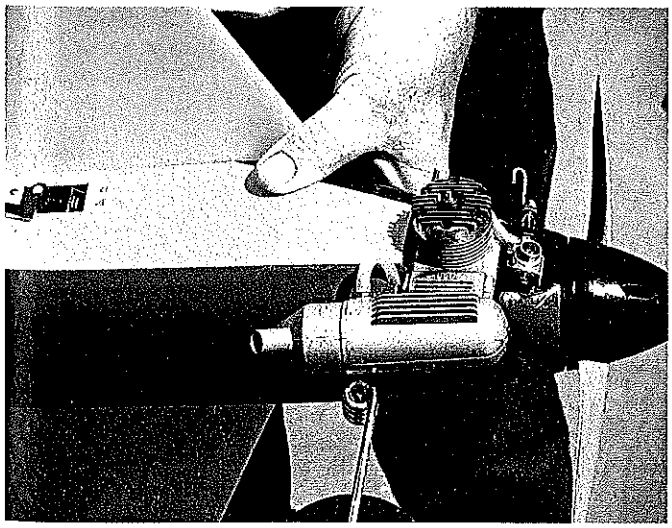
CONSTRUCTION

Select light-grade balsa unless otherwise stated. Sheet balsa for the wing must be able to "curl" easily along its length to match the airfoil and to eliminate any tendency to pull free. All blocks must be light wood. Wood sizes are given on the plans and are generally not mentioned in this text.

Wing: Make 1/16 plywood patterns of the tip and root ribs. The core will be cut off flat behind the inner leading edge and the front of the aileron spar (we used Evans Aircraft for both cores and double-stick lightweight tape for skinning).

The overall sequence for building the wing is: Attach inner leading edge and aileron spars to each core panel. Prepare skinning materials; make servo and landing gear cutouts; drill cable access tunnels; apply the skin; add root, tip, and trailing edge pieces; add tips; join panels on their centerline. The last step is preparing the center leading edge cutout for the fuselage.

Begin by tapering the inner leading edge strip to nearly the required shape. Make it slightly oversize for safety and sand to match the airfoil after it has been pinned and glued in place (use yellow [aliphatic resin] glue). Use long straight pins for holding and alignment, and wrap with short pieces of masking tape to



OS .40 FP fits in nicely. Note needle valve extension, probably not necessary on newer rear-needle engines.

Designers' Notes

Balsa selection has a significant effect on the success and performance of a model. Industry rates balsa as light (six to nine pounds per cubic foot), medium (nine to 12), and hard (12-16). This method of grading is too coarse for good scratch-building. If you used a cubic foot of ten-pound-density "medium" balsa in a project, the wood alone could weigh more than the desired gross weight of the completely finished, appropriately built model.

At five pounds, eight ounces, the Ascender weighs 55 percent of the weight of a cubic foot block of balsa.

Expert builders rate balsa as light (four to six pounds per cubic foot), medium-light (six to eight), medium (eight to nine), medium-hard (10-12), hard (13-15), and extra-hard (15+). In Ascender I used light, medium-light, and medium balsa (the upper medium limit is sufficiently hard for the foreplane and aileron spars). Fuselage sheeting and the cores of the vertical stabilizer and foreplane are six-pound-density maximum. Foreplane and wing sheeting is six- to eight-pound density. Leading edges are medium-light.

Hobby shops with large, well-stocked wood supplies may enable you to make a one-stop selection. Some "send-away" suppliers select from open stock, light, medium, and hard, if you so specify. Some will hand-select wood for an extra charge. Some even carry certain sizes of light wood at a modest premium price.

I consider a medium-light sheet of 1/4 x 3 x 36 to be roughly 1.75 ounces (seven-pound density), and a light piece to be one ounce (four-pound density) to 1.25 ounces (five-pound density). Reasonably hard 1/4 x 3 x 36 sheet weighs about 2.2 ounces (about 8.5-pound density). In general, six-pound-density is beautiful wood.

Serious builders will order more wood than needed, to ensure a wide range from which to select.

The above notes do not consider grain—another important factor in balsa selection. Grain selection is addressed where relevant in the Ascender construction notes. Balsa weights for larger, more powerful designs will require more-dense wood for load-carrying members.

Bill Winter & John Hunton

Photos by Bernie Stuecker Graphic Design by Carla Kunz

ensure a firm joint. Sight along the wing to check that the edges are not bowed. Note that the outer leading edge is attached later, after skinning. Attach the aileron spar the same way.

Make a sanding board from a piece of plywood to which sandpaper is attached with spray adhesive. Sand the edges in repeated spanwise paths, from root to tip. Vacuum the panel thoroughly.

