Lee Renaud's AQUILA

The ultima Thule in Standard Class competition

The sport of R/C Soaring has advanced rapidly in technology and performance during the past five years. Radio systems, accessories, launching methods and aircraft design have been improved and refined so that today's models provide outstanding flights in all conditions of terrain and weather conditions. The thrills and aesthetic reward of flying with the eagles has attracted many new modelers until R/C sailplane flying has become a major segment of radio control modeling. We believe that the Aquila represents another step forward in the state of the art of aircraft design and flight performance.

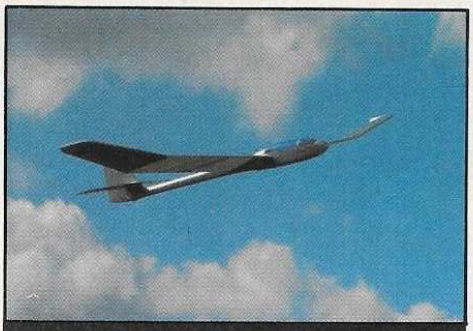
Standard Class sailplanes offer many advantages over their Unlimited Class counterparts, particularly in cost and ease of transportation. However, most design development has been in the larger ships particularly for thermal duration tasks, as the larger ships *theoretically* fly better. Despite this, Standard models have completed very successfully in major contests flying against the larger ships. Mark Smith won the 1974 LSF Tournament outright and Dave Shadel narrowly missed winning overall in the 1974 Soar-Nats with a two channel Standard Class ship. For 1975 contests the NSS rules permit unlimited control functions and the use of thermal sensors in Standard Class.

The Aquila (pronounced ah-keel'-ah as in tequila) provides Unlimited Class performance with a Standard Class model. This has been achieved by aerodynamic design and structural refinement. It is, basically, a chopped wing span Unlimited Class model.

The wing chord is 9'' to increase Reynolds number and provide increased wing area. We feel that these factors are more important than the reduction in induced drag from higher aspect ratios. The wider chord provides greater visibility at high altitudes since the width of the wing is more significant than the span. The increased area also provides higher launches as it will carry the weight of the launch line better than the smaller area ships. (As long as all models are flown on the same launch equipment and the launch device is sized to lift the big ships the smaller ships are at a disadvantage.)

The airfoil is a medium thickness, flat bottomed section with a low entry point. The leading edge radius is fairly large to provide a soft stall and the high point is located at 30%. Our experience shows that this type of airfoil performs better than the undercambered sections under all conditions except dead calm. Since some wind seems to prevail during most contests, the ease of building and covering far offsets the minor loss of performance under atypical conditions.

The wing planform with constant chord center panels and double tapered tips is nearly as efficient as an elliptical planform and much easier to build and repair. Positive Hoerner tips are utilized to reduce tip vortex



TYPE AIRCRAFT
Standard Class, Competition Sailplane
WINGSPAN
101.25 Inches — Flat
99.0 Inches — Projected
WING CHORD
9" Center Panels
5.75" At Tip
TOTAL WING AREA
810 Sq. In. Effective

losses and increase effective span. This style tip is used on the full-scale Duster sailplane and discussions with Hank Thor, the Duster designer, while researching a scale model convinced us that this type of tip would improve model performance. Polyhedral is used because of the superior turn characteristics over Vee dihedral. The change in leading edge radius on the tip panels eliminates tip stalling and avoids the loss of lift caused when wash out is used for this purpose.

The use of a large diameter joiner and double shear webs in the center panels provide a very rigid wing. We believe that span-wise wing flex causes significant reduction in launch height and can contribute to poor handling while flying in gusty air. The overall wing structure is quite light but very strong and rigid, while still retaining a low moment of inertia around the Center of Gravity.

WING LOCATION
Mid-Fuselage
AIRFOIL
Flat Bottom 9.6% Thick
WING PLANFORM
Constant Chord Center Panels
Double Taper Tip Panels
DIHEDRAL, EACH TIP
Polyhedral 4% Center
8% Tip

The empennage design features a lightweight structure with thick sections and all flying control surfaces. The diamond section airfoil provides excellent control response and avoids premature stalling problems inherent in flat plate surfaces. The stabilator provides positive pitch control with less drag than a conventional elevator surface. Detachable stabilator panels and rudder permit packing in a smaller box for ease in transportation. Two complete models can be easily packed in a box measuring 10" x 12" x 50".

The fuselage design is conventional and provides a large accessible radio compartment and room between the wings for a thermal sensor. Ballast space is provided to hold up to 20 ounces of C.G. weight plus extra nose weight. The structural design provides a lightweight and easily aligned fuselage. The canopy and overall lines are very scale-like and contribute to the Aquila's beauty. While not as quick to build as a slab sided box the extra carving and sanding pay off when you examine the finished model.

Optional lift spoilers are incorporated in the design. These are very effective (more than those on the Grand Esprit) and provide

O.A. FUSELAGE LENGTH
46.2 Inches
RADIO COMPARTMENT AREA
(L) 11" x (W) 2.2" x (H) 2"
STABILIZER SPAN
25.2 Inches
STABILIZER CHORD (incl. elev.)
4.7" Average (flying stab.)
STABILIZER AREA
106 Sq. In. (13.1%)

exceptional glide path control with minimum pitch disturbance. They provide a controlled means of descent from high altitude and also stabilize the ship while landing in turbulent ground conditions.

Recently, there has been a great deal of controversy regarding two-function versus unrestricted Standard Class contest rules. Frankly, we don't understand what the fuss is all about. Certainly spoilers provide more control of the model and increase the pilot's available options for his flight plan. They are not, however, a cure-all, and will not magically place the model on the landing spot. Pilot skill and practice is still the major determining factor in winning contests and this will be true under any set of rules. Trying to write rules to legislate a "beginner's" event has never worked in modeling or any other competitive sport. Personally, we like spoilers and will fly with them as often as possible. However, if rule changes prohibit their use in competition flying we'll just tape the blades closed and keep on flying. The Aquila will slow up and land easily without spoilers so the choice is up to you. If you have three servos try the spoilers for an added dimension in R/C Soaring and don't knock it until you've tried it!

The spoilers can be very useful when slope flying as they permit landing in very restricted areas. Instead of flying behind the slope into the normal sink area, turn closer in and extend the spoilers. This technique is

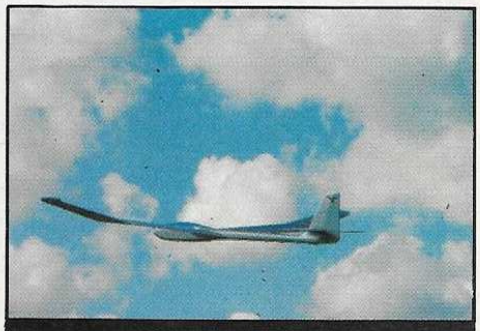
STAB AIRFOIL SECTION
Diamond
STABILIZER LOCATION
Mid Fin
VERTICAL FIN HEIGHT
10 .1 Inches
VERTICAL FIN WIDTH (incl. rudder)
4.7 Inches Average
REC. NO. OF CHANNELS
2 Minimum, 3 Optional

a lot easier on the model than landing in the trees or trying to fly into the ground.

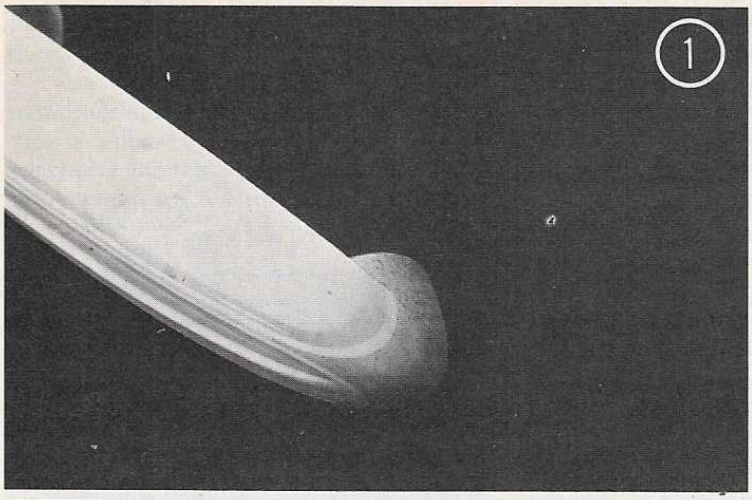
Since the spoilers reduce the lift of the wing, they effectively increase the wing loading of the model. We have had good results when flying on the slope by cracking the spoilers open in windy conditions. The same technique seems to work well when thermal flying in strong winds, but further experimentation of this technique is required.

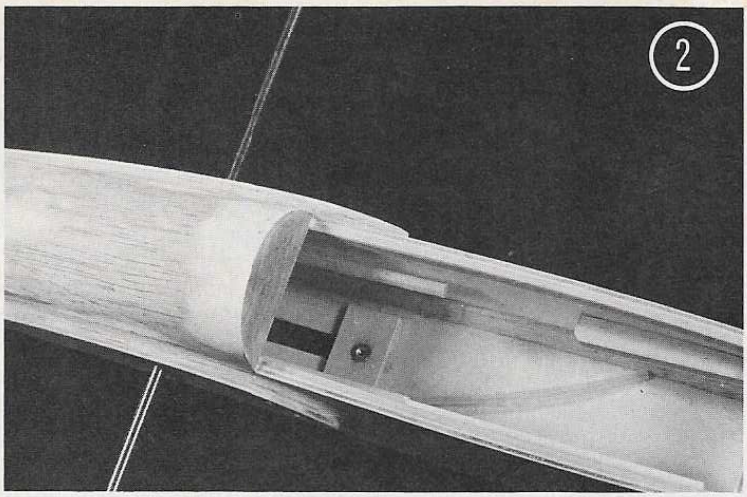
Let us know if you try this technique as a substitute for ballasting the model.

