The Gambler+

Instruction Manual

Wright Brothers R/C

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Thank you for purchasing The Gambler+ Discus-launch Glider kit. This kit is designed to be easy to build and easy to fly. It also is designed to be able to be discus-launched while still being constructed mostly of built-up balsa construction that provides an affordable entry point into this exciting and growing hobby. I hope you enjoy your Gambler+ as much as I have enjoyed designing and flying it myself.

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Table of Contents

Specifications

Wingspan: 48”/1.25 Meter
Chord: 6” At Center
Wing Area: 256 sq. in.
Weight: 6.3-6.9 oz
Wing Loading: ~3.7 oz/sq. ft.
Channels: 2

Kit Contents

1 – full-sized plan
1 – instruction manual
3 – 1/16” balsa sheets with laser cut parts
1 – 3/16” balsa sheet with laser cut parts
1 – 1/8” lite-ply sheet with laser cut parts
1 – 1/32” lite-ply sheet with laser cut parts
6 – 1/32”x18”x2” balsa sheets
3 – 1/8”x18” hardwood dowel LE stock
3 – 1/8”x1/2”x18” balsa TE stock
4 – 1/16”x2-1/8x6” balsa sheeting
1 – ¼”x1/2”x2-1/4” balsa stick
3 – 2-1/4”x1/8” CF rods
1 – threaded hardwood ‘nut’
1 – 4-40 nylon bolt
1 – carbon fiber boom
1 – 1”x1-1/2”x1-1/2” balsa block
1 – 6”x15-1/2” 2 oz. fiberglass cloth
1 – 4”x4” Kevlar cloth
2 – 1/32”x27” piano wire pushrods
1 – pkg. Du-Bro Mini E/Z connectors
2 – Du-Bro Micro E/Z Link pushrod connectors
2 – Du-Bro Micro control horns
2 – ½”x60” Iron-on carbon fiber ribbon
2 – 18” piece of Kevlar thread

Required Materials

1 – Roll of lightweight covering material. (Recommended Oracover Light or So-Lite/Nelson Litefilm)
Thin C/A and Medium or Thick C/A glue
Epoxy finishing resin, preferably 30-minute on longer cure
3-M Super 77 spray adhesive, or similar
Clear packing tape

Suggested Electronics

GWS R4P Receiver, Berg Microstamp (single conversion) or FMA M5 receiver (dual conversion)
Two micro-servos. Hitec HS-55 highly recommended. Similar may be used (GWS Pico, Cirrus CS-10).
Receiver battery. Can be 3x50mAh Nicad or 4x110 or 280 mAh NiMh or 1x4.2V Lithium

General Assembly Information

Please thoroughly read these instructions carefully before starting construction. Those who have built balsa models before will find the construction sequence quite straightforward. For those who have not, I hope to have provided sufficient detail at each step to make the instructions clear. If you have any questions, e-mail info@wrightbrothersrc.com for assistance. A PDF version of this manual is available on our website which you can print out on your printer with color illustrations.

This kit contains laser-cut parts that may have light charring on the cut surfaces. If you use Ambroid or aliphatic resin glues, you may want to lightly sand the edges of these parts with 220-grit sandpaper to allow for better glue bonding. I recommend thin CA (cyanoacrylate a.k.a. 'super glue') for assembly of this kit. It speeds assembly and does not require additional sanding of the laser-cut parts. Except where indicated, parts can be first held together, then thin CA can be "wicked" into the joints. The laser-cut parts are held onto the balsa sheets by small, uncut spots on each part. Remove the parts from the sheet by carefully cutting these spots with a sharp hobby knife as the parts are needed.

Besides the required materials listed above, you should have the following building supplies: 220-grit sandpaper; a hobby knife; small clamps; straight edge, ruler and right-angle gauges; and a flat work surface with reference lines on it.

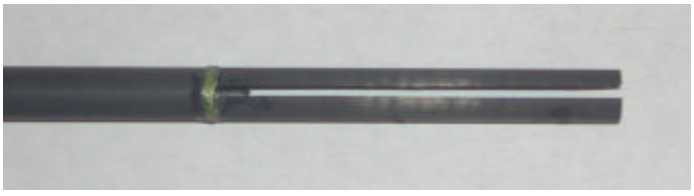
Skilled builders should be able to assemble this kit in three to four evening building sessions. Beginners should allow four to five evening sessions to comfortably assemble this kit. Both will take an additional evening to cover the wing and pod with covering. Take your time and enjoy the experience!

Assembly Instructions

Step 1: Locate the fuselage pod bottom on the 1/16" laser cut sheet. It is the only part not completely cut out with the laser. Carefully cut out the part, making sure to leave at least 1/2" of extra wood outside of the drawn lines. You will trim this panel to size later. Once you have the part cut out, you may cut/sand the nose side and tail side (the two shortest sides) flush with the drawn outline, leaving the other sides oversized.

