

## **Build instructions F6F Hellcat for R/C combat**

*The F6F Hellcat is a foam model of the WWII fighter, to be used in 1/12 scale combat (ACES Aircombat, etc.). The original fighter was a big, rugged carrier-based fighter built for one purpose – to win the war. It entered service in early 1943 after a very short design, construction and test-flight cycle, taking advantage of all the experience made in previous encounters with Japanese fighters.*

### **Model details**

Span: 1080mm

Weight: 1000-1300g

Radio: 3 channel, 3 servos+ESC (ail, elev, thro)

Engine: 400-600W electro or .25 IC

### **Material:**

Foam

3mm plywood

6mm birch dowel (or similar, for instance cheap wooden sticks to hold flowers)

5mm Depron or 4mm balsa

Brown-paper roll

Glass fibre net streamer roll (preferably self-adhesive)

Rudder-horns (3pcs)

Engine and radio

### **Tools**

Foam-cutter

Knife

Sand-paper

Hot-glue gun

Wet-room wall-paper glue

20-30mm brush

## Numbered parts

1. Front fuselage template
2. Front middle fuselage template
3. Rear middle fuselage template
4. Rear fuselage template
5. Front fuselage foam block
6. Rear fuselage foam block
7. Fin (5mm Depron or 4mm balsa)
8. Stabilizer (5mm Depron or 4mm balsa)
9. Elevator (5mm Depron or 4mm balsa)
10. Wing mount dowel (6mm birch dowel or equivalent)

The Hellcat is mainly built up by foam. You need a foam-cutter to cut the foam-blocks according to the templates. A simple foam-cutter can be made by using a brushed ESC (note, brushed, not brushless!) and a servotester to control it. Make a saw-handle using three wood-pieces and a metal guitar string as hot-wire.

Make fuselage templates (nbr 1-4) and airfoil templates. Also make templates (2 pieces each) to cut out wing-mount and slot for stabilizer in the rear part of the fuselage. Make sure to cut a passway for the hotwire to get inside the four fuselage templates. One way to do this is to cut through the template at 2 o'clock on templates nbr 1 and 4, and at 10 o'clock on template nbr 2 and 3. Fuselage templates nbr 1-4 can be made using thick cardboard. Airfoil templates can be made using 2-3mm plywood. Glue the paper airfoil templates onto both sides of the plywood templates, to make it easy to follow the numbers whilst cutting the wing-halves.

Cut out foam-blocks using the measures on the plan. Please note the measures are minimum measures, it is advisable to make the foam blocks a little bit bigger if possible. Markup centerlines on the foam-blocks. You need four foam-blocks: two different fuselage foam-blocks and two equal wing-halves foam-blocks. Markup the wing-halves as one left and one right-side wing-half. Markup what is upside, what is front side on the wing-halves, not to get confused and cut two left-side halves or the like.

Attach the foam-cutting templates to the different foam-blocks and cut according to the templates. Very important: The rear end of each of the outer airfoil templates must be angled 5mm up from the centerline, while the front of the templates must align with the centerline. This is to accommodate washout to your wing, which is absolutely necessary to make it fly ok. Don't miss this!

With the fuselage blocks, cut out the inside first. With the winghalves, cut the upper side first. Apply weights of some sort to the upper side of the foam-block to be cut, to keep it in place.

Apply the wing-mount templates to both sides of the front fuselage block (nbr 5) and cut out the wing-mount. Do the same to the rear fuselage block (nbr 6). Apply stabilizer slot templates to both sides of the rear fuselage block. Cut out the stabilizer slot.

Make the firewall (engine mount) from 3mm plywood. Use fuselage template nbr 1 outer outline as template. Possibly add a few millimeters to the outline to compensate for increase in fuselage width and height, if using an outrunner electro engine. Use the engine mount to markup holes to be drilled. Drill holes for engine mount and for engine cables if using an outrunner. Add blind-nuts and fasten them using four screws and CA-glue, if using an outrunner electro engine.

Glue fuselage parts nbr 5 and 6 to form the fuselage. If using an inrunner, cut off the fuselage 5-10mm from the front end of the fuselage, depending on engine size. If using outrunner engine, cut off the fuselage 25-35mm from the front end, depending on the size of your electro engine.

Please note: If using an inrunner it might be a good idea to mount the engine before you glue the firewall to the fuselage.

Glue firewall to the front of the fuselage. Then glue the front piece of the fuselage – that you cut off in the previous step – to the firewall. Sand fuselage to smooth shape.

Cut out stabilizer, elevator and fin from 5mm Depron or 4mm balsa. Sand all parts to aerodynamic shape. Sand front leading edge of elevator to wedge form, to enable elevator movement, both up and down. Cover stabilizer, elevator and fin using brown-paper and wet-area wallpaper-glue. Put glue on both the parts and on the paper, to make covering easier. Consider adding water to the glue to make it easier to apply. A 50/50 mix is often used. Apply glue using a 10-20mm wide brush. Attach elevator to stabilizer by using a 30mm wide piece of long brown-paper to the top side of both stabilizer and elevator. Make sure the gap in the elevator wedge is located downwards, so that the elevator can easily move both up- and downwards.

When cover has dried, glue stabilizer, elevator and fin to the fuselage. Make sure stabilizer and fin are aligned to the fuselage centerlines. Be very careful with this, to make your fighter fly good.

If you use a foam canopy, glue the canopy to the fuselage. If you use a transparent canopy, wait until fuselage is painted until you glue the canopy in place, but cut out the cockpit interior according to the thick line on the plan using a sharp knife.

Cut each winghalf in two parts at 170mm from the middle of the full wing (the fuselage short side of the wing-half). Take inner and outer part of the winghalves and sand to enable each outer wing to join at approximately 40mm dihedral (V-shape).

Glue the outer wings to the respective inner wing using support beneath each of the outer wings. After glue is dry, try-fit the two wing-halves and sand if necessary. Then apply glue and fit the two halves together. Be extra careful when joining the four wing-parts so that it gets straight and not twisted.

