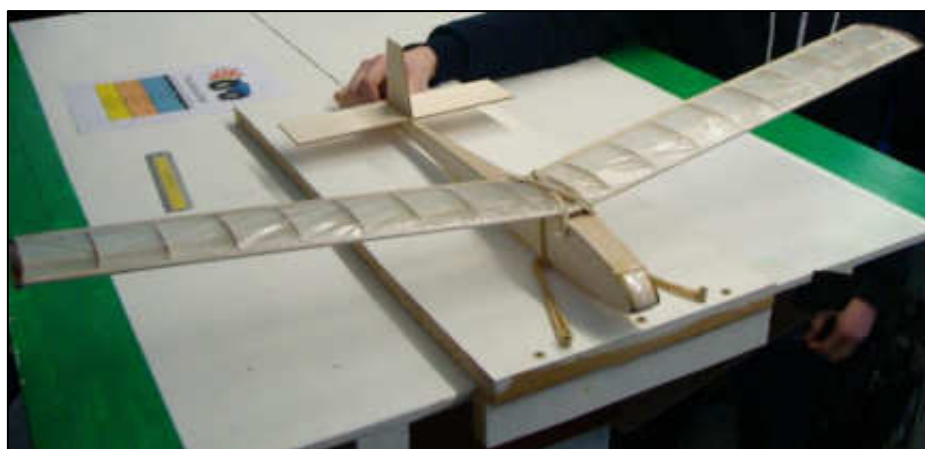
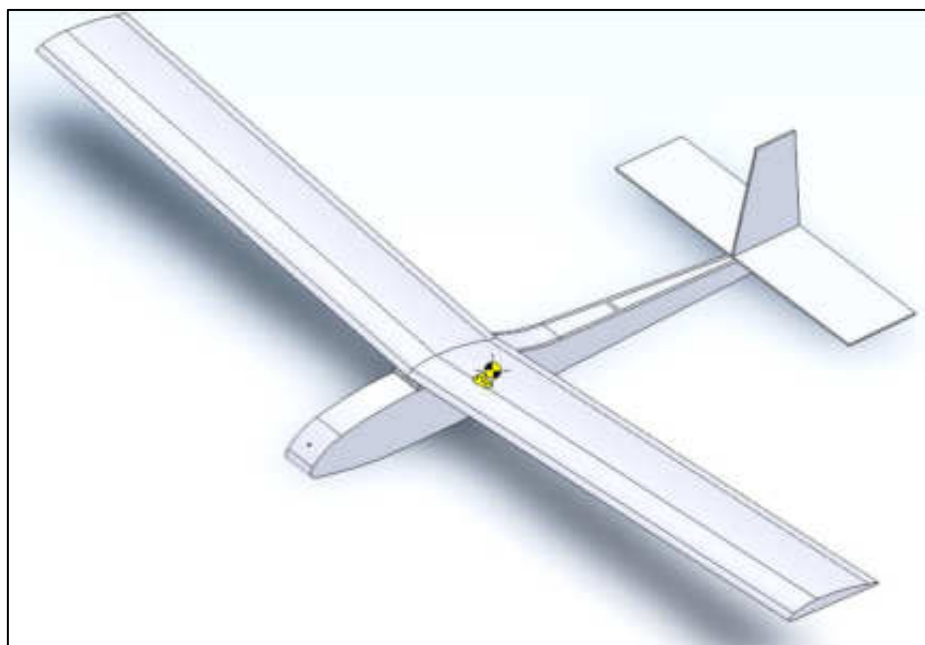




Construction of a Balsa Wood Model Glider



Instructions

The purpose of these guidelines is to illustrate how to assemble a model glider made from balsa wood parts which you have been supplied with. Please complete the assembly process in the following order:

1. Using a pen, a ruler and a set square, mark out the position of the ribs and the leading and trailing edges of the wing on a block of styrofoam, as shown in Figure 1. The rib spacing is 52mm and the distance from the leading to the trailing edge is 95mm (the dimensions are shown in Appendix 1 in this document).

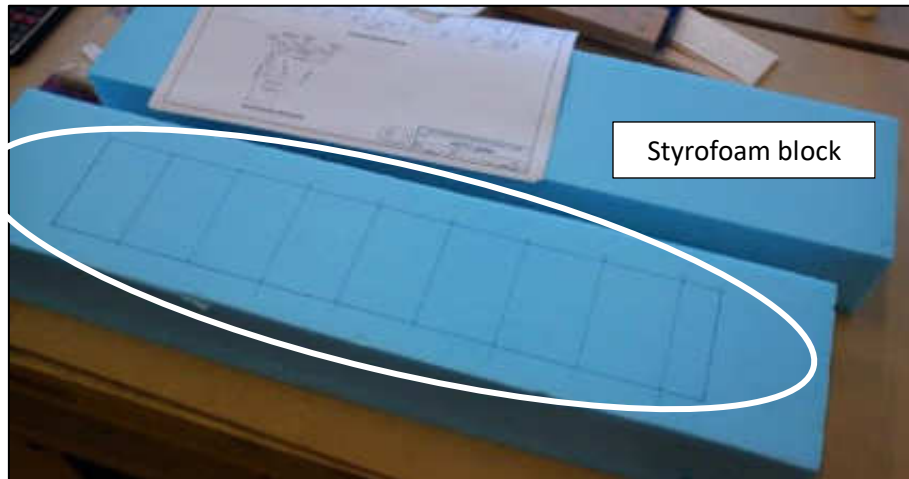


Figure 1: Marking the wing layout.

2. Lay a piece of clear plastic sheet over the Styrofoam. Using cocktail sticks, position the main ribs as shown in Figure 2.

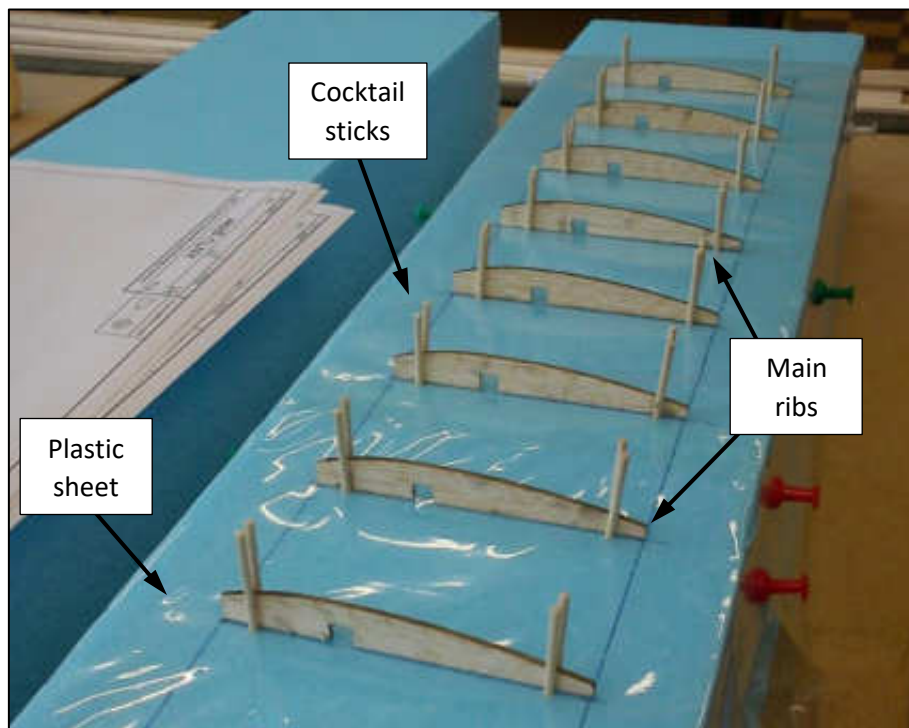


Figure 2: Positioning the wing ribs.

3. Use more cocktail sticks to locate the leading edge, the spar and the trailing edge, Figure 3.

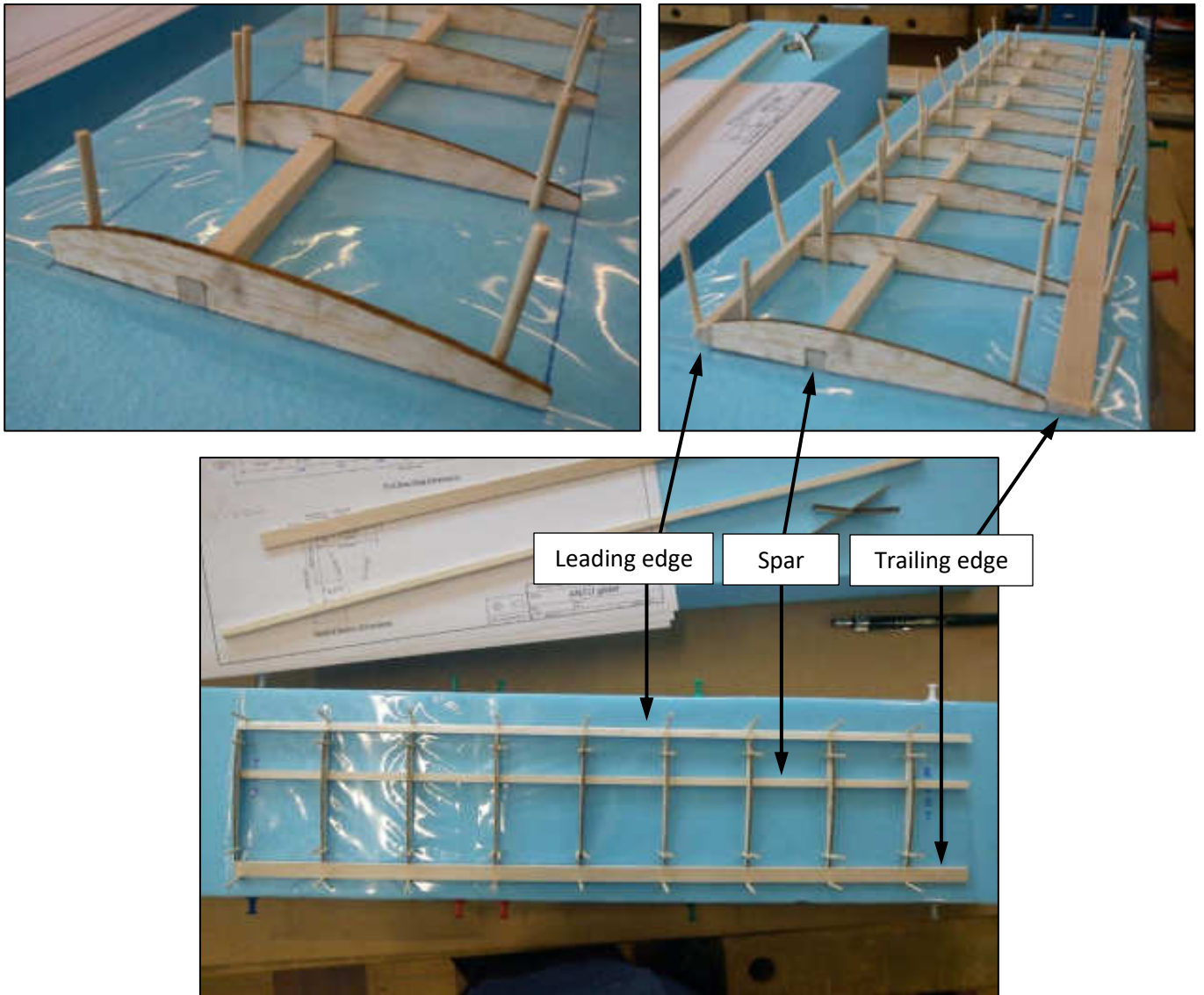


Figure 3: Positioning the spar and leading and trailing edges.

