Making a parachute.

Prototype
6 gore, ripstop fabric

Test the fabrics.

Select an appropriate fabric. It must be suitable for printing as well as light and structurally strong. Will it fly? Traditionally parachutes were made from silk, modern parachutes are made from rip-stop nylon. I chose habotai silk 43gsm. This fabric is strong and light-weight and has a lovely sheen. As the parachute is not intended for use there were no safety considerations to be made.

Silks
43gsm

Ripstop test piece
65gsm

The maths.

Establish size of the parachute's canopy: 500cmD in this case.

Decide on the number of gores (the gores are the sections that make up the hemisphere. The angles of the gores at the top of the parachute should add up to 360°):
In this case the gore number is 12.

Calculations used to shape and size the gores of a parachute with an overall diameter of 500cm:

Radius of whole (cm)	=	500/2 = 250
Number of gores	=	12
Angle at top of each gore	=	360°/12 = 30°
Height of one gore (arc length)	=	(arc angle/360°) x (2πr) = (90°/360°) x (2π250) = 392.7
Width of one gore at base	=	2π250/12 = 130.9

Seam widths (cm):
Between gores = 1.0
Chute opening = 1.0

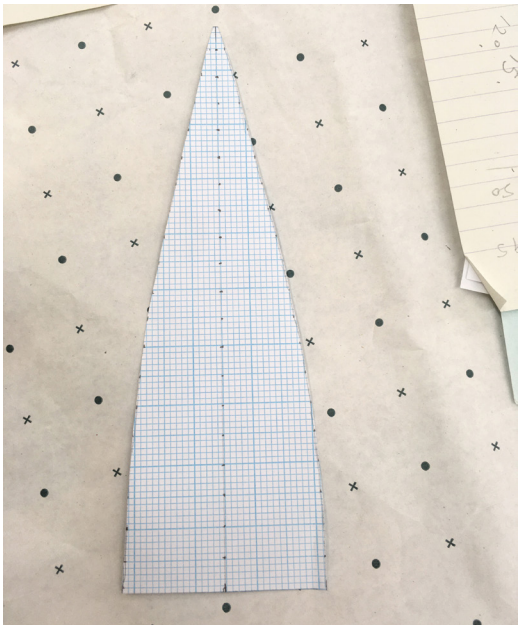
The gore now needs to be divided vertically into 20 points, beginning at the opening, in order to calculate the width of the curved edges at each point (the parachute is hemispherical rather than circular so the gores are not triangular and do not have straight edges):

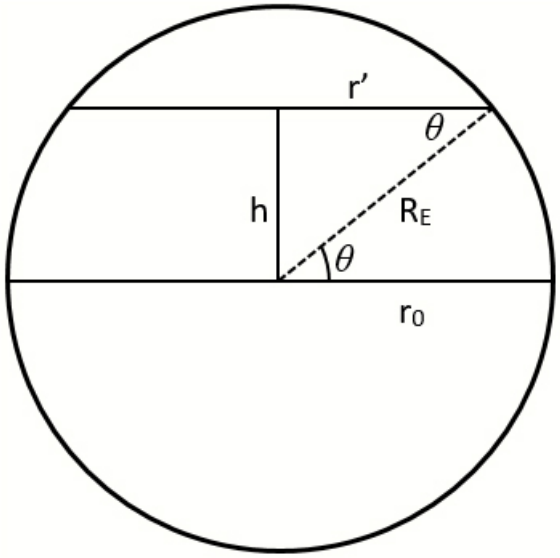
Height of one gore (392.7cm) + 1cm seam allowance / 20 = 393.7 / 20 = 19.6cm.
The vertical centre line of the gore is then divided into 20 points with a distance of 19.6cm between each point.

To calculate gore width at each point find C at each point / 12
Use formula C = 2πr (circumference at base) x cosØ