Use 6mm hardwood dowel to form the wing leading edge spar. Cut it to appropriate length and glue to each of the winghalves. Form wingtips using a sharp knife and sanding-paper. Also sand the wing surfaces to make it smooth and eliminate any "bumps" made while cutting the wing-halves.

Reinforce the wing using glass-fibre net stripes along the middle of both the upper and bottom surface and wrap around the winghalf join. Reinforce the net stripes using wet-area wall-glue, press the glue into the net using a no longer used credit card or the sort of plastic piece. Let the glue dry.

Make extra reinforcement of brown-paper over the already applied net stripes. Make the brown-paper stripes some 20-40mm wider than the net-stripes. Then cover both fuselage and wing with brown-paper. Try not to stretch the paper when wet, as it will pull back when dry and twist the wing.

When the brown-paper and glue has dried, sand paper edges and on fuselage and wing to get a smooth surface. Be careful not to sand too much, so the that the foam blends through the paper.

Drill two holes through the fuselage for the two 6mm dowels (nbr 10). These two make the rubber band holder for the wing mount.

Cut out ailerons on both outer wing-halves. The wing top surface brown-paper act aileron hinges. Mark up the aileron on the outer wing bottom sides, using a straight ruler or the like. The aileron is approximately 35mm wide. Use a very sharp knife and adjust the blade length not to reach through the top surface brown-paper. Cut a vertical slot from the bottom surface to make the aileron, but be careful not to cut through the top brown-paper cover!

Bend the aileron gently approximately 180 degrees so that it lies on up-side-down on top of the wing upper surface. Use the knife to sand of the aileron front edge to make it wedge shaped so that the aileron can easily move up and down.

Install aileron- and elevator-horns on both ailerons and on elevator. Cut slots in upper surface of wing, in the upper part of the inner wing part but very close to the outer wing, for wing-servos. Glue wing-servos into the slots. Connect servo to aileron-horn with linkage. Cut small slots for servo-cable through wing upper surface into middle of wing, i.e. inside of the fuselage. Cover the servo-cable slots with brown-paper glued on top.

Cut slot for servo in fuselage under stabilizer (left or right side). Attach servo extension cable to servo cable. Run cable through slot and into the fuselage. Glue servo to slot in fuselage. Connect servo to elevator-horn using linkage.

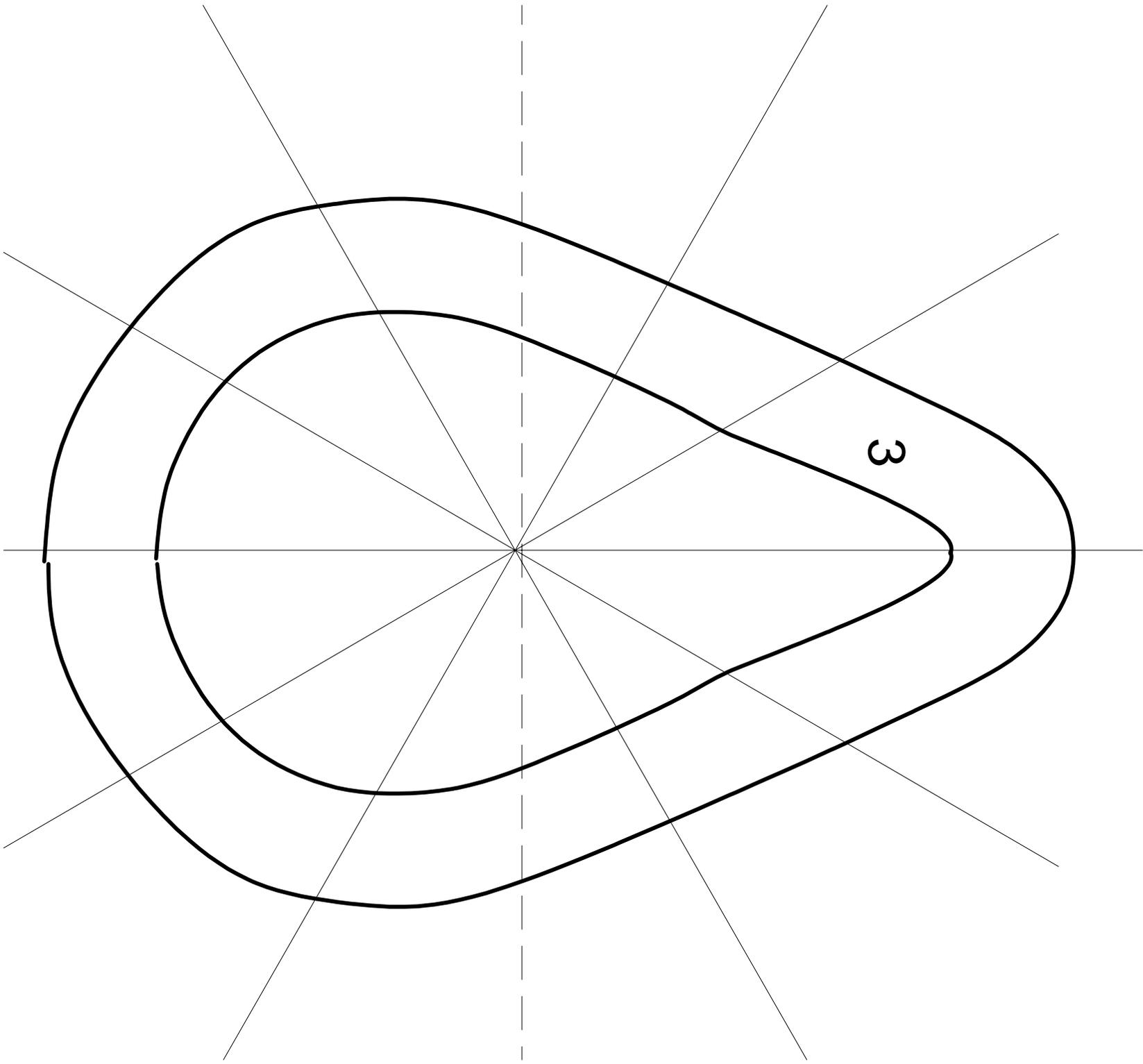
Paint fuselage and wing. There are many different color-schemes to choose from. Be careful not to add too much weight while painting – use thin layers.

