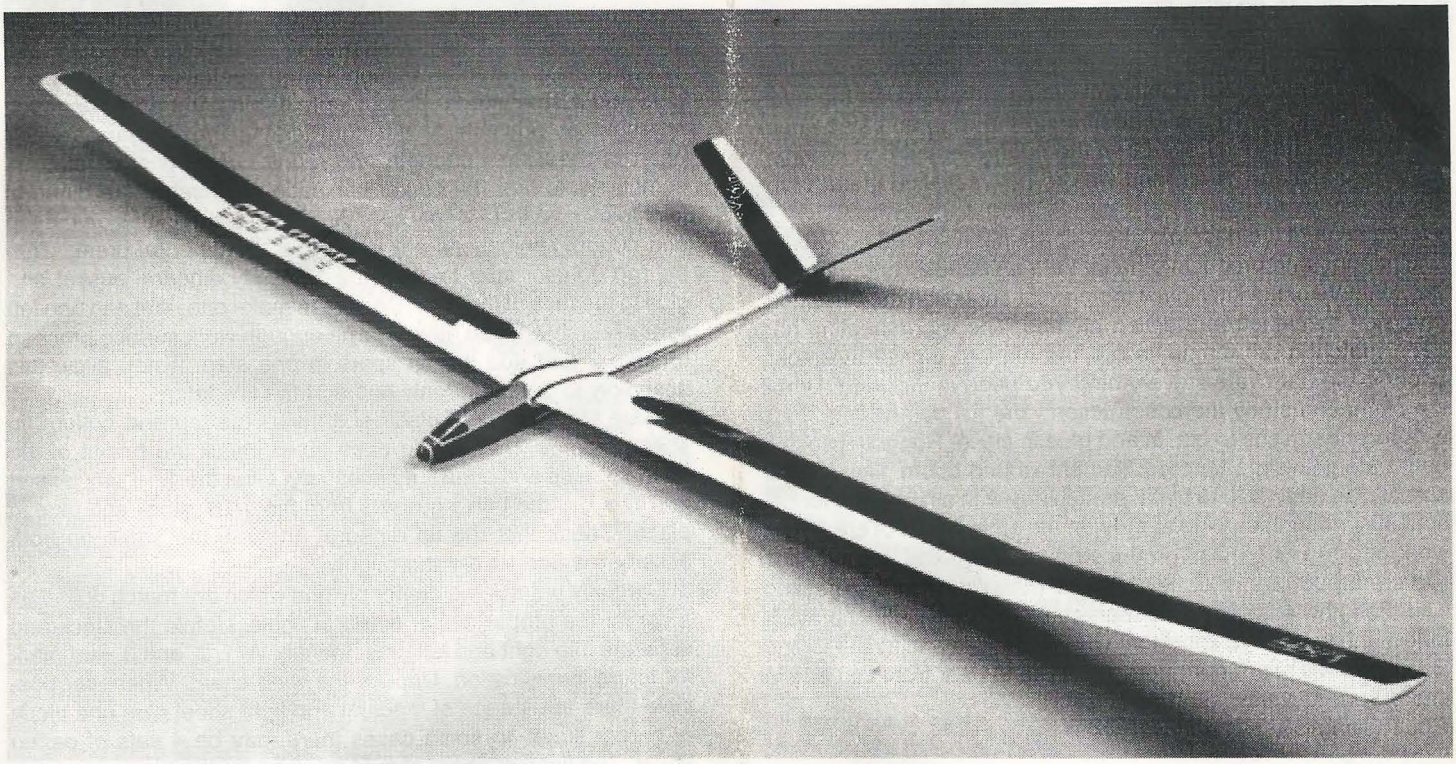
Building instructions

for the

Grand Esprit

Radio control sailplane



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INTRODUCTION

The Grand Esprit is an advanced high performance R/C sailplane featuring aerodynamic and structural design of the highest level. It represents a Step forward in the state of the art an[] has the potential to win at the national championship level. It is intended for the competition or advanced sport flier, and is definitely riot recommended for the beginner,

The design has been developed through many test models and is the result of our experience in designing the other sailplanes in the, Airtronics line, plus many other ships not kitted. The basic design is a scaled up version of the Esprit, with refinements in aerodynamic design and a much stronger and simpler structure. The objective of this design was to develop a large ship which would he competitive in multi-task events in all weather conditions, with structural strength to Survive the rigors of a season of contest flying. In addition, we wanted a design that could be reproduced easily by any experienced modeler, without resorting to special building or trimming techniques.