The following skinning method was used on the Ascender; you may prefer preassembling the four wing skins before starting. If so, allow at least ¼ inch overlap along the long edges, as tolerance for minor layout errors.

With double-stick tape it is convenient to put down one skin section at a time, using an appropriate width of tape strips. All sheet pieces must be precisely trimmed to match, using a straightedge.

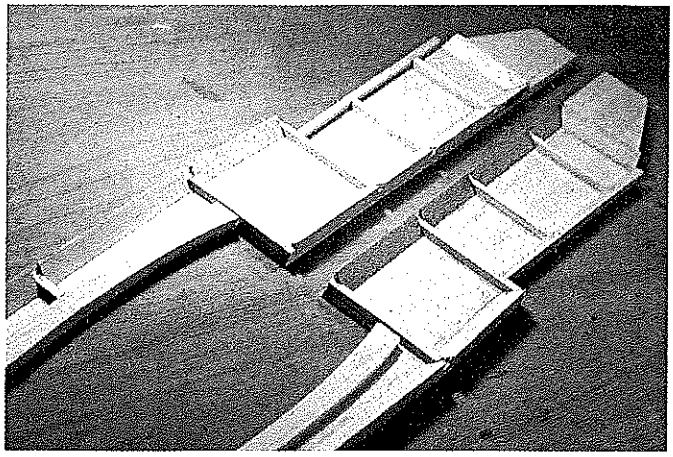
Begin skinning by installing two four-inch-wide sheets, one overlapping the inner leading edge and the other overlapping the trailing edge spar, grain parallel to each edge. After the servo mounting rails and landing gear blocks have been installed, fill the remaining open triangular shape with a prefitted triangular skin section. Apply a thin coat of yellow glue along the butt edge of the sheet being installed to ensure a good, strong joint.

Make a cardboard pattern for the servo and landing gear block cutouts, locate the outlines, then cut through the skins with a rule and #11 knife blade. Excavate the cavities for the servo mounting rails and landing gear blocks, which are set flush with the foam. The skin overlaps the wood at the servo mounts for best strength. To permit this, the triangular skin pieces are hand-fitted and removed. Install tailored pieces after the wood parts are installed.

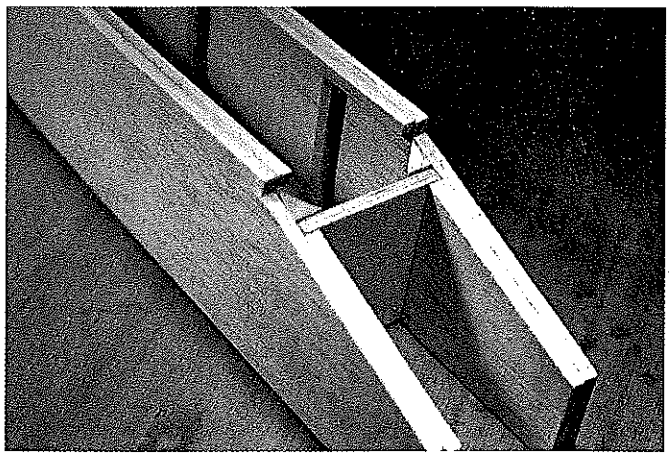
Use spade drills or sharpened tubing to cut servo wire access tunnels. Note that the landing gear torque forces are transferred to the top skin by an additional block that is set under the skin.

The front wing root cutout is made *after* the finished and sanded panels have been joined. Note that the ailerons and the inboard and outboard trailing edge chord extension pieces are ¾ thick, laminated from ¼ and thinner sheets. After gluing the extensions in place, block-sand the tips square and install the tip blocks.

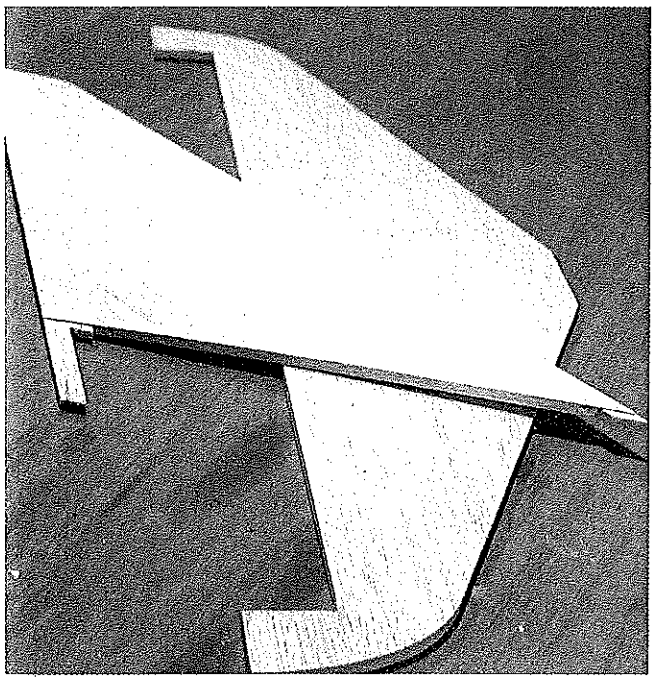
Trim overlapping skins true/flush with the edges, then attach the slightly oversized outer leading edge piece. Sand the top and