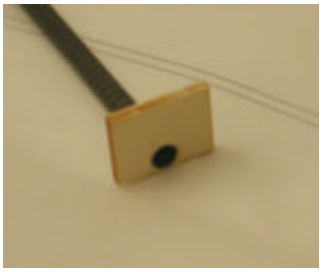
If you have a building board, cover it with wax paper, and pin the pod bottom onto the board with the pod centerline aligned with one of your board's reference lines. If you're not using a board, draw a straight line with a long straightedge on the back of the plan, cover that with wax paper and pin down the pod bottom aligned with the drawn reference line.

Step 2: If your tailboom doesn't have a slot cut in one end, cut a slot 1/16" wide into one end 2-1/16" long. At the end of the slot wrap the boom with Kevlar thread and soak with thin CA. This will strengthen the boom and prevent it from splitting when launched. If you wish you may color the Kevlar thread with permanent black magic marker.

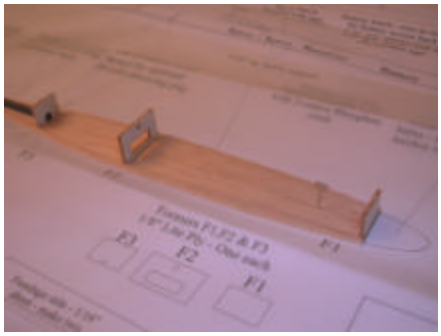


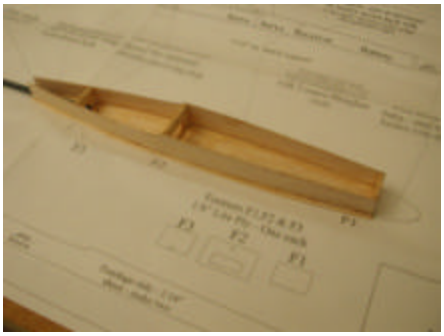
Locate former F3 on the lite-ply part sheet. Remove it and check the fit of the boom to the hole. Insure that the non-slotted end of the carbon fiber (CF) boom fits snugly and will align with pod bottom when glued. Enlarge the hole in F3, if necessary. Lightly sand the area of the boom that will be glued with 220-grit sandpaper to allow the glue to bond well. Slide the former onto the boom but do not glue yet.

Using pins, secure the boom to the building board -- making absolutely sure that the tail end of the boom is aligned with the centerline of the pod and the front end of the boom is located at the front reference line of F3 as drawn on the pod floor. Shim the tail end of the boom with a scrap of balsa to insure it is level. Using a scrap of balsa temporarily inserted into the slot in the boom, insure that the slot is perpendicular to the building board. Once you're sure everything is on the centerline, and F3 is located over the drawn location on the pod floor, secure the assembly to the pod floor with thin CA.



Step 3: Glue formers F2 and F1 to the pod floor with thin CA where the location lines are drawn. Make sure that they are at right angles to the pod floor.





Step 4: Remove the two laser-cut fuselage pod sides from their sheet and glue to the pod bottom as drawn on the part. Secure the sides to the formers with thin CA. Note: For now, the tail ends of the sides are glued against the CF boom at the rear of the pod. Since the boom is tapered the sides may not fit exactly where drawn on the floor part. This is OK.

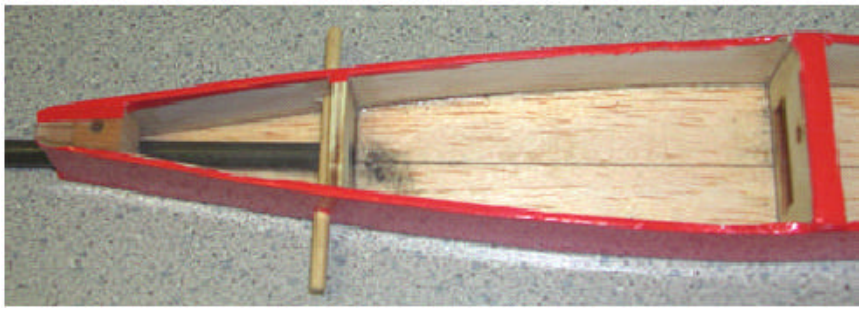
Step 5: Choose one of the trailing edge pieces and cut off a 1" section. Cut this in half making two 1/2" sections. Using 2-3 pieces of 1/16" scrap as a spacer, create a wedge that will fill the void at the rear of the pod over the boom. You may file or sand a slight curve in the bottom of the wedge to match the contour of the boom. Glue this wedge into the rear section of the pod to join the sides at the rear. Sand this piece flush with the rear and top of the fuselage sides.