Install engine and ESC. Connect receiver and battery. Connect elevator-servo. Connect aileron servo using Y-cable. Trim ailerons and elevator to neutrals. Adjust to center-of-gravity. Test-run engine.

The Hellcat has no undercarriage, so it needs to be thrown into the air. Get a helper for this the first couple of flights. Be careful on first flights! The Zero is fast and highly maneuverable. When you have learned to fly your Hellcat, hook up a streamer and challenge other pilots on a real dogfight!

**Alternate instructions if you plan to use an IC-engine (glow-engine)**

Make firewall a few millimeters bigger in diameter. Drill holes for fuel-lines in the firewall. Cut off fuselage at proper distance from the front, to accommodate the IC-engine. Mount the IC-engine in a nylon engine-mount, or the like. Drill holes in the firewall for the nylon engine mount. Glue the front fuselage foam to the firewall. Cut out the foam in the front to give room for the IC engine cylinder-head, carburettor and silencer.

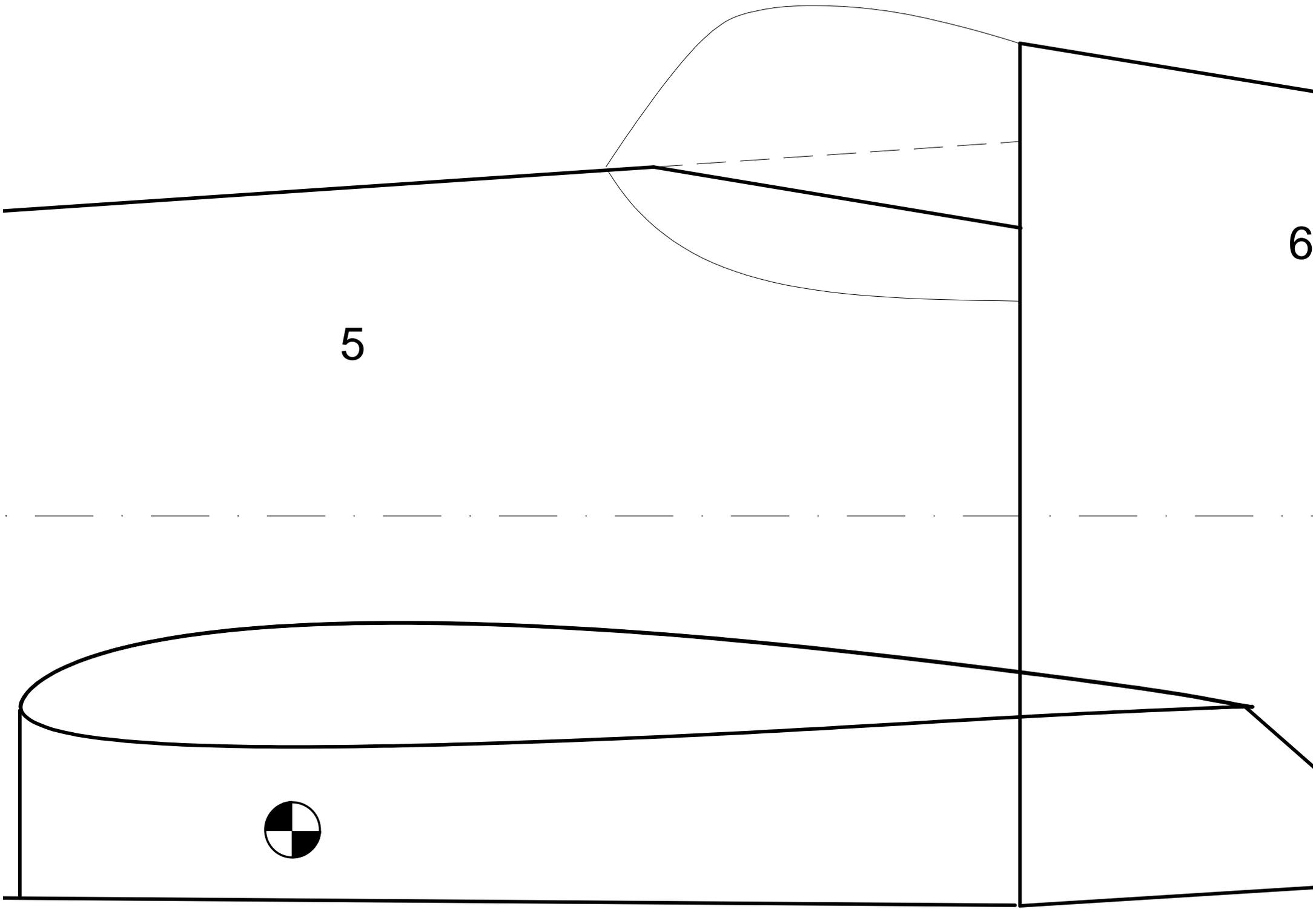


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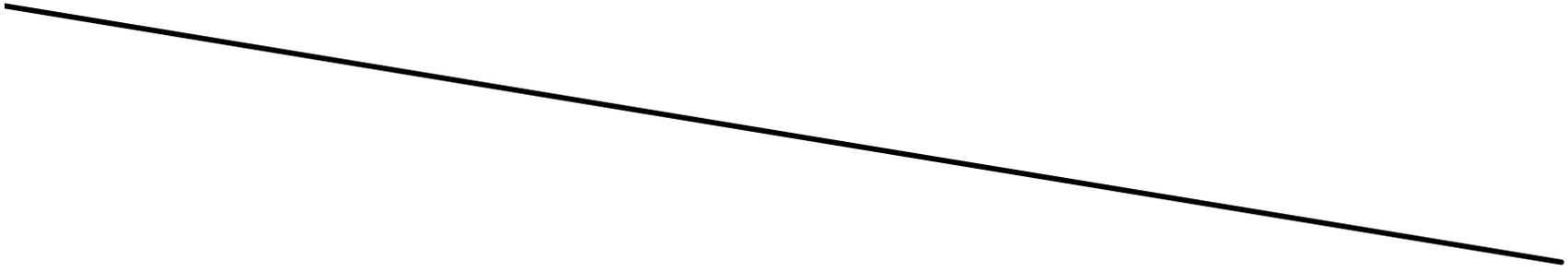