4. Locate the wing tip at the end of the wing, and use drawing pins to hold the trailing edge down onto the Styrofoam.

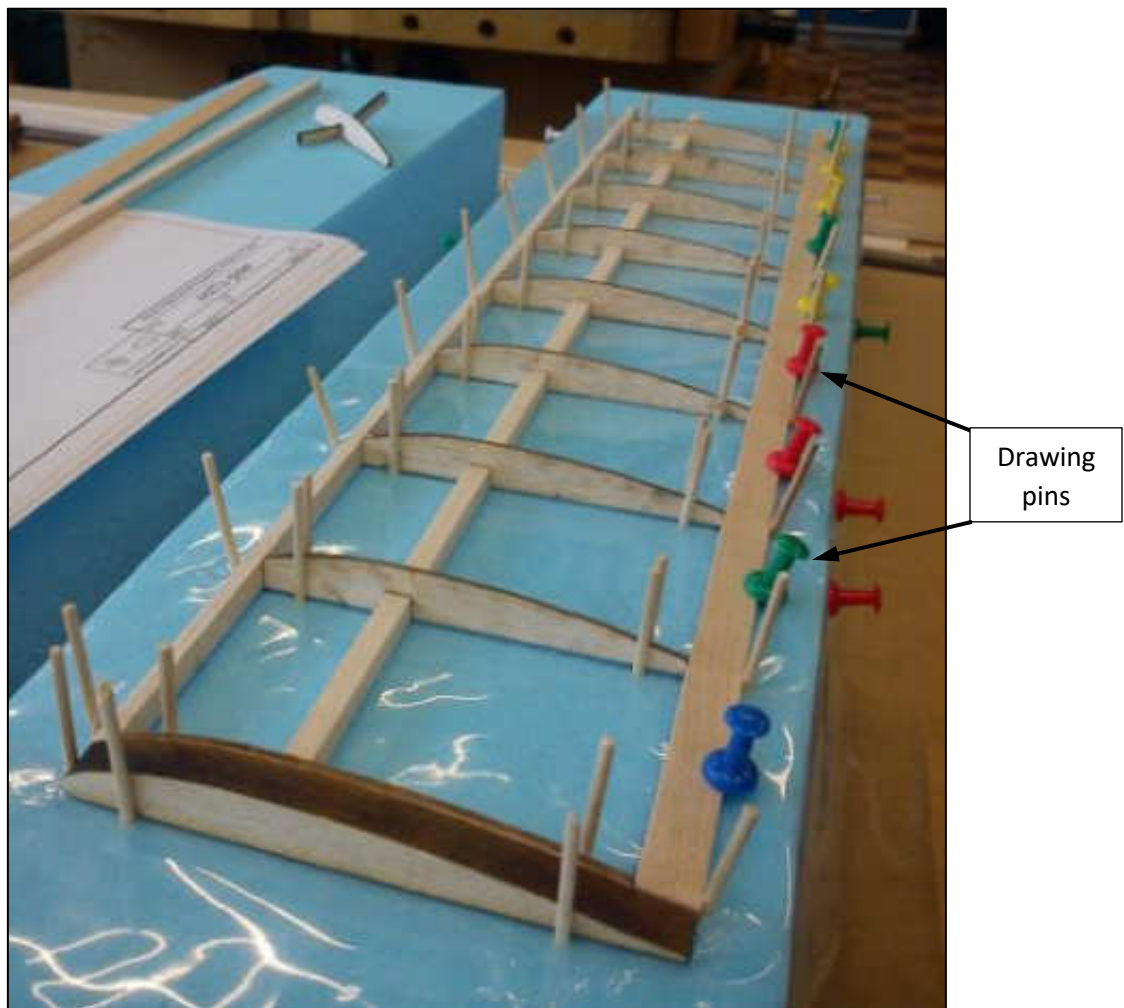


Figure 4: Positioning of the wing tip and holding the trailing edge in position.

5. Glue the ribs to the leading and trailing edges and the spar. Sequentially lift each rib, apply the glue to the relevant edges, then replace. You can use a cocktail stick to apply the glue. Ensure that the glue is smooth in the corners, Figure 5.

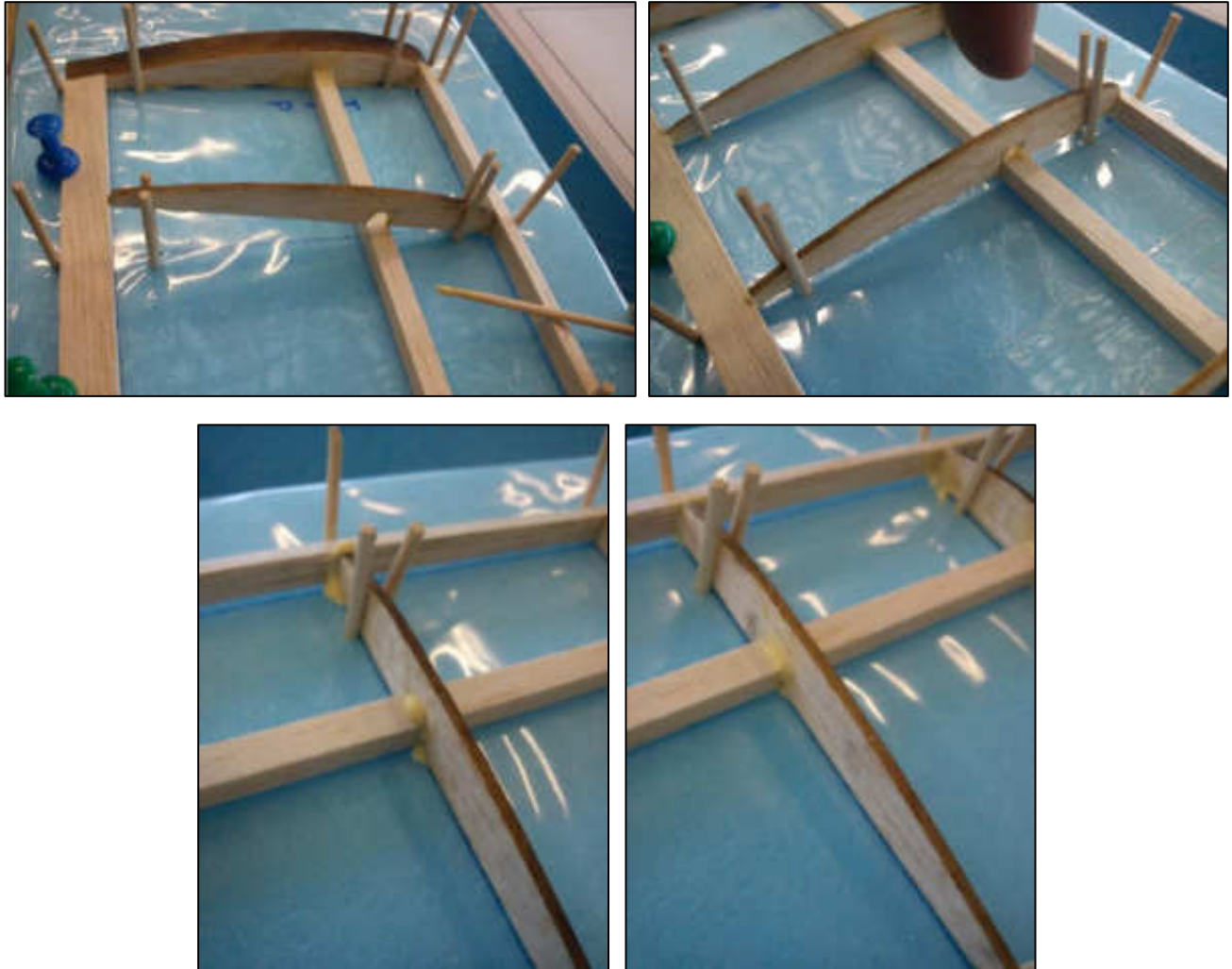


Figure 5: Glue each rib to the other wing components.

- Repeat steps 1-5 to create another wing which is a mirror image as shown in Figure 6.

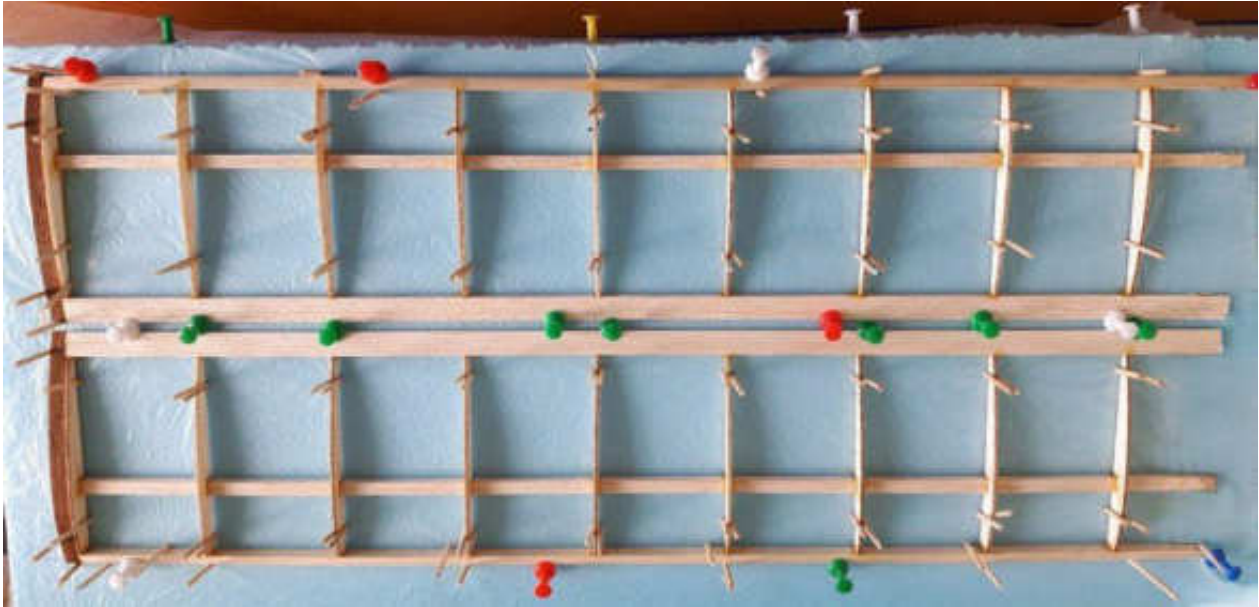


Figure 6: Both wings after they have been glued.

- Use trigonometry to raise the wing by tip 5° . Note that the angle is steeper in Figure 7 but you should use 5° for your design.