Prototype kits were released to selected modelers throughout the United States early in 1971. Some of these ships competed at the 1971 Nationals and LSF Soar-lympics, with outstanding success. All who have flown the Grand Esprit have been very enthusiastic about the design and flight performance, and several have built a second ship. Flights have been made in all sections of the country and on varying weather conditions by experienced pilots, and design improvements from this extensive test program have been incorporated into the production version. The two most significant changes have been the addition of landing spoilers and beefing up the wing and stab structure. These changes have been thoroughly tested and included in the production version and we are now satisfied that the design is ready.

To compliment the design of the ship we have spared no effort in engineering and producing the kit for the Grand Esprit. Examine the contents of the kit. Notice the pre-cut angles on the truss ribs, precision machined and drilled ply ribs. The wing sheeting has been matched, all materials are the highest quality available. Look at the hardware - everything you need is included. Unroll the plans and study the construction - the full depth wing spars with no shear webs to cut, fit and glue in place. Rugged fuselage pod and lightweight tapered filament wound boom. Despite the size, it's an easy ship to build, particularly with all the pre-fabrication. Just enough carving to provide the satisfaction of creating a work of art - not a mass-produced plastic airplane.

We are proud of this kit. It has been manufactured and packed with the knowledge that this represents the best sailplane available in the world. We know that when you build and fly the Grand Esprit you will share our pride. We'd like to hear from you and to share your success with this ship.

Good Flying Lee Renaud

STAB / ELEVON ASSEMBLY

1) Assemble the leading and trailing edges for the stabilizer by laminating the 1/4" x 3/8" balsa and 1/16" x 1/4" spruce pieces together. Carefully check the pre-cut dihedral angles to identify the right and left hand leading edge. Use Titebond glue and pin down to ensure straight parts.

2) Pin trailing edges to plan, use pre-cut center and tip ribs to locate leading edge and pin in position. Now, cement the center and end ribs in place, and install the center T.E. gusset.

3) Cut and fit the truss ribs from the 3/32" x 1/4" balsa stock. Glue these in place working from the center toward the tips. This way if you cut a piece too short it can be used for the next outboard rib. Let this assembly dry thoroughly before removing from the work surface.

4) Leave one panel pinned to the board and prop up the other so that the tip is raised 21 inches above the work surface. Check fit of center joint and epoxy panels together, pinning the raised panel so that it rests tightly on the board. Epoxy the triangular gusset block in place, aligning carefully. Add 1/32" ply reinforcement plate. This completes the stabilizer assembly.

5) Plane and sand the elevons to a tapered section as shown on the plans. We suggest that you leave the top surface flat and taper from the bottom, so that any mistakes will be less visible. The tail group is now ready for final sanding and covering.

WING ASSEMBLY

NOTE: All material for the landing spoilers is included in the kit, however, the ribs have not been machined for the spoilers as all fliers may not wish to incorporate this feature. The instructions include the steps required to build in the spoilers since we feel that they greatly increase the versatility of the Grand Esprit and recommend their use. We advise that you at least install the nylon tubes in the wing, since the remaining structure can be installed after the wing is covered.

