

# T&J Models

R/C Model Designs By Jim Young

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## de Havilland D.H.-88 Comet



### Introduction

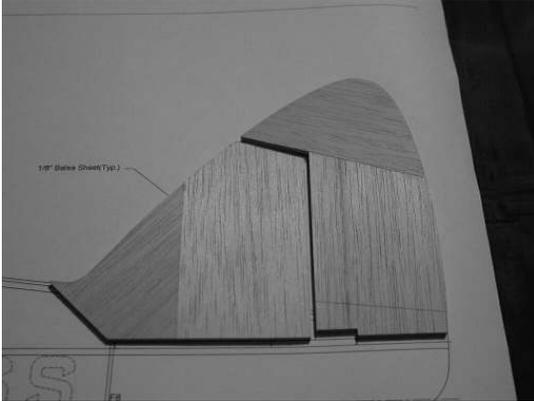
The de Havilland DH-88 Comet was a purpose built racer for the England to Melbourne race. Three Comets were entered in the race, two finished placing first and fourth. The third racer, Black Magic, was leading the race when it burned up it's engines after getting the wrong fuel in Allahabad. Apparently it was so far ahead of the pack, that their refueling crew did not expect them so early. The airfield crew on hand did not speak any English, and they put the wrong fuel in the plane. The Grosvenor House went on to win the race.

The outline of this model is quite accurate, with the exception of the wing tips which have been enlarged for better flight characteristics. Construction is of typical balsa and plywood. So, let's get started and build some history.

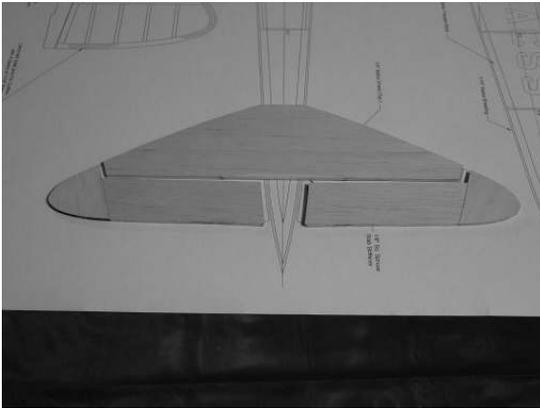
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### Tail Feathers

The tail feathers supplied are built from solid 1/8" balsa sheet. An optional built up structure is shown on the plans. The original Comet had fabric covered tail feathers, so if you want to keep a scale appearance it may be worth the extra effort to frame it.



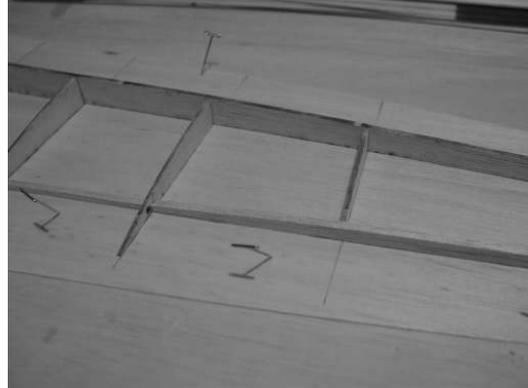
If you want to use rudder control, separate the rudder from the fin extension along the score line. The fin extension is glued to the rest of the fin assembly.



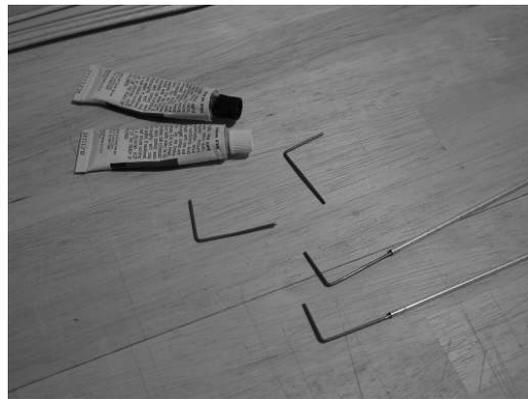
The elevator tips are not symmetrical, so line all of the pieces up and make sure they are right before gluing. The elevator halves are joined with a piece of 1/16" music wire. Do not glue the halves together at this time. This will be

done later when the tail is assembled to the fuselage. The stabilizer has a piece of 1/8" square spruce embedded in the trailing edge. This provides some additional strength. Sand all the pieces, round the leading and trailing edges, and set them aside.