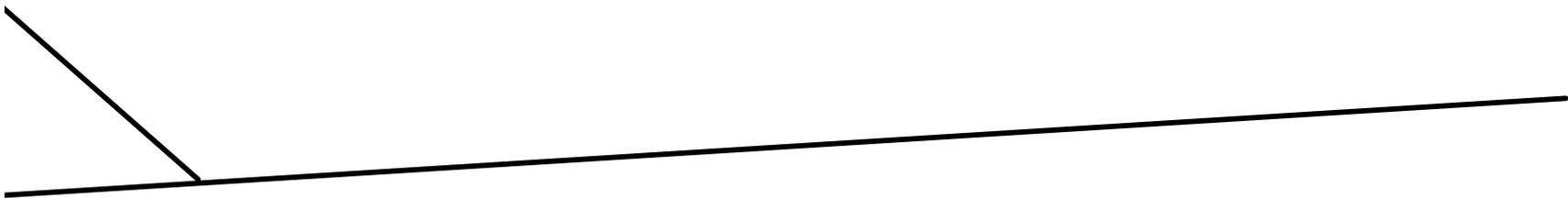
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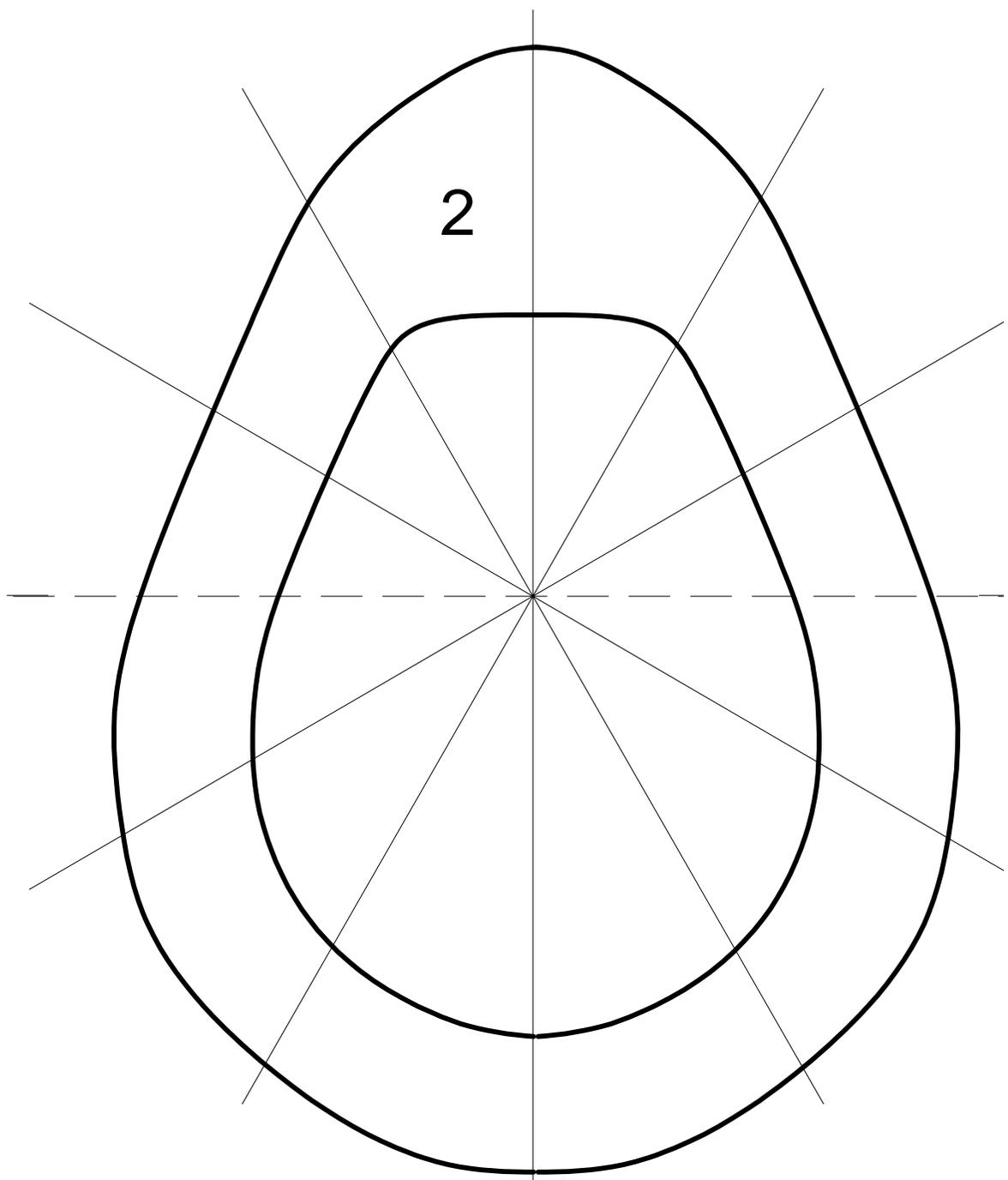