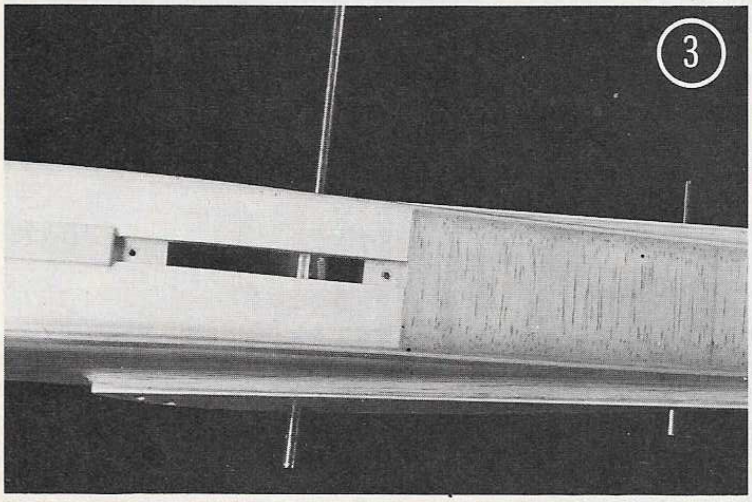
The flying characteristics of the Aquila are outstanding! The ship has a very broad speed range in the un-ballasted condition and will really smoke if a little down trim is fed into the elevator. By adding up-trim and holding some up-stick she will really slow down to walking speed without dropping a

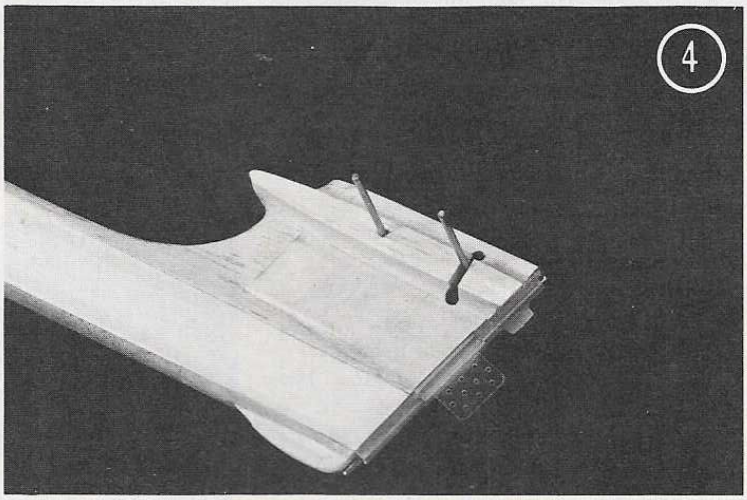


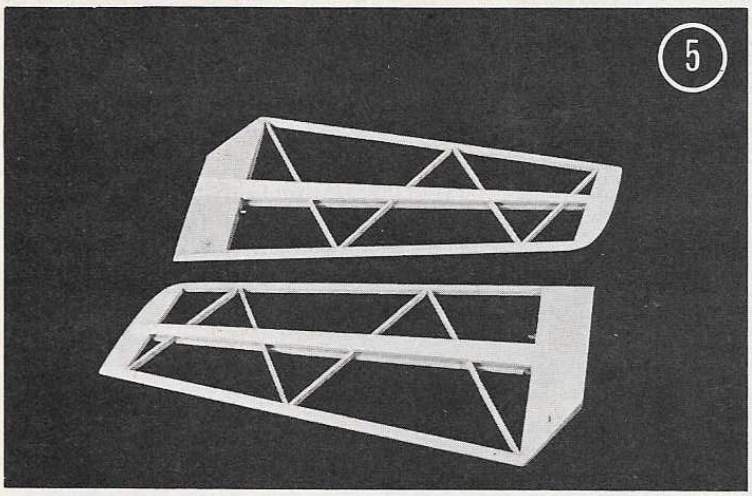
CONTROL FUNCTIONS
Rudder, Elevator, Optional Spoilers
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Ply, Spruce
Wing ..... Balsa, Ply, Spruce
Empennage ..... Balsa
Weight Ready-To-Fly ... 40-44 Oz. w/spoilers
Wing Loading
7.5 oz./sq. ft. without ballast,
10.0 oz./sq. ft. with ballast