Step 6: Locate the wing hold-down block and 4-40 nylon screw. Remove the screw and set it aside. Dry-fit the block in the rear of the fuselage where indicated on the plans and mark it for the proper size. Cut, sand or shim it to fit where shown on the plans. When sizing the block to the correct height, it may

be desirable to remove some material from each end rather than all from one end since the threads in the middle of the block are usually the strongest. When gluing the block in place, use thick CA or epoxy to insure that excess glue does not enter the threaded area. At this time while you have the epoxy or thick CA out, you may apply some additional support to the boom by creating a fillet of glue between the boom and the pod floor. Be careful to add just enough for strength as this also adds significant weight.

Step 7 (optional): Provided are three 1/8" CF rods. One of these rods will be used for the javelin-throwing peg. Since you will be mostly side-arm launching the plane, this peg is optional. Some people prefer to grasp the fuselage sides when javelin launching and leave the peg off, saving a tiny amount of weight and some drag on the airframe. If you're unsure I recommend installing the peg. The additional weight and drag is minimal. If you do not have a preset or snap-roll toggle switch on your transmitter you will most likely prefer javelin launching and you will want the peg. You will javelin launch when trimming the plane. I often do this a couple times at the start of each flying session, so I prefer to have the peg installed.

If you wish to use the peg, drill a 1/8" hole in the fuselage sides just behind former F3 and dry-fit the throwing peg. Note: The holes must allow the peg to be located over the boom since the control rods will run inside the boom. I prefer to glue the peg in after fiber-glassing and/or covering the pod, so once you are happy with the fit, set the peg aside.



Step 8: You will need to sheet the top of the front of the pod. To balance the plane, one or both of the servos are located directly in front of former F2. To make installation and removal of this servo easier, a semi-permanent hatch is used. Glue a 1/4" strip of 1/16" sheet (taken from one of the 1/16" sheets provided) directly over former F2, making sure the extra width protrudes over the forward servo area.

Glue in the 3/16"x 3/16" hatch support as indicated on the plans, and glue a 1/4" wide strip of 1/16" sheet over the support making the extra width protrudes back towards the servo area. Cut a piece of 1/16" sheet to cover the servo opening, and temporarily secure in place with tape.

Cut a small piece of 1/16" sheet to glue over the most forward section of the pod as shown on the plans and glue in place. The opening left will be the main battery compartment hatch. Size the remaining piece of 1/16" sheet to fit. You may reinforce the underside of the hatch with the 1/32" lite ply reinforcer provided on the laser cut sheet; I like to have a small tab of the lite ply reinforcer protruding from the forward edge of the hatch. Later when this hatch is hinged with tape at the front edge, the tab will provide additional support. Secure the hatch in place temporarily with tape.

Step 9: Cut the pod bottom sheeting flush with the pod sides and remove from the building board.

Step 10: Locate D-shaped laser-cut nose block pieces on the 3/32" sheet. Laminate them all together to form the nose block. Glue the block to the front of the pod. Thick CA, aliphatic resin or epoxy is best. Carve and sand the nose block to the shape shown on the plans. Try to achieve a bullet-shaped cross section. It may be desirable to harden the nose block after shaping by wicking thin CA into the end-grain and re-sanding the nose smooth. Using 220-grit sandpaper, round all the corners of the pod slightly making sure not to remove too much material, which may compromise the pod's strength. Having the two hatches temporarily secured with tape allows them to be sanded to a contour that matches the rest of the pod.

Step 11 (optional): If you want to make your fuselage pod much more durable, cover it with the supplied 2-ounce fiberglass cloth and epoxy resin. Epoxy finishing resin can be purchased at your local R/C hobby store. It is thinner than normal epoxy and specifically suited for applying fiberglass cloth without adding too much weight. This will add approximately 3 grams of weight to the total weight of your glider, which is quite acceptable for the amount of strength it adds. If you choose not to do this, apply a full-weight covering such as MonoKote to the pod to increase the pod's durability.

To glass the fuselage, spray a slightly oversized piece of the 2-ounce fiberglass cloth with 3-M Super 77 spray adhesive. Stretch the cloth around the curves of the pod, allowing the adhesive to secure it in place. Smooth out any wrinkles to achieve a good bond to the wood. When you are happy with the location of the cloth, apply epoxy resin soaking the cloth, then squeegee out as much resin as possible with a rubber squeegee, spatula or old credit card. You can use a rag or paper towel to blot the resin from the cloth as well. If you've done this correctly, this will add approximately 3 grams or less weight. Allow the epoxy to dry and lightly sand.

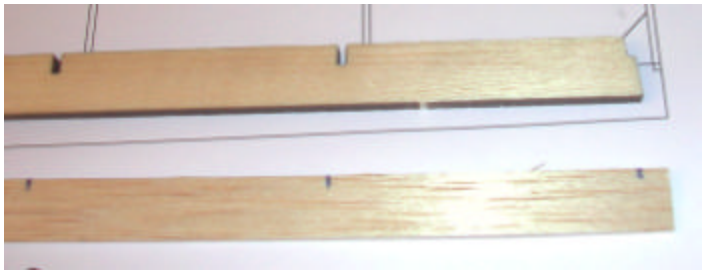
Alternatively or additionally you may reinforce the pod sides with some of the provided CF ribbon as shown below. Be sure to set aside enough CF ribbon to reinforce the wing (three – 1/4"x 48" pieces) and rudder (two – 1/4"x 6-3/4" pieces) first. If you apply both CF and fiberglass do the CF first then cover with the fiberglass.