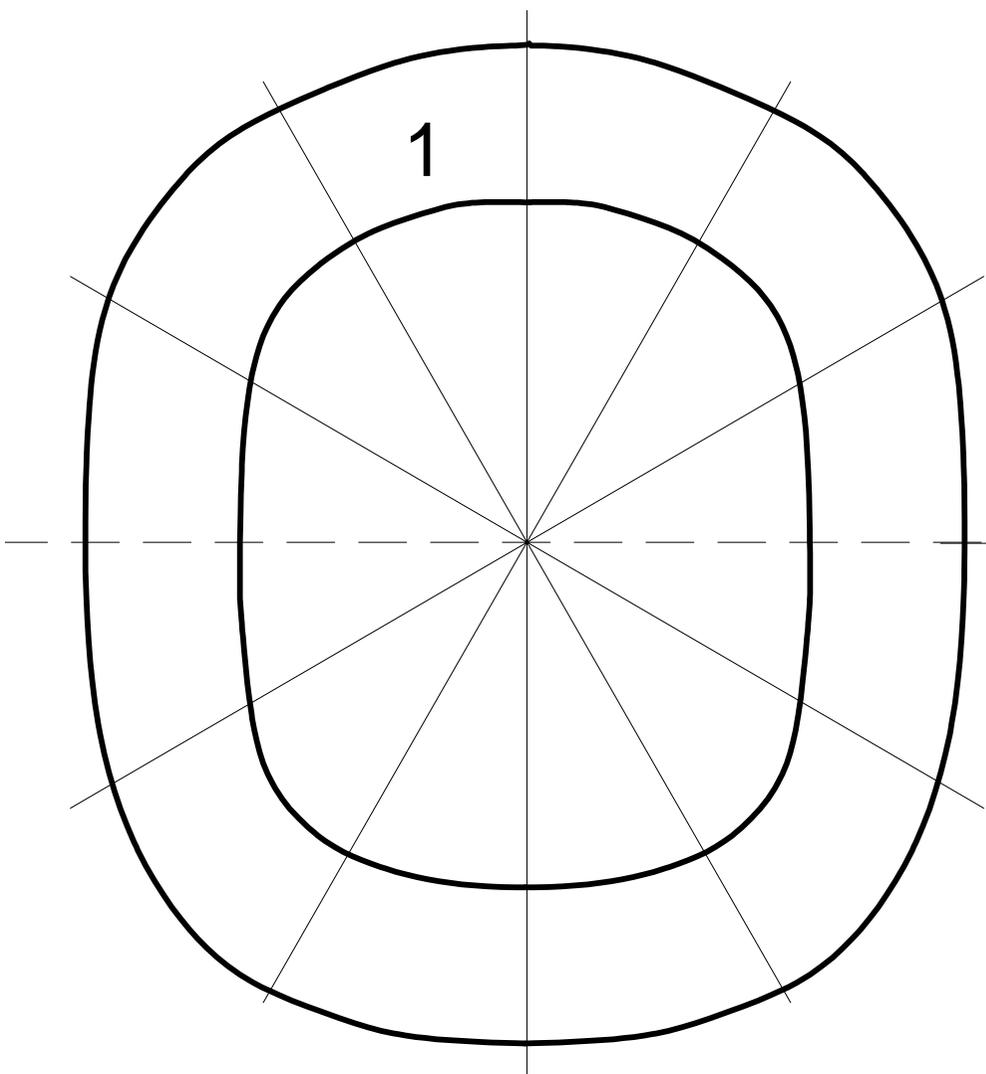
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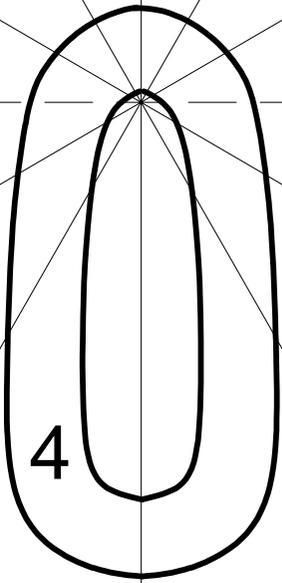