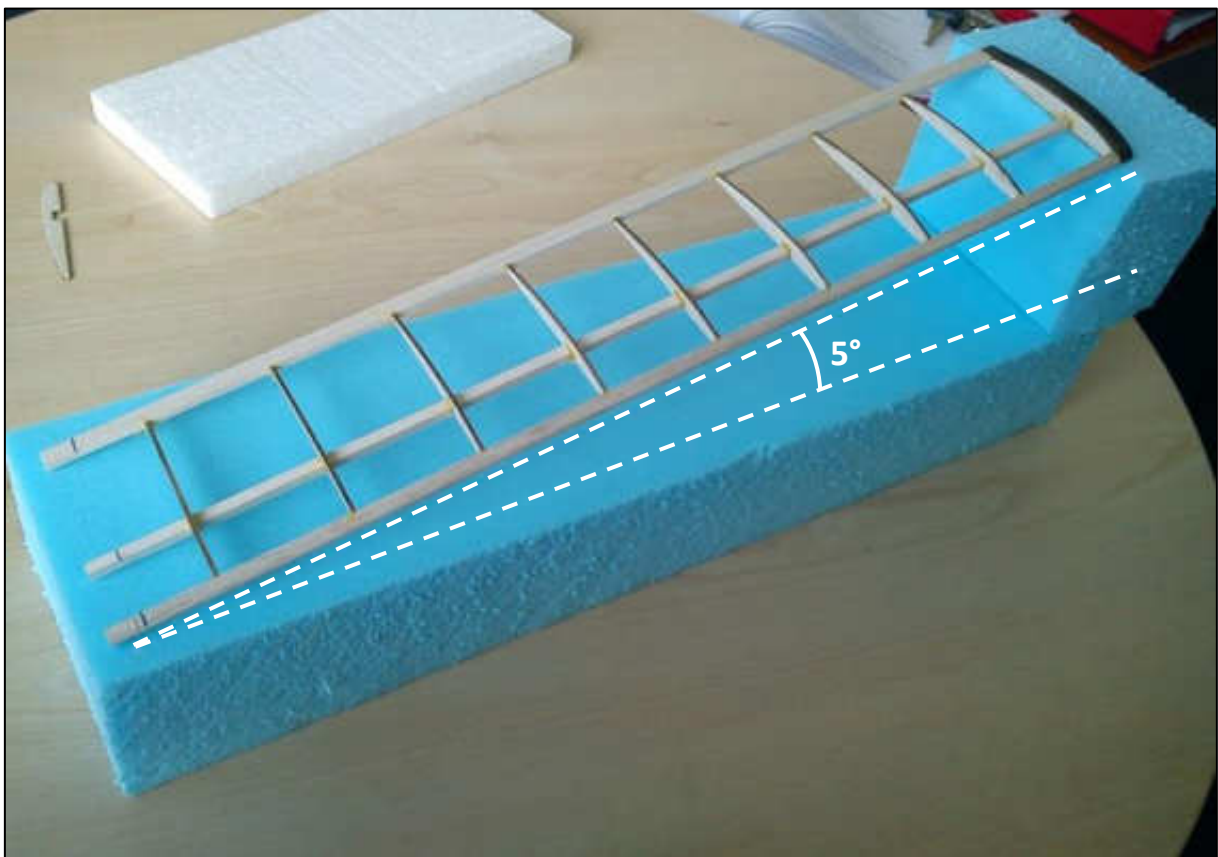


Figure 7: Raise the wing tip by 5° .

8. Use a pen and a ruler to mark the leading and trailing edges and the spar. The marks should be 453.5mm from the wing tip, see Appendix 1. Use a saw to cut most of the excess wood, but ensure that you leave some beyond the mark as shown in Figure 8.

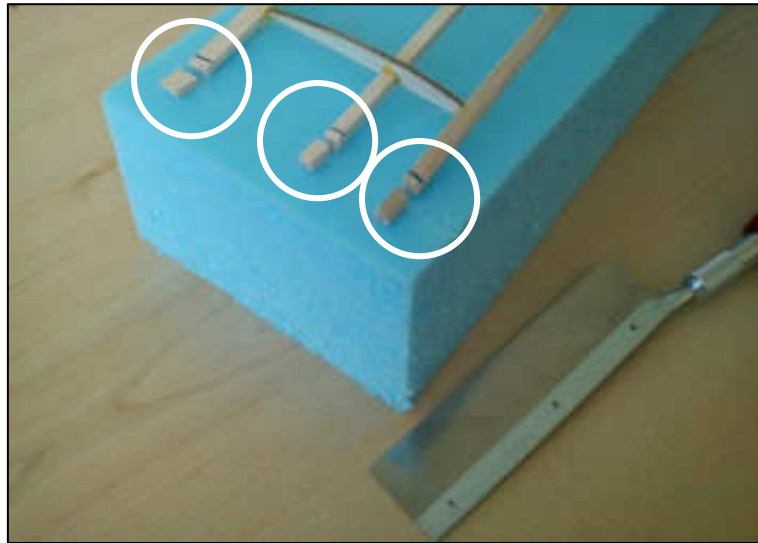


Figure 8: Mark the wing.

9. Using cocktail sticks, locate the central rib so that it is positioned vertically. Glue the rib in place as shown in Figure 9. Repeat for the second wing.

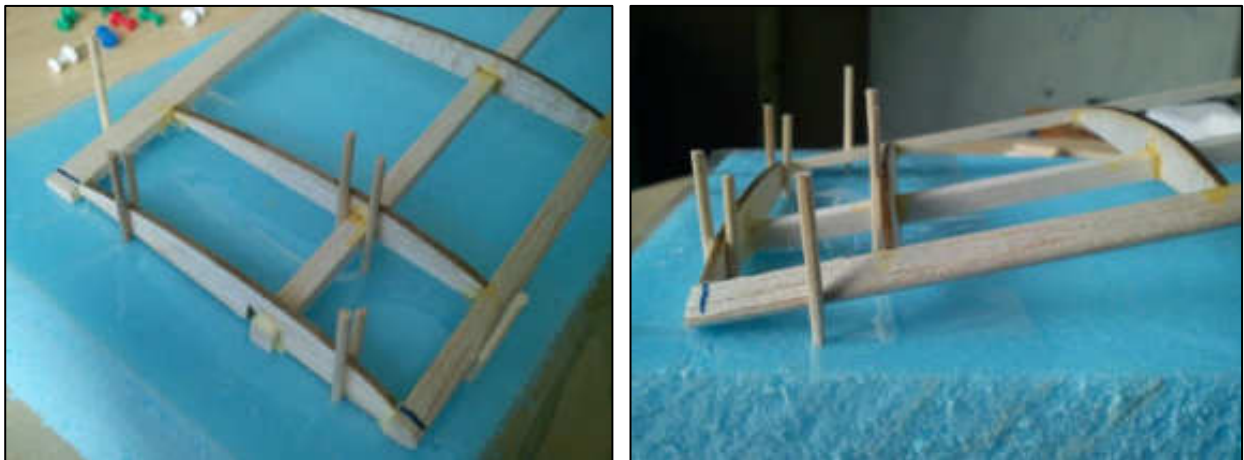


Figure 9: Position and glue the central rib.

10. Once the glue has dried, use the saw to remove the excess wood, Figure 10. Repeat for the second wing.

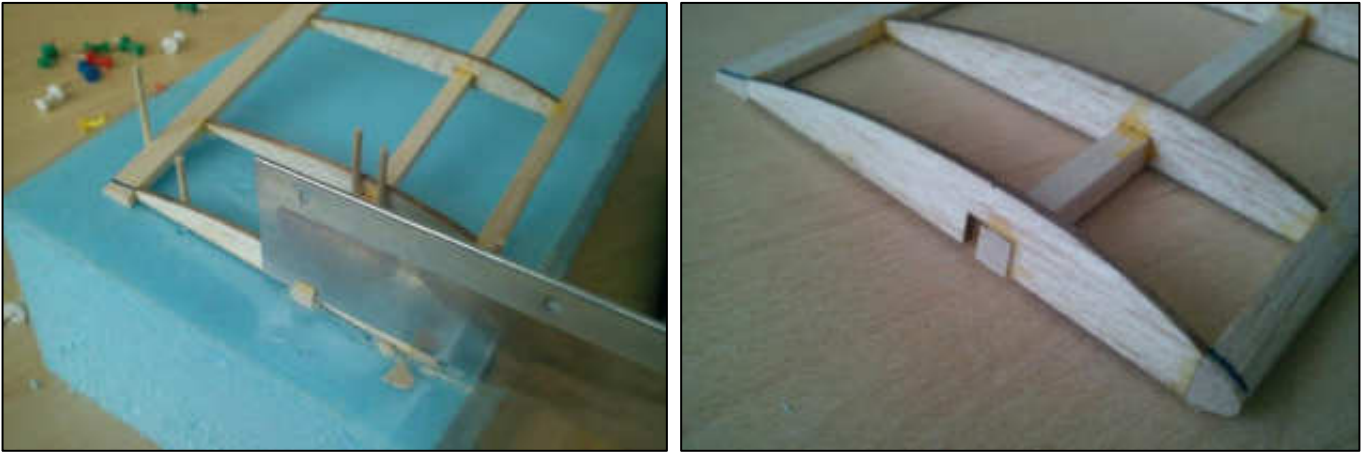


Figure 10: Remove excess wood from the wing root.

11. Use the central 'V' piece of wood to join both wings. Glue both wings together, applying plenty of glue to the central ribs and the 'V' piece. Use clamps to hold the wings together while the glue dries, Figure 11.

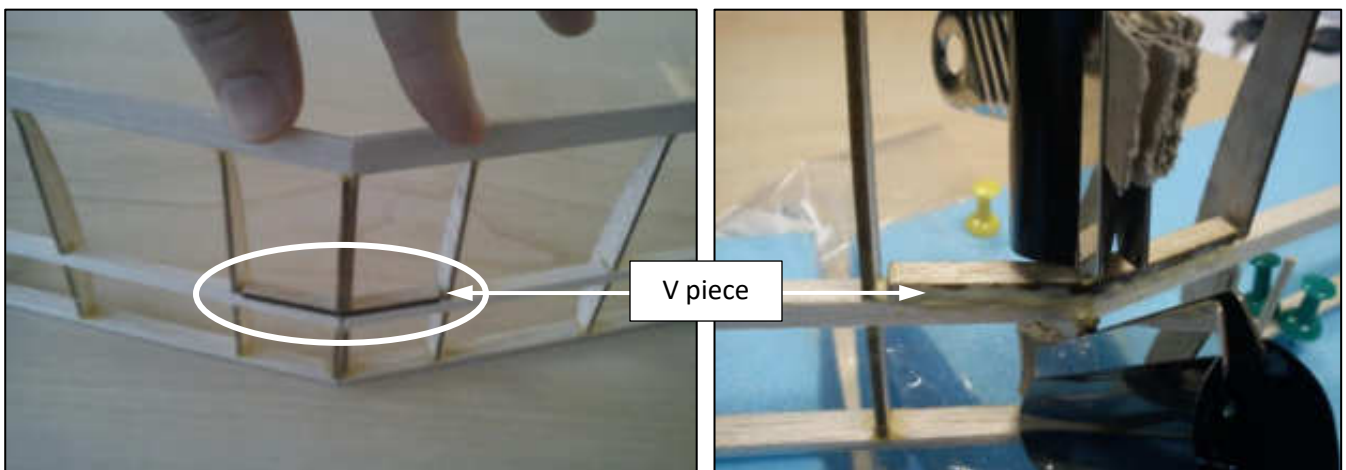


Figure 11: Glue the wings together using the 'V' connector.

12. Using a pen, mark the centre of the horizontal tail and use pins to hold it to the Styrofoam, Figure 12:

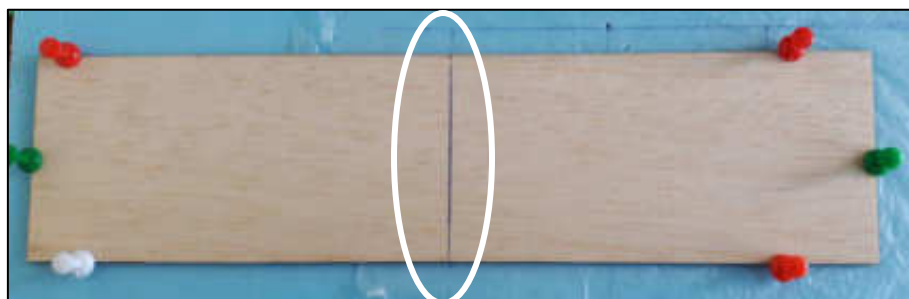


Figure 12: Mark the horizontal tail.