Cover the glassed pod with covering to prevent the texture of the applied cloth from picking up dirt and debris when landing. I prefer a full-strength covering for the pod such as MonoKote for added resistance to abrasion on landing, but lightweight coverings also are acceptable.

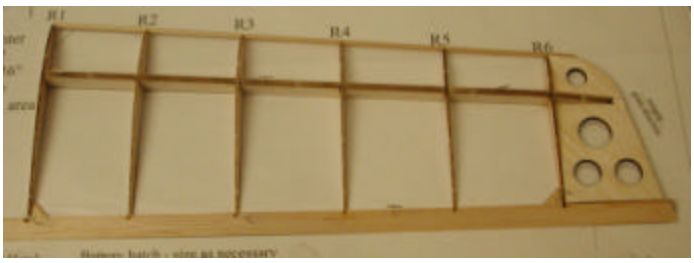
Step 12: If you chose to use a javelin-throwing peg, you may glue it in place now.

We will now begin building the wing. Since this is a polyhedral wing, it will be built in three sections: the center panel and each tip panel. The technique for all three is similar with a couple additional steps on the center panel.

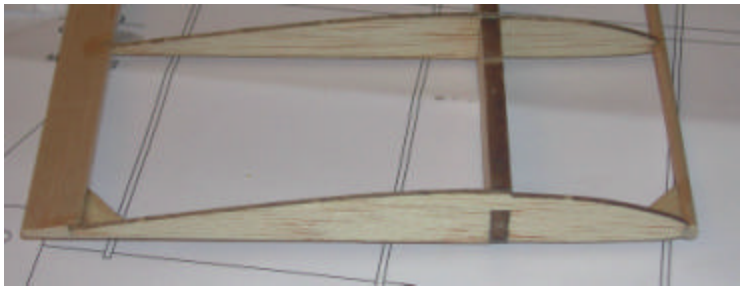
Step 13: Remove the center section spar from the 3/16" sheet. Note: The ends that meet at the dihedral breaks are angled to accommodate the dihedral angle when the panels are assembled into the completed wing. Locate one piece of trailing edge stock. Mark the trailing edge at each rib location using the spar (not the plans) as a guide. Where the ribs are angled, use the bottom of the spar as the mark location on the trailing edge (this angle and any small inaccuracies in the laser cutting is why you should not mark using the plans). Once the trailing edge is marked, cut a 1/16" wide slot in the front edge of the TE to the depth indicated on the plans at each mark. These slots should allow the 1/16" ribs to fit snugly. You may find using an X-acto brand razor saw for this step helpful.



Step 14: Cover the plans with wax paper and pin the spar and trailing edge to the plans. Glue in the ribs making sure that they are <u>fully against the building board at the trailing edge</u>. **Note:** The trailing edge is thicker than the ends of the ribs and will be sanded later.



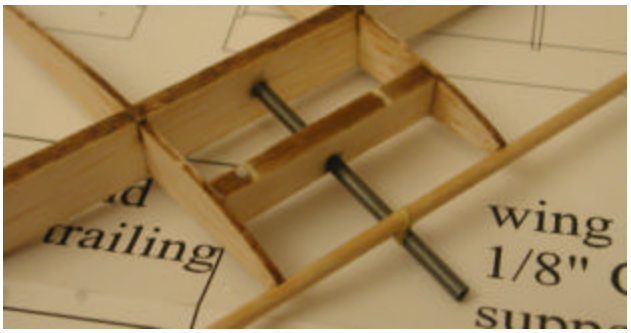
Step 15: Using thick or medium CA, glue in one of the leading edge hardwood dowels and pin in place until the glue sets. Glue in the laser cut gussets as indicated on the plan. Note that two of the gussets are cut at a different angle. These go on the outer panels between the innermost rib and the leading edge.



