Thank you for purchasing the Dandy Sport. The Dandy Sport has been designed as an easy to build aileron trainer. Take your time and enjoy building this plane.

Specifications:
Wingspan: 35”
Wing Area: 300 sq. in.
Weight with 8x720 NiMH batteries: 12 ounces
Required Equipment

To build:
- Xacto with #11 blades
- Thin and Thick CA – Cyanoacrylate glue (Super Glue)
- Sanding block with 200 grit sandpaper
- Smooth, flat work table
- Wax paper to protect plans
- Needle nose pliers
- Wire cutters
- Hobby Iron for applying covering – also called a sealing iron

To fly:
- Four channel radio (The Berg5^dsp is highly recommended, second is the GWS-R4P micro receiver. Three micro servos: Hitec HS50s, HS55s, or GWS Pico servos recommended
- GWS EPS100-A motor with 10x8 propeller
- Motor Speed Control: GWS GS100 suggested
- Battery pack: 8 cell 370mAh or 720mAh Nickel Metal Hydride recommended.

Parts List
1 ea – 1/8” laser cut balsa sheet
1 ea – 3/32” laser cut balsa sheet
6 ea – 1/16” laser cut balsa rib sheet
1 ea – 1/64” laser cut plywood sheet
1 ea – 1/32” laser cut plywood sheet
1 ea – 1/16” laser cut plywood sheet
1 ea – 1/8”round x 19” hard wood leading edge
1 ea – 1/8”round x 17” hard wood leading edge
3 ea – .032” music wire pushrods
1 ea – 1/16” x 13.5” landing gear wire

1 ea – 6” Heat shrink tubing for pushrods
1 ea – ½” heatshrink tubing for wheel retainers
1 ea – Velcro strip for mounting the battery
2 ea – 1/8” dowel wing hold downs
1 ea – 4-40 landing gear bolt and blind nut
1 ea – Battery compartment magnet and tack
1 ea – Tire Rubber
2 ea – 1/2” long aluminum tube wheel axle bearings
1 ea – Tyvek battery compartment hinge strip
1 ea – 1/16” x .75” x 4.25” plywood battery mount

1 ea – Roll of covering material
Notes and Hints

- The Dandy has been designed with weight in mind. Parts and reinforcements were chosen so as to keep the plane light. Special care must be taken when making glue joints to ensure that the Dandy can survive rough landings.
- There is very little that is critical when building the Dandy. The only thing that requires special attention is to make sure the wings are not twisted. If the wings are straight, the Dandy should fly hands-off without any trim.
- Heat shrink can be heated with a soldering iron or, if you dare, with a lighter. Pay close attention to what is near the heat shrink when you are heating it.
- You really need the sealing iron (Also called a hobby iron). You will find putting on the covering so much easier. They are reasonably inexpensive and invaluable.
- The parts are held into the sheets by retaining gaps. When you break a part loose, you should lightly sand the nubs left by the gaps down.

Assembling the tail

1. Lay down some wax paper on a flat work area.
2. Remove the tail parts from the 1/16” balsa sheets.
3. Carefully holding the pieces together so that you don’t glue yourself to the model, flow some thin CA into the joints.
4. Sand a 45-degree bevel into the leading edge of the elevator and the rudder.
5. Sand the tail surfaces smooth and round the edges except for the bevel you sanded in previously. Leave the trailing edge of the horizontal and vertical stabilizers square, not rounded.
6. Paint the tail surfaces but try to use as little paint as possible as paint is heavy.
7. Attach the rudder and elevator to the stabilizers using tape as a hinge. Packing tape cut down to ¾” strips works quite well. Leave the slightest gap, maybe .010”, to allow free movement of the surfaces.
8. Build the wheels by assembling the parts over the aluminum axle. You will sandwich the plywood hub, balsa hub, plywood wheel, balsa wheel, plywood wheel, balsa hub, plywood hub. Slide the parts over the aluminum tube and get everything aligned. The smaller round punch-out with the axle hole is the wheel hub. Flow thin CA over the wheel to glue it taking care to not get CA in the aluminum tube. Wrap the tire rubber around your wheel to measure it and cut it 1/16” too short. Glue the ends together with CA. You now have a ring. Slip the ring over the wheel, center it then glue it to the wheel with thin CA.
**Wing Assembly**

- **Note:** It is very easy to make two wings of one side, i.e., two right wings. This is a bad thing.
- Tape a sheet of wax paper over the plans to protect the plans and to prevent glue from sticking to them.
- Remove the two vertical spars from the 1/16” balsa sheet. You will note that they fit together with a V joint to form the center wing. **Be very careful to make a left and a right wing.** It doesn’t matter which vertical spar forms the left or right side.
- Slide the ribs into the vertical spars. The 3/32” rib goes in the innermost position. Do not glue yet.
- Position the lower spar caps (the narrower ones) so that they line up with the notches in the ribs. Ensure that the end of the bottom spar with the arrow shape is towards the center of the wing, that everything is tight, that the ribs fit fully into the lower spar and that the vertical spar is touching the lower spar. Once everything is aligned, flow some thin CA into all the joints.