### Wing



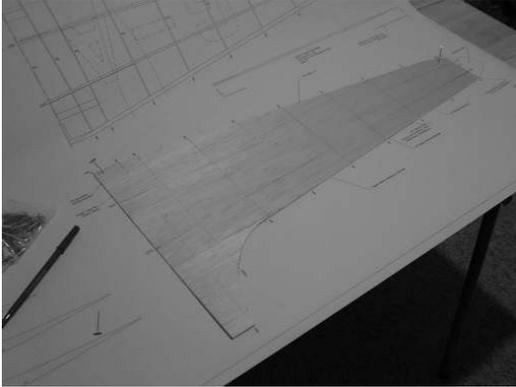
Cut the two wing joiners WJ1 from 1/64" plywood. Glue the wing joiners to one of the main spars. Cut 1/8" square balsa for the rear spar. Add a 1/8" square balsa doubler to the rear spar from R6 to R10. The doubler should taper down from R7 to R6.



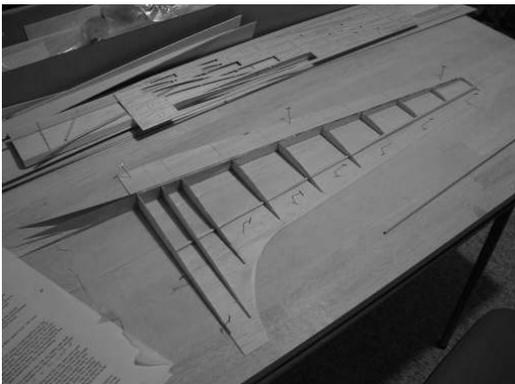
1/8" aluminum tube torque rods drive the ailerons. Cut two tubes 14 1/4" long being careful not to bend or kink the tube. Cut and bend 1/16" music wire as shown on the plans. Each piece of

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music wire should have a slight bend in it where it is inserted in the aluminum tube. The bend should be enough so the wire does not rattle around in the tube, but not too much where it deforms the tube. Clean the tube and wires with alcohol and scuff them with sand paper. Epoxy only the aileron end piece into the aluminum tube at this time.



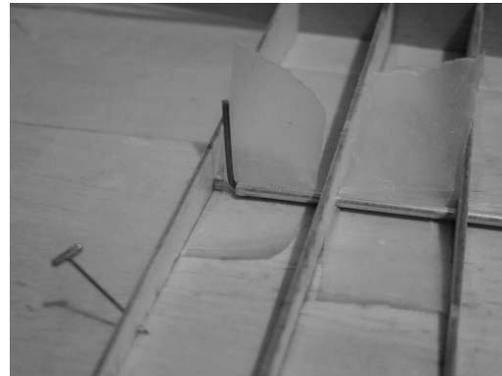
The wing is entirely sheeted with 1/16" balsa. Glue 1/16" balsa sheet together for the wing skins. Cut the lower sheeting to the outline of the wing and mark the locations of the spars and ribs using the guides provided on the plans. The sheeting can be left over size at the leading edge. Taper the trailing edge of the sheeting as shown on the plans. The easiest way to do this is to place masking tape at the taper line, line up the trailing edge with the edge of your workbench, and sand it down. Pin the sheeting to the board from the main spar aft.



Glue the main spar assembly to the wing sheeting. Without gluing, use the rear portion of R2 to R10 to position the 1/8" sq. balsa rear spar. Once everything is lined up, use thin CA to glue the spar and ribs in place. Note that the rear portion of R1, R2, and R3 is not flat. Use scrap balsa under the sheeting to bring it up to the ribs.