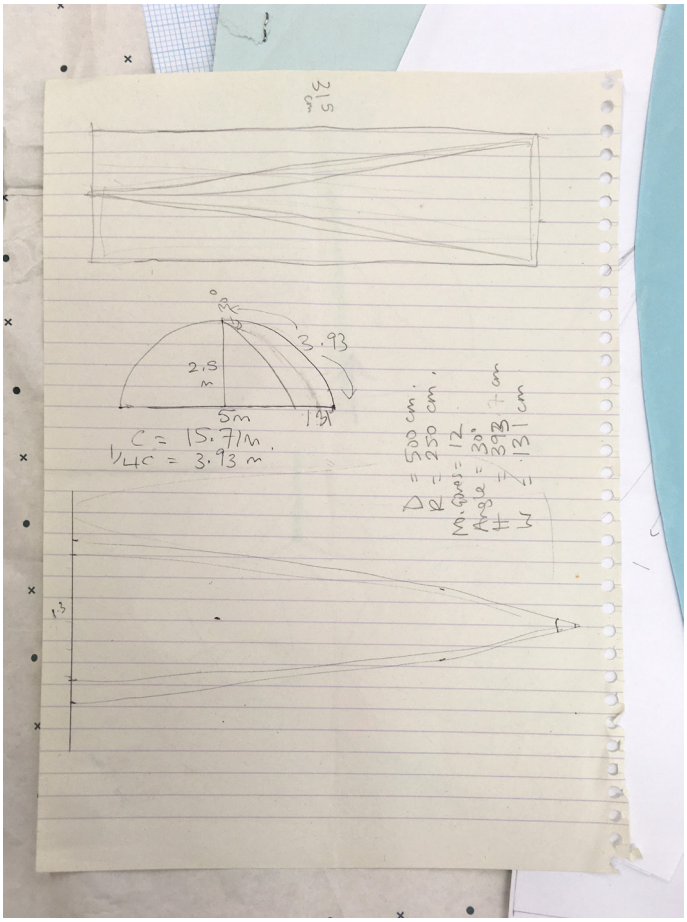
CosØ at point 1 is 90° / 20 = 4.5°
Circumference at bottom edge (point 0) is 2xπx250cm = 1571cm

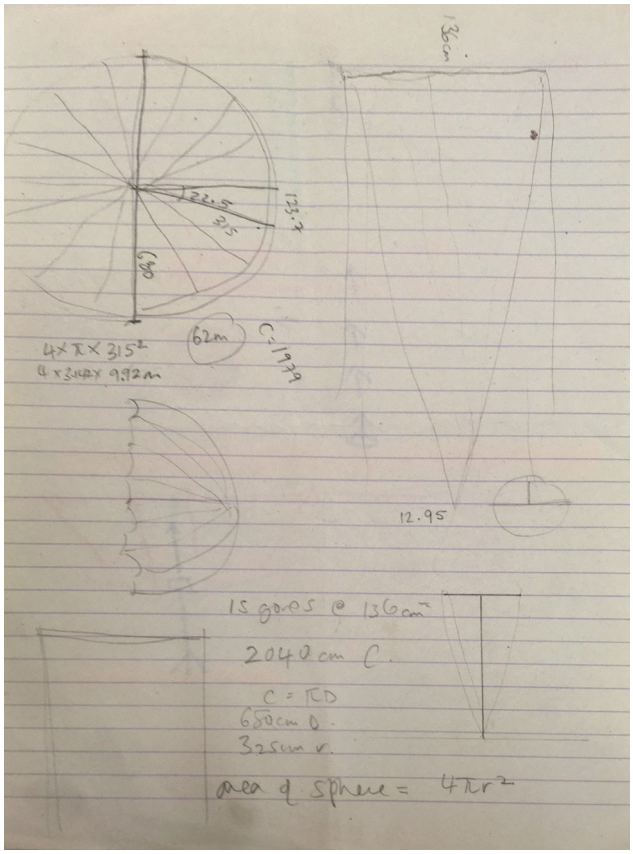
C at point 1 = 1571 x cos4.5° = 1566.15cm.
Divided by 12 to get width of 1 gore = 130.5cm + 2cm for each vertical seam = 132.5cm
Continue up the points, increasing the cosØ by 4.5° each time