- Position the top spar caps over the ribs. Position as before and glue with thin CA.

- Position the 1/8” trailing edge so that it is flush with the bottom of the ribs and that it is pushed as far forward as possible. The end that is shaped like an arrow goes towards the center of the wing. Glue with thin CA.
- Measure and cut the 1/8” hardwood leading edge dowel so that it is flush with the outer edge of the outermost rib and only goes halfway through the innermost rib. We only go halfway through the innermost rib to leave room for the short center leading edge dowel. Glue in place with thin CA.
- Bevel the wingtips so that they mate up well with the end rib and glue as shown in the photos. It is easiest to glue from the spar to the trailing edge then, once the glue has set, raise the leading edge of the wingtip towards the leading edge dowel and glue in place.

- We will now glue the two wing halves together. Start by placing the 3/32” x 1.9” x .6” rectangle with the tab on either end in the slots in the center ribs. Now join the two vertical spars together and glue with thin CA.

- Glue the top and bottom center spar in place. Make sure you have a good joint and that the top and bottom spars are well glued to the vertical spars.

- Glue the center trailing edge in place.
- Cut and glue the center 1/8” hardwood dowel leading edge.
- Glue the smaller 1/64” plywood sheet to the bottom of the center wing such that it is 1/16” behind the front of the bottom spar. The hole should be closer to the front. **Take special care to ensure that the plywood is well bonded to the bottom spar, especially at the edges of the plywood where it is outside the center ribs.**
Glue the two 1/16” plywood servo reinforcements to the 1/64” plywood sheet as shown. Take care to not fill the holes with glue.

Glue this 1/64” plywood sheet to the top of the center wing such that it is flush with the back of the trailing edge and centered. The opening should be towards the front. Take special care to ensure that the plywood is well bonded to the top spar, especially at the edges of the plywood where it is outside the center ribs.

Glue four 3/32” balsa braces to the leading edge dowel and the center ribs as shown.
Glue two 3/32” balsa braces to each of the outer ribs as shown.

Verify that the top and bottom spars are glued to the vertical spar completely and that there are no gaps in the glue joints.

Lightly sand the wing to remove any bumps and glue.

Aileron Assembly

The ailerons are made up from the 3/32” laser cut sheet. Lay the plans out on a flat worktable and tape them down, and then lay a sheet of wax paper over the plans. This will protect the plans from the glue. The pieces of balsa are positioned over the plans and glued together. Each joint can be glued by holding the two pieces in place and applying a drop of thin CA to the joint. In the past, you may have used pins to hold parts down, but I find this process to be faster and you don’t have to worry about the pin damaging the balsa. You do have to worry about keeping your fingers far enough away from the joints or your fingers will become part of the model.

Once the parts are dry, carefully remove them from the wax paper then sand them. Round all the edges EXCEPT the front of the ailerons need to have a 40 degree bevel sanded in to them. How you sand the bevel in the ailerons determines whether the aileron will be for the right or left side. Make sure you make one left and one right.

Covering the Wing

The Dandy kit comes with a clear, paintable covering called Doculam which is actually a laminating film. The frosted side has a heat activated adhesive. Unlike most coverings, Doculam does not have a backing sheet. Compared to SoLite (Solarfilm Lite – another excellent choice for the Dandy), Doculam is stronger, heavier, and needs a higher temperature to adhere and to shrink. It should also be painted which will add weight. We will cover one half of the wing at a time.

Lay the wing on the table and cut a piece of covering so that it starts at the inner rib of the opposite wing and overlaps the wingtip and the leading and trailing edges by ~2”. The first piece will cover the center wing.

Tack one corner of the trailing edge then the other corner of the trailing edge with a covering iron, ensuring that the covering is tight.

Pull the covering tight and straight then tack the two corners of the leading edge.

Tack down the entire leading and trailing edge. Wrap the covering around the back of the trailing edge and tack it down across the back of the trailing edge.

Pull the covering tight across the high point of the wingtip and tack.

Here’s the fun part: work the covering around the curve of the wingtip so that the wrinkles are evenly distributed. This will make shrinking the wrinkles out easier.