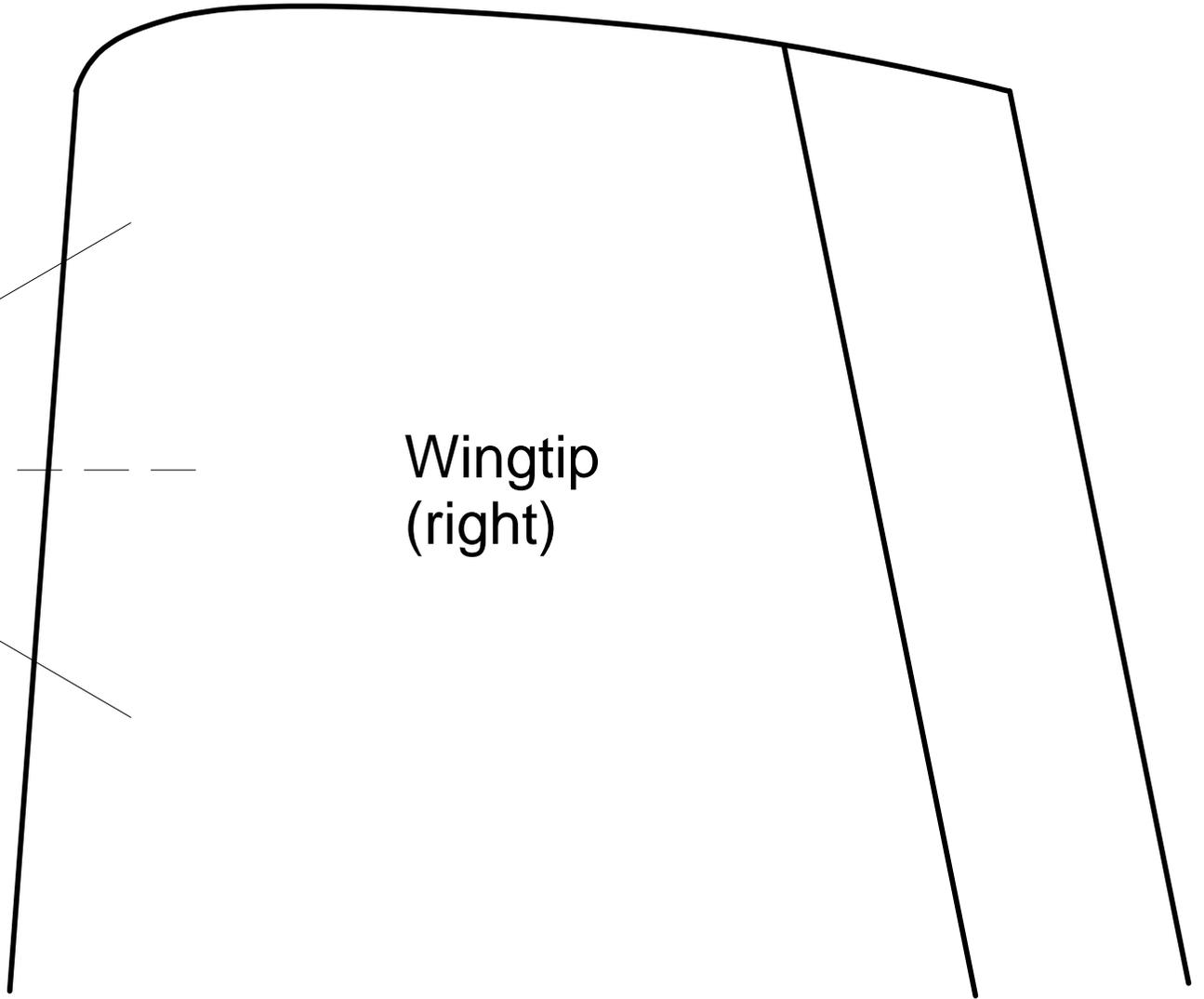
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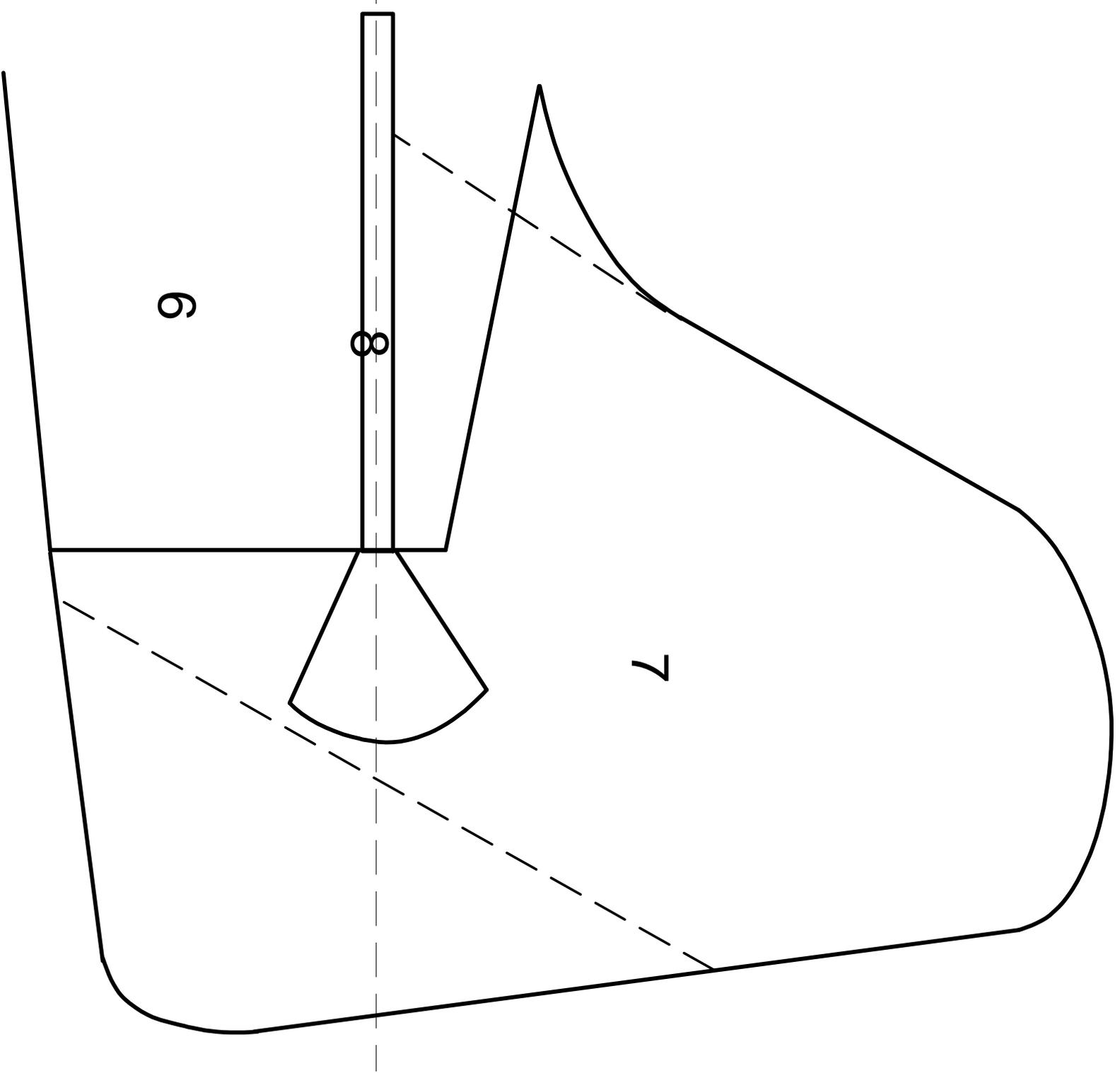