Thread the torque rod assembly into the holes in R7 to R2.



Protect the wing sheeting between R1 and R2 with wax paper and epoxy the 1/16" music wire root end into the aluminum torque tube.

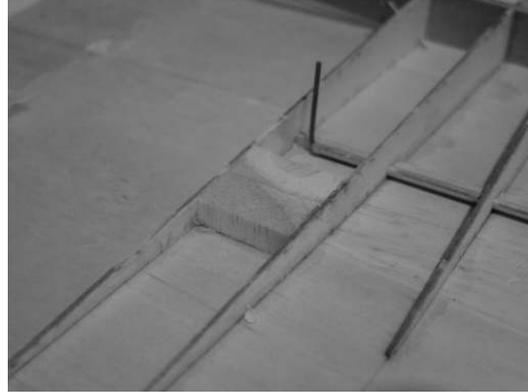
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Frame in the aileron with 1/8" balsa for the L.E. and 1/4" balsa for each end. Notch the leading edge for the torque rod. Offset the end pieces 1/32" from R7 and R10. Use scrap balsa to reinforce the torque rod in the aileron but do not glue the torque rod to the aileron at this time. Glue in the aileron portions of R8 and R9. Mark the location of the aileron with pin holes in the lower wing sheeting.



Keeping the rear portion of the sheeting flat on the board and the main spar square to the sheeting, glue the forward portion of R1 to R10 to the main spar ONLY. Use scrap balsa under the front lower sheeting to bend it up to meet the ribs. Use thin CA to glue the sheeting to the ribs. Install a paper tube between R2 and R3 for the motor wires.



Add the vertical grain balsa block wing mount between R1 and R2. Trim the L.E. of the lower sheeting flush with the front of the ribs.

Remove the wing assembly from the board. Cut a hole in the bottom sheeting near R4 for the motor wires.



Using the washout jig under R10, re-pin the assembly to the board. Use a shim under the trailing edge at each rib location to create a gradual twist in the wing from R4 to the tip. The upper wing sheeting runs from R2 to R10. Cut and glue the upper wing sheeting in place.

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Remove the wing assembly from the board and build the other half onto it. One wing tip should be blocked up 2 1/2" to set the dihedral. Add scrap balsa reinforcement to each side of the R1's to make a pocket for the wing mount dowel. After the second half is sheeted, the center top wing sheeting can be cut to size and glued in place from one R2 to the other R2.

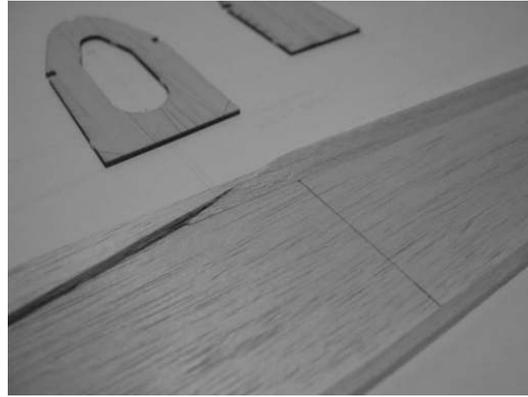
Cut and install the 1/4" balsa leading edge and sand to shape. Add the balsa block wing tips and carve to shape. Cut the ailerons from the wing, bevel the L.E., and temporarily hinge it to the wing. Glue in the 1/8" wing mount dowel.