1) Laminate the center section spars together using Titebond glue and a straightedge. Use plenty of pins and apply as much pressure as possible to get tight joints. These spars are the heart of the wing's strength and require your most careful assembly. Note that the center lamination is inset at the dihedral joint to receive the 1/8" ply spar tie. The pre-cut angles on the top and bottom laminations are located at the dihedral break. Trim the top doubler spar to clear the 1/16" ply dihedral gusset and glue to the face of the spar. Be sure to make one right and one left spar assembly. If you have a large enough work surface proceed to Step 2 and add the tip spars in one step. If not, allow this assembly to dry thoroughly and add the tips later.

2) Glue the spar tie in place and install the top and bottom tip spars in place. Use the tip nose rib to check the height of the spar at the tip and adjust, if necessary. Glue the 1/16" ply gusset in place. Cut the balsa gussets from the 1/16" stock and glue in place. Check that the tip dihedral angle is the same on both assemblies and let dry thoroughly.

3) Carefully unpack the center ply ribs which are match drilled as a set for the proper center dihedral angle. Unfold the stack and separate into right and left sets. Identify W-1, 2, and 3, and mark for future identification. Unpack the wing sheet. Whenever possible there are 4 each of medium and light sheet plus one piece of harder stock. In some cases there may be 4 sets of paired sheet. The lightest sheet should be used for the tip lower sheet, the next harder for the top tips. Use the quarter-grain stock for the top surface. We suggest that you mark the sheets now to ensure proper location in later assembly steps.

4) Notch the ply center ribs W-1, 2, and 3, plus eight balsa nose ribs to clear the 1/8" diameter nylon tubing using a small round file. Drill a 1/4" diameter hole in the four root ribs to clear the spoiler actuating cable. Drill through the center spar lamination as shown on the plans. Notch 4 right and 4 left hand center truss ribs to clear the spoiler blade. Drill 1/8" diameter holes in 2 of these ribs to clear the tubing. Refer to the plans for additional detail.