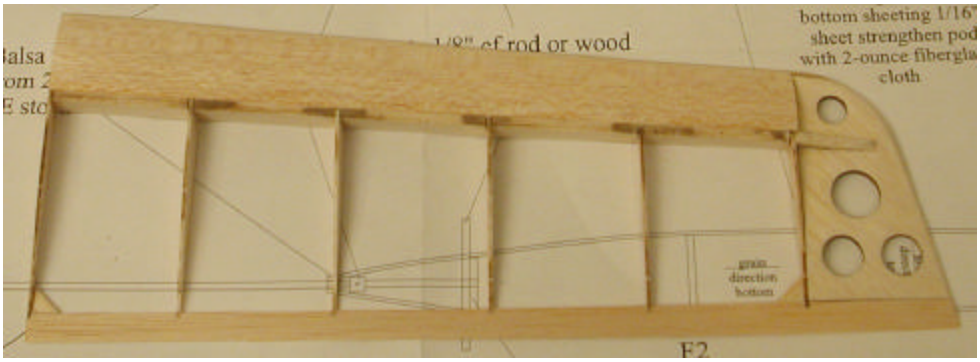
Step 16: Trim the LE and TE to length and sand to match the dihedral angle.

Step 17: Repeat the procedure in steps 13-16 for each wingtip panel. Note: Only the inner rib is angled for dihedral; the other smaller end rib meets the wingtip panel. The wingtip panel is pinned to the building board with the TE and spar in step 14. In step 16, the rear portion of the wingtip panel is sanded to an airfoil shape and the outer edge is rounded.

Step 18: In this step, before gluing, dry-fit the parts until you're satisfied with the fit of the center panel of the wing to the fuselage. Locate the second 1/8" CF rod and the wing locator dowel support. The rod will be glued to the wing LE, through the locator support and attached to the spar. Remember that after this dowel is attached there will be a 1/32" thick D-tube sheeting and a 1/16" center section sheeting added to the bottom and top of the wing. To insure proper fit, the support most likely will be glued in a position that will protrude a little below the bottom of the ribs and then it will sanded flush later. Every wing is a little different so trial fitting the wing is important. Once you're happy, glue the parts in place. The small piece of Kevlar thread should be wrapped around the locator dowel and the LE and CA can be applied for additional support.

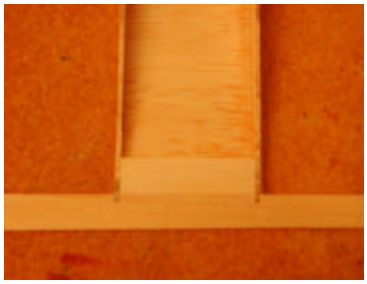


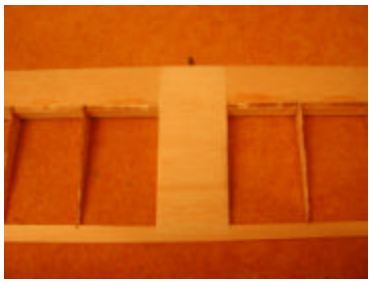
Step 19: Glue the 1/32" sheeting to each of the wing panels to form a D-tube. Note: The ribs are notched so that the sheeting butts up against the spar and does not go over it, but you may allow the sheeting to cap the LE, then sand the sheeting at the LE to shape. Thick CA or other slower setting glues are best for this step. Sand the sheeting flush with the rib at each dihedral break.



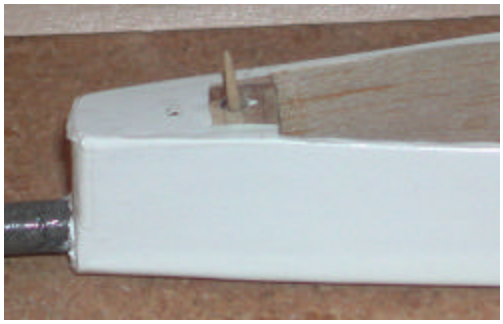
Step 20: Pin the center section to the building board. Glue each wingtip panel to the center section, insuring that each tip is raised off the building board 3-3/4" at the wingtip TE. Be careful not to introduce any twisting in the wingtip panels during this step.

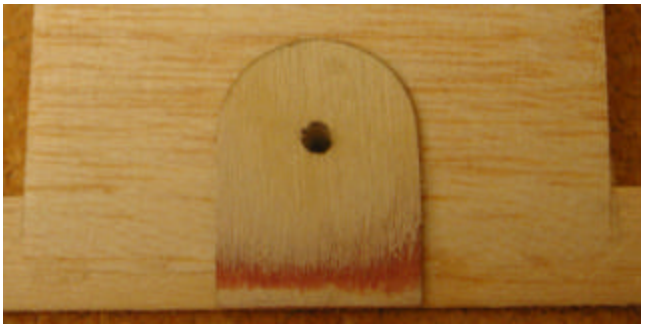
Step 21: Using one of the 6" long pieces of 1/16" sheeting, sheet the bottom of the center bay of the wing center section. This sheeting will go over the 1/32" sheeting applied in Step 19. Using some scrap from the 3/32" sheet put a filler block between the two inner ribs where the wing hold-down bolt will go. This will support the hold-down bolt. Sand to match the ribs and then sheet the top with the second of the 6" long pieces of 1/16" sheeting. Again, sand the leading and trailing edges to the appropriate shape. It may aid in covering if you feather the sides of this sheeting by sanding them before they are glued to the wing.