13. Using cocktail sticks to position the vertical tail, glue this to the horizontal tail, Figure 13.

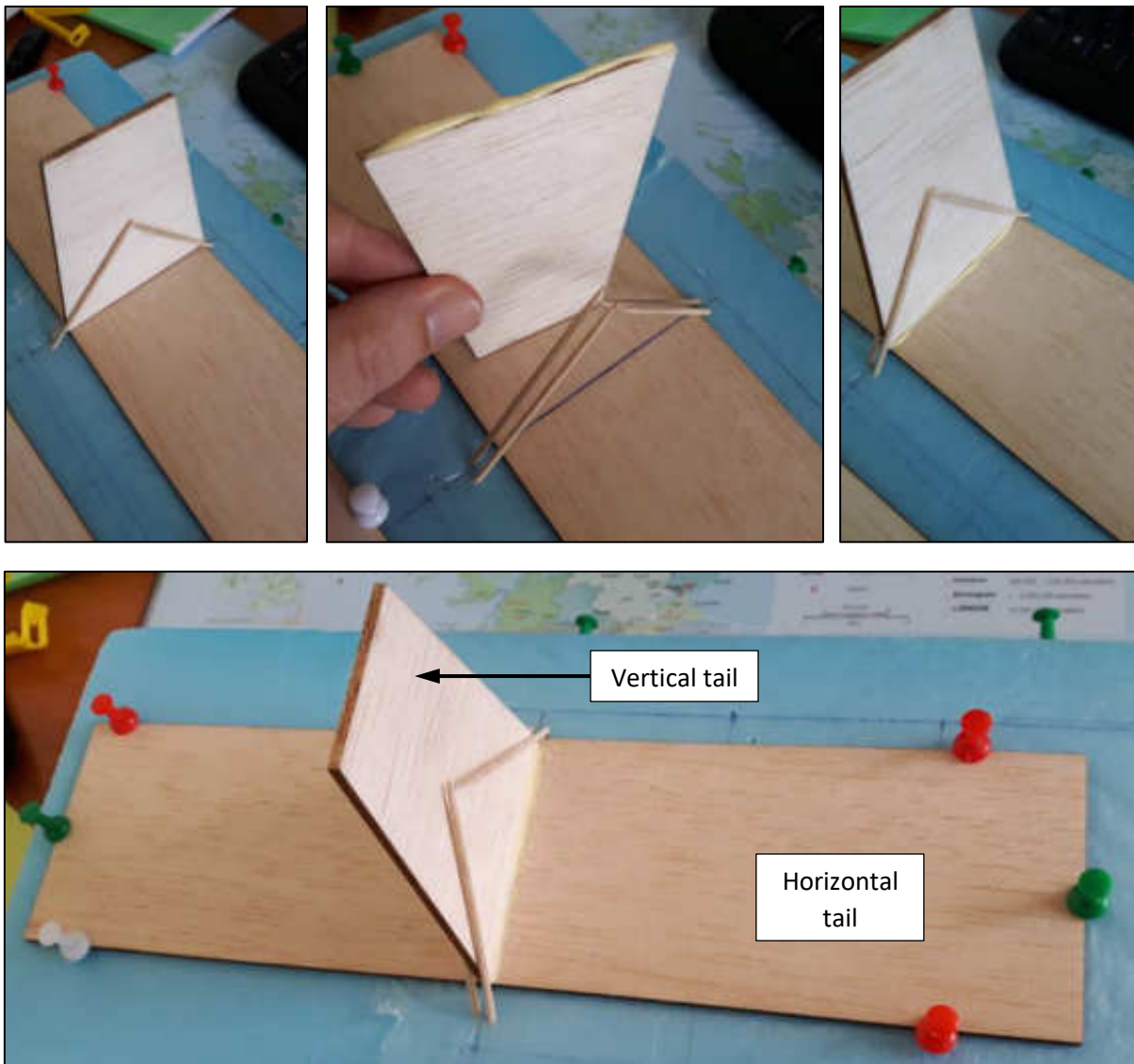


Figure 13: Glue the tail together.

14. Position one of the fuselage side panels on the Styrofoam and use a pen to draw lines locating the three bulkheads. You may need to refer to the engineering drawings in Appendix 1, Figure 14.

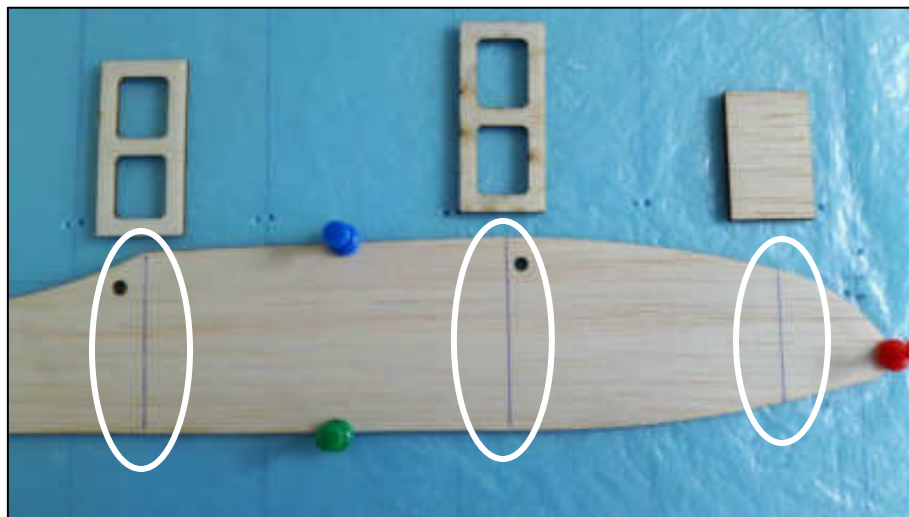
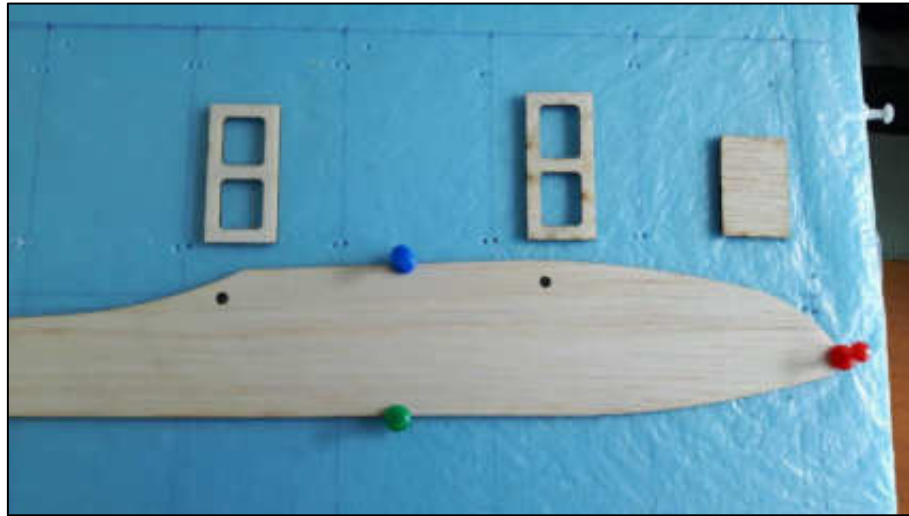


Figure 14: Mark the locations of the bulkheads on one fuselage side panel.

15. Use cocktail sticks to locate and glue each of the three bulkheads, Figure 15. Remove the cocktail sticks when the glue has dried.

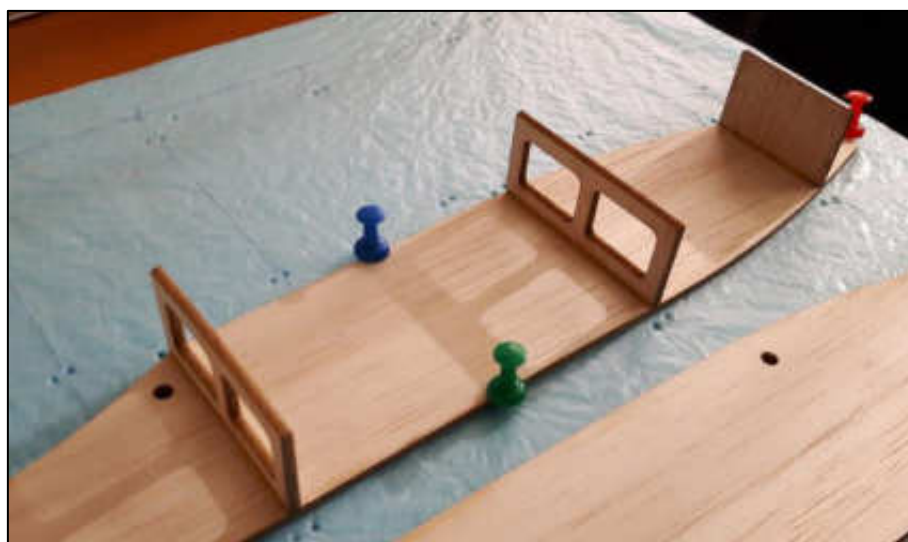
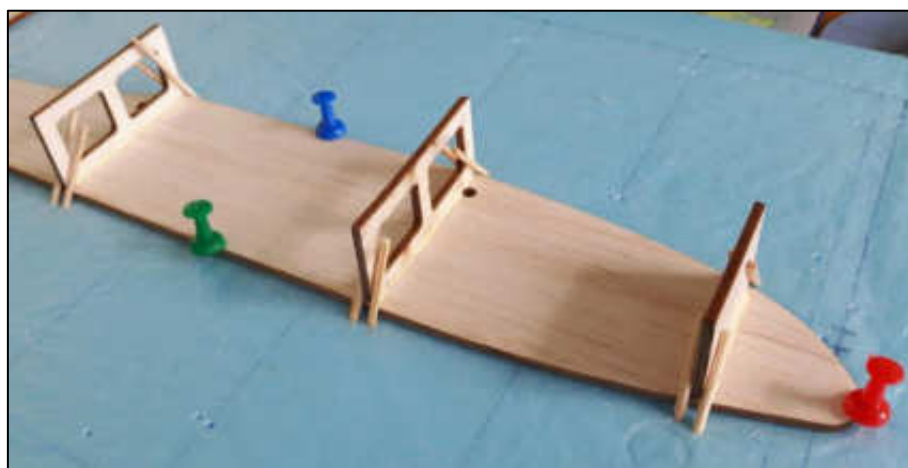
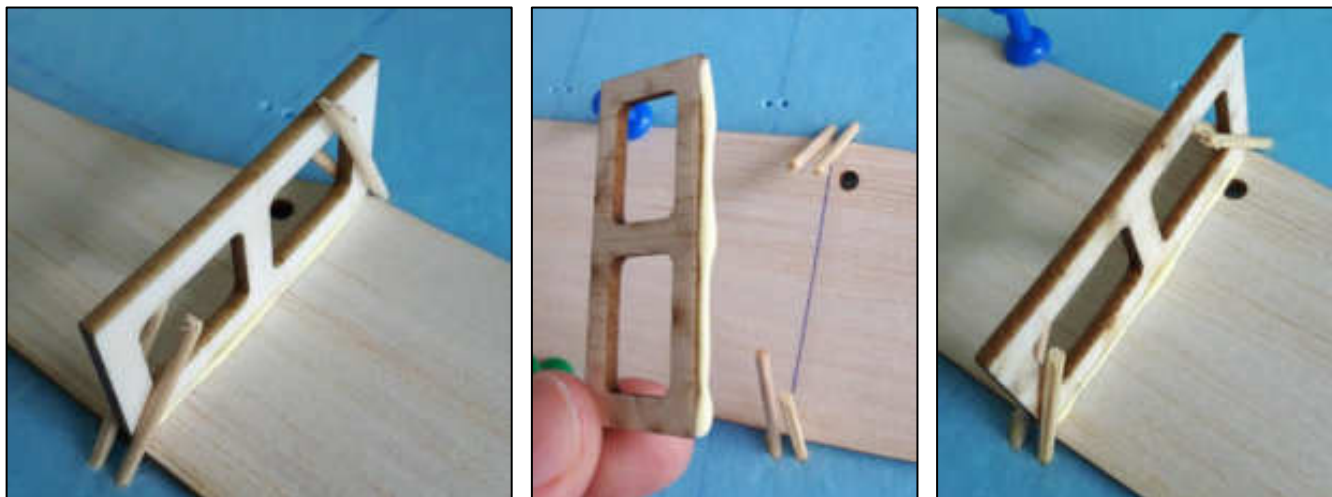


Figure 15: Glue the bulkheads to one fuselage side panel.