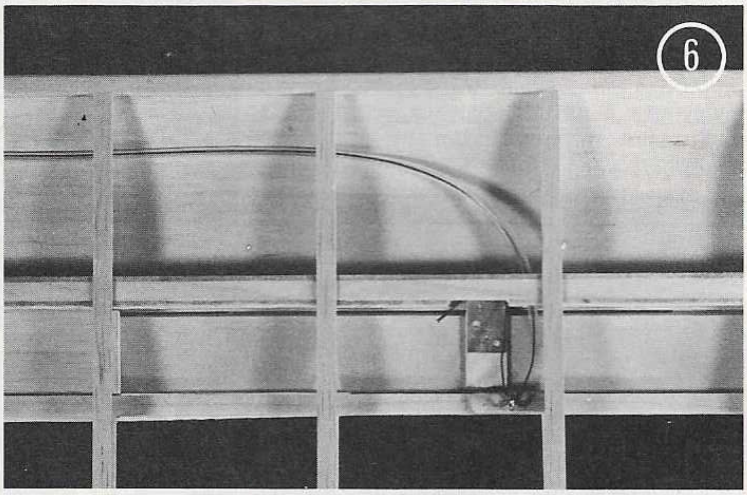


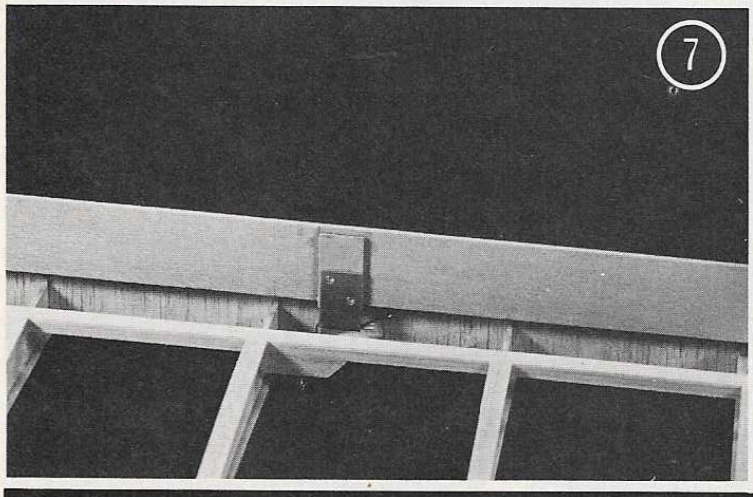


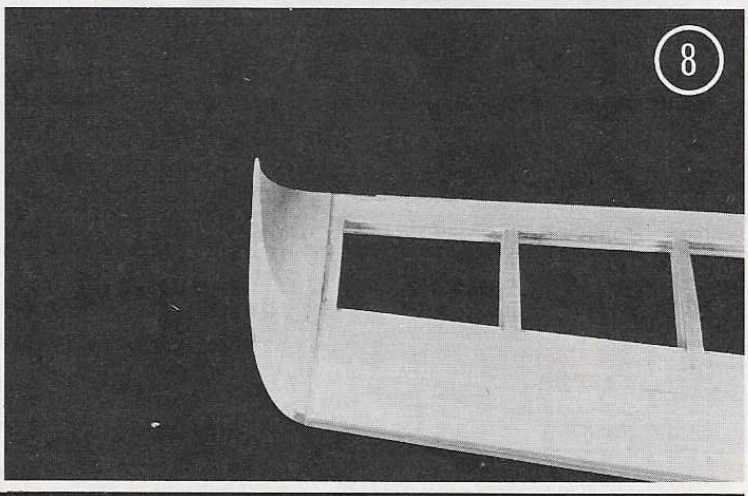




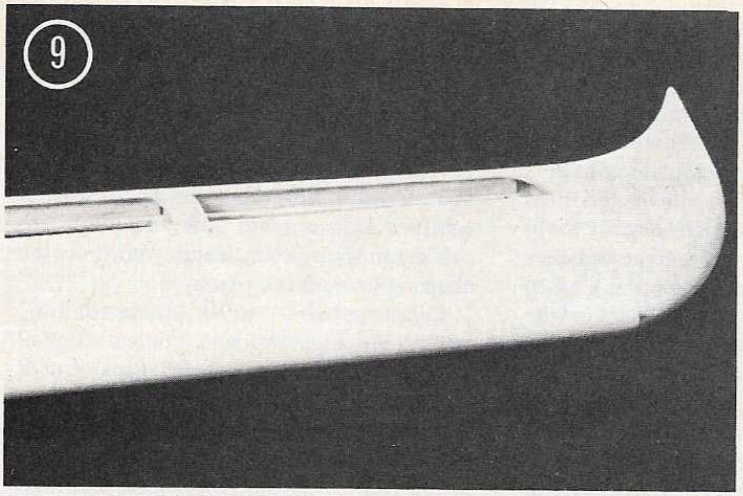


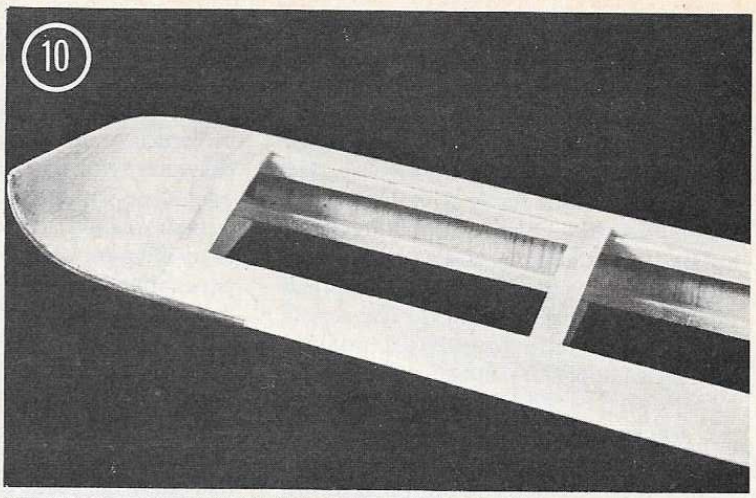


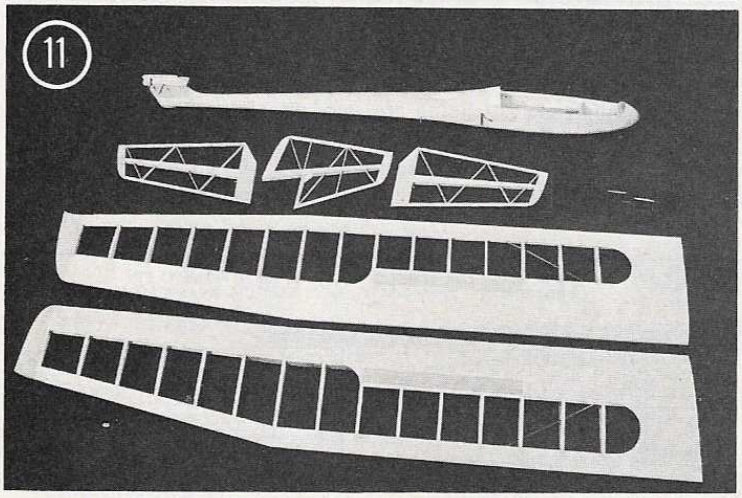


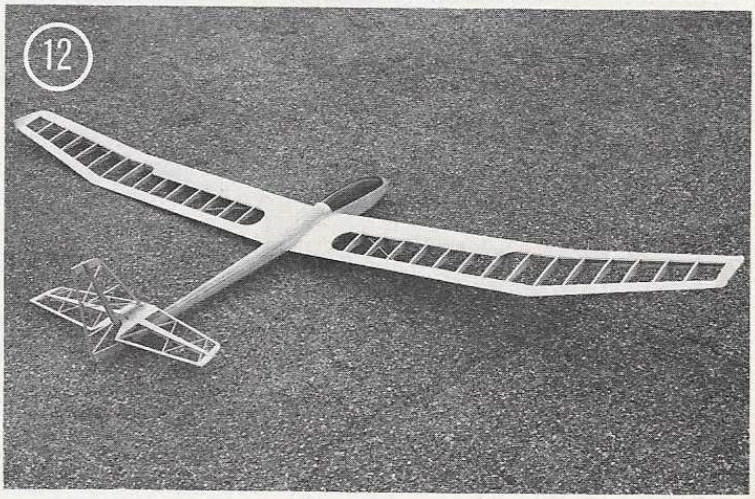


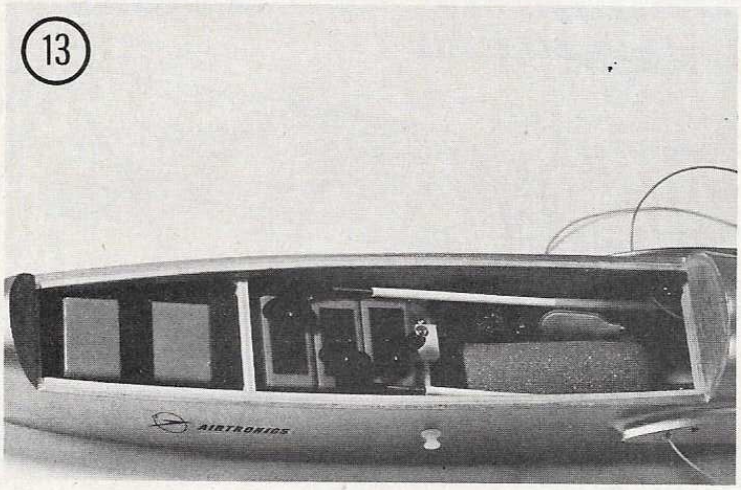
(1) Fuselage nose final sanded and ready for finish. Note contour lines in plywood, providing a guide when shaping. (2) Radio compartment with servo rails and pushrods installed. Nylon tubing for internal antenna. (3) Slot in plywood bottom and mounts for towhook bar. (4) Completed fuselage tail section with stabilator joiners in place. Hinge pin and rudder hinge ready for rudder installation. (5) Stabilator panels ready for covering. Trailing edge brace not installed yet. (6) Bottom view of spoiler bay showing routing of spoiler cable and control horn. (7) Spoiler blade in extended position toothpick retainer on right side of spoiler horn. (8) Tip block rough carved and sanded.

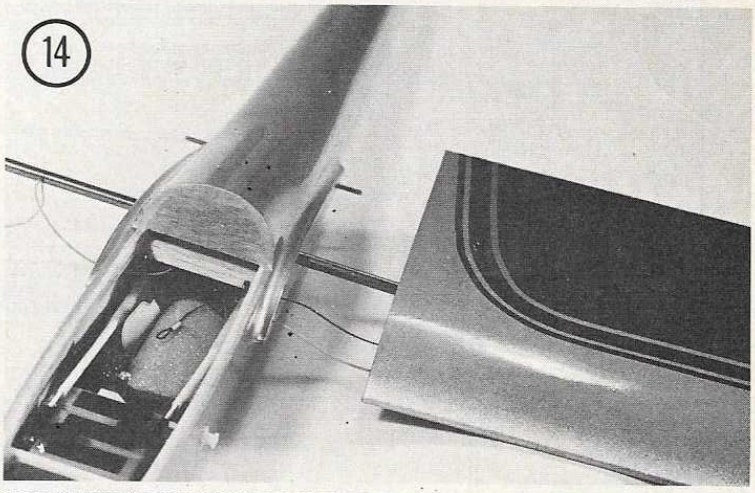


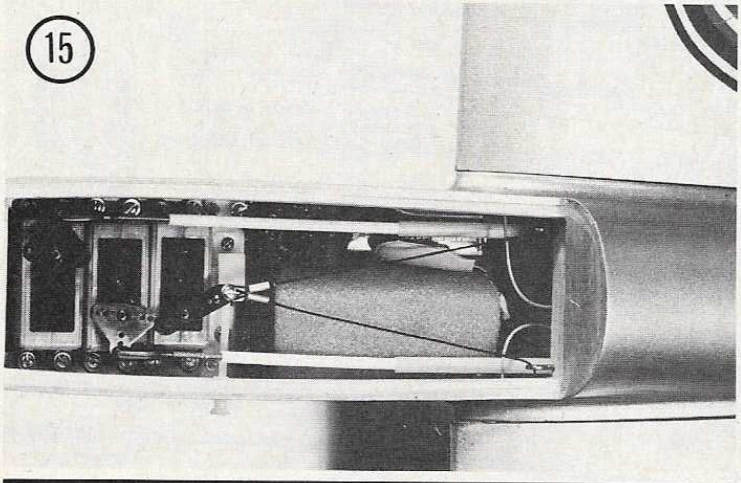


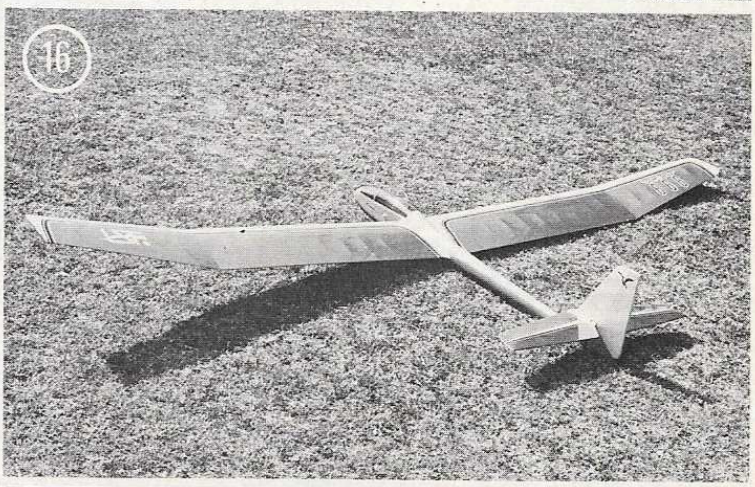












(9) Front view of the wing tip after final sanding. (10) Rear view of wing tip block after final sanding. Note how reinforcing wire acts as a guide when shaping the block. (11) All parts sanded and ready for covering and painting. (12) Even without the covering, the classic beauty of the Aquila is evident in the framework. (13) View of the radio compartment with RS Systems installed. (14) View of the spoiler hook-up lines. (15) With the wings in place, the spoiler lines are attached to the servo. (16) The finished Aquila – the ultimate ship for Standard Class Competition.

tip. With normal trim and stabilator throw, stalls must be deliberately introduced. The stall is soft and straight ahead with no tendency to fall off. Rudder control is very positive and effective in all conditions. Turns are flat without skid or slip tendencies. Tight turns with high bank angles are easily achieved by holding a little up-stick to maintain glide path. When properly trimmed you can set up a thermal turn and neutralize both sticks. The Aquila will hold the turn for several minutes without additional command — in fact we have flown for 15 minutes without touching the transmitter. Lift response is very positive and provides strong visual response. Even when you can't find the lift the Aquila will!

Tow characteristics are excellent. With the hook properly positioned she will climb like an arrow and get higher much faster than any other ship we have flown. On a heavy duty surgical tubing Hi-Start, point the nose up and heave javelin style while holding a little up-stick. Alternately, launches from a six volt winch are also superb.

Handling is also great. Despite the high performance potential, the Aquila is a very easy ship to fly. Control response is immediate with no adverse characteristics. In fact, we think the Aquila is as easy to fly as an Olympic with the advantage of better penetration. If this sounds like the kind of sailplane you would like to fly, clear off the workbench and get started. If you are a serious contest flier, build two so that you have a back-up model available throughout the contest season.