Tack down the covering to the inner rib.

Trim the covering so that there is a 1/8”-1/4” overlap around the inner rib. Tack down the overlap to prevent the covering from pulling away when you shrink it.

Cover the other side. This side does not need to cover the center wing but should overlap the other sides covering by at least ¼” to ensure a good bond.
Once both sides of the wing are covered, shrink the covering with a covering iron or heat gun. If you are using the supplied clear covering, you will need a fair amount of heat to shrink the covering but too much heat will result in a hole.

Tack the covering down around the servo hole then cut the hole out with a sharp Xacto.

You can paint the supplied Docolam covering with Testors Pactra Racing Finish car body paint, which has been specifically designed for lexan car bodies. Krylon spray paint will also work.

Cover the ailerons in the same manner you did with the wings.

Apply the hinges to the control surfaces. I have had excellent results using packing tape sliced down to ¾” as a hinge. Ensure the control surfaces move freely.

Cut covering from the slots for the control horns and glue the control horn in place with thin CA.

**Aileron Servo**

- Install the aileron servo through the top of the wing.
- Use a servo control horn with two arms.
- Cut four pieces of 1/32” music wire 3.25” long. Bend a Z bend in one end of each wire.
- Install two of the wires in the outer holes of the aileron control horns and the other two wires in the outer holes of the servo control horns.
- Cut two pieces of heat shrink tubing 2” long. With the heat shrink, join the pushrods.
- Adjust the pushrod lengths so that the ailerons are level with the wing. Use a drop of thin CA to prevent the pushrods from slipping in the heat shrink. If you really want to get fancy, use Dubro Micro Connectors on your servo horn as shown.

**Fuselage Assembly**

1. Lay the two fuselage sides down on a piece of wax paper so that the word “INSIDE” faces up.
2. Position the forward fuselage doublers on the fuselage sides and glue with thin CA.
3. Glue the .75” x .875” x 3/32” balsa rectangle to F3. Use the guide lines that are etched onto F3. Press the blind nut into the hole in the balsa.

4. Lay the bottom fuselage on the wax paper and glue the bulkheads in place with thin CA. F5 is not placed at this time. The balsa and blind nut you glued to F3 face towards the rear of the fuselage.

5. Position the fuselage sides over the bulkheads and glue the sides to bulkheads F4 and F6.
6. Remove the battery compartment door from the bottom fuselage sheet then glue the bottom sheet to the side sheets from F4 to F6.
7. Position F5 in the side fuselage sheets and glue with thin CA.
8. Squeeze the sides together in the front and glue the sides to bulkheads F1-F3 and to the bottom fuselage sheet.

9. Squeeze the fuselage sides together at the back and, while making sure everything is aligned, glue the sides to bulkheads F7 and F8 and to the bottom fuselage sheet.
10. Place the servo tray as shown and glue with thin CA. Give it plenty of time to dry.

11. Cut two 14” lengths of 1/32” music wire. Make a Z bend in one end and thread the other end through the holes in the rear bulkheads starting with F6. This leaves the Z bends in the fuselage by the servo tray. Tape the wires to the tray so that they don’t fall out.
12. Glue the top rear fuselage sheet into place.
13. Glue the front battery mount support into bulkhead F4.
14. Glue the 1/16” x .75” x 4.25” plywood battery mount to the support you just installed and to F5 using thick CA. Attach a Velcro strip to the bottom of the battery mount. You may want to flow some thin CA under the Velcro to ensure it is firmly attached to the ply.

15. Cut the Tyvek hinge material (the white paper like material in the parts bag) so that it is almost as wide as the battery compartment door. Glue it to the door so that half of the Tyvek overhangs the door. An easy way to glue the Tyvek is to hold it down with some wax paper and flow some thin CA over it. The CA will soak through the Tyvek.

16. Position the door so that it is square in the opening and glue the Tyvek to the fuselage bottom. Note that the hinge is oriented towards the front of the airplane.

17. Once the door is dry, open it and glue the magnet to the inside of the door as shown. Flow some thin CA across the end of the door to stiffen it.

18. In the parts bag you will find a tack pushed into a ¼” x ¼” x ¾” stick of balsa. Remove the tack from the balsa and glue the balsa to F5 ¼” below the edge and on the same side as where you placed the magnet on the door.

19. Position the tack on the balsa stick so that it will line up with the magnet. Here’s the tricky part: only push the tack in a little, place a drop of thin CA on the stem of the tack, then quickly close
the door and push down on the door so that it is flush with the fuselage. This will set the tack to the proper height. Give the glue a minute to dry and you’re done. If the magnet is too strong you can attach some tape to the thumbtack to weaken the pull.