5) Pin the 1/16" ply triangular gusset in place over the plans. Trim the lower leading edge sheet to butt against ply gusset and epoxy joint. Pin sheet in location lining up the rear edge with the plans. Glue the spar in place, aligning it with the rear edge of the sheet. Use T-pins to hold in position. Don't pin through spar!
6) Install the ply and balsa nose ribs, gluing to the spar and lower sheet. Add 1/8" x 1/4" balsa pre-shaped sub-leading edge, gluing to ribs and lower sheet. Use the aft ply ribs as spacers to locate the trailing edge and pin it in place. Check to be sure that top of nose ribs do not protrude above the spar or sub L.E. Sand lightly, if necessary.
7) Fit lower center section and glue in place. Install aft section of ply ribs and the balsa straight rib gluing to spar and lower sheet. Use the dihedral gauge to angle W-1 for the center dihedral angle. Use the brass tubes and a root rib to make sure that the ply ribs are properly positioned. Cut the sub-spar sections to fit between the ribs, notching to clear the aft brass tubing. Cut and fit the 1/4" x 3/8" balsa fillers.
8) Scuff the outside of the brass wing tubes with coarse sandpaper. Sharpen one end with a file, epoxy inside of this end and use as a punch to cut a plug from scrap 3/16" or 1/4" balsa, rotating tubing as you press down. These plugs prevent the wing joiners from entering the wing too tar. Now, clean outside surface with alcohol or similar and insert the tubes through the ply ribs, letting inboard end protrude 1/8" beyond W-1.
9) Mix a batch of High Strength epoxy, such as Sig or Hobbypoxy Formula 11. DON'T USE 5 MINUTE EPOXY! Liberally coat the faces of the ribs and the tubing with epoxy. Add the forward fillers and sub-spar before the epoxy sets. Adding micro-balloons to the epoxy will stiffen the mixture and keep it from flowing. For maximum strength make dams from scrap balsa and fill solid with epoxy.
10) Separate center truss ribs and check for fit, using ribs from each stack to form the truss. Pre-cement ends of ribs and let dry, or use Hobbypoxy Formula I epoxy to install ribs. Note that the inboard angled rib must be trimmed to clear the upper and lower center section sheeting. Be sure to properly locate the notched ribs in the spoiler section.
11) Use a straightedge to cut notches in the top surface of the truss ribs to receive the forward and aft spoiler sub-spars. Use the spoiler blade to check the distance between the spars. Be sure that the sub-spars are flush with the top surface of the ribs. Glue sub-spars in place. Relieve top surface of ribs between sub-spars as required for top sheet.
12) Install nylon tubing through notches in ribs and spar, then fish through holes in truss ribs. Be careful not to kink tubing; slot edges of hole through spar with round file, if needed. When satisfied with fit, epoxy tubing in place.
13) Install top leading edge sheet, lining up with the forward edge of the truss ribs. Be sure sheet is tight against the spar edge and false leading edge. Install center section top sheeting and small triangular piece outboard of spoiler blade.
14) Trim forward edge of leading edge flush with sub-leading edge, working carefully. Add pre-shaped spruce L.E. Leave this assembly on board at least eight hours,
15) Assemble bellcrank mount and supports. Assemble bellcrank and check for smooth action. Epoxy this unit to bottom surface of sub-spars and main spar. Trim ends of spoiler blade to fit opening and chamfer inner surface of both ends so that spoiler blade clears end ribs when opening.
16) Make up spoiler pushrod and attach mini-snap to bellcrank, noting that bend faces inboard, and that the wire clears the spar by 1/16 - 1/32 inch. Slip horn over wire and flip wing over so bottom side is up. Mark position of 1/16" Ply horn Mount and epoxy to blade. Locate horn mounting holes and drill through Mount with a #55 drill. Install horn with two #2 S.M.S. Check action and trim locally for clearance as required.
17) Trim lower sheet to size. Pin in place over plan lining up inboard edge carefully. Prop LIP the completed center panel so that the tip spars are flat on the work surface, Align carefully at the dihedral break and check that the center panel is not swept forward or back. Pin center panel in position.
18) Add nose ribs, and Sub leading edge. Now lay out the two tip truss rib stacks on a flat surface, starting with the longest ribs in the center. Now select the longest rib from the right stack, the second longest from the left stack, third from right, fourth from left, etc. These ribs will be used on one tip, and the remaining ribs form the other tip. Band this stack together until you are ready to Use them.
19) Fit truss ribs in place, trimming at trailing edge as required for proper fit. Pre-cement ends and Install. Add straight ribs at break and tip. Cut gussets from strip stock, trim to fit and epoxy in place.
20) Position top sheet over spar and trim inboard edge to provide a tight joint with the center Panel sheet. Trim surplus from tip and leading edge. Install sheet and trim flush with sub leading edge, when dry. Add spruce leading edge. Let panel dry at least eight hours before removing from board.
21) Trim spars, sheet, etc., flush with tip rib and epoxy tip block to rib, using 5 minute epoxy. Carve and sand to shape when dry. Epoxy root rib in place.
22) Refer to plans and carve the center panel leading edge to the shape shown. Note that the airfoil section changes from the dihedral break to the tip, and that the shape of the leading edge changes also. The tip nose radius should be quite blunt and gently rounded blending to the center section shape at the dihedral break. This is quite important to the flying characteristics of the Grand Esprit as it ensures that the center section stalls before the tips.
23) Assemble opposite Panel following steps 1 through 22 above. Both wing panels are now ready for finish sanding.