Read through the building instructions and study the plans to familiarize yourself with the design before starting construction. We suggest that you cut out all parts before starting assembly creating your own kit. This method reduces overall building time and lets you build several parts simultaneously.

Cut out all balsa wing ribs using ply templates and the sandwich method for the center panel ribs. Cut the tip ribs in pairs using the outlines on the plan. Pre-cut the shear webs by trimming a sheet of balsa 2-13/16'' wide and using a small square to cut 3/4'' high webs. Cut the 1/16'' ply webs and dihedral ties. Cut the tip blocks to outline. Use a table saw, or plane, to pre-shape the spruce leading edge to the shape shown on the plans.

Laminate two 2'' x 9¼'' pieces of 1/8'' poplar ply together with contact cement then cut into two 1'' wide strips. Cut 2 pieces of 1'' x 9¼'' 1/16'' thick plywood and stack together with the 1/4'' thick ply blanks. Rubber cement the root rib template to the face of the stack and drill the holes through the stack using a drill press for accurate alignment. Be certain the holes are accurately positioned in all ribs since the holes are used to align the wing panels. Shape the outer contour while the ribs are stacked together.

Cut the fuselage sides from 1/8'' poplar

plywood tack glued together for accurate alignment. Drill holes for the brass tubes, spoilers, and cables, again making sure the holes are accurately positioned. Check alignment with the root ribs and correct any errors.

Note: If you are not able to obtain the 1/8'' poplar ply (Sig-Lite or equivalent) you may substitute hard 1/8'' sheet balsa with a 1/32'' ply doubler contact cemented inside from the noseblock to the forward edge of F-2. Cut F-1 1/16'' narrower than shown on the plan to compensate for the doubler thickness. Cut the nose block, towhook mounts, and former F-2 to match the plans. Cut the 1/4'' balsa top block to match the top view of the plans and slot 3/8'' wide at the aft end to receive the fin. Cut the forward floor to shape and slot for the towhook bar. Now you are ready to start assembling the model.

You will need a flat surface at least 48'' long and 10'' wide into which you can push pins to build the model. No special jigs or tools will be required. Cut the plan to fit your work surface, tape down and cover with Handi-Wrap or the equivalent.

We don't recommend the use of model airplane cements for structural assembly. Wilhold aliphatic glue or similar glues can be used for all joints except the brass tube installation. 5-minute epoxy such as Hobbypoxy Formula 4 or Devcon are quite useful. Hobbypoxy Formula 1 is used to assemble the wing trailing edge joint and install the wing tubes.

Our own prototype airplanes were assembled completely with Hot Stuff, except for the Formula 1 joints and the side nose block joint. Several months of flying has shown no structural failures and we totally recommend its use. It's not inexpensive but the time saved in building is fantastic. We framed two ships in the time normally required for one by using Hot Stuff.

All of the hardware called out on the plans is available from Airtronics, P.O. Box 626, Arcadia, California 91006. The canopy, towhook skid and stabilator control horns are normal hobby shop accessories. A special scratch-builders kit including these items plus spoiler hardware, wing and stabilator joiners and tubes is available on direct order from Airtronics for $9.95 postpaid. Airtronics will release a complete kit for the Aquila in the near future for those who prefer to enjoy pre-cut parts.

CONSTRUCTION NOTES
STABILATOR

1) Cut the leading and trailing edges for both panels from 3/16'' x 1/4'' stock and pin in position over plan. Cut the tips from 3/16'' x 3/4'' stock and fit snugly. Fit the center section strips and glue all outline joints.

2) Cut the ribs from 3/32'' x 3/16'' stock and fit tightly. Glue all ribs in place.

3) Strip the tapered spars from light 1/8'' x 3'' sheet and install the spars. Cut and fit the 1/8'' center section sheeting and glue in place. Let this assembly dry thorougly.

4) Remove from plan and pin down again in inverted position with the spars and center sheet against the plan; use scrap 1/8'' sheet to shim the leading and trailing edge.

5) Cut notches in the center ribs for the forward brass tube. Check fit carefully and be sure tube is square and parallel to the work surface. Insert 3/32'' joiner in aft hole in control horn and 1/8'' brass tube in forward horn hole. Cut two pieces of brass tubing 1½'' long and slip over the wire joiner.

6) Position forward tube in the notches and cut notches for the aft tubes using the horn as a spacer to locate the aft tubes. Check alignment and epoxy all tubes in place. Crimp the ends of the tubes slightly with pliers.

7) Install tapered spars and center sheet and let dry completely. Use a razor saw to cut the forward tube flush with the root ribs and remove horn. Block sand face of root flat and square.

8) Cut stabilator fairings from 1/4'' x 1/2'' stock and drill 1/8'' diameter holes for the forward brass tube and rear joiner. Spot glue fairings to stab roots.

9) Carve center sheet and root fairings to airfoil shape, plane corners of leading and trailing edges. Block sand structure blending spar ends into tips as shown on plan. Round leading and trailing edges and tip. Do not remove root fairings at this time.

RUDDER

1) Cut the outline from 3/16'' x 1/4'' stock and pin in position over plan. Cut tips from 3/16'' x 3/4'' stock and fit tightly. Glue all outline joints.

2) Cut the ribs from 3/32'' x 3/16'' stock and fit tightly. Glue all ribs in place.

3) Strip the tapered spars and install the spar and 1/8'' x 1/4'' filler on the root ribs. Let dry thoroughly.

4) Remove from plan and install right hand spar and filler.

5) Cut a slot in the rudder post for the rudder hinge but do not permanently install hinge now. Make slot approximately 1/8'' longer than hinge to provide vertical adjustment when fitting rudder to fuselage. Use hinge as a guide to drill a 3/32'' diameter pilot hole through the root rib, then enlarge hole to 1/8'' diameter with small rat-tail file. Cut a 3/8'' length of 1/8'' O.D. brass tube, deburr ends and epoxy into root rib using hinge and 3/32'' diameter hinge pins to check alignment.

6) Carve and sand spars and outline to shape shown on plans.

WING

The wing construction sequence described assumes a limited working area and no special jigs. If your work area permits we suggest that both wing panels be built at the same time for reduced building time. If you have a hinged building board the center and tip panels can be joined on the board permitting even quicker construction.

The plans show optional tubes installed for the antenna of the optional Thermic Sniffler. We suggest that the holes for these tubes be drilled in the ribs and ply shear webs before starting assembly. The nylon tubes are installed after basic assembly is complete and before adding the top sheet and capstrips.

We also suggest that you install the spoiler tubes and spoiler frame even if you do not plan to use spoilers initially. In this way the opening can be cut out of the covering and the spoilers added at any time. Do **not** omit the 1/8'' x 1/4'' spruce sub-spar even if you have no intention of adding spoilers since this spar adds significant strength.

1) Seven sheets of 1/16'' x 3'' x 36'' balsa are required for the wing. The hardest stock should be used for the trailing edge strips and the lightest for the tip panels. Prepare the sheet before starting assembly as follows: (Mark each piece after cutting for easy identification during assembly.)

a) Cut one sheet into two 18'' lengths and trim off triangular piece 5/8'' wide at one end. These are the tip leading edge top sheets.

b) Cut one sheet into two 18'' lengths and cut four pieces tapering from 1⅜'' to 1''. These are the tip trailing edge sheets.

c) Cut two sheets 30'' long for the center leading edge top sheet.

d) Cut two sheets 30'' long and then cut these into four strips 1⅜'' wide for the center panel trailing edge sheet.

e) Cut one sheet 12½'' long and then cut two strips 1-7/16'' wide from this piece for the top sheet out to the spoiler bay. Cut pieces 4'' long for the bottom center sheet. The rest of this sheet and the 6'' cut-offs from steps (c) and (d) are used for the top center aft sheet and the small piece outboard of the spoiler bay.

2) Taper the aft section of all four trailing edge pieces as shown on the plans. Pin down trailing edge sheet, fitting the inboard end of the tip sheet tightly against the center sheet but do not glue this joint.

3) Pin shaped spruce leading edge in place. Cut and fit bottom center sheet and glue in place. Cut all bottom

capstrips to length and glue in place. Note that the cap at W-3 is not installed until the panels are joined.

4) Glue W-1 in place using the end of W-10 to tilt this rib outboard slightly. Note that the leading edge is 1/4'' outboard of the trailing edge to match the fuselage sides.

5) Cut the 1/8'' x 1/4'' spruce spars to length and glue the bottom spars to the center sheet and all capstrips using the ribs to locate the spar accurately.

6) Install all ribs except W-1A, W-2A and W-3 gluing to capstrips leading edge, spar and trailing edge sheet. Use the pre-cut shear webs as spacers to locate ribs and keep them square. Be sure ribs are tight against the bottom caps using pins as required to ensure proper location.

7) Glue the top main spars in place checking that the spar is flush with the top surface of all ribs. Add the sub spar.

8) Install the forward ply shear web W-10 and all forward balsa shear webs except in the bays adjacent to W-3. Be sure that the webs fit tightly against the bottom capstrips and top and bottom spar faces and use plenty of glue to ensure strong joints!

9) Cut ribs W-1A and W-2A apart at the spar notch and trim to clear W-10. Install forward portion of these ribs. Note that the aft section of the ribs and aft W-10 are not installed until later.

10) Glue all aft balsa shear webs in place. Note the gap to clear the spoiler horn. Fit and install the 1/16'' x 3/16'' trailing edge supports and the 1/4'' x 1'' T.E. filler blocks between W-1 and W-1A. Use the 1/16'' ply root rib to locate the notches for the spoiler cable tubing. Cut notches, drill hole through shear webs and install nylon tubing. Be sure the tubing does not project above the upper rib contour.