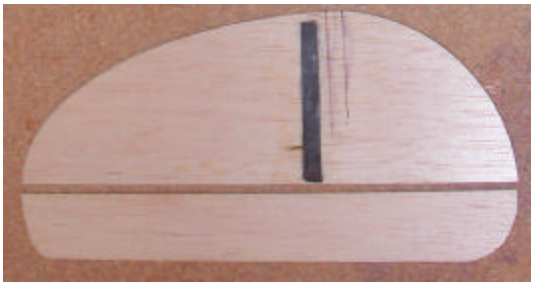
Step 22: Locate the laser cut 1/32" plywood wing hold down reinforcement panel. Put a toothpick or pin in the hardwood block temporarily and insert the wing to mark the underside of the wing where the hold-down bolt will pass through the wing. Drill a hole in the wing at that mark, then glue the reinforcement panel to the top of the wing with the hole in the reinforcement panel over the hole in the wing. Trim the reinforcement panel to length at the trailing edge. Bolt the wing to the fuselage to check the fit. Sand the fuselage sides and wing center section until you get a good fit. The wing must not be able to rock or twist.



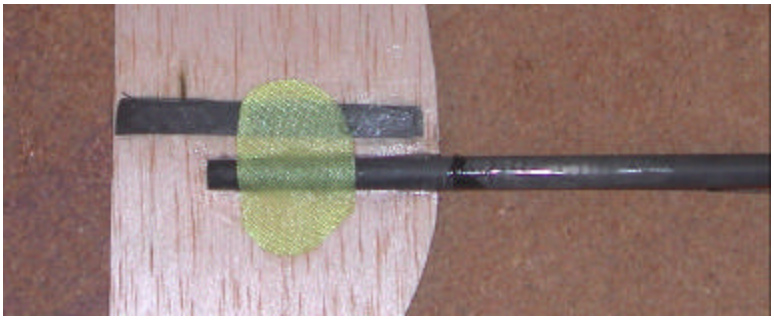


Step 23: Using your covering iron without a sock, iron on the CF ribbon. Be careful to follow the directions in the CF package. One strip goes on the underside of the trailing edge, one on the topside of the spar and one on the underside of the spar. Overlap at the wingtips to reinforce them as shown below. If you have extra CF, reinforce the dihedral joints at the wing LE but be sure to leave enough CF for the tail reinforcement in Step 24. Soak all the CF ribbon with just enough thin CA to saturate the ribbon. If you gently rub the CA soaked ribbon with some wax paper it will help the CA absorb and improve the bond to the balsa. Sand any irregularities out of the CF ribbon, and using a sanding block, carefully sand the topside of the TE to a taper that matches the ribs.

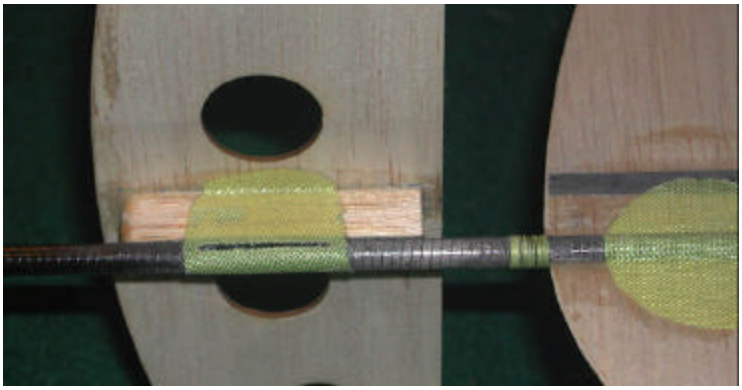
Step 24: Remove the rudder and elevator pieces from the sheet and reinforce where indicated with CF ribbon soaked with CA. When applying the CF, be sure not to introduce any warping in the surfaces. It may help to mark the elevator where it will attach to the boom beforehand to help in locating the CF. Lightly sand the CF to remove any high or rough spots being sure not to remove any of the balsa wood. Lightly sand the LE of each surface to an elliptical shape.



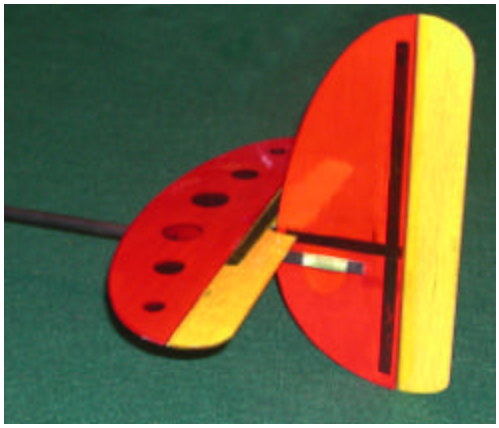
Step 25: Insert the rudder into the slot in the boom and while clamped, glue with thin CA. Cut two patches of Kevlar fabric and lightly spray with 3-M Super 77 adhesive and apply to each side of the rudder overlapping the boom. Saturate with thin CA to reinforce the joint.