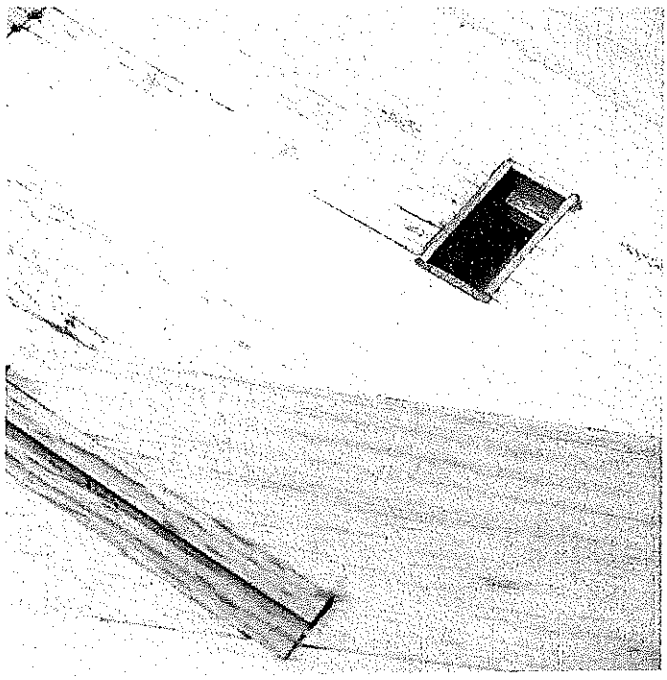
Triangular longerons are notched for ¼ verticals and cross-members. Sides shown completed and ready for former installation.



Install firewall and plywood former in one side, squared up, then add other side. Cross-pieces added in parallel area.