16. Apply glue to the tops of the three bulkheads and position the other side of the fuselage on top. Use a book or another object to apply pressure until the glue dries, Figure 16.

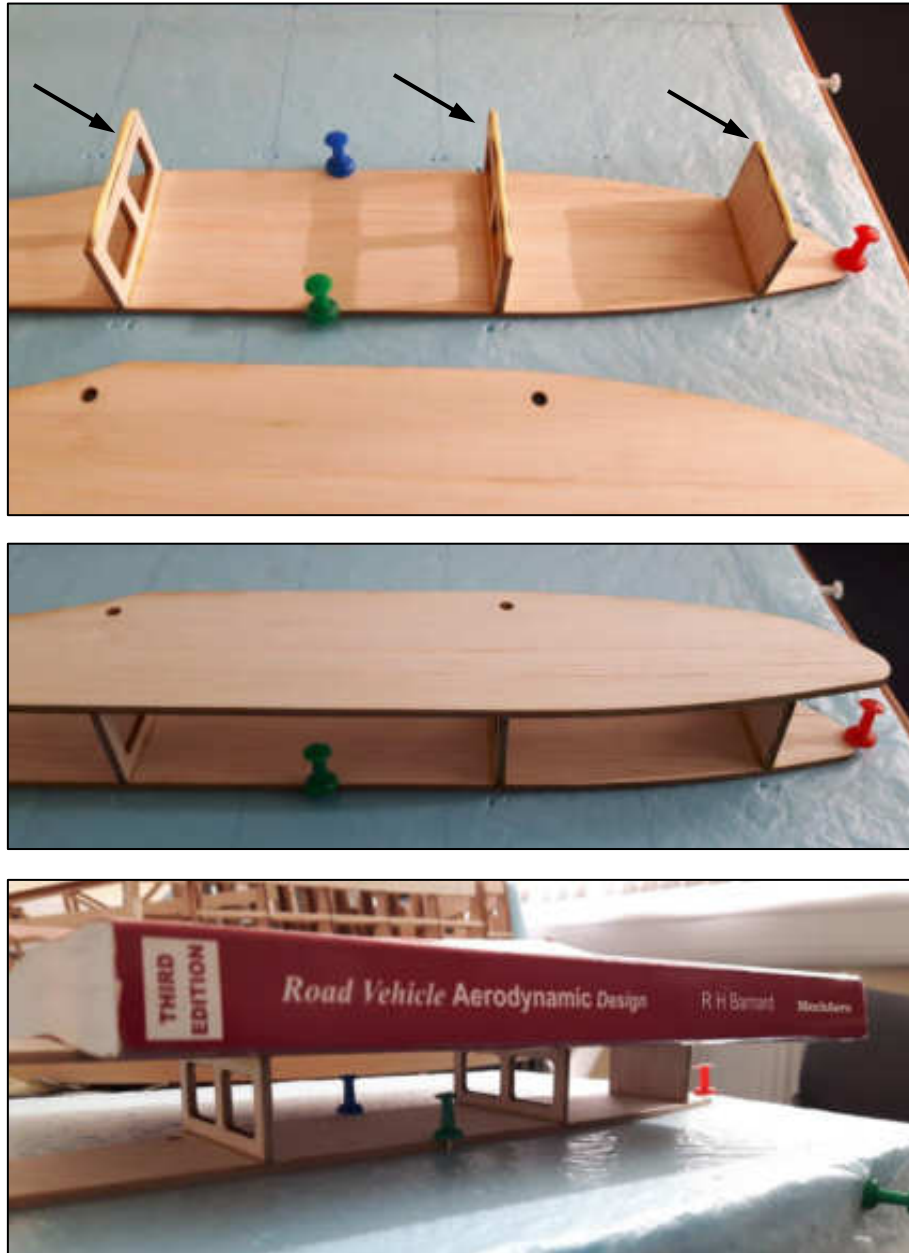


Figure 16: Glue the other fuselage side panel to the bulkheads.

17. Use a clamp and some glue to join the tail of the fuselage together. Remove the clamp when the glue has dried, Figure 17.



Figure 17: Gluing the tail together.

18. Use two pieces of thin balsa wood to create the top and bottom skin of the fuselage. Use a knife to trim the excess wood, Figure 18.

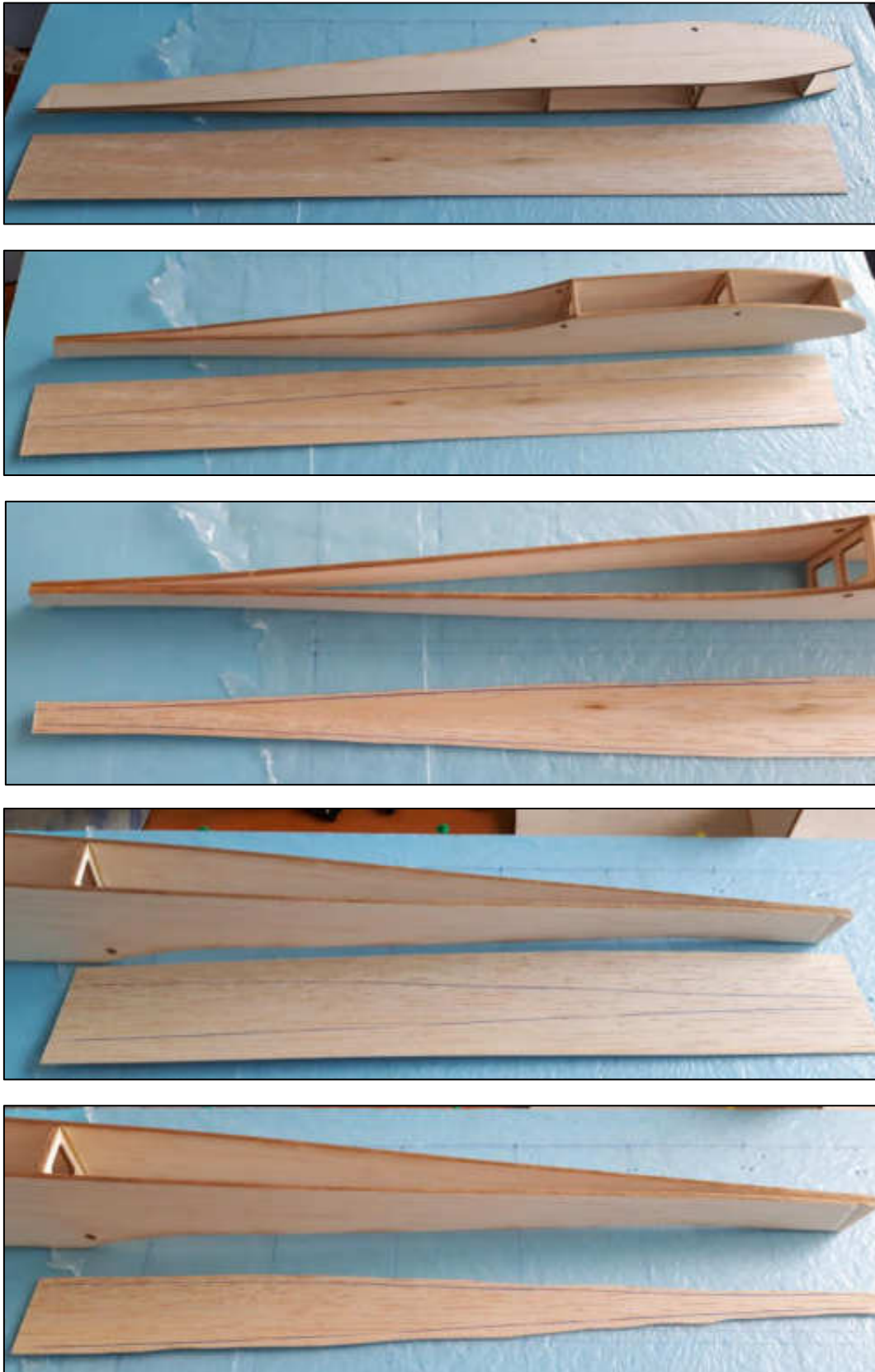


Figure 18: Create the top and bottom fuselage skins.

19. Apply glue to the bottom of the fuselage and position it over the bottom skin, Figure 19.

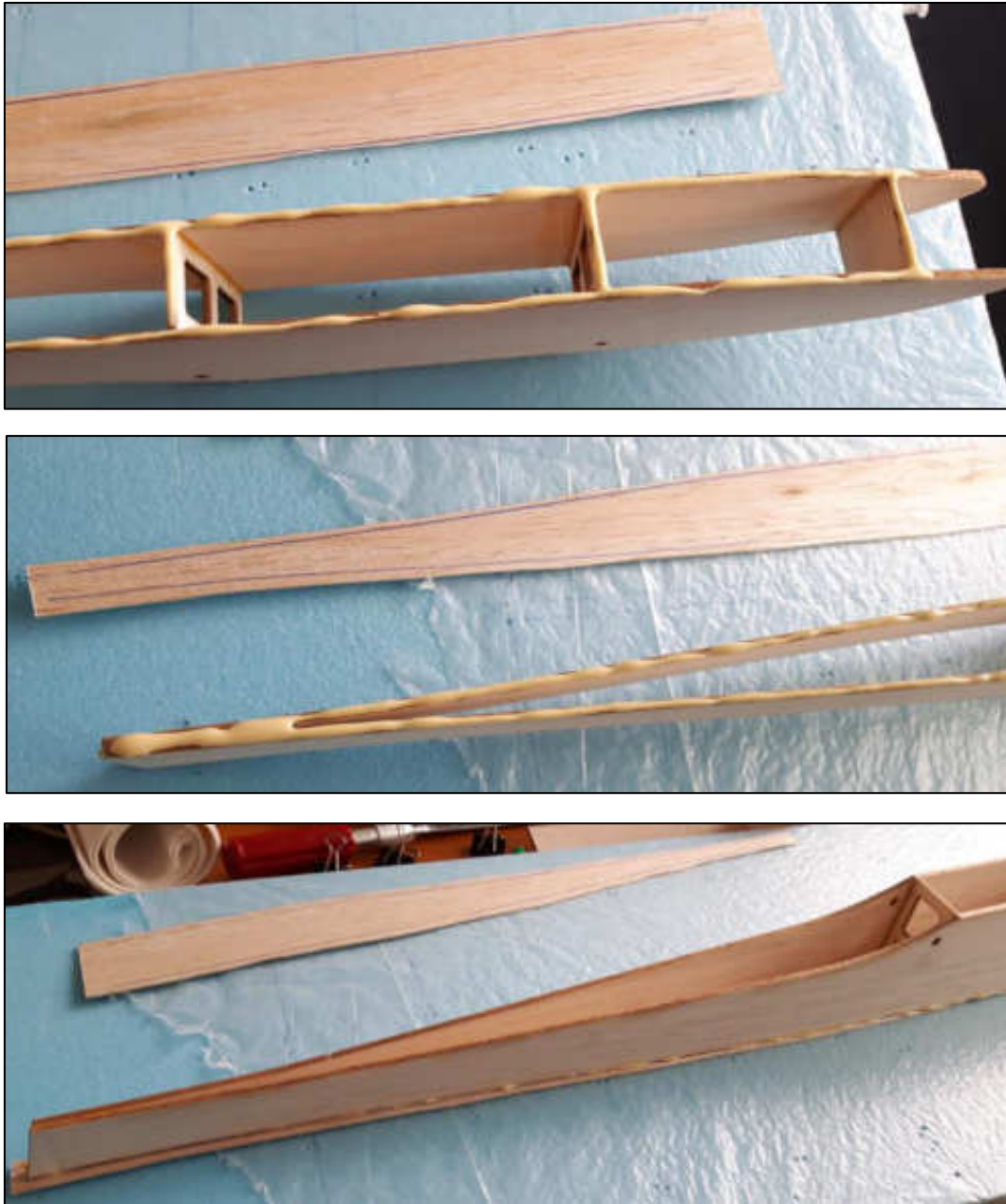


Figure 19: Glue the bottom skin to the fuselage.