This completes the basic wing assembly. Let it dry thoroughly (at least eight hours if using aliphatic glues) before removing from work surface. The second wing panel must be completed through this point before continuing assembly.

11) Sharpen the inside end of the 1/4'' O.D. x 3'' long brass wing tubes with a #11 X-Acto blade. Using the 1/16'' ply root ribs to locate the hole and use the tubing as a drill to cut through W-1. Leave the balsa plug in the end of the tube to prevent epoxy from getting inside the tube. Check that the hole is adjacent to the forward W-10 and the bottom edge of the top spar. Use a rat-tail file to correct any misalignment.

12) Cut the tapered spar fillers from 1/4'' x 1/2'' stock and epoxy to the top and bottom spars and W-10. Sand the outer surface of the tubes with coarse sandpaper and clean thoroughly with acetone or similar solvent. Push tube through W-1 and against the end of the spar filler in both panels. Insert the 7/32'' diameter wing joiner into both tubes and set panels flat on the work surface with the trailing edge facing toward you. Block up both panels so that each polyhedral joint is raised 2-3/16'' above the work surface. Check alignment carefully being certain that there is no sweep in either panel and that the rod is parallel to the work surface then spot epoxy the tubes in place with 5-minute epoxy and let dry thoroughly.

13) Check alignment again and correct any errors before continuing, then remove the joiner. Mix up a generous batch of slo-drying epoxy and micro-balloons or use slo-dry filled epoxy. Pack the cavity around the tube completely with epoxy holding the panel with leading edge down to keep epoxy in place. Coat the edge of the top and bottom spars and face of the spar filler as well. Install the aft ply web, W-10, and use clothespins or clamps to squeeze it tightly against the spars. Clean off any excess epoxy and let dry before removing clamps. Install aft portion of ribs W-1A and W-2A.

14) Trim the tip shear webs and trailing edge supports flush with the top contour of the ribs and spars. Prop up tip panel so that the bottom surface of W-9 is 1¼'' above the work surface and block sand the leading and trailing edges and spar ends hand launch glider style. Prop up center panel so that W-1 is 2-3/16'' above work surface and block sand. Set center panel flat and raise tip rib 2½'' above work surface and check fit of joints; re-sand if necessary to correct any errors.

15) Pin the center panel in position then apply glue to L.E., T.E., and spars and butt the tip panel against the end with the bottom of W-9 2½'' above the work surface. Cut a 3/4'' length of 1/4'' x 1/2'' stock and glue between the spar ends at the joint. Lay some scrap 1/16'' shims under the spars about 1½'' each side of the joint and glue both W-11 dihedral braces in place. Check that the bottom edge of the braces are flush with the bottom spar face and resting on the 1/16'' shims. Use plenty of clamps to secure the braces. Install balsa webs at each end of W-11.

to page 80

AQUILA

from page 47/40

16) Cut the lower edge of the 1/8'' x 1/4'' x 3'' spruce leading edge tie to match the bottom edge of W-11 and glue to the aft side of the leading edge, using clamps to hold in position. Cut rib W-3 apart and trim to fit, then glue in position using a 1/16'' shim under the forward section to position the rib properly. Slant the rib inboard slightly so that it is centered on the spar joint.

17) Apply Hobbypoxy Formula I epoxy to the beveled portion of the center trailing edge and glue to the top edge of the spar supports and rib surface. Position top trailing edge sheet and pin the forward edges in place. Lay a strip of 1/4'' x 3/8'' or 1/4'' x 1/2'' balsa over the aft portion of the trailing edge and pin every 2 or 3 inches through this strip and the trailing edge sheet into the work surface. This clamping strip will ensure a straight trailing edge. Don't use aliphatic glues for the trailing edge seam as it will warp or curl the thin section.

18) Trim the aft edge of the leading edge sheet with a straight-edge then trim the end so that it is centered on rib W-3. We recommend contact cement to install the leading edge sheet as it eliminates tedious pinning and drying time. Use a small brush to apply cement to the spar, leading edge and rib surfaces, then coat the inside of the sheet where it contacts these points. Let contact dry and press 2 or 3 pins vertically into the spar to act as alignment guides. Align sheet against pins and drop onto spar, supporting the sheet so that it does not contact the ribs or leading edge. Rub down firmly against the spar then lower the sheet slightly and rub with your palm so that the sheet contacts the ribs. Work forward from the center toward each end finally rubbing down the leading edge joint. The panel can be removed from the board as soon as the sheet has been completely rubbed down. If you prefer to glue the sheet in position be sure that the joints are completely dry before unpinning the panel.

19) Cut and install the top center sheet, starting with the 1-7/16'' x 12½'' piece butting against the leading edge sheet. Note that the outboard end of this sheet is flush with the outer face of the rib. Install the sheet on the outboard end of the spoiler blade. It's easier to trim the contour of these pieces after installation. Fit and install the 1/16'' x 1/4'' fillers that outline the forward and aft edges of the spoiler bay. Fit and install all center panel capstrips. We suggest cutting the caps slightly oversize and then bowing them in place to eliminate pinning. This completes assembly of the center panel. Remove from work surface when dry.

20) Prop up the center panel so that the bottom tip spar is flat against the work surface. Install the trailing edge sheet, leading edge sheet and capstrips following the methods outlined in steps 17, 18, and 19. Let dry completely and remove from work surface.

21) Trim the L.E., spars, and sheet flush with the outboard edge of W-9 and epoxy tip block in place. Set block 1/16'' forward of the wing trailing edge. Form the soft wire reinforcement to the shape shown on the plans (match the second wire to the first now so that both wing tips will be identical). Notch the trailing edge to receive the wire and epoxy wire to trailing edge and tip block. The wire serves as a guide when carving the tips and prevents the tip from breaking during handling or when bent by curious hands. Rough shape inner surface tip using a scoop gouge and coarse sandpaper wrapped over a 1'' diameter form (a section of MonoKote tube core is ideal). Carve and sand outer surface using a block, following the wire and tapering toward the leading edge. Wrapping a strip of masking tape around the wing inboard of the tip block joint is helpful to prevent sanding the top sheet or capstrips. Finally carve the forward top portion to match the contour of the leading edge sheet. Check the photos and cross-sections shown on the plans and work carefully.

22) Trim sheet, spars and leading edge, plus nylon tubing, flush with W-1 taking care to avoid changing the angle of W-1. Stack the ply root ribs and fuselage fillet ribs together using the brass tubes to align and shape the leading edge contour to match the plan. Unstack and glue the ply rib to the face of W-1. Add bottom capstrip at W-3. This completes the wing panel assembly except for final sanding and spoiler installation.

23) Use rubber cement or contact to secure a piece of #120 or #180 sandpaper to a sanding block at least 3'' x 10''. Be sure that the paper is tight against the surface of the block to avoid sanding undercamber into the wing. Block sand the entire lower surface being sure that the block contacts the leading and trailing edge at all times. Then sand upper surface taking care to follow the rib contour on the capstrips. Check that all seams and joints are smooth and flush by running your fingertips over the wing.

24) Use a small block or razor plane to shape the leading edge. **Important Note:** The tip panel leading edge must be shaped so that it becomes progessively blunter toward the tip. Check plan for the correct shape at the polyhedral joint and tip rib. Work carefully when shaping the leading edge and be sure both wing panels are identical. Block sand to final contour then change to #220 or #240 sandpaper and final sand entire wing panel including tips.

NOTE: The brass tubes for the wing alignment pin are not installed until the fuselage has been assembled. The fuselage is used as a jig to accurately locate the holes in the wing.

SPOILER INSTALLATION

1) Cut 1/4'' x 1/4'' balsa supports and pre-drill holes for screw-eyes. Epoxy supports to bottom surface of the sub-spar and rib. Install screw-eyes making sure that the joint of the eye faces aft, and the bottom of the eye is flush with the support.

2) Trim the three ribs marked ''X'' on the plans to provide clearance for the spoiler blade. Cut the 1/4'' x 1'' T.E. stock blade to fit the opening, allowing a 1/32'' gap all around the blade. Sand blade smooth all over.

3) Locate the aluminum control horn as shown on the plans and epoxy or Hot-Stuff to the lower surface of the blade. Note that the horn projects 1/4'' forward of the blade leading edge and that a right and left hand blade is required. Temporarily hinge the blade in place with masking tape and fit the 1/8'' x 1/8'' balsa blade supports at both ends of the spoiler bay. Use your fingertips to check that the blade is flush with the surrounding structure.

4) Cut two lengths of dial cord and insert into tubing from the root end. Hold panel tip down to help feed cord smoothly through tube. Pass end through screw-eye then back forward to the inboard side of the control horn. Pass cord through the hole in the horn so that one inch projects past the horn. Cut a 3/8'' long piece from the end of a round toothpick and use this as a wedge to secure the dial cord by pushing into the horn from the outboard edge. Pull dial cord from root to check blade action and be sure the horn and retainer clear the shear web.

FUSELAGE SUB-ASSEMBLY

SIDES

Align right side over plan and draw vertical lines indicating the position of the aft edge of the nose block, F-1 and F-2. Transfer these lines to the left side aligning sides carefully. Cut 1/8'' x 1/4'' spruce doublers to fit

between nose block and forward face of F-2 then glue to sides. Allow a 1/8" gap for F-2 and cut the 1/4" triangular stock top longeron to length and glue flush with the top edge of the side. Glue bottom longeron in place starting at the tail end cutting kerfs with a razor saw if necessary to follow the side contour. Use pins as required to hold side and longerons in position and flat on the board. Repeat for the other side making sure that you make a right and left side. Cut the aft spacer from 1/4" x 1/4" balsa and glue to either side positioning carefully. Let the side sub-assemblies dry thoroughly before removing from the work surface.

TAILPOST

Cut two pieces of 1/8" x 1/4" spruce 3¾" long. Lay out the hinge locations and file a 1/64" deep slot in each piece to receive the tang for the rudder hinges.