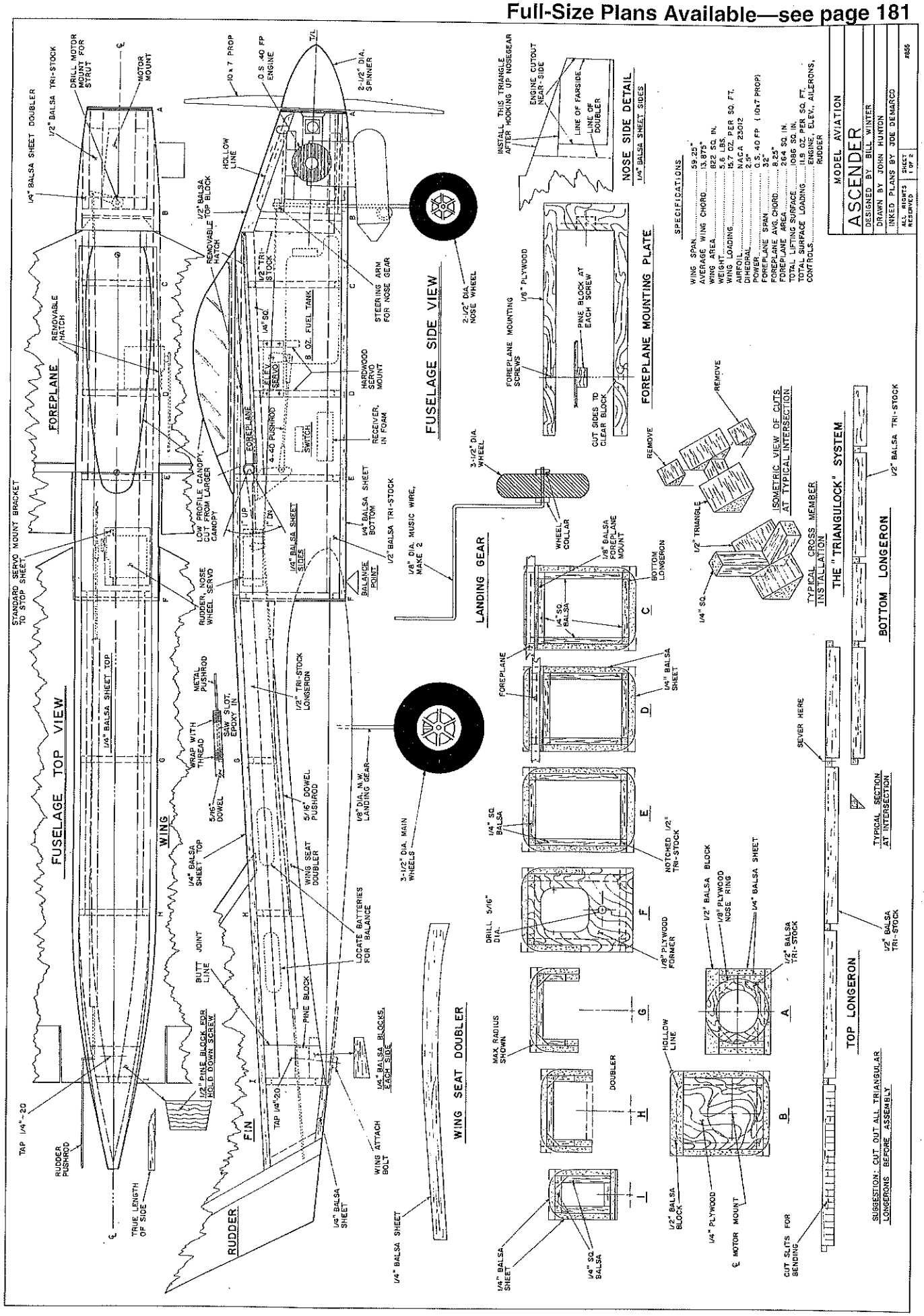


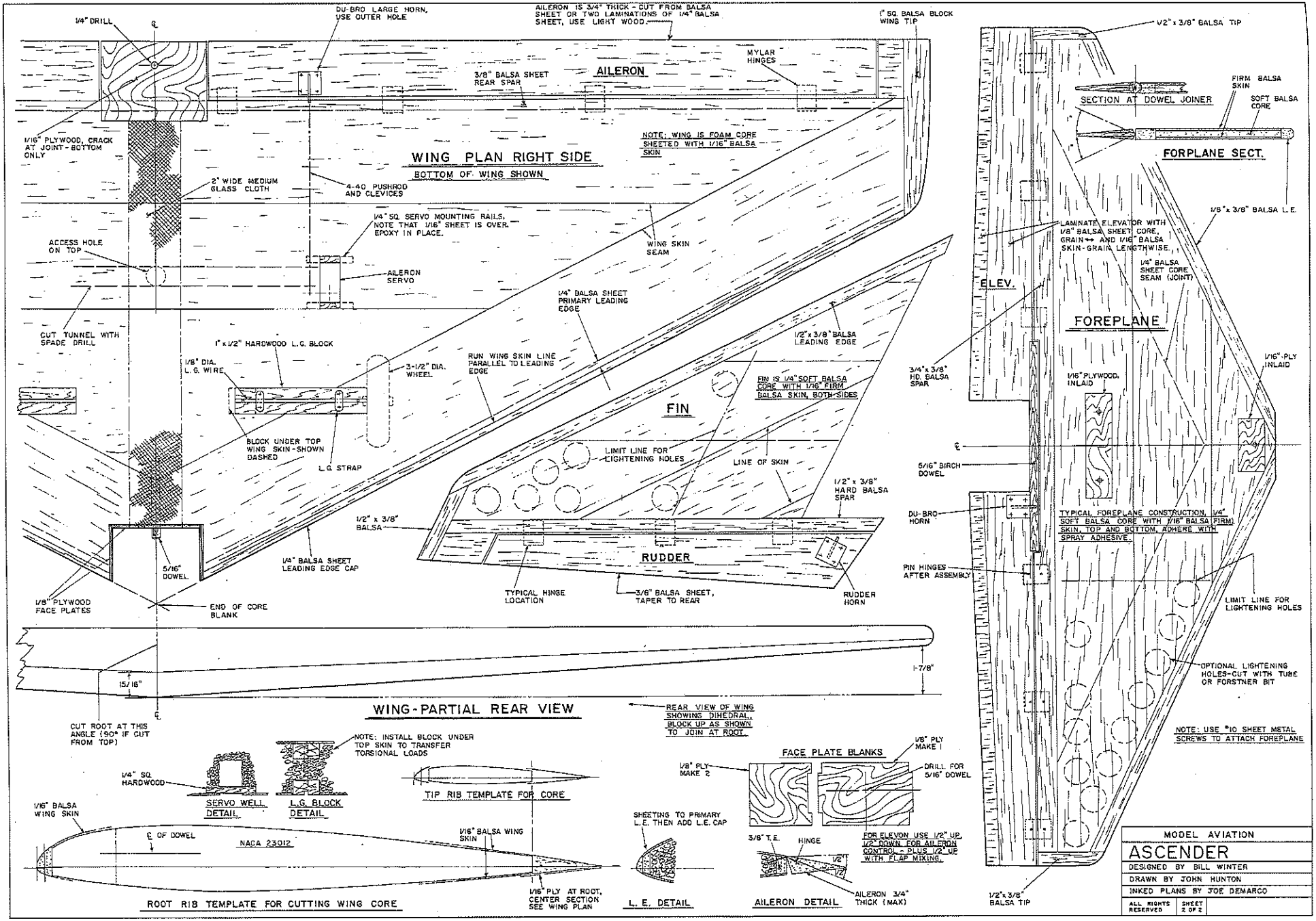
mpennage is built from ¼ soft balsa cores with firm 1/16 neeting overlay, attached with contact cement.