### Fuselage

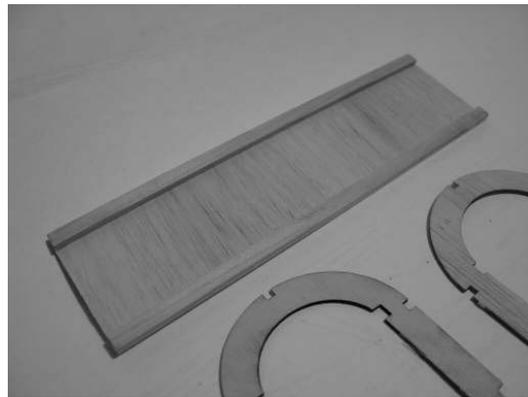


Cut out two fuselage sides from 1/16" balsa. Mark the locations of the formers. Glue the 1/8" square balsa stringers

along the top edge and the lower front of the fuselage sides (I won't remind you to make a right and a left side). All of the fuselage formers are keyed to this stringer, so make sure it is straight.



Add FS1 to each side. FS1 butts up to the top of the stringer on the lower front and is even with the bottom of the side at the rear.



Add the 1/4" balsa triangle stock as shown. Assemble the battery tray from 1/16" cross grain balsa and 1/8" x 1/4" spruce. Add the 1/8" square balsa rear side stiffeners as shown on the plans.

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Glue F3, F4, and F5 to one side. Insert, but do not glue, the battery tray into F3, F4, and F5 being careful with F4. Glue the other side to F3, F4, and F5. The battery tray will help keep F4 from being crushed during this stage.



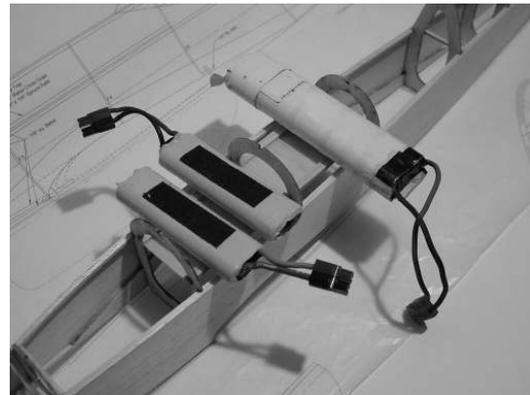
Glue in F6, F7, and F8. Cut and glue in place 1/8" square balsa cross braces for F6 and F7.



From the plans add the rear 1/8" square balsa cross braces at the tail. Sand the triangle stock to shape at the tail. Square up the tail and glue the two fuselage sides together.



Cut and glue two 1/8" square balsa cross braces to F2. Glue F2 in place. You may need to wet the fuselage sides and use some rubber bands to hold the sides together. Glue F1 in place and use some more rubber bands to hold the fuselage sides together.

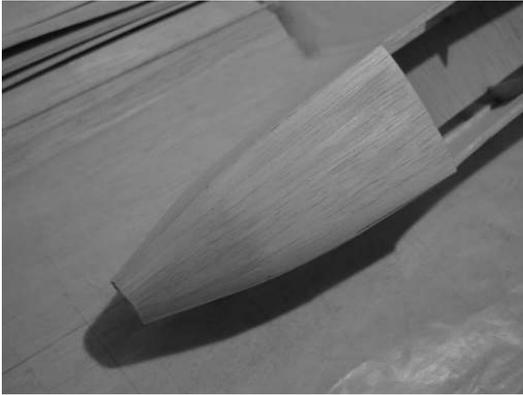


Square up the fuselage upright over the plans. Make any final adjustments and glue the battery tray in place. Laminate the two WM1's together and glue in place.