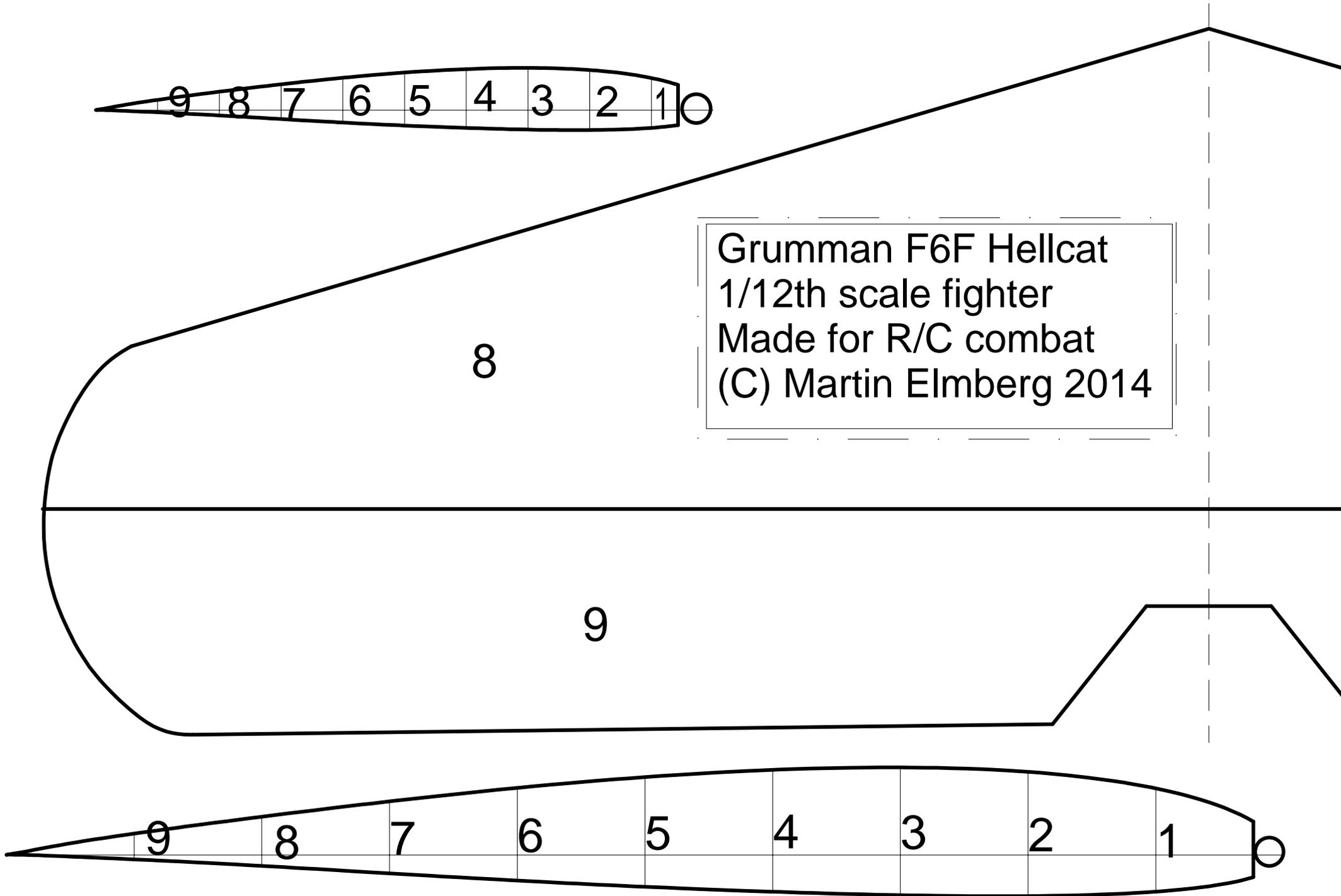


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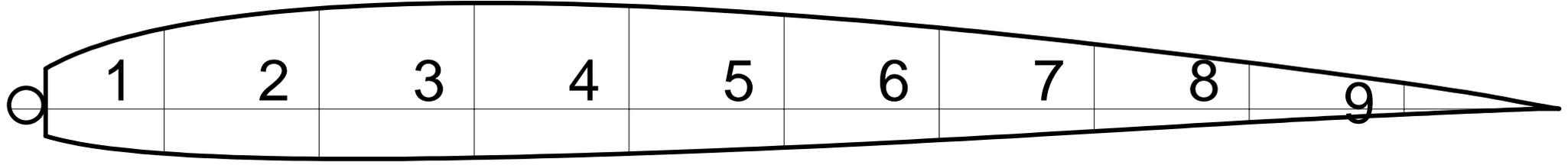
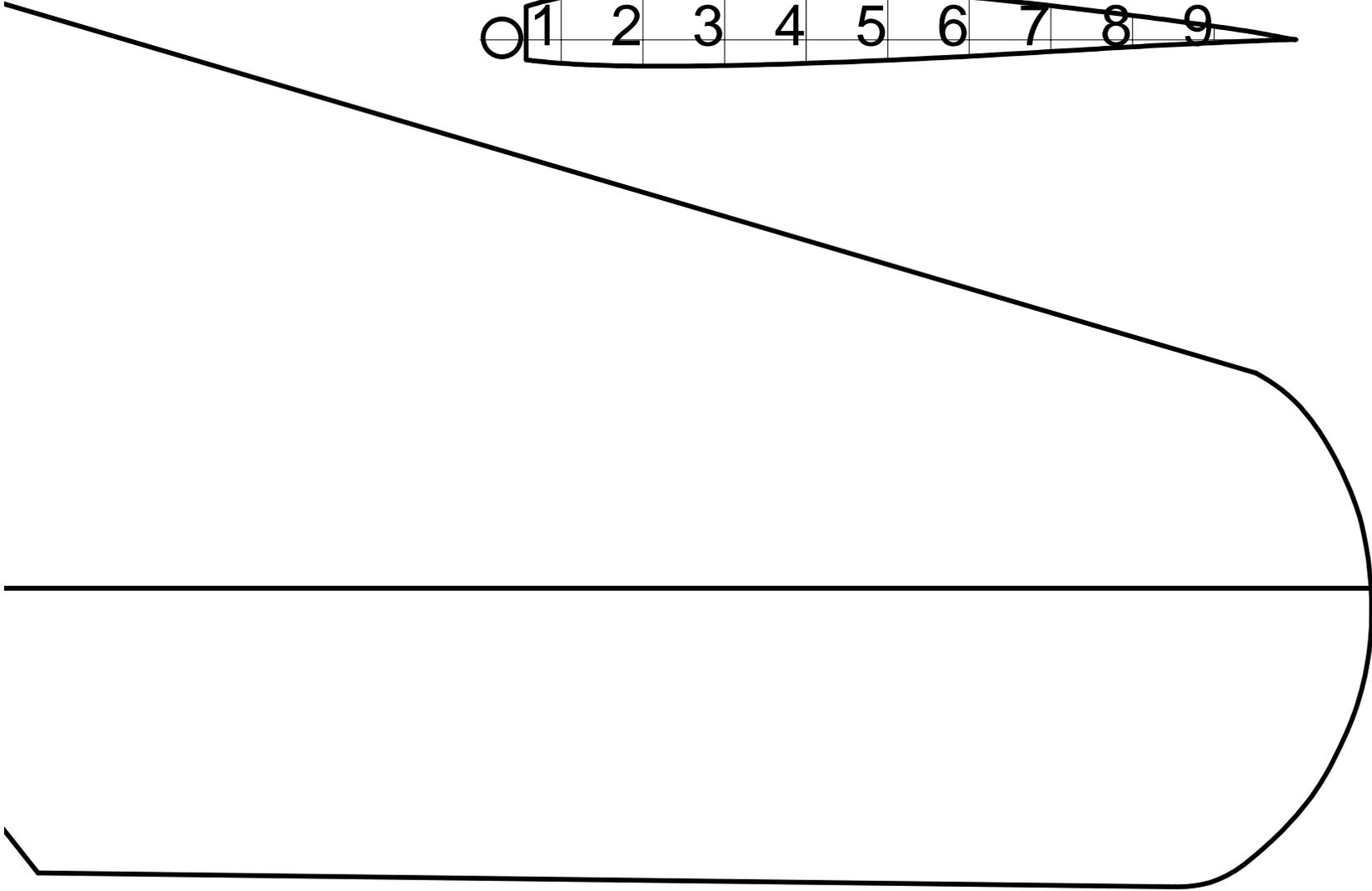
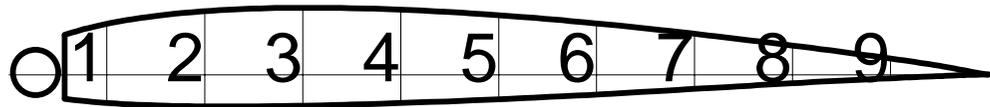