Servo mounting rails under skin for protection against rocking forces; gear block cut into sheet skin for shear resistance.

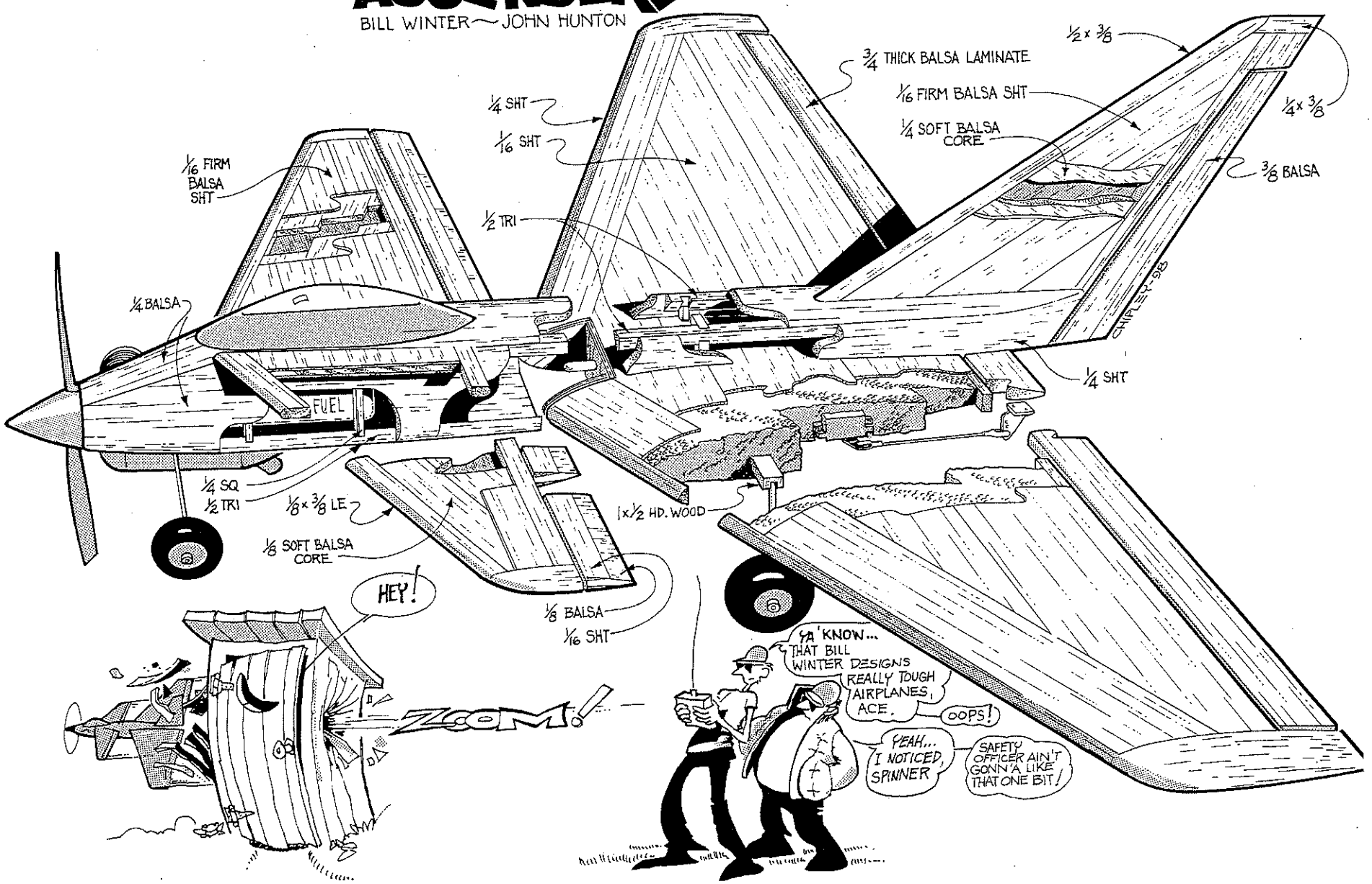
Full-Size Plans Available—see page 181




1/4" DRILL
DU-BRO LARGE HORN, USE OUTER HOLE
AILERON IS 3/4" THICK - CUT FROM BALSA SHEET OR TWO LAMINATIONS OF 1/4" BALSA SHEET, USE LIGHT WOOD
1" SQ. BALSA BLOCK WING TIP
MYLAR HINGES
3/8" BALSA SHEET REAR SPAR
AILERON
1/16" PLYWOOD, CRACK AT JOINT - BOTTOM ONLY
NOTE: WING IS FOAM CORE SHEETED WITH 1/16" BALSA SKIN
WING PLAN RIGHT SIDE
BOTTOM OF WING SHOWN
2" WIDE MEDIUM GLASS CLOTH
4-40 PUSHROD AND CLEVICES
1/4" SQ. SERVO MOUNTING RAILS, NOTE THAT 1/16" SHEET IS OVER. EPOXY IN PLACE.
WING SKIN SEAM
ACCESS HOLE ON TOP
AILERON SERVO
CUT TUNNEL WITH SPADE DRILL
1/4" BALSA SHEET PRIMARY LEADING EDGE
1/2" x 3/8" BALSA LEADING EDGE
1" x 1/2" HARDWOOD L.G. BLOCK
1/8" DIA. L.G. WIRE
3-1/2" DIA. WHEEL
RUN WING SKIN LINE PARALLEL TO LEADING EDGE
FIN IS 1/4" SOFT BALSA CORE WITH 1/16" FIRM BALSA SKIN, BOTH SIDES
FIN
BLOCK UNDER TOP WING SKIN - SHOWN DASHED
L.G. STRAP
LIMIT LINE FOR LIGHTENING HOLES
LINE OF SKIN
1/2" x 3/8" HARD BALSA SPAR
1/2" x 3/8" BALSA
RUDDER
5/16" DOWEL
1/4" BALSA SHEET LEADING EDGE CAP
TYPICAL HINGE LOCATION
3/8" BALSA SHEET, TAPER TO REAR
RUDDER HORN
1/8" PLYWOOD FACE PLATES
END OF CORE BLANK
15/16"
1-7/8"
WING - PARTIAL REAR VIEW
CUT ROOT AT THIS ANGLE (90° IF CUT FROM TOP)