Epoxy the two pieces together forming a 1/4" square post with two 1/32" wide slots in the center. Epoxy hinges into slots and cut off excess flush with the tailpost. Use 3/32" diameter hinge pin to check hinge alignment.

FIN

Tack glue the 1/16" ply fin sides together aligning edges carefully. Cut-out the template from the plan and use rubber cement to glue the template to the ply. Drill a 1/8" diameter hole for the horn pivot tube and a hole at each end of the rear alignment pin slot. Use a coping or jig-saw to cut the slot and file smooth. Be sure the slot is wide enough (3/16") to clear the boss on the control horn. Separate the two ply pieces and remove paper template.

Epoxy the tailpost to the aft edge of the right fin side aligning carefully. Cut the 1/8" x 1/4" and 1/4" x 1/4" frame and epoxy in place. Insert a 4" length of brass tubing into the hole in the plywood and install the stabilator control horn. Check horn action to ensure that full travel is available. Trim frame pieces if required.

Coat frame faces with epoxy and push left fin side down the tubing until it contacts frame. Use a small square or triangle to check that the tube is vertical in all planes and use weights or tape to hold together until the epoxy cures. Don't epoxy the brass tube to the sides — it is used only as an alignment fixture, and is removed when the epoxy has cured.

FUSELAGE ASSEMBLY

1) Insert the 1/4" O.D. x 3" long and 1/8" O.D. x 4" long aft brass tubes through the holes in the fuselage sides with the inner edges of the sides facing each other. Insert F-2 between the sides and push sides tight against F-2. Bring rear edge of sides together, trimming the 1/4" triangular stock so that the 1/4" square spacer is firmly contacting both sides. Apply glue to spacer and clamp sides together tightly checking alignment of the aft edges.

2) Apply glue to the edges of F-2 and install between sides. Use tape or clamps to squeeze sides tightly against the former. Invert over top view and check alignment. Be sure F-2 is tight against the 1/4" tube, and flush with the top edge of the sides. Do **not** pull nose together yet!

3) Pin 1/4" sheet top block to work surface over the top view of plan then apply glue along each side and across the forward edge where the sides and F-2 contact top block. Drop sides into place using pins to hold in position. Use straight-edge to check that sides are straight between F-2 and tailpost, pinning as required. Let assembly dry completely before continuing.

4) Use your hand to squeeze the front of the sides together against the noseblock, pushing block back against lower longerons and spruce doublers. Wrap the rubber bands and check alignment over the top view by lining up a square or triangle against the side. Be sure the nose is centered over the plan. Correct any misalignment by trimming the doubler and longerons. When satisfied with alignment apply glue to both sides of the noseblock, squeeze sides together, then use a length of strip rubber or several large rubber bands tightly wrapped around the sides to clamp the nose together.

5) Install F-1 between the sides slightly aft of its final position. Apply a bead of glue to the sides at the former location and slide F-1 into final position. F-1 will be a tight fit between the sides and pressure will hold it in place.

6) Cut the anti-crush crosspiece from 1/4" x 1/2" stock to fit across the sides aft of the 1/8" tube for the wing alignment pin. Glue crosspiece to sides, but not to brass tube. Cut the former reinforcements from 1/4" triangular stock and fit around F-1, F-2 and bottom edge of noseblock. Remove brass tubes.

7) Pre-form the forward ply floor by drawing it across the edge of your bench pressing down with your hand in the manner you curl or straighten paper. A few passes with controlled pressure will form the floor to match the side contour. Epoxy the 1/8" ply hook mounts in position on the inside of the floor. Note that the aft mount projects 1/4" behind the edge of the floor. Position the towhook extruded bar in the slot and use a 1/8" diameter drill to transfer the mounting holes to the ply plates. Enlarge these holes with a 5/32" diameter drill and press-in #4-40 blind nuts from inside of floor. Epoxy around nuts to secure.

8) Remove the rubber wrapping from the nose and block sand entire bottom edge of sides to ensure good contact with bottom sheet and floor. Mark aft edge of floor and apply glue to sides, former edges and noseblock. Install floor starting at aft edge using masking tape to draw tightly against sides. Wrap nose section with rubber strip or bands to secure. Let this assembly dry thoroughly and remove from work surface. Remove all tape, pins, etc.

9) Trial fit the fin sub-assembly into the aft end of the fuselage. Check that the tailpost fits snugly against the 1/4" square aft spacer and that the forward bottom is seated against the top surface of the longerons. Correct any problems now and remove fin.

10) Cut a piece of 1/8" O.D. brass tube 13/16" long and insert through the holes in the fin sides and control horn. Be sure the tube projects equally on each side of the fin and epoxy the tube to the fin sides. Work the horn back and forth to check for smooth action. Prepare the aft end of the inner elevator pushrod as shown on plan and snap the clevis over the outer hole on the horn.

11) Check your servo action to determine the best routing for the rudder and elevator pushrods and the location for the rudder horn. Cut the rear exit in the appropriate side. You may have to cross the pushrods to obtain correct throw at the surface. Mark servo position on the plans to eliminate confusion when you are installing the radio.

12) Scuff the outer pushrod tubing with coarse sandpaper and install the outer elevator tube. Position tube so that the aft end is 3/4" forward of the fin slot and epoxy the forward end to F-2 and the trailing edge crosspiece. Insert inner pushrod into the aft end of the outer tube, pushing forward until fin is positioned in slot. Check horn throw and epoxy fin into slot and tailpost between sides. **Note: This is a permanent assembly** — the elevator pushrod cannot be removed after the fin has been installed. Be sure that everything fits and works correctly! Epoxy the aft end of the outer pushrod to the top sheet and against the sides for extra rigidity.

13) Install the outer rudder pushrod tube, epoxying in place as described above. When dry, trim flush with the outer face of the fuselage side. Install the optional tube for an internal antenna installation at this time.

14) Place the fuselage on your work surface, propping up the aft end so the the top surface is parallel to the bench. Measure carefully! Insert the forward joiner through the brass pivot tube in the fin and the rear joiner into the horn boss, then slip the stabilator panels over the joiners against the sides of the fin. Use pins or tape to temporarily position stabilator. Check fuselage position again and adjust stabilator position until the leading and trailing edge are the same distance above the work surface. This ensures that the stabilator is parallel to the top of the fuselage and provides proper longitudinal decalage. When satisfied with alignment glue the root fairings to the sides of the fin. When completely dry, cut the stabilator panels free from the root fairings, but do not remove from joiners yet.

15) Insert rudder hinge pin from the bottom of the fuselage, holding rudder in proper position. Be sure that the pin is inside the brass tube in rudder root rib. Check that the rudder is square with the stabilator using a triangle or square. Correct any misalignment by enlarging the rudder hinge slot and shifting rudder sideways. When satisfied with alignment epoxy the rudder hinge into the rudder.

16) Remove brass wing tubes from the fuselage and slip joiners through holes in the sides. Plug the wing panels onto the joiner and rest the trailing edge on top of the alignment pin. Sight from nose to check that the empennage is properly aligned with wing. If misalignment exists it can be corrected by twisting the aft fuselage when installing the aft bottom sheet, to counter any twist between wing and empennage. Remove the wing panels from the joiners.

17) Cut aft bottom sheet from 1/8" balsa and install, starting at the end of the ply floor. Use 5-minute epoxy and pin sheet in place. Work toward tail butting sheet tightly but don't install last 10-12 inches of sheet until re-checking wing and empennage alignment. Twist the fuselage if necessary and install the remainder of the sheet, locking fuselage alignment. Cut a slot in the last section of sheet for the antenna tube and tailpost and install. Remove stabilator panels and rudder.

18) Glue tapered aft fairing block to top sheet and block sand top sheet to match the face of the block. Cut the 3/8" sheet fin fairing block 1/16" outside final shape and fit between stabilator root fairings. Glue to fin and fuselage top.

19) Build the canopy floor frame from 3/32" x 1/4" spruce, fitting between fuselage sides. Use the crosspieces to hold side pieces against sides, and epoxy frame together. Remove frame from fuselage and assemble canopy floor from 1/8" sheet and glue to frame. Bevel forward edge to match front fairing block then insert frame back into fuselage and trim floor flush with top edge of sides. Draw a line 1/32" inset from edge and trim floor to this line to ensure finished canopy will be flush with sides. Cut canopy formers from 1/8" sheet and glue aft former to floor against aft fairings. Cut triangular stock to match angle and glue in place to reinforce joint.

20) Glue forward canopy fairing block to top surface of nose block, using the canopy frame as a spacer. Bevel lower edge of C-1 and glue to canopy floor. If you plan to install the optional instrument housing and panel, do so at this point. Remove the canopy frame from fuselage and spray forward section of frame and housing flat black. Cover floor and aft former with flat black contact paper. If you prefer use a color which compliments the color scheme you select.

21) Cut both ends off the canopy and place over the frame. Mark trim lines with tape, or felt-tip pen, and cut the canopy 1/8" oversize. If you perfer a colored canopy it can be easily accomplished by dying with household dye and hot water. Use a whole package of dye in a gallon of hot water in a cake pan or similar utensil. Place on the stove and heat until the water is just below boiling. Stir thoroughly and insert the canopy in the dye for 15 to 20 minutes. Check the color often and remove when you are satisfied with the color depth. Wash the canopy clean and dry with a lint-free cloth. Use a tack rag to remove dust from the canopy frame and canopy.

22) Position the canopy over the frame and spot glue to the frame at the high point of C-1 and C-2. Be careful not to distort frame by applying excessive pressure. We have had very good results using Hot Stuff to install canopies, but you can use epoxy or other adhesive that you feel appropriate. Cut two strips of 1/4" square balsa or equivalent and place against sides of canopy at the floor to act as clamping strips. Wrap both ends with rubber bands to clamp sides against floor. Glue canopy to both end formers, using your fingers and/or tape to hold canopy against formers. Finally, glue the side seams against the floor and let dry thoroughly before trimming the canopy flush with frame. Check canopy fit and apply 1/4" wide DJ or B & E striping tape to cover frame edges. Fold tape over the edge of the canopy and press tightly against floor and formers to help secure canopy. Add the simulated bow from 1/8" wide tape. Position completed canopy on fuselage and draw outline on fairing blocks to provide a guide when carving fuselage.