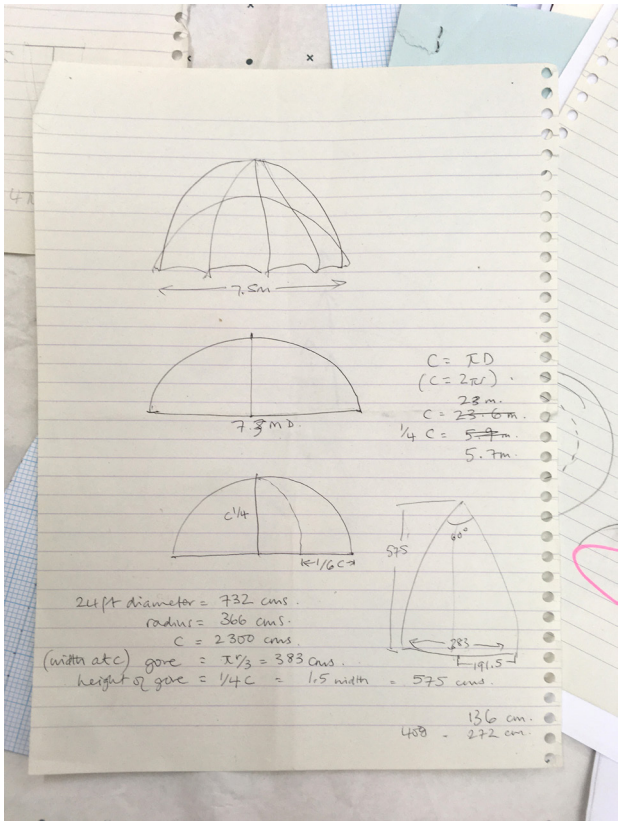


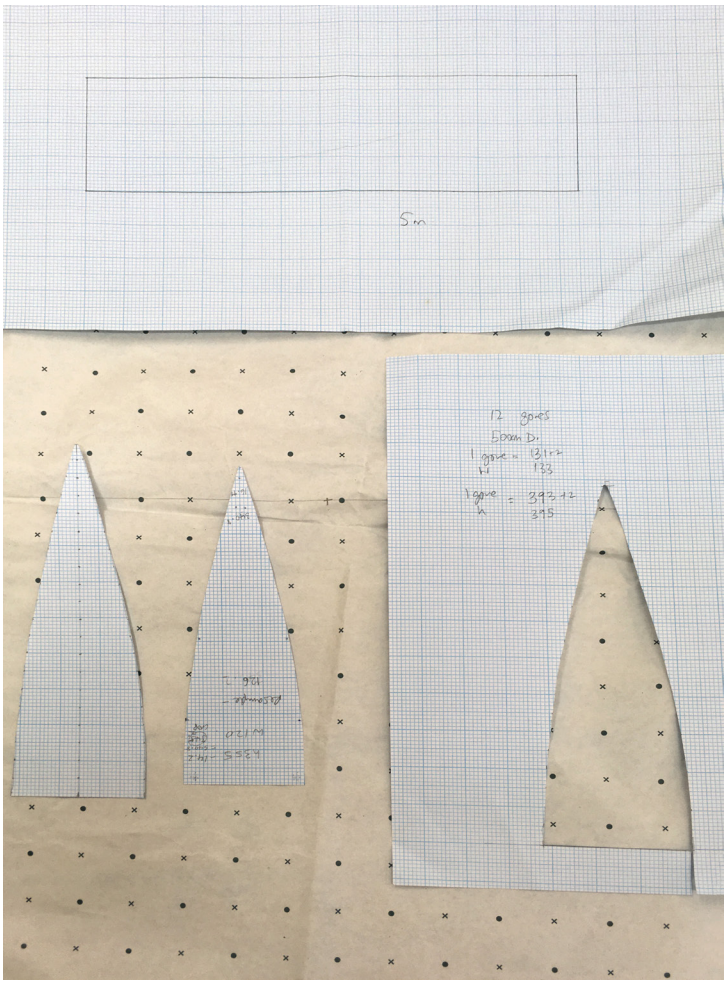


Trials and errors...