REAR VIEW OF WING SHOWING DIHEDRAL, BLOCK UP AS SHOWN TO JOIN AT ROOT
NOTE: INSTALL BLOCK UNDER TOP SKIN TO TRANSFER TORSIONAL LOADS
1/4" SQ. HARDWOOD
SERVO WELL DETAIL
L.G. BLOCK DETAIL
TIP RIB TEMPLATE FOR CORE
1/16" BALSA WING SKIN
℄ OF DOWEL
NACA 23012
1/16" BALSA WING SKIN
1/16" PLY AT ROOT, CENTER SECTION SEE WING PLAN
ROOT RIB TEMPLATE FOR CUTTING WING CORE
SHEETING TO PRIMARY L.E. THEN ADD L.E. CAP
L. E. DETAIL
FACE PLATE BLANKS
1/8" PLY MAKE 1
1/8" PLY MAKE 2
DRILL FOR 5/16" DOWEL
3/8" T.E.
HINGE
1/2"
FOR ELEVON USE 1/2" UP, 1/2" DOWN FOR AILERON CONTROL - PLUS 1/2" UP WITH FLAP MIXING.
AILERON 3/4" THICK (MAX)
AILERON DETAIL
1/2" x 3/8" BALSA TIP
SECTION AT DOWEL JOINER
FIRM BALSA SKIN
SOFT BALSA CORE
FORPLANE SECT.
1/8" x 3/8" BALSA L.E.
LAMINATE ELEVATOR WITH 1/8" BALSA SHEET CORE, GRAIN ↔ AND 1/16" BALSA SKIN-GRAIN LENGTHWISE.
1/4" BALSA SHEET CORE SEAM (JOINT)
ELEV.
FOREPLANE
3/4" x 3/8" HD. BALSA SPAR
1/16" PLYWOOD, INLAID
1/16"-PLY INLAID
℄
5/16" BIRCH DOWEL
DU-BRO HORN
TYPICAL FOREPLANE CONSTRUCTION, 1/4" SOFT BALSA CORE WITH 1/16" BALSA FIRM SKIN, TOP AND BOTTOM, ADHERE WITH SPRAY ADHESIVE.
PIN HINGES AFTER ASSEMBLY
LIMIT LINE FOR LIGHTENING HOLES
OPTIONAL LIGHTENING HOLES-CUT WITH TUBE OR FORSTNER BIT
NOTE: USE #10 SHEET METAL SCREWS TO ATTACH FOREPLANE
1/2" x 3/8" BALSA TIP
MODEL AVIATION
ASCENDER
DESIGNED BY BILL WINTER
DRAWN BY JOHN HUNTON
INKED PLANS BY JOE DEMARCO
ALL RIGHTS RESERVED
SHEET 2 OF 2