23) The fuselage is now ready for final shaping and sanding. Use a small plane and sharp knife to slab off the fuselage corners down to the triangular stock. Temporarily position the fillet ribs on the sides and draw a line 1/8" outside the rib outline. Do **not** carve fuselage inside this line. Be careful when carving the cross-grain bottom sheet not to gouge out chunks of sheet. Contour the nose area following the detailed photos. Use very coarse (#50 or #80) garnet paper, and/or a wood rasp to further shape and contour the fuselage, using the photos and plans as a guide. Be sure to round the aft portion of the fuselage as shown on the plans to avoid a tail heavy fuselage. Wrap ends of canopy with 2 or 3 layers of masking tape to protect canopy and install in the fuselage. Use a block to shape the forward and aft blocks to fair smoothly with the canopy contours. Shape the aft canopy fairing to blend smoothly into the fuselage top contours. Final shape the fin fairing, blending contours into the stabilator fairings and fuselage top. Finish all shaping with coarse sandpaper and avoid using finer paper until all contours are final shaped. Then smooth all over with progressively finer paper. Add spruce nose and tail skids and fair into fuselage.

to page 84

YOU ARE INVITED TO BECOME A MEMBER OF

NRCHA

NATIONAL RADIO CONTROL HELICOPTER ASSOCIATION

Sponsored by R/C Modeler Magazine, the National R/C Helicopter Association has been established to promote and encourage active participation in sport and competition R/C helicopter flying. It is a vehicle whereby the R/C helicopter builder and flier will have a forum from which to discuss various ideas, helicopter competition rules, and provide a communications media with which to assist the Academy of Model Aeronautics in future programs in conjunction with helicopter contests. The organizational structure is very similar to other established organizations within the R/C framework such as the NSRCA for pattern fliers, the NMPRA for pylon racers and the LSF for sailplane pilots and will be structured in such a fashion as to promote helicopter activities within the existing governing body for all phases of model aviation, the Academy of Model Aeronautics.

As mentioned, the primary purpose of the NRCHA is to encourage the dissemination of information between R/C helicopter pilots as well as to establish and create a self-improvement and achievement program similar to that utilized by the League of of Silent Flight. A five step Grade Level Proficiency Program has been established with gold proficiency pins awarded for each grade level you complete successfully.

The Association is a non-profit organization whose administrative and clerical details are handled by the R/C Modeler Magazine staff on a gratis contributory basis. Membership dues have been deposited in a separate account in the name of the organization and those dues are used for actual expenses of membership cards, and physical materials necessary for the initial operation of the organization. A full accounting of all funds will be made on a periodic basis and will be certified by a public accountant. Additional funding has been donated by R/C Modeler Corporation.

As a member, you will receive a membership card in the NRCHA and will be assigned a registration number which you can use on your helicopter which will consist of the letter N followed by a number issued on a first come, first serve basis followed by a letter designating the district in which you reside. These registration numbers will not only serve as an indication of your membership in the organization, but will enable the model magazines to be able to identify the owner of a helicopter in contest photographs by simply checking the organizational file for the individual membership card bearing that number. As a member you will also have the opportunity to associate with individuals across the continent whose interest in the hobby parallels that of your own. It is our hope that each and every one of you will participate in any degree possible within the organizational structure, contributing ideas, building information, flying tips, and/or working and serving on the various committees that will be established in the future. Any assistance that you can render will be appreciated by each and every R/C helicopter pilot in the country. The annual dues have been established at $4.00 per year to cover postage, printing, etc. All additional costs will be absorbed by R/C Modeler Magazine.

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AQUILA

from page 81/40

Important: The completed fuselage without empennage and wire joiners or canopy should balance level approximately 3½'' behind the wing joiner when supported between your fingers. If the balance point is further aft, excessive nose ballast will be required. Further shaping and sanding is recommended to move the balance point forward.

24) Insert the main wing tube through the sides and epoxy to the sides and former F-2, checking that the tube is centered in the fuselage. Insert the rear tube but do not epoxy. Slip root fairings onto tubes and tack glue to fuselage sides, using the tubes to hold fairings in proper alignment. Trim the 1/4'' O.D. tube flush with the fairings and remove the rear tube. Insert joiner and install one wing panel, aligning the root rib and fairing. Use a long 1/8'' diameter drill (sharpen the tubing and use as a drill if you don't have a long drill bit) inserted from the opposite side of the fuselage to pick up the 1/8'' diameter hole in the root rib and drill 3/4'' into the wing filler block. Work slowly and carefully. Repeat this process for the other panel. Insert the brass tube in the fuselage as a temporary joiner and plug both wing panels in place. Check the fit of the wing root against the fairings and overall aircraft alignment. Add shims between sides and fairings if necessary, then epoxy fairings to sides. Remove wing panels. Cut the rear tube into three sections and epoxy in place in fuselage and wing roots. Be careful not to get epoxy inside tubes. Trim flush and chamfer ends.

25) Build up fillets around wing and stabilator fairings with 5-minute epoxy and cornstarch or Sig Epoxylite. By chamfering the end of the main wing joiner you will have a good tool to smooth the fillets. When fillets are dry, sand smooth and cut slot in stabilator fairings matching slot in fin sides. Insert rear joiner and check control action.

26) Cut the 1/4'' x 3/8'' plywood servo rails to suit your radio installation and install in fuselage. Add the 1/4'' triangular stock reinforcements. Cut the 1/4'' x 1/2'' crosspiece located under the aft canopy block and fit to fuselage. Insert screw-eyes 3/8'' in from ends and glue in positionusinga 3/32'' joiner to align the eyes with the holes in the fairings for the spoiler cables.

This completes the construction of your Aquila. It is now ready for the covering and finishing and installation of the radio and final assembly.

COVERING AND FINISHING

We suggest that you use Super MonoKote to cover the wing panels and empennage. The other plastic film materials that we have tried are more flexible and contribute no skin stiffness to the airframe, causing flutter problems at high air speeds. For contest work, including speed and distance tasks, you want all the stiffness possible. For beauty, toughness and light weight this is the only way to fly.

Because of the compound curves the fuselage is best painted. We find the following process works well and provides a lightweight repairable finish:

1) Check contours and final sand. Fill any cracks or dents with Hobbypoxy Stuff or Dap.

to page 86

AQUILA

from page 84/40

2) Use a foam brush to flow on one coat of Hobbypoxy Clear Epoxy. Hang the fuselage nose down and let dry overnight. Most of this coat will soak into the wood. Lightly sand with #120 No-Load sandpaper.

3) Spray on one coat of Ditzler Primer well thinned. Allow 3-4 hours drying time and sand with #180 or #240 No-Load paper. Inspect carefully and rework any problem areas. Most of the primer should be sanded off.

4) Spray a second coat of primer and let dry. This should have completely filled the grain and resulted in a uniform color. Sand lightly with #280 No-Load and you are ready for color.

5) We prefer Ditzler Acrylic Lacquer plasticized with Southern R/C Products Flex-All for final coats. There are hundreds of colors available and custom mixing is very easy. The finish is durable as well as beautiful and can be repaired very easily. Spray on two coats and let dry overnight. Rub out with DuPont white compound then with Wright's Silver Cream and you will have a beautiful gleaming fuselage.

SPOILER FINAL INSTALLATION AND RIGGING

1) Slit covering in the spoiler bay and fold down and iron all around to the frame edges. Trim off surplus material and seal edges. Check blade fit and cover both sides and all edges of the blade. Be sure that you cover top and bottom and shrink covering carefully to avoid warping the blades.

2) Cut a strip of Slictac or similar material 1/2" wide by 12" long. Drop blade into opening and center so that the gap is even all around. Press on hinge and then iron firmly to the wing and spoiler blade. No internal pieces are required. Trim ends and check blade action.

3) Feed cable through tubing starting at the root end. Use tweezers to feed through screw-eye and back through horn. Wedge in place and pull cord to open spoilers. Apply 1/4 ounce stick-on weight on the bottom of the blade and check spoiler action. The blade must retract freely and be flush with the wing. Correct any binding before flying.

We have found that the return weights work better than spring or band returns and present less load to the servo. We have flown the ship inverted without any evidence that the spoilers extended.

4) The final step is terminating the servo end of the cables, which is done after the spoiler servo is installed in the fuselage. Plug wing panels in place on the joiner fishing the cord through the holes in the fuselage sides and through the screw-eyes. Insert a #2 x 5/16" sheet metal screw and eyelet onto the outer hole of a long servo arm, forming a post. Wrap cord 1/2 turn around the post, pulling the slack out of the cord and attach the free end with tape. Check spoiler action to be sure blade opens 90° and retracts fully. When satisfied, place a drop of epoxy or Hot Stuff on the cord, forming a small loop. Cut off excess cord after the epoxy sets. Repeat this process for the other panel, making sure that the blades extend equally. Any further adjustments can be made with the toothpick peg in the spoiler horn.

Slip loops off the post and remove wing panels. Hook-up, when assembling the model, is quick and easy by threading the loops through the sides and onto the post.

FINAL ASSEMBLY

1) Install rudder hinge pin and rudder, and check that rudder swings freely. Insert stabilator joiners through horn and plug on stabilator panels. Install rudder and elevator servos on rail and mount switch. Be careful to leave room for the battery lead through former F-1. Position the battery pack and receiver.

2) Mount the rudder horn with two #2-56 x 9/16" long screws. Make up inner pushrod termination and insert in fuselage and attach to rudder horn. Cut pushrods to length and connect to rudder and elevator servos. Check control action and throws and adjust to provide servo throws shown on the plan.