FUSELAGE ASSEMBLY

1) Scuff boom with #120 sandpaper at both ends where epoxy will be used and clean with acetone or alcohol. Use slow drying epoxy to assemble FA to the boom, using a square or triangle to check alignment. Position former 3 inches frorn the forward end of the boom. Let dry thoroughly before starting Step 5. Be Sure not to get blobs of epoxy on the bottom edge of the former.
2) Draw lines on inside edges of the sides to locate formers. Check for radio clearance and move F-2 fore or aft to accomodatee equipment used. Taper lower longerons from F-4 aft and glue in place. Glue triangular stock gussets to sides on forward side of F-1 and F-2, and trim flush with top edge of side.
3) Fill nose block with approximately 3 ounces of cerrobend or lead, working carefully to avoid burns. Slip brass tubes through sides and epoxy nose block in place, clamping across sides. Check over top view to be sure that tubes are square with sides, and both sides are flush with the forward face of the nose block. Be sure both sides are flat on the work surface their entire length. Let this assembly dry thoroughly before continuing. Leave brass tubes in place through Step 24.
4) Add F-1, F-2, and F-3, using clamps and/or rubber bands to ensure tight fits. Be sure the bottom of F-3 is flush with the lower edge of the sides as this is important for proper boom alignment.
5) Align pod assembly over top view of plan. Secure in place by pinning scrap balsa chocks against each side from F-2 to F-3 to hold the pod in place.

Pieces 3/4" square x 8" long will work well. Be Sure chocks are tight against sides, and that pod is centered. Insert the boom from the rear of the pod and insert boom into F-3 so that it is flush with the forward face of the former. Pull sides together until they contact the edges of F-4 and clamp tightly. Now check the aft end of the boom to ensure that it is centered between the line up marks. Check vertical line-up by measuring up from the work surface to the center of the boom. This dimension should be 19/32 (.59) inches. Slight misalignment can be corrected by pushing the boom into proper position and using scrap blocks and pins to hold alignment.

6) Remove clamp on F-4 and apply slow drying epoxy to the vertical edges of FA around the end of the boom, and to the beveled inner faces of the sides. Insert boom through F-3 and clamp F-4 again. Use a second clamp. to squeeze the sides tightly against the boom. Check boom alignment again, and loosen clamps, if necessary, to re-align. Tighten clamps and let epoxy set firmly before removing this assembly from board.

7) Press the two blind nuts into the 1/8" ply saddle floor. Epoxy the floor and 1/16" ply sides together, using the 1/4" O.D. brass tubes as spacers to position floor. Be sure back side of blind nuts are facing up and clamp tightly together and let dry. Flip over and epoxy the tapered spruce filler blocks to the floor and sides,

8) Wrap the aft end of the boom with #120 sandpaper and push saddle back and forth to bevel the lower edges of the sides. Make sure that both blind nuts contact the boom surface. Use slow drying epoxy to secure saddle to boom, carefully checking alignment using either of the following methods:

a. Temporarily mount the stabilizer to the saddle using the eyelets and screws. Leave stab in place and prop up both sides until tips are equidistant from the work surface. Use weights to hold in place.

b. Slip one of the wing joiners through the holes in the pod sides. Tape the other rod to the top face of the saddle sides. Sight from the nose or tail and twist saddle until both rods are parallel. Hold saddle in position with masking tape.

9) Epoxy the 1/16" ply floor to the top edges of the sides, the upper side extensions, aft face of F-3, and top edge of F-4. Install the 1/4" x 3/8" aft tube support and 1/4" x 1" T.E. stock, epoxying between side extensions and to fly floor. Add 1/16" ply top from T.E. stock to find edge of F-3. If top drops too low, push up with small screwdriver or similar through wing tube holes.

NOTE

We suggest that you plan the radio equipment installation before proceeding on the fuselage, particularly if you plan to use the landing spoilers. Any of the modern servos up to KPS-10 size can be mounted crosswise in the fuselage under the top fairing block, with the servo arm in line with the actuating cable holes through the root ribs. Install short vertical rails on each side or use foam mounting tape to secure the servo. Alternatively the servo can be located in the forward fuselage and the actuating cables routed forward. It's easier to add any necessary blocks/etc. before the top or bottom are in place. If more clearance is needed, hollow top block.

10) Install top block, and the 3/32" sheet fill-in between the sides and boom. Be sure that the block is above the forward tubing holes. When dry, sand face of block flush with sides.