ASCENDER

BILL WINTER—JOHN HUNTON



bottom faces to match the airfoil. Mark the precise leading edge forward point with a straightedge and felt-tip pen for guidance while shaping. The final shape of the leading edge is critical for good flying and stall characteristics, so shape it accurately.

Gradually shape the outer leading edge with a balsa plane for roughing, and your sanding board for sculpting the desired profile. Work in paths from root to tip, removing material progressively. Finish with a fine sandpaper pad.

Cut the wing roots to proper angles in the horizontal and vertical planes, using a table saw or just by shaping with a sanding block over the edge of your workbench. To do this, jig up each panel with blocks. Spot-glue or pin the blocks to the wingtip. The sanding board is held flush to the bench face and used in a long-stroke milling action.

Check mating of the cores for flush fit, then epoxy the roots together, blocking up the panels for the required dihedral angle. Use long straight pins and/or masking tape to help hold in position. If crevices remain in the joint after the epoxy has cured, fill with a mixture of epoxy and filler. Outline and cut out the front wing recess and install facing plywood pieces.

The sides of the cutout are sloped to fit against the fuselage sides. The spanwise plywood dowel plate is glued in first. Trial-fit the wing to the fuselage, checking that the two side cutout pieces fit snugly and will butt against the dowel plate. Remove the wing and glue the side plates in place.

Cut the rear protective bolt plate from 1/16 plywood, put it in a vise, and force partial cracking along its centerline. Set at the required dihedral angle, then glue it to the bottom of the wing. Apply two-inch-wide fiberglass (lightweight) over the top and bottom of the center section joint with

epoxy or cyanoacrylate (CyA—be sure to use a foam-friendly brand).

Trial-fit the control horns to the ailerons and "dry fit" the hinges for minimum gap between the ailerons and the rear spar. Slotting depends on the type of hinge. Nylon strip hinges are simple, light, and as strong as anything else, if properly installed. For insurance we "pinned" the hinges with a toothpick so they stay in place. Hinge slots can be accurately cut with a #11 blade. Mark positions exactly, use something straight for a guide, and be sure that the cut is parallel to the surface.

Fuselage: Construction of the Ascender fuselage is somewhat unusual, with our "triangulock" detailing, the use of slotted triangle stock to key in uprights and crossmembers for easy and accurate building.

Cut out all triangular longerons and notch them accurately as shown. Make a thin cardboard pattern of the mainplane (wing) cutout area and accurately scribe the sides with a pencil around the outlines to be removed as well as the doubler. Cut the fuselage sides to outline shape.

Attach the triangles to each side, being very careful to get them in accurate position. Be sure to make a right side and a left side. Install the wing, foreplane, and nose doublers.

Pin the blanks together back-to-back and true all edges to identical outlines. Place a sheet of sandpaper on the workbench and slide the paired sides back and forth with a milling action. Part the sides, then taper the aft ends for joining later.

Install all vertical members in each side. Cut the firewall (install blind nuts now) and both plywood formers. Install the firewall and formers into one side, using a triangle to true them, then attach the other side. Do not pull the rear together yet.

Install all crosspieces between the former and firewall along the straight-sided portion of the fuselage, then pull in the tail after the assembly is dry (temporary crosspieces can be added at the foreplane area). True the top and bottom with a sanding block, then install the top and bottom sheeting. Add the nose ring and

quired doubling.

Basic shaping and sanding of the selage should be done now. Corners ould be well-rounded, but leave them uare at the wing root leading edge and at e foreplane mount area.

Prepare the plywood foreplane seat. Be re to install the hardwood blocks to the ıderside of the plywood plate to receive e hold-down screws. Check that the replane area is level and true, then mount e plywood plate.