Step 26: Shape the 1/4”x 1/2”x 2-1/4” balsa stick into the stabilizer pylon by rounding each end and sanding one thin side to match the shape of the boom. Draw a centerline on the underside of the stabilizer, and glue the pylon to the stabilizer. Lightly sand the boom where the pylon will be attached with 220-grit sandpaper. Temporarily tape the elevator to the stabilizer with masking tape, and clamp the assembly to the pod insuring that there is enough clearance for the elevator to function without hitting the rudder. With the wing bolted to the pod, insure that the stabilizer is parallel to the wing and perpendicular to the rudder. Glue the pylon to the boom with thin CA. Reinforce the boom/pylon connection with Kevlar fabric using the same method as with the rudder wrapping a single patch down one side of the pylon, around the boom and up the other side. It is best if the reinforcement wraps up onto the stabilizer about 1/8” as shown below.



Step 27: Bevel one edge of the rudder and elevator so that when they are attached, they will be able to deflect +/- 30 degrees. Cover the mounted portions of the tailfeathers as well as the rudder and elevator. Attach the rudder and elevator with clear packing tape.



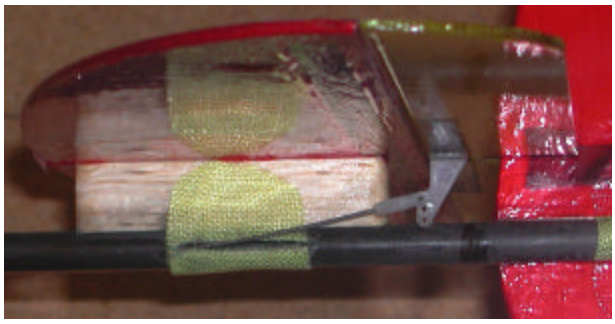
Step 28: Using a Dremel with an abrasive cutting wheel, cut a slot in the boom through this patch to allow the elevator pushrod to exit the boom. Make the slot on the left side if you are right-handed, reverse for left-handed launching.

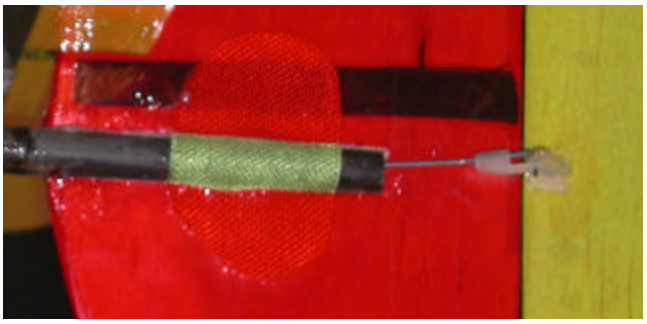
Step 29: Bend a 1/4" 90-degree angle in the end of each of the supplied pushrods. Slide the unbent end of one of the pushrods into the boom from the tail end. This will go on the right-hand side of the rudder for right-handed pilots, left-hand side for left-handed pilots. For now do not trim the pushrod to length. Remove a small section of covering from the rudder, and glue one of the Du-Bro control horns to the rudder. Test fit the pushrod. It will probably be necessary to bend a slight bend in the pushrod as it exits the boom for it to work freely. Once you are satisfied with the fit, secure the pushrod by clipping on the provided Du-Bro Micro E/Z link clips as shown in the diagram below.

Figure 7 – Du-Bro Micro E/Z Link Installation

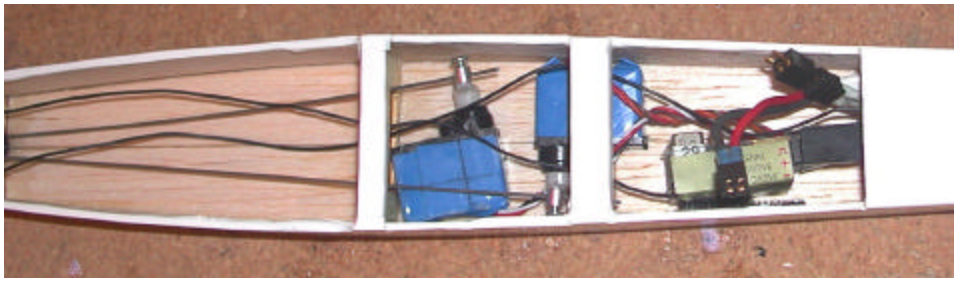
Repeat this procedure for the elevator pushrod, using the exit slot created in Step 28.