20. Apply glue to the top of the fuselage and position the top skin above it, Figure 20.



Figure 20: Glue the bottom skin to the fuselage.

21. Use elastic bands to hold the top and bottom fuselage skins to the fuselage before the glue dries.

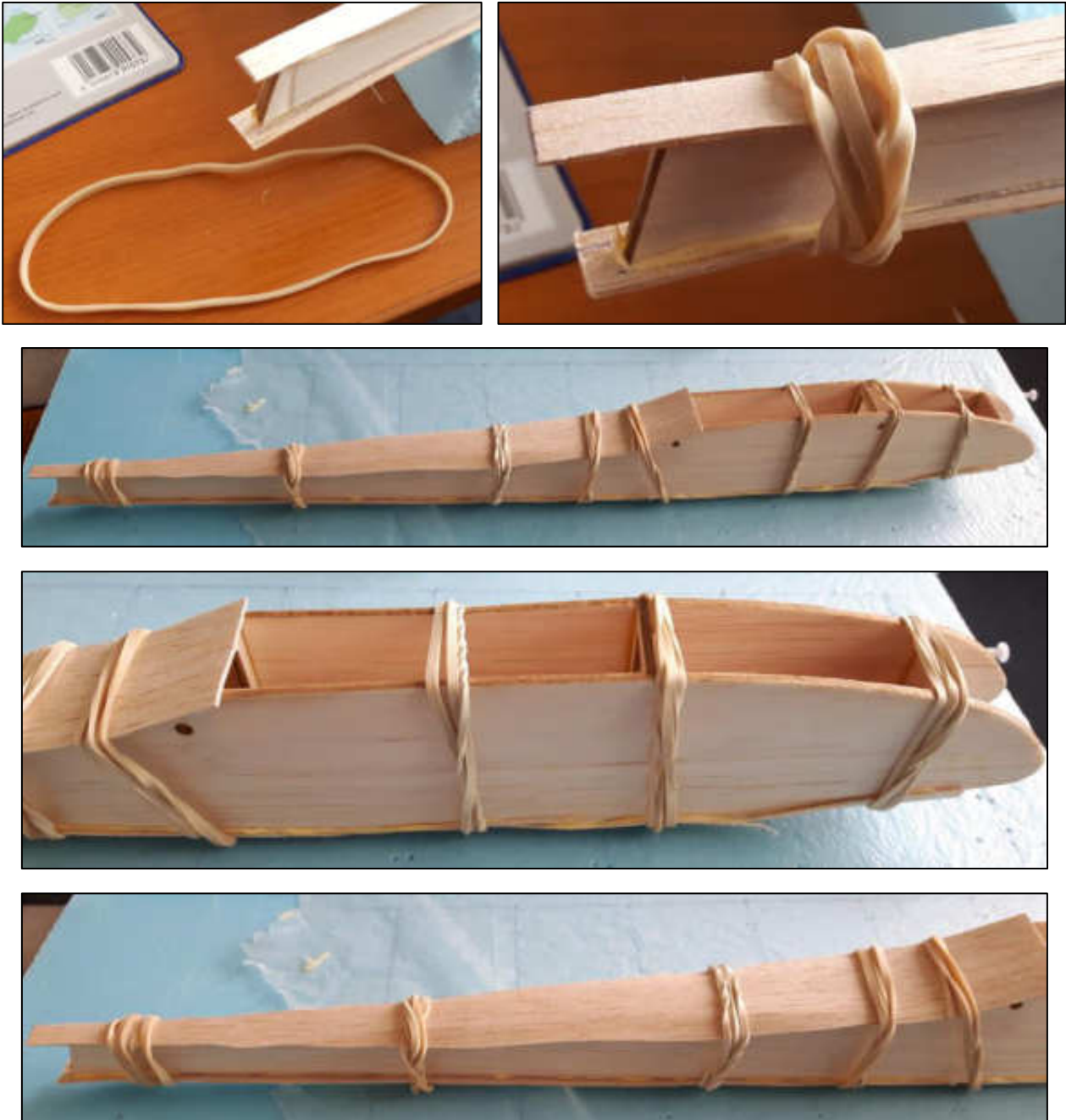


Figure 21: Clamp the skins to the fuselage with elastic bands.

22. Repeat step 21 to glue an additional piece of skin to the front of the fuselage, or you can do this at the same time as step 21, see Figure 22.

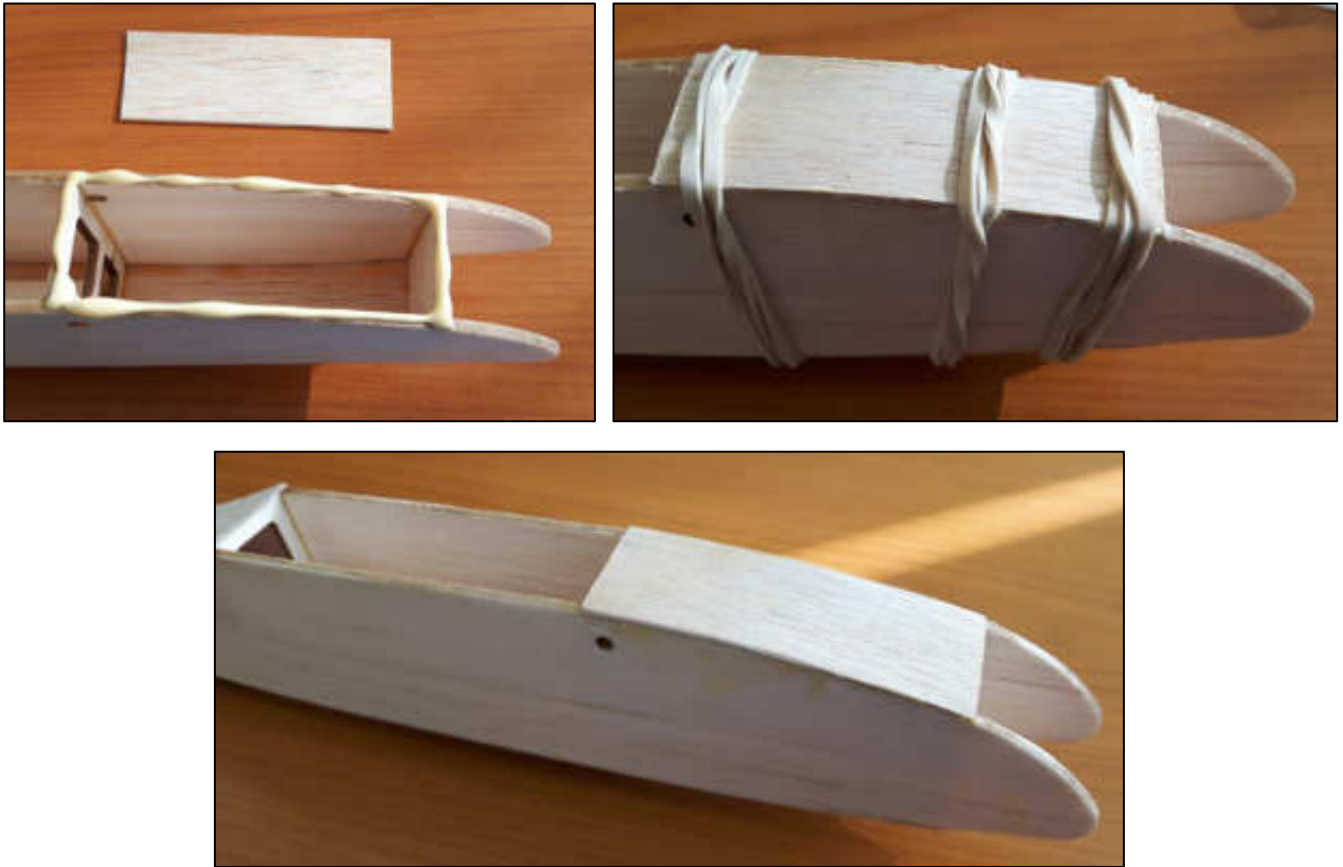


Figure 22: Glue skin to front of the top of the fuselage.

23. When the glue has dried, trim the excess fuselage skin using a knife. Use sand paper to make the edges smooth, Figure 23.

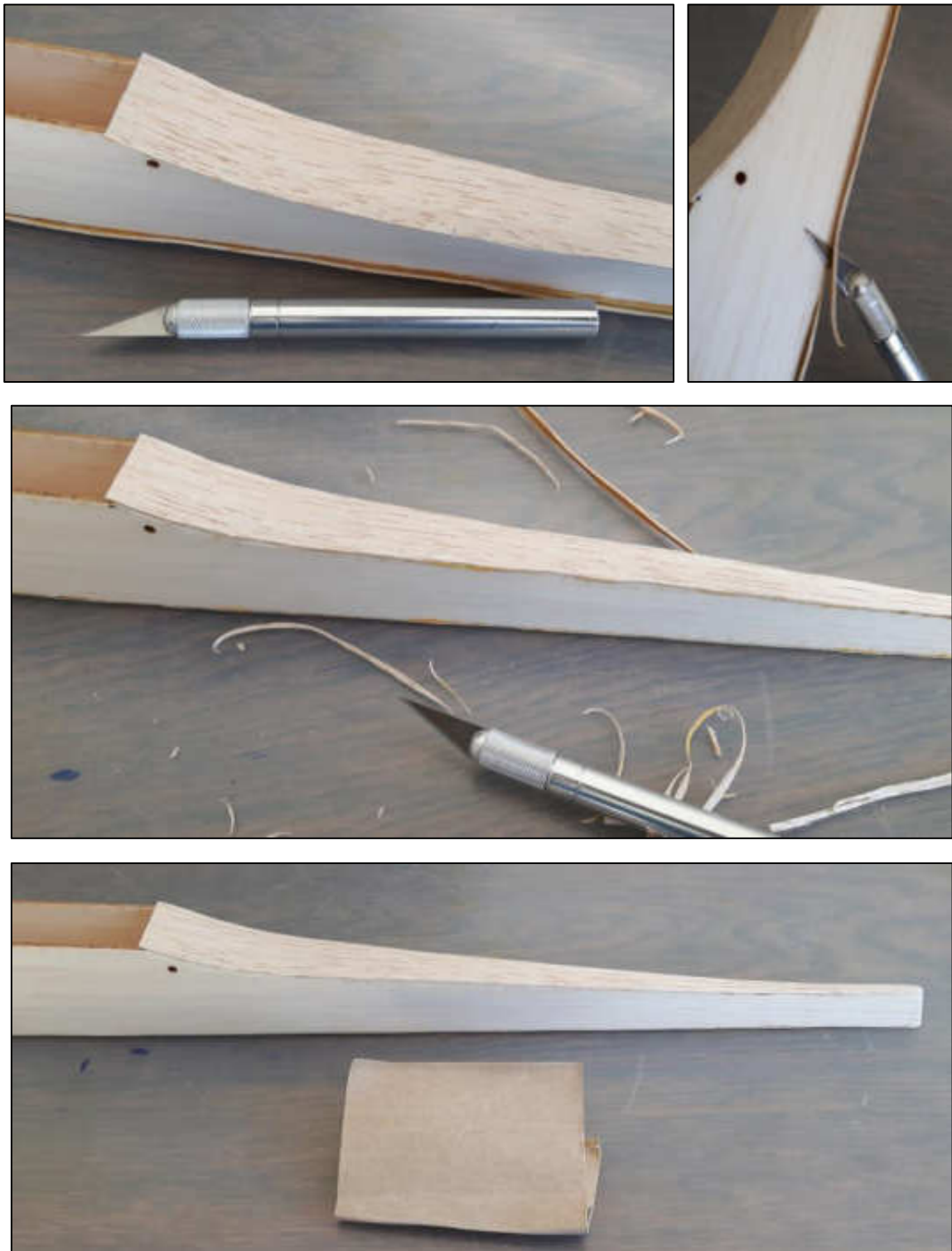


Figure 23: Trim the fuselage skin and sand the edges.