The fiber-reinforced plastic engine ount used had holes for the typical ısewheel strut, but because the mount is rned on its side, similar holes (5/32) must drilled sideways through the stock mount.

Cover the engine mount bolt holes with asking tape tabs, then coat the front face of e firewall with epoxy and allow to set. ial-install the engine and nose gear. Install e fuel tank and as much plumbing as can done at this stage.

Install the servos; note that the foreplane rvo is mounted directly through the side of e fuselage, with one end mounted to a ¼ uare vertical and the other to a ¼ square rdwood block. The rudder/nosewheel rvo can be mounted in a stock bracket om the inside top sheeting.

The canopy is assembled after the replane is in position. Mark the centerline the top rear fuselage sheet and cut holes r the fin attachment tabs.

ertical Stabilizer and Foreplane: Build the rtical stabilizer and foreplane by sembling a light balsa core with hard balsa r the fin and foreplane main spars. Make ghtening holes on the outer areas of the res as indicated. Use a Forstner bit, or ake a hole-cutting tool from large thin-alled tubing with its cutting edges arpened. Use a repetitive twisting motion. etape the entry side for protection.

Sheet with the skins at a diagonal grain the core. Sand the leading edge square, en add the leading edge piece, which is ll thickness. Install the plywood foreplane inforcements. Sand all surfaces to shape ith the sanding board, then smooth with ıe sandpaper.

Cut and glue the block for the wing hold-

down bolt, but do not drill the bolt hole until the wing has been finished and fitted. Assemble the two elevator blanks and connecting dowel piece snugly against the rear of the main surface, with a strip of waxed paper between them and the foreplane. Pin all parts down accurately. Use epoxy on the dowel joint.

After the epoxy has cured, pick up the work, then taper/sand the elevator assembly with a sanding board. Do not feather the trailing edge of the elevators or rudder (see plan). Shape the elevator hinge line as shown.

Canopy/Foreplane Hatch: Cut the canopy base from ⅛ sheet (match to your canopy shape if required). Trial-fit the canopy to the base by gently sanding the wood to match the canopy slope around the perimeter. The mount will be glued (later) to the top of the built-up fairing block, which is cross-sectioned to fit on top of the foreplane.

Preassembly: Mark locations of the foreplane hold-down screws. Pin the foreplane assembly over the plywood foreplane mount. Drill guide holes for #10 self-tapping sheet-metal screws. There are three such screws to hold down the removable foreplane (for tank access) and two smaller screws in the canopy assembly. After installing the screws, remove them and strengthen the holes with CyA. Temporarily install the hinges and elevator horn, but remove them until covering is complete.

Fit the wing to the fuselage before installing the hold-down dowel. The rib profile on the fuselage will be fairly accurate, but the inside doublers will have to be tapered and shaped to fit the wing. Run masking tape along the top of the wing where it will meet the fuselage and coat the tape with lipstick. Seat the wing, remove it, and trim away the material that is marked with lipstick. Repeat the process until the wing is seated and is level with the foreplane.

With the wing accurately mated to the fuselage, drill a 3/16 hold-down hole through the wing and the rear plywood

X-TREME Aerobatics

FAZER Specifications...
Engines: .25 to .40 2-stroke
.40 to .50 4-stroke
Wingspan: 48 in.
Wing Area: 697 sq. in.
Weight: 3-1/2 to 4 lbs.
Wing Loading: 11.6 to 13.2 oz./sq. ft.
Length: 40 in.
Radio: 4-channel with 5 servos
(2 ail, 1 ele, 1 rud, 1 thr)

KIT NO. RC-68
SIG FAZER

SIG

KIT NO. RC-71
SIG ULTIMATE

Unlimited Aerobatic Capability!

ULTIMATE Specifications...
Engines: .32 to .46 2-stroke
.40 to .50 4-stroke
Wingspan: 42 in.
Wing Area: 798 sq. in.
Weight: 4-1/2 lbs.
Wing Loading: 13 oz./sq. ft.
Length: 43-1/2 in.
Radio: 4-channel with 5 servos
(2 ail, 1 ele, 1 rud, 1 thr)

FAZER and ULTIMATE Kit Features...
- ✗ Easy-To-Build All-Wood Design
- ✗ Simple Profile Fuselage
- ✗ Built-Up Balsa Wing, with room inside for all the radio gear
- ✗ Formed Aluminum Landing Gear
- ✗ CAD Drawn Plans
- ✗ Photo-Illustrated Instructions
- ✗ Complete Hardware
- ✗ Large Decal Sheet

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