3) Temporarily install the canopy and insert the main wing joiner in the fuselage and check balance by holding the rod in your hands. Add ballast as required to the nose block cavity until the fuselage hangs level when supported by the rod. Remove 1/2 ounce of balance weight and affix the rest firmly in the nose block. The 1/2

to page 88

AQUILA

from page 86/40

ounce weight will be used for the first test flights then reduced as the airplane is trimmed out. Wrap the battery pack and receiver in foam and install in final position. If using an internal antenna insert through the fuselage tubing, otherwise run through a hole and down the side of the fuselage.

4) Install the towhook in the extruded bar and mount the bar in the fuselage. Position hook approximately 1/2'' forward of the main joiner for the first test flights. Be certain that the lock nut on the hook is firmly tightened as movement of the hook may have disasterous consequences.

5) Assemble the complete model and hold in one hand and jiggle it up and down. Check all surfaces for movement. If necessary kink the stabilator joiners slightly to tighten their fit in the panels. The wing panels are retained by friction only as we have found hooks and bands across the fuselage unnecessary. When everything is shiny and new, however, the wings may tend to slip outboard. If this happens, push the joiner wire ends into an orange or potato and let it sit overnight until it rusts slightly. Normal handling and weather will keep the rods rusty.

PRE-FLIGHT CHECKS

Before you go out to the flying field we suggest that you run through the following pre-flight check list. It is a good idea to develop the habit of regularly checking the model and radio system between flying sessions. Many times you will find a problem in the shop which, if not corrected, might cause a crash.

☐ 1) Inspect the model carefully. Check the radio operation by trying all control functions and make certain that the surfaces move in the proper direction. Be sure that the rudder and stabilator surfaces are neutral when the transmitter trims are set at neutral. Check that the spoiler blades close tightly and extend equally. Adjust clevises and/or spoiler cables, if required.

☐ 2) Check that the servos are firmly mounted and that the receiver and battery pack are secure. Make sure that the nose trim ballast is firmly mounted and cannot shift forward **or** backward. A strong launch can shift things toward the tail.

☐ 3) Check all flying surfaces carefully for warps. Remove any warps present by re-heating the film covering. Be sure that the tip panels are not washed-in (leading edge higher than trailing edge at the tip). A small amount of wash-out is okay as long as both tips are the same.

☐ 4) Check the span-wise balance by making a string sling and supporting the ship by the main wing joiner. If it rotates span-wise, add weight to the lighter wing tip. A slight tilt can be tolerated but excessively out of balance wings will cause erratic turns. Remove the wing panels and recheck that the fuselage hangs level when supported by the main joiner. This will provide slightly nose heavy trim which we find is safer for the first few flights.

☐ 5) Check your batteries, both in the transmitter and airplane. If you are using dry batteries be sure they are fresh; if Ni-Cads, that they are fully charged. Remember that more radio failures occur from defective or improperly charged batteries than any other cause. Don't be a statistic!

FLYING THE AQUILA

The Aquila is a very clean and responsive aircraft. It is capable of very tight turns and will really move out if you feed in down elevator. Be careful not to over-control on your first flights and make all commands smoothly until you have become accustomed to the control response.

We suggest using a Hi-Start with 3/16'' x 1/16'' surgical tubing for your first flights.

If you have a fish scale available check for 8-10 pounds of line tension for winds up to 10 mph. Note your position on the field and adjust accordingly on succeeding flights. Face directly into the wind and hold the nose up slightly. Release the airplane smoothly with the wings level. If the ship starts to weave back and forth during the launch, apply a little down elevator. Control rate of climb by feeding in slight up or down elevator. Check glide trim and turn response using transmitter trims, if necessary. All of the test ships have flown well on their initial flight, so you should experience the thrill

to page 90

AQUILA

from page 88/40

of the majestic glide and beauty of this ship on your first launch. We suggest that you don't use the spoilers on early flights. When landing don't set up the approach too high as the glide is very flat and the tendency is to overshoot. Just get it on the ground smoothly, and don't worry about hitting a spot. Don't try diving during the landing approach as the speed builds up, the L/D improves, and the ship just keeps going!

Adjust clevises and throws, if necessary, and you are ready for another flight. Try a few tight turns by applying rudder and holding a little up elevator. Point the nose into the wind and pull up stick to check the stall characteristics. Because of the sharp leading edge radius, the stall will be sharp, but the ship should not drop a wing. Concentrate on flying smoothly and plan your flight path so that you are ahead of the sailplane. If you find some lift, circle a few times and watch the climb. Now you're ready to try the spoilers. Point the nose into the wind and apply half the stick travel, feeding in up elevator to counteract the nose down tendency. Watch your altitude carefully and retract the spoilers while you are still high enough to set up the landing approach. Perhaps you would like to try the spoilers on this landing. Pop them up halfway and leave them out during the final approach, controlling the rate of descent with elevator control. Experiment on later flights with more spoiler throw, starting at altitude as with full throw they are very effective and will bring the airplane down in a hurry. Leaving the spoilers up during landings will help to stabilize the ship in gusty weather and we suggest that you use them routinely.

SPECIAL FLYING NOTES FOR COMPETITION

1) Recent C.D. rule interpretations have been quite strict about loss of landing points if any part of the model is shifted or detached. This can be a problem, particularly if landing on concrete or asphalt runways. Use 3M plastic tape or masking tape to secure the canopy to the sides. Wrap wing roots to fuselage with tape. If the runway is rough apply masking tape skids to the bottom wing surface at the dihedral breaks and tip ribs.

2) For spot landing events on asphalt or concrete, tape a pad of Pylon Golden Foam or G-Pad to the forward fuselage bottoms. This will prevent skating across the spot on a hot landing.

3) For two minute precision tasks don't worry about maximum height on launch. The spoilers are very helpful in dumping excess altitude and in setting up the landing approach. Try to set up a straight upwind approach so that you don't have to turn when nearing the spot. Concentrate on hitting the center of the spot as our experience is that more points are lost here than in missing the target time. The ideal landing would be to stall the airplane out directly over the spot from 6 inch altitude, but this approach is dangerous in windy, gusty

to page 96

AQUILA

from page 90/40

conditions, when it is better to grease it in with plenty of flying speed during the approach.

4) Be careful when winch launching in high wind. This is a strong airplane and winches very well, but use a little common sense and discretion. Pulse the winch to control the speed during climb. With proper technique you can use the ship to pull line off the winch drum, gaining more altitude.

If the winch line breaks while you are on tow apply full down elevator immediately, no matter what the altitude. Get the nose down and level the ship out quickly. You are entitled to a new launch if this happens so don't try to stretch a poor launch into an official flight, even if you are in a thermal. Your mental concentration has been broken, so take the attempt and re-launch for your official.

5) For Duration events try to gain maximum height on tow and concentrate on a smooth release with level wings directly into the wind. During the contest watch the other ships to see where lift is present, and head for those areas. Concentrate on flying smoothly and avoid abrupt control movements, particularly when searching for lift. In weak lift conditions conserve altitude carefully and make large slow turns. This ship rides low ground lift very well and will eke out seconds under 50 feet when other ships are landing. Don't give up any lift or even zero sink air and work the air for all it's worth. It's amazing how you can pick up an extra minute of time by fighting for every foot of air.

In windy conditions try dynamic soaring against the wind by flying a slope pattern across the wind. This can be very effective when thermals are scattered or overdeveloped and will gain more time than circling. In calm conditions, in weak thermals, try pulsing beeps of slight up elevator every 2-3 seconds. This seems to work better than up elevator trim and will lower the sink rate very effectively, if you pulse evenly.

Of course you may get lucky and find a real boomer! If you do keep the circle constant and feed in up elevator to climb. Don't worry if the ship stalls occasionally as you are going up all the time. The stall is from excess lift and this trim will really gain altitude. Just don't let the stall build up excessively. Gain all the altitude you can—this is a big airplane and easy to see up high. Remember those spoilers — you can dump altitude faster than a thousand feet per minute.

6) Speed tasks are a very demanding test, both of the airplane and pilot. The only way to learn is by flying in contests or practicing this type of flying. The following hints seem to help and we suggest that you try them.

For events timed from the tow release don't use full altitude. Turn the ship downwind while still on the line and release downwind. Keep the nose down and head for the first pylon. Turn sharply and fly to the downwind pylon conserving altitude still keeping the nose down. Make a pylon turn at the far end, kick down elevator and head back, still keeping altitude, and then pylon turn and start the second lap. The ship should be in a shallow dive during this lap, depending on the altitude remaining. The

to page 98

AQUILA

from page 96/40

last pylon turn should be at 100 to 150 foot altitude. The last lap is a real dive with the ship really on the step. Aim for the ground right at the finish line — ideally you should pass the line 6'' off the ground. Once past the finish line, release the down stick and let the ship zoom to gain altitude from the excess airspeed.

If the event is timed from entry into the traps, launch to full height and enter the traps as high as possible. Dive through the whole first lap and finish as above.

The most important thing is to keep the nose down through the course. Momentary removal of down stick will result in a zoom and lose a great deal of time. It requires real concentration and a lot of courage to fly this course well, and practice is the only way to succeed.

We have not flown the ship with ballast for the speed task, and suggest you gain experience before trying this approach. This design is very fast and contest results to date have proven that the pilot is the limiting factor. Remember that control response will be faster due to the high speed so be careful not to over-control. You may wish to desensitize the controls by using the outer holes in the horns or decreasing servo throw for speed task.

7) A final caution about the spoilers. Be sure that you always fully retract them after use. Check before each launch, and while you are flying. If possible rig your transmitter so that the spoiler control is spring loaded to the closed position, which will save grief. Several of the test crew, both sport flying and in contests, have flown with the spoilers partially extended during the flight. Just develop a mental check list and keep them closed when not in use. □