11) Round rear side of the aft canopy former to match side radius. Cover forward sides with Handiwrap or similar, and epoxy canopy floor and aft former together. Epoxy front former to floor using the balsa forward fairing block to help position the former at the proper angle. Be sure that former and floor edges are aligned. Check clearance along edges of floor which should be inset from Outside edges about 1/32", sanding edges of floor, if required. We suggest that You finish the floor and formers with contact paper, as it will not warp the frame, rather than painting. Use frame to locate the front block and drill hole through block into pine nose block. Epoxy retainer into block. Cut a 1/4" x 1/8" spruce key to fit snugly between the sides and epoxy to floor beneath the joint with the aft former. This positions the canopy and strengthens this joint.

12) Trim the vacuum formed instrument housing, using the molded lines as a guide. Spray with flat black enamel. Cut out instrument panel and use contact cement to glue to housing. Glue completed housing to frame with model airplane cement or epoxy.

13) Use a piece of 1" x 2" pine or balsa notched to clear the key under the frame as a stiffener and cover frame with canopy. Use masking tape to hold canopy down and trim canopy approximately 1/4" outside the frame. Remove canopy and apply a thin coat of Duco Plastic Cement (the blue tube) to all edges of the frame, and let dry. Wash inside of canopy to remove fingerprints, etc., and rinse and dry thoroughly. Replace canopy and pull down again with masking tape. Be careful not to distort the frame. Use glue such as Devcon Zip Grip or similar cyanacrylate glue to run a bead along the seam between the canopy and frame. Capillary action will draw the cement into the joint. Don't use too much cement as it will bleed up into the canopy and be sure to follow the instructions provided with the cement. Place canopy upright and let dry overnight before removing tape. Trim canopy edges flush with frame.

14) Sand face of forward block flush with noseblock and sides. Position rear portion of nose cap so that it is centered on the sides and the lower edge protrudes 1/8" below noseblock. Mark hole positions and drill 3 holes with a #55 drill. Note that lower hole is in the slug of ballast. Cover face with epoxy and install cap with 3 #2-S.M.S.

15) Drill a 1/8" diameter hole through both sides of the boom at the front of rear edges of the notch in the saddle sides. Use X-Acto knife and file to make slots for the outer pushrod tubing. Note that the slots are sloped upward at the aft edge to align the pushrods with the control horns. Insert pushrods from the tail through the slots, crossing the pushrods in the tail. Scuff outside of pushrods with #120 sandpaper and epoxy pushrods in place.

16) Install servo rails. Locate the 1/8" ply sub-floor and epoxy to balsa bottom block. Insert towhook bar into slot and drill through holes into sub-floor and boom with a 1/8" diameter drill. Remove bar and enlarge holes to 5/32" diameter. Press #4-49blind nuts into place, epoxying the aft nut to the boom. Now remount towhook bar, covering outer face with masking tape to protect finish when sanding.

17) Slip forward end of pushrods through holes in pushrod mount and epoxy pUshrods and mount in place. Check control action against the servo travel of your servos and flip mount over to recross pushrods, if necessary. On radio equipment which permits altering direction of throw, this will not be necessary.

18) Trim and sand bottom edges of sides and formers to remove any excess glue. Epoxy 1/4" ply keel into slot in bottom block, flush with inside surface of block. Be sure that the shorter edge of the slot faces out on the same side as the contoured edge of the keel. Trim rear portion of slot to receive the adjustable towhook bar. Note that the front edge of the bar rests on the notch in the keel. Aft end is Supported by a shim of 1/8" x 1/4" spruce epoxied into the aft end of the slot. Epoxy bottom block to sides, formers and boom. Pour plenty of epoxy in the area where the sides meet the boom. Use masking tape to hold bottom in place until the epoxy cures.