Step 30: Equipment installation: Connect your servos to your radio, zero your trims on your transmitter. Wrap each servo with electrical tape or shrink-wrap. It will be helpful if you remove the servo's mounting lugs. Install the provided Du-Bro EZ-Link connectors on your servo arms, and slide a pushrod through the connector without tightening the locking screw. Mark the position of the pushrod and location of the servo. Disconnect the pushrod from the control surface, and slide it forward to allow you to tighten the locking screw. Re-connect the pushrod and locate the servo so that the control surface is centered. When you're happy with the fit, secure the servo to the pod floor with thin CA.

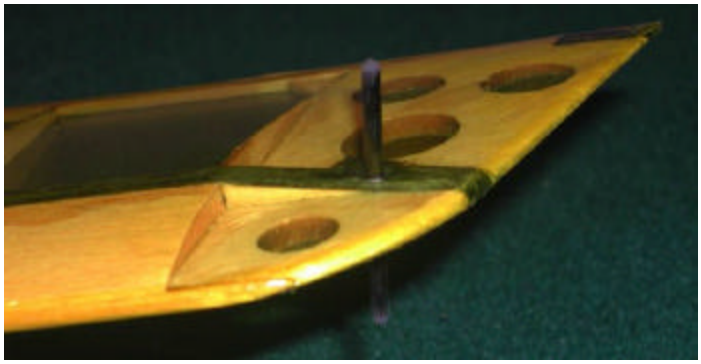




The tape or shrink wrap can be removed from the servo later to extract the servo from the pod. Repeat this procedure for the second servo. If you're using a lighter receiver like the GWS R-4P, both servos should be located ahead of F2. If you're using a larger receiver, one servo can be mounted behind F2 below the wing. Once your servos are mounted, secure the rear hatch permanently with clear tape.



Step 31: Install your radio and receiver battery in the forward compartment. Adjust their location to balance the model at the main spar. Once trimmed you can fly with the CG up to 3/8" behind the spar for optimal maneuverability and glide. After your equipment is secured, use clear tape to hinge the forward portion of the main hatch. When flying I use electrical tape to secure the rear portion of the hatch. It works well for opening up the hatch several times before it needs to be replaced and doesn't leave residue on the covering. If you prefer you could install a charging jack and close the forward hatch permanently with tape.



Step 32: Drill a 1/8" hole in one wingtip for the throwing peg. The location is showed on the plans. The hole should be drilled perpendicular to the ground when the wing's **CENTER SECTION** is parallel to the ground. The hole should be in the middle of the CF reinforcement of the wingtip as far inboard as possible while still providing a comfortable grip. For right-handed pilots the peg goes in the left wingtip. Round each end of one of the CF rods with sandpaper, and insert the rod in the hole. Once you are happy with the location of the pin, secure it by wicking thin CA into the joint from each side.

First flights: Glide test the plane starting with gentle tosses into tall grass or some other soft surface. Continue to work up to harder overhand/javelin throws until you're satisfied with the trim of the plane and are getting 30-second flights or more. If you're new to hand launch gliders, you may want to take several sessions of overhand launching to get used to the flight characteristics of gliders with extremely light wing loading.

The Discus Launch: Once you have your model flying nicely with overhand launches, you can proceed to discus-launching. Begin with very gentle launches and work up to stronger launches. The proper grip is with the index finger on top of the wing, palm forward, with the remaining fingers below. Do not attempt to hold the plane level by the wingtip and peg. This will only weaken the wing and possibly damage it significantly. Instead let the plane dangle and while you rotate, the wing's lift will raise the plane level. Do not throw with your arm, rather keep your arm straight and allow the spinning motion of your body to propel the plane. Many people find taking a step or two forward during the launch helpful as well as spinning on only one foot during the final rotation. For more information on discus launching, there are many good guides on the Internet, including the Lift-Zone's HLG discussion groups.

Once you release the plane it should start to climb and immediately straighten out. If the plane doesn't leave straight away from you you're probably releasing too early or late. When the climb slows, nose the plane over the top to carry some velocity into your initial level flight. Once you've made the transition, you're ready to start grabbing those thermals. If your Gambler+ stalls right after you push over the top, then you are not transitioning to level flight soon enough. If it wants to balloon, then you've pushed over too early.

You can trim your Gambler+ for maximum lift by adjusting your up trim until the plane just starts to porpoise, then adjust with a couple clicks of down. If you want to cover more ground and carry more energy, apply a couple of additional clicks of down. I find this is also a good idea in windy conditions to aid in penetration. With winds of 5-10 mph, the Gambler+ can get slope lift off of the smallest of terrain and penetrates well. If you would like to ballast the Gambler+, a single R/C lead weight, or 2-3 quarters, may be taped to the servo under the wing with electrical tape.

Congratulations on completing your Gambler+, and may you always find light air! I'm always happy to hear from people who are enjoying their kits. If you would like to send digital photos or movies of your Gambler+ for our web gallery, they can be submitted to: info@wrightbrothersrc.com.

Thank you!
Allan Wright Jr.