24. Cut a piece of reinforcement material and glue to the inside of the fuselage as shown in Figure 24. It is recommended that you glue two pieces of material to provide strength to the fuselage.

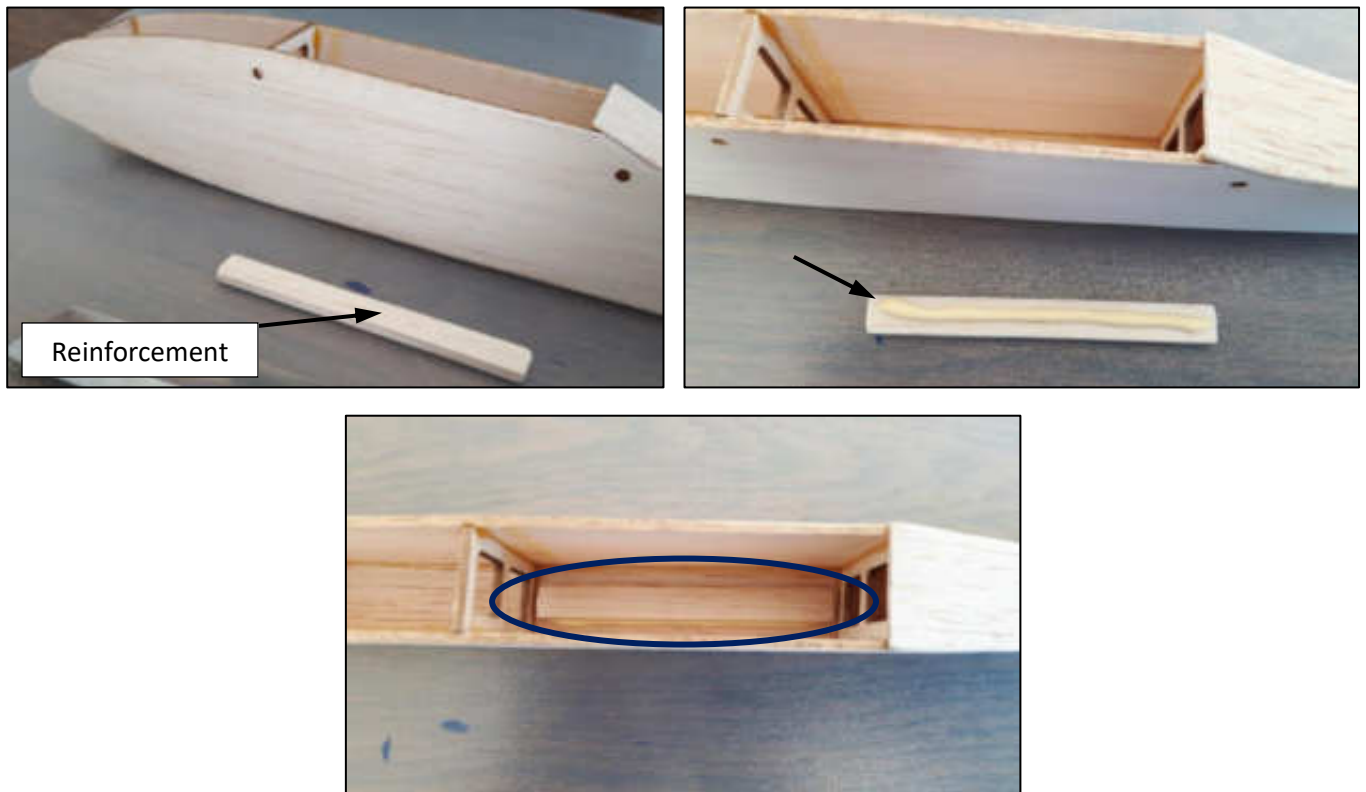


Figure 24: Reinforce the fuselage.

25. Create a launch attachment from two pieces of balsa wood, glue them together and attach them to the fuselage lower skin using elastic bands, Figure 25.



Figure 25: Glue the launch attachment to the fuselage.

26. Insert wooden dowels into the fuselage and glue them in place, Figure 26. These dowels are used to attach the wing to the fuselage using elastic bands.

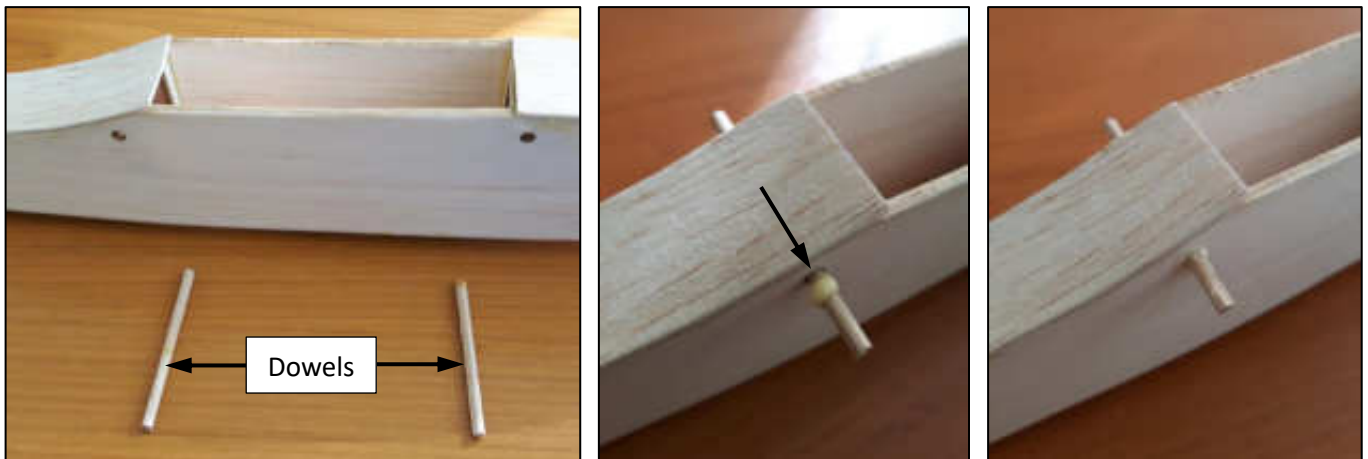


Figure 26: Glue fuselage dowels in place.

27. This stage is optional. Use a 2.5mm drill bit and a counter sink to create a hole for a small screw. Insert the screw to provide extra support to the launch attachment, Figure 27.

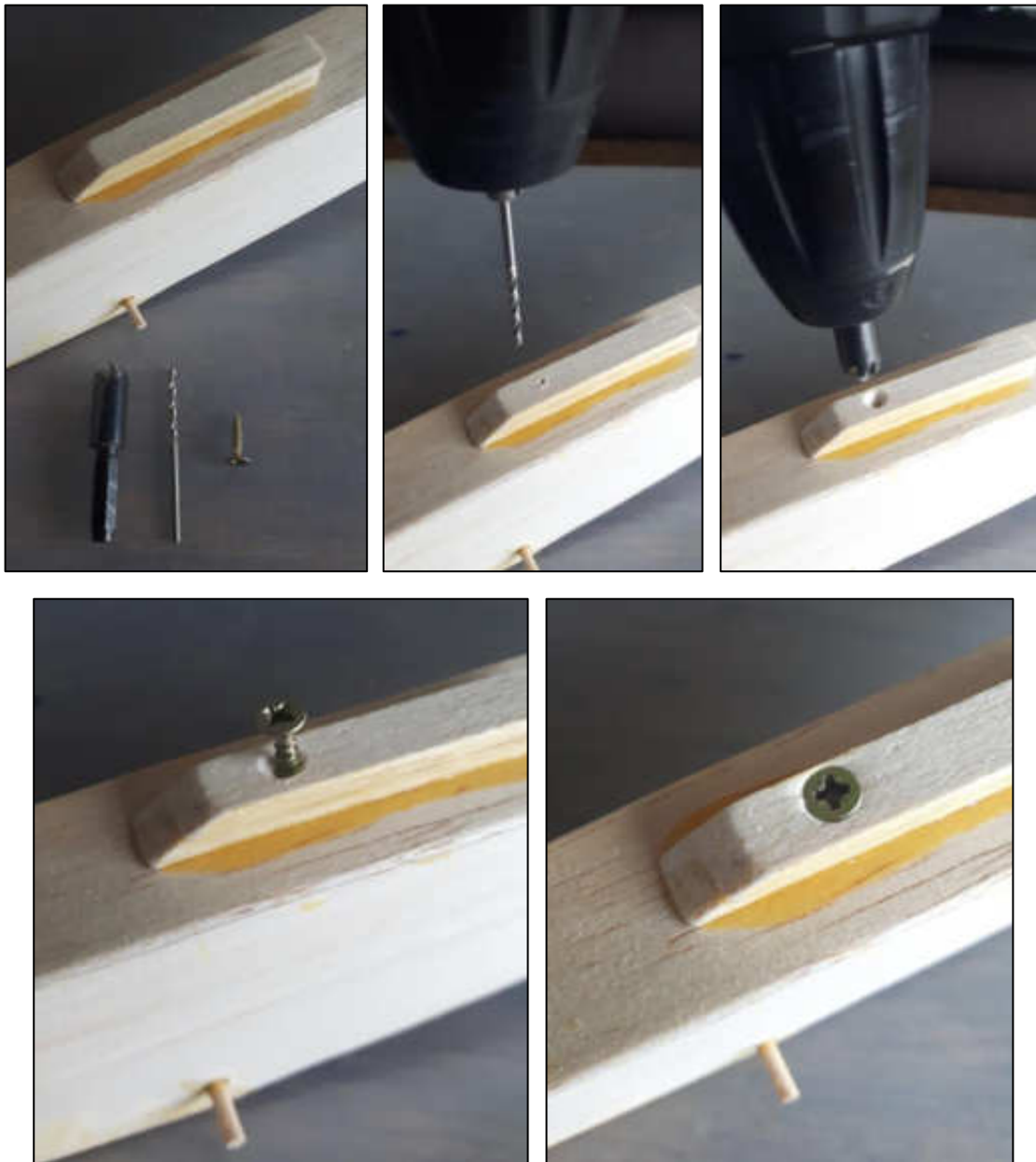


Figure 27: Insert screw into the launch attachment.