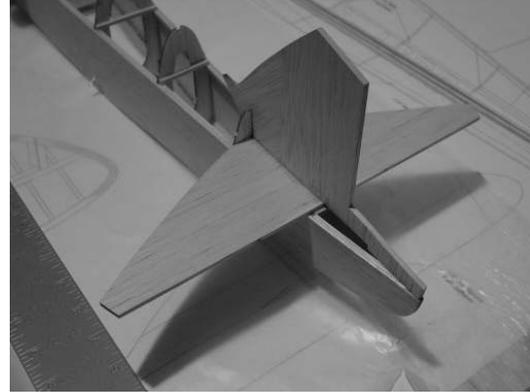
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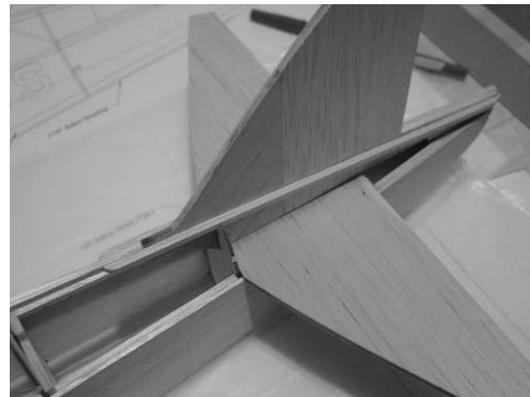
Cut 1/16" cross grain balsa for the lower rear sheeting and glue in place. Check the alignment of the fuselage with the plans as you go.



Add the 1/8" square balsa lower stringer from F1 to F3. Plank the lower nose with 1/16" balsa strips, again checking the alignment with the plans. If you have to wet the planking, pin it in place and allow it to dry before gluing. This will prevent the bottom from being pulled in as the wood dries and shrinks.

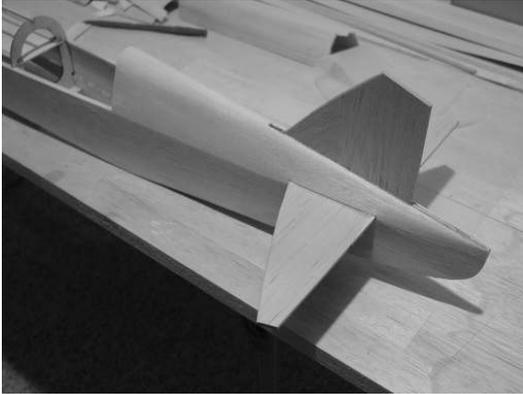


With the fuselage squared up over the plans, glue the stabilizer and fin assembly in place. The slot in F8 should be sufficient to hold the fin square to the stabilizer.

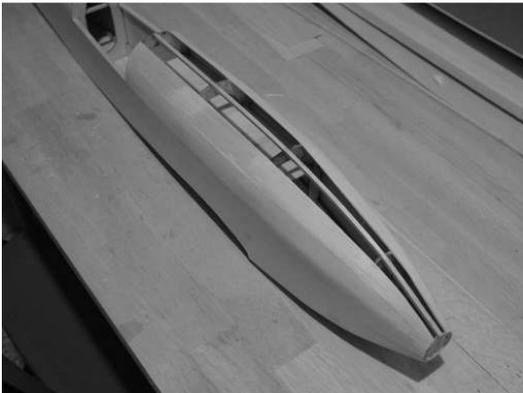


Glue in the 1/8" balsa top stringers in place. There are two stringers that flank the fin and tie the top stringer and fin together. These stringers also provide a gluing surface for the turtle deck sheeting. Round over these stringers so the sheeting will lay over them smoothly.

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Tape the 1/16" music wire elevator joiner to the trailing edge of the stabilizer. For an internal control, silver solder a control horn to the joiner and connect a control rod now. The turtle deck sheeting can be applied in two pieces. Wet one side of some 1/16" balsa sheet and tape it in place over the fuselage and allow it to dry. True up one edge of the sheeting and cut a notch for the stabilizer. Glue the sheeting to the top of the fuselage side. Working slowly, trim an opening to clear the fin. Once the sheeting will fit neatly around the fin it can be glued to the formers and stringers. Trim the sheeting to the center of the top stringer and the side of the fin extension. Repeat for the other side.



The forward upper portion is planked with 1/16" balsa. Patterns for planking this with 6 pieces are on the plans. When planking this compound curved

surface, you will need to wet the balsa. Cut the pieces slightly over sized, wet them down, and pin or tape them in place on the model. Wrapping them with an elastic bandage also works well. Do not glue them in place at this time. If you glue them in place, as they dry the wood will shrink causing the portions between the formers to be pulled in. When the sheeting is dry, trim them to fit and glue in place with a sandable glue. Add the balsa block nosepiece and carve/sand to shape. Add the 1/16" balsa upper fuselage side between F4 and F5.