Wingtip  
(right)

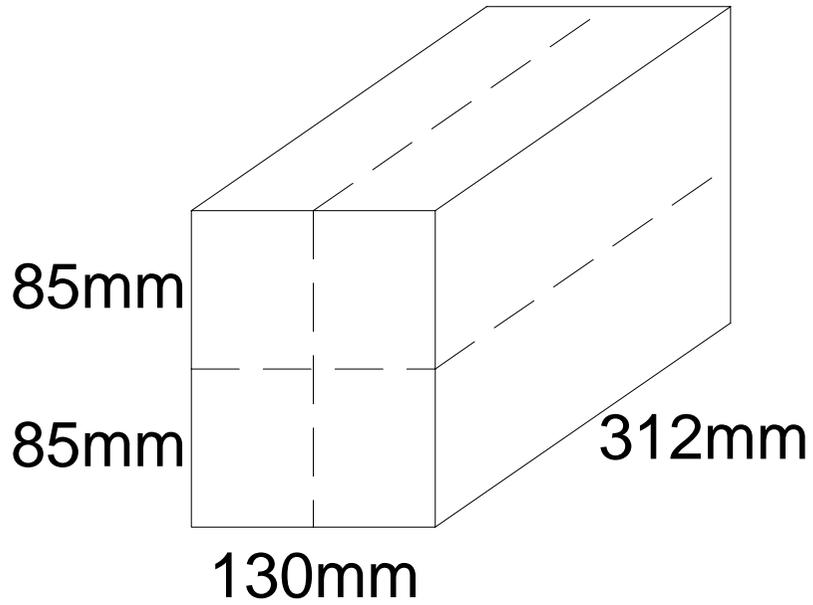




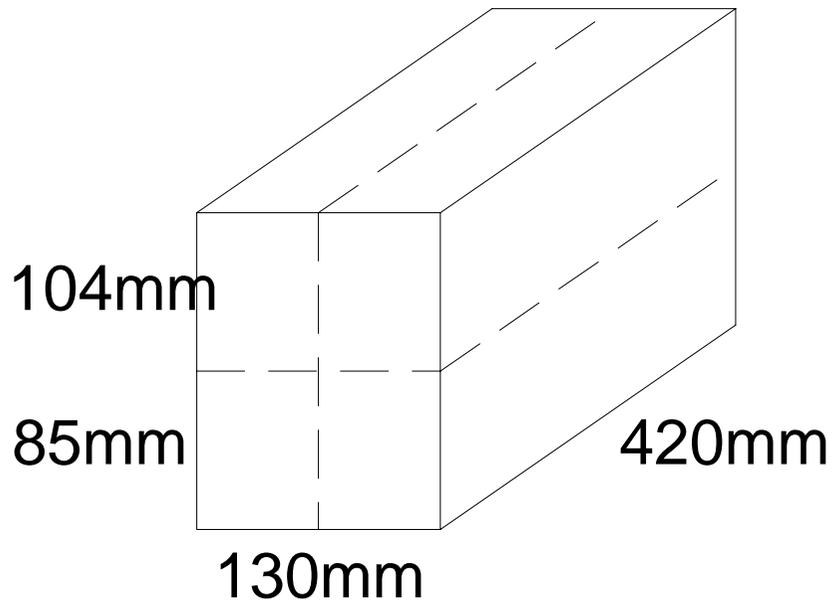
Grumman F6F Hellcat  
1/12th scale fighter  
Made for R/C combat  
(C) Martin Elmberg 2014



Front block (nbr 5)



Rear block (nbr 6)



Wing block  
(2 pcs)

Front leading edge