28. Attach the tail to the fuselage using glue, Figure 28.

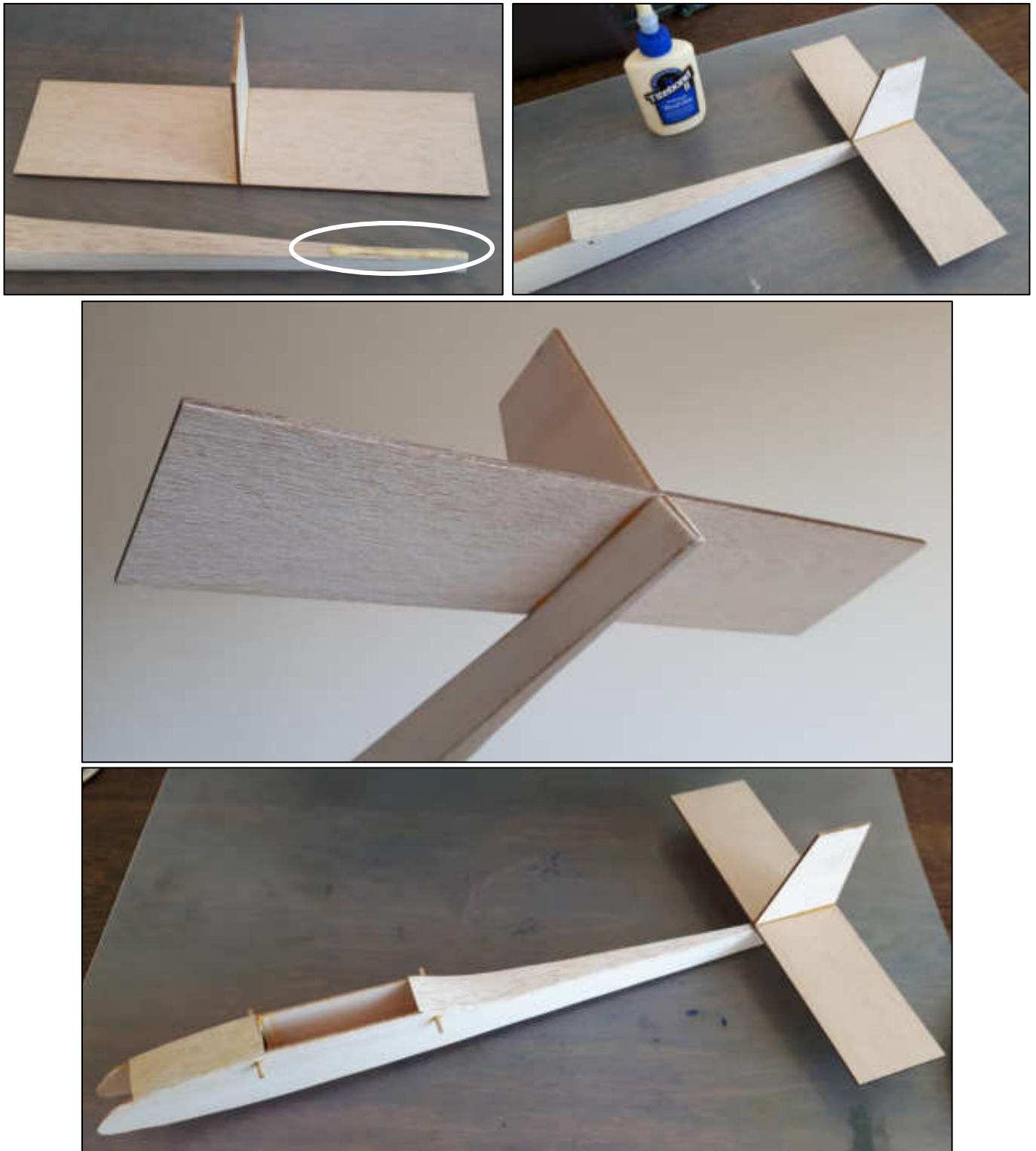


Figure 28: Attaching the tail to the fuselage.

29. Place one of the wings on top of a sheet of tissue paper. Use a knife to make two cuts at the wing root, as shown in figure 29.



Figure 29: Wing skin preparation.

30. Apply PVA glue to the top of the leading and trailing edges, the wing tip and the wing root, Figure 30.



Figure 30: Apply glue to the top of the wing.

31. Apply glue to the bottom of the leading and trailing edges, the wing tip, the wing root and the spar, Figure 31.



Figure 31: Apply glue to the bottom of the wing.

32. Firmly press the bottom of the wing onto the tissue paper, Figure 32.



Figure 32: Position the wing on top of the tissue paper.

33. Pull the tissue paper over the top of the wing, pressing down firmly on the trailing edge and the wing tip, Figure 33.

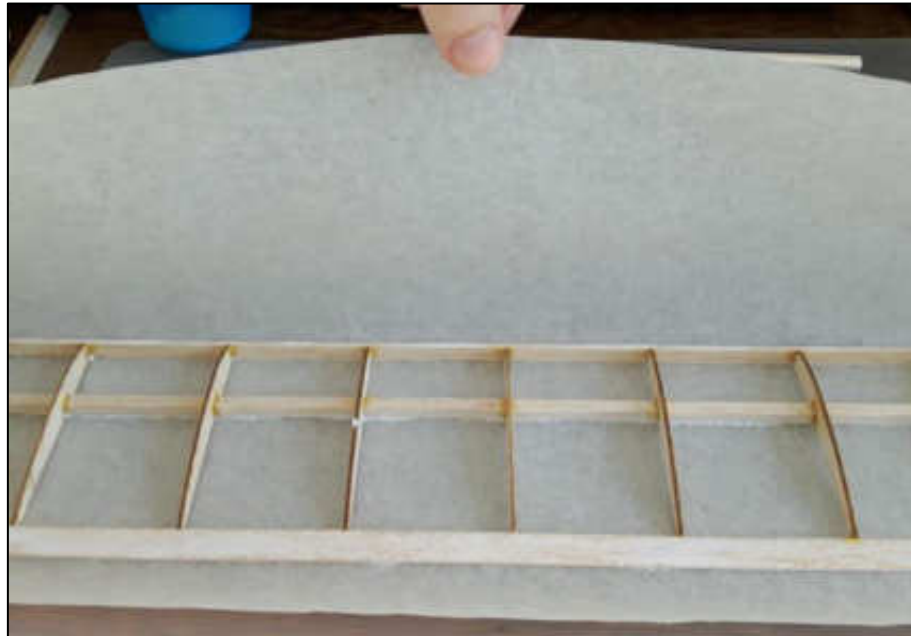


Figure 33: Attaching the wing skin to the wing structure.

34. In the same way as step 29, use a knife to make two cuts to the tissue paper, to allow it to follow the contours of the wing more easily, Figure 34.



Figure 34: Make cuts to the tissue paper at the wing root.

35. Once the glue has dried, use a knife to cut the excess paper from the wing, Figure 35. Repeat steps 29-35 to the other half of the wing.



Figure 35: Trim the excess tissue paper from the wing.

36. Mix PVA glue with water to produce a milky substance in a container. Use a paint brush to apply this to the skin of the wing. Allow this to dry and after a while, the wing skin will become taught, see Figure 36.

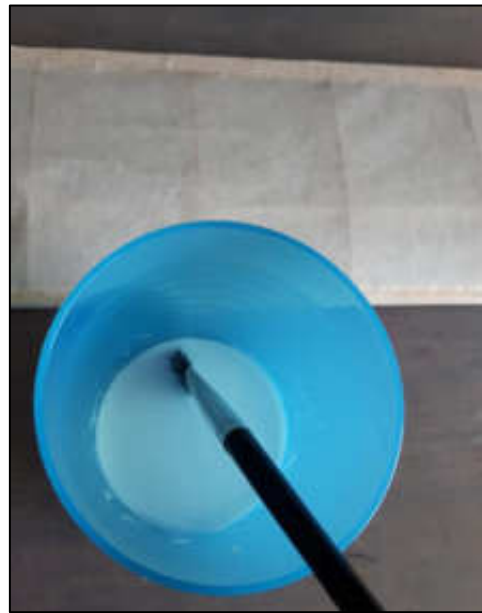
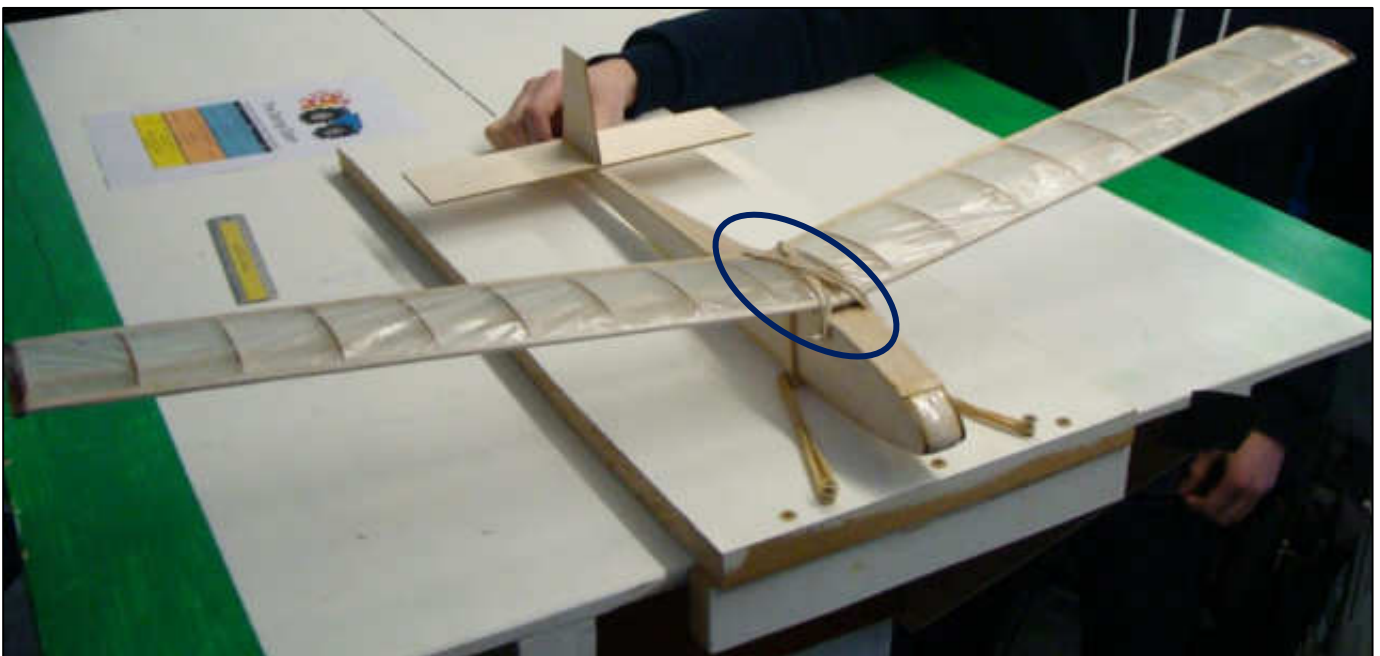


Figure 36: Apply watered-down PVA to the wing skin.

37. Add ballast to the nose of the fuselage using blue tack (or putty) to attach metal ball bearings (or other metal objects such as nuts) to the nose.



38. Attach the wing to the fuselage using elastic bands and the dowels. Once you have adjusted the mass of the ballast, your glider is ready to be launched:



Appendix 1: Glider design and engineering drawings.