Fit the wing to the fuselage. Trim the wing saddle if necessary for a good fit. Align the wing to the fuselage and pin or tape it in position. Drill the wing mount hole through the wing into WM1 for the 6-32 wing mounting bolt. Tap WM1 for 6-32 threads and open up the hole in the wing for clearance. Harden the threads with thin CA.

With the wing attached, round the lower rear fuselage corners and blend them into the wing.

### Nacelles

Cut four nacelle sides from 1/16" balsa. Add the 1/8" square balsa stringers to the sides. Make two right and two left sides. Taper the stringers at the rear of the nacelles as shown on the plans. Glue the two nacelle sides together at the rear, holding them up side down over the plans to keep them square. Position the assembly upright over the plans to align N2 and glue it in place. Wet the sides and use rubber bands to wrap them around N1. Square up N1 over the plans, and use thin CA to glue it in place.

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Fill in the lower front of the nacelle with balsa block. Glue the 1/2" balsa nacelle bottom in place and carve/sand the nacelle to shape. Repeat these steps to build the other nacelle.

### Final Assembly

Final sand the wing and mark the nacelle centerline on the bottom of each wing. Fish the motor wires through to each nacelle. Line up the nacelle on the wing with N2 flush against the leading edge. Tack glue them in place and check the alignment.



Make any necessary adjustments before permanently gluing the nacelles in place. Install the motors and connect the wires. When everything is set, glue in the 1/8" balsa N3 and plank the top of the nacelle with 1/16" balsa. Protect the wing with masking tape while you final

shape and sand the nacelles. If motor service becomes necessary, an access hatch can be cut in the inboard side of the nacelle behind N2.



Cut two 1/64" plywood launch grip sides as shown on the plans. Laminate 1/8" balsa between the two grip sides. Cut two slots in the bottom wing sheeting behind the main spar and on either side of the R1s. Insert the launch grip in the slots and make sure it fits tight up against the main spar. Glue the launch grip in place.

Any of the available iron on coverings are acceptable for this model. Install the radio and hook up the servos. The elevator servo is installed in the rear of the battery tray. The receiver is secured to the fuse side with some Velcro in the cockpit area. The recommended control throws are listed on the plans. Position the battery pack to balance the model. A Velcro strap is used to secure it to the tray.

Trim the canopy to fit and install along with a pair of pilots.

### Flying

The full size Comets are not known for their great flight characteristics, only their speed. I have strived to make this

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model easy to fly, but it does require some skill. The launch grip helps tremendously with the launch. However, since it is below the C.G. it can cause the model to pitch up with that final push. We finally figured out that we need to keep one finger behind the grip to prevent this during the launch. With that said, the Comet needs a gentle, running launch into the wind. Power from the two Speed 400 motors is more than adequate. Most aerobatics can be performed with half throttle.

I would suggest that for your first flight you climb to altitude and check the low speed stall characteristics. I found that in a stall the Comet will drop a wing tip, but will recover with little loss of altitude. It does have a high speed stall, but you really need to bank and yank it to get it to bite.

The Comet is capable of mild aerobatics (loops, rolls, Cuban eights, etc...). It has a very clean airframe, and can really pick up speed on the down line out of a loop or stall turn. However, keep on a bit of power to keep the elevator effective. Inverted performance is also good. It really looks cool on a high speed pass down the runway.

For landings, setup low and keep the turn onto final gentle to help keep away from a stall. Keep power on until you're over the threshold and keep the wings level. The nacelles are tall enough to keep the propellers from getting damaged. It seems to slide forever after touch down, but the design has proven quite durable.

While the Grosvenor House has been restored and is still exists intact, the other Comets were relegated to a

Portuguese mail route and met with various demises. Not a very glamorous ending for such beautiful, thoroughbred racers.

# DH-88 Comet

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