20. Glue the four motor mount sides together ensuring that they are pressed together tightly and are square. Sand it lightly and test fit it to the motor. Glue the motor mount to bulkheads F1 and F2 so that it projects forward 1.25” from F1.

21. Glue the fuselage front top onto the fuselage sides.
22. Sand the front of the fuselage so that it is flat. Glue the two 3/32” nose cowls together then glue them to the front of the fuselage. The cowl with the vertical grain should be furthest from the fuselage.

23. Sand the fuselage smooth, round the corners, and shape the nose cowl. Bend a tail skid as shown from some 1/32” music wire and glue to the bottom if the fuselage with thick CA. It is a good idea to reinforce the joint by laying a small section of Tyvek over the wire.

24. Insert the two 1/8” dowels into the holes in the fuselage. Center the dowels and glue with thin CA.
25. You may wish to paint the fuselage at this time. Paint is heavy so go easy.
26. Slide the horizontal stabilizer into the fuselage and glue with thin CA.
27. Attach the vertical stabilizer to the notches in the fuselage and glue with thin CA. Ensure the vertical stabilizer is straight.

28. Lay the 1/32” ply gear holder on the wax paper and position the 1/16” balsa gear holder as shown. Glue with thin CA.

29. Find the halfway point in the 1/16” music wire landing gear and bend it so that it fits in the gear holder.

30. Place the gear in the holder then position the second 1/32” ply over the assembly and glue with thin CA. Allow some CA to soak up into the assembly along the legs to harden the 1/16” balsa.

31. Measure in ¾” from each end of the gear legs and bend up so that they will be parallel to the ground.

32. Slide wheels over axle and retain with 3/16” long heat shrink tubing. Heat the tubing then set with a drop of thin CA, taking care to not get any CA on the wheels.

33. The gear slides into the fuselage and is retained by a 4-40 bolt.

**Final Assembly**

1. Glue the two control horns into the rudder and elevator. The rudder horn will be on the opposite side of the elevator horn. The elevator horn faces up.
2. Insert two servos into the servo mounts. Insert the Z bends of the pushrods into the servo control arms and mount the servo arms onto the servos so that they are centered. Use the outer holes in the servo control.

3. Cut two pieces of 1/32” music wire 2.5” long. On each one, make a 90 degree bend 1/4” from one end.

4. Slip a piece of 3/4” long heat shrink tubing over the tail end of the pushrods. Slide the long end of the L bend wire into the heat shrink and place the short end into the center hole of the horn. Flip the end of the pushrod over the horn then carefully shrink the heat shrink tubing.

5. Adjust the length of the push rods by sliding the L bend wire in or out of the pushrods until the tail control surfaces are straight back and lined up with the stabilizer. Carefully secure the wires in position with a drop of thin CA. Ensure that the locking arm is in place – opposite the L bend.

6. Install receiver and speed control. The receiver is velcroed to the top of the battery mount and the speed controller is light enough to be suspended by its wires. Wire the speed control and servos to the receiver.

7. Slide the motor onto the motor mount and push it as far back as possible. Through the access hole in the top of the fuselage, drill a tiny pilot hole through the gearbox housing and into the motor mount. Use the small 3/8” long screw to secure the motor to the mount.

8. Rubber band the wing to the fuselage with at least 6 of the supplied rubber bands.

9. Check your control throws. The rudder should move ~1.5” from center to each end measured from the furthest point back. The elevator should move .75” – 1” up and down from center.

10. Set your throws for 1” (low rates) to 1.75” (high rates) total distance, end to end, measured at the furthest point out on the ailerons (by the fuselage).

**Flying**

Attach the wing to the wing mount with around 6 rubber bands. Check that none of the control surfaces are binding and that everything, including the battery, is secure.

Before you fly the Dandy, check that the control surfaces move the correct directions. Always check the directions while you are behind the airplane. I highly recommend that you check the control surfaces before EVERY takeoff.

The center of gravity (CG) should be from the trailing edge of the wing spar to ¼” behind the spar. With the battery installed, place a finger on each side of the fuselage just behind the spar and lift the Dandy. It should balance there. If not, adjust the battery forward or backwards till the CG is correct.

For your first flight, be patient and wait for a calm day. Choose a large field where you have a smooth surface to use as a runway. Set the plane down pointing away from you. I would say to point it into the wind but it’s a calm day, right? If everything goes well, applying full power will result in a short rollout and a rapid climb with little to no need to trim the plane. Initiate turns slowly till you get used to the way the Dandy flies.