19) File a slot in the bottom of the aft end of the boom to rieceive the 1/8" ply tail skid. Epoxy aft fairing block in[] .-,kid together and epoxy to end of boom and saddle. Note that skid keys the bock to the hoom and reinforces this joint. Epoxy forward fairing block to boom and saddle. Epoxy wire skid in place.
20) Mount stabilizer on saddle and carve forward arid aft blocks to fair smoothly with the top of the ply reinforcement plate. Carve blocks to shape and blend contours smoothly. Hinge elevons with masking tape and check clearance in down position with aft fairing. Trim block and/or elevons for 1/16" minimum clearance at full throw. Remove stabilizer.
21) For internal antenna installation, drill hole through aft fairing block and insert a plastic soda straw. Tie a length of elastic thread to the end of the antenna and insert a length Of Music wire from the tail through the boom. Attach thread to wire with masking tape and pull antenna through boom. Make fitting from tee pin and tie to elastic thread to hold antenna in place with slight tension. Remove antenna and reinstall after finishing fuselage.
22) Cover canopy with masking tape to protect it from scratches and use a template to shape forward and aft fairing blocks. Epoxy forward canopy retainer into balsa block. Insert forward former onto dowel arid spot glue aft end of canopy in place, using tape to secure. Carve and sand blocks and ply sides to fair smoothly into the canopy.
NOTE: Each modeler has a favorite canopy retention system, and you are welcome to use any that you prefer. We have been using a simple system for some time and suggest you give it a try. Use an X-Acto or similar gouge to scoop out two ~hallow cavities about 1/4" diameter by 1/8" deep in the face of the top block. Pack these cavities with white floral clay so that it protrudes slightly above the surface. Push canopy over the forward retainer arid press down against the block. That's it, the floral clay will hold it down, yet lets you easily remove canopy.
23) Carve bottom block to side contour of the keel and taper the rear section as shown on the plans. Carve corners round as shown on the cross sections, particularly behind F-3, blending smoothly into the boom. Leave the ply keel and block each side flat so that the skid has a hearing surface. Use a small plane to shape the ply sides and remove enough material so that the triangular stock lower longerons are exposed approximately 1/16". The laminations of the plywood provide a good contour map and let you see if both sides are identical. Use a coarse file and sandpaper to round to final contour.
24) Push root ribs into place and trim brass tubes flush. Check fit of wing panels by inserting joiners and plugging panels onto joiners. Correct any misalignment by filing holes in sides. Epoxy tubes and root ribs to sides being careful not to get epoxy inside the tubes. Check wing alignment again before epoxy sets. Drill holes for spoiler cables.
25) Sand top sheeting and floor to blend smoothly into aft section of the sides. The aft section of the floor must be feathered for the correct shape. Trim edges of floor to form fillets as shown in top view. The fuselage is ready for final sanding and finishing.

COVERING AND FINISHING

For added strength and ding resistance we Suggest that You fiberglass the bottom block, extending up the ply sides approximately 1/2". Use lightweight cloth and Hobbypoxy Formula I I glue for maximum strength.
Fill any cracks and dents with Dap patching compound or Hobbypoxy Stuff. Fillet the boom joint, wing roots and saddle with epoxylite or Micro-balloons and epoxy. Sand Structure smoothly with progressively finer grades of sandpaper ending up with #400 or #600 grit.
We recommend that you finish the fuselage with Hobbypoxy or K&B Superpoxy materials, following their instructions.
The flying surfaces are designed to be covered with the iron-on film covering materials, and do not require fabric covering for strength. We prefer Super MonoKote because of its higher stiffness, but Solarfilm was used successfully on several of the prototype test models. Be sure to adhere the covering to all ribs and sheet on the top and bottom surfaces for maximum strength.
Cover the stabilizer, wing panels, elevons and spoiler blades as separate pieces. Use a straightedge and razor to cut four 5/8" wide by 18" long and two 3/8" wide by 18" long strips from the hinge material. Lay one side of stabilizer flat on bench and weight to hold. Use scrap 1/16" sheet to block up elevon flush with top of stabilizer, and scrap 1/16" sheet shims to gap elevon L.E. from stabilizer T.E.
Remove backing from one of the 5/8" wide hinge strips and lay in position centered over the gap. Iron in place to stabilizer and elevon. Remove stabilizer from board and fold elevon back 180' so that it lies on top of the stabilizer. Apply a 3/8" wide strip across the two surfaces and iron in place, bonding to the top hinge strip. Fold elevon back to position and run iron along top surface. Repeat for second elevon.
Apply top hinge strips to spoilers as described above, shimming blades as required. Be sure that the blades are flush with the upper wing surface. Fold blade back and apply three one inch long strips to the inside faces, in the center and each end. Don't run this strip full-span as the spoiler will be difficult to retract smoothly.
NOTE: These full-span hinges are important to the flight characteristics of the Grand Esprit. They have been proven over several flying seasons and are durable and easy to apply. The material is transparent and almost invisible on the finished model. It can be painted if you desire. Do not use any other type of hinge if you want to enjoy the maximum performance of this sailplane.

FINAL ASSEMBLY

After all parts are finished to your satisfaction you are ready to begin the final assembly of the Grand Esprit.
1) Epoxy eyelets into the holes in the stabilizer center block, press down firmly to ensure the eyelets are seated. Position horns as shown on the plans and mount with #2-56 x 5/16" screws.
2) Run a #2-56 tap through all devises and both ends of the inner pushrods. Then assemble pushrods and insert through outer tubing. Mount stabilizer to saddle and snap clevis onto control horns. Check for smooth action and correct any binding. Run a 1/8" drill into the outer tubing and/or file clearance removing any paint, etc., if the pushrods bind at the aft exits.
3) Mount the Vector Director, pre-drilling the holes in the subfloor with a #55 drill. Connect pushrods to outer holes in control arms. Align all arms vertically, and adjust clevis for proper elevon alignment. Mount elevator and rudder servos (or brick) and make up the control links. Adjust with servos in neutral so that the arms of the Vector Director are vertical. Use the second hole down from the top for both rudder and elevator connections. Check elevon position and re adjust, if necessary.
Check control surface movements. Be sure that the right elevon (viewed from the tail) moves down when right turn is commanded. Set up throws as shown using the center hole on the elevon horns and adjusting the servo arms and/or Vector Director to get movement shown on plan.
4) Install the battery pack and receiver and spoiler servo. Fish antenna through boom and attach tee fitting. Add canopy and check balance point which

should be 3/8" behind the front joiner. Add ballast in front of battery pack, if necessary.

5) Install spoiler actuating cables, through tubes. They can be blown through easily with compressed air, or using one of the dust removing aerosols available from photographic stores. Attach outboard end to pin and connect to bellcrank. Install two #10 bands for spoiler return springs and check spoiler action. The blades must retract smoothly and flush with the wing. Do not use more rubber bands but instead eliminate any binding until the blades snap shut.

6) Install joiners through fuselage and plug wing panels in place, fishing spoiler cables through holes in sides. Make up fittings from bent pins and attach with slip-knots to spoiler cables. Use long nose pliers to attach fittings to servo arms and adjust cable length as required. This is a tedious job so work slowly and carefully to get the proper set up. The blades should open 70' to 90' at full servo throw. Adjust control horn or bellcrank attach point to achieve proper travel.

7) Install towhook in bar, locating as shown on the plan. Tighten lock nut securely. Mount this assembly to the bottom block.

8) With airplane completely assembled check the balance point again. Balance 1/4" forward of the spar for first test flights.

9) Check all surfaces for warps. Remove any warps before flying the model.

SPECIAL FLYING NOTES

The Grand Esprit 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. Stretch back and let her rip. The ship will go up as if on rails if aimed into the wind. 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 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 kicking the stick hard over and feeding in 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.

The following suggestions are offered for competition flying involving

Multi-task events.

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. Tape the removable nose cap in place. Wrap wing roots to fuselage with tape. If the runway if tough 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 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. DO NOT USE UP ELEVATOR to steepen the launch angle unless you want to make new wings. 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 its 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 over-developed 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 second.

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 release tow 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 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.

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 overcontrol. You may wish to desensitize the controls by using the outer holes in the horns or decreasing servo throw for speed tasks.

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.