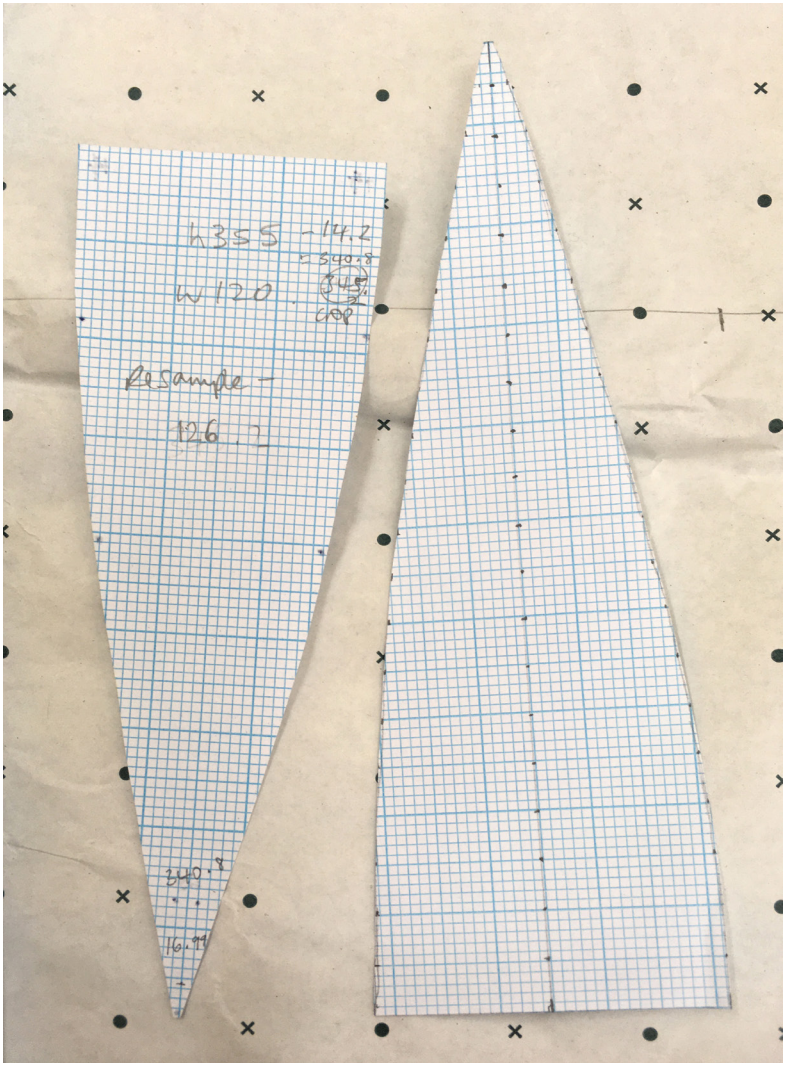


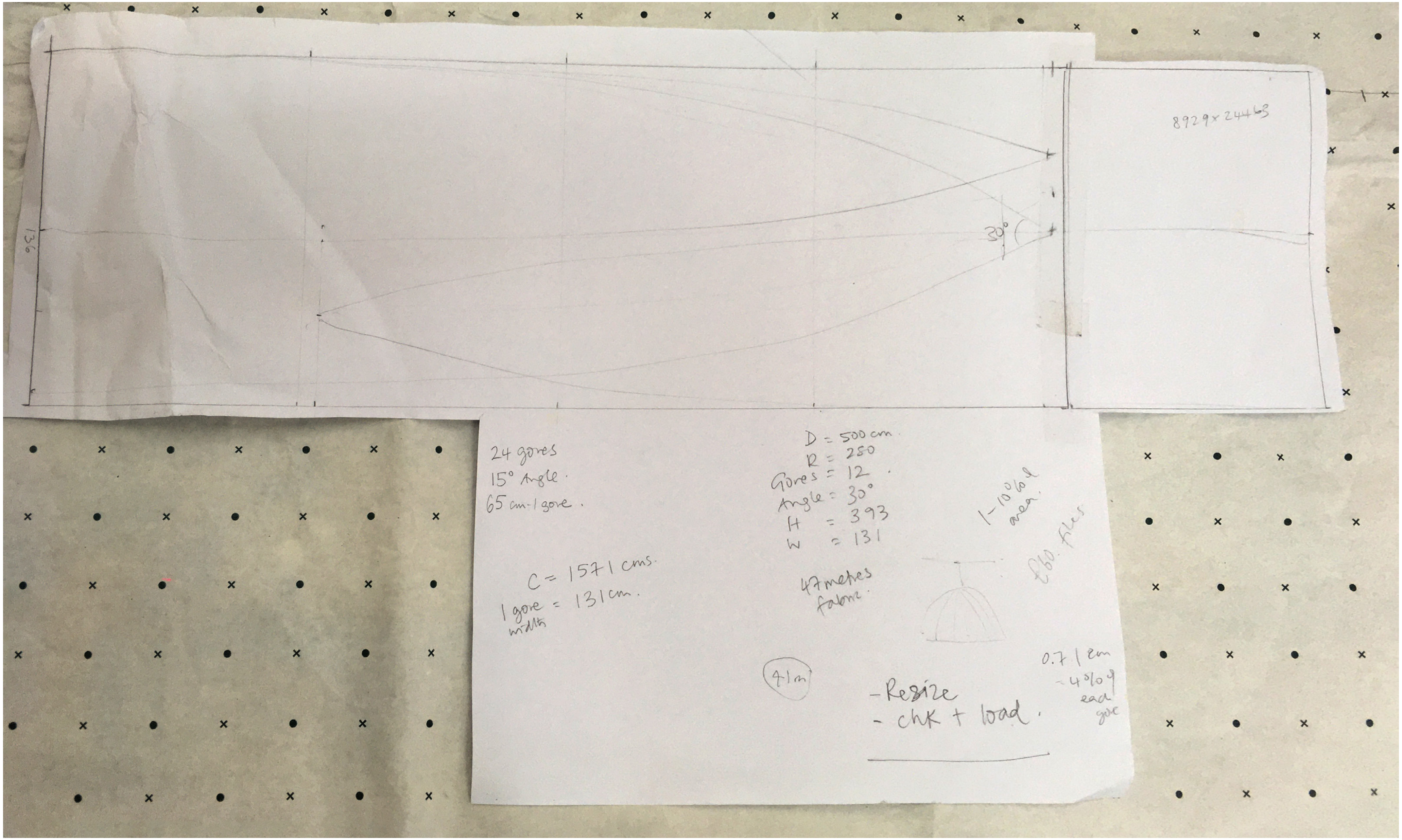




Measurements for 12 gore 500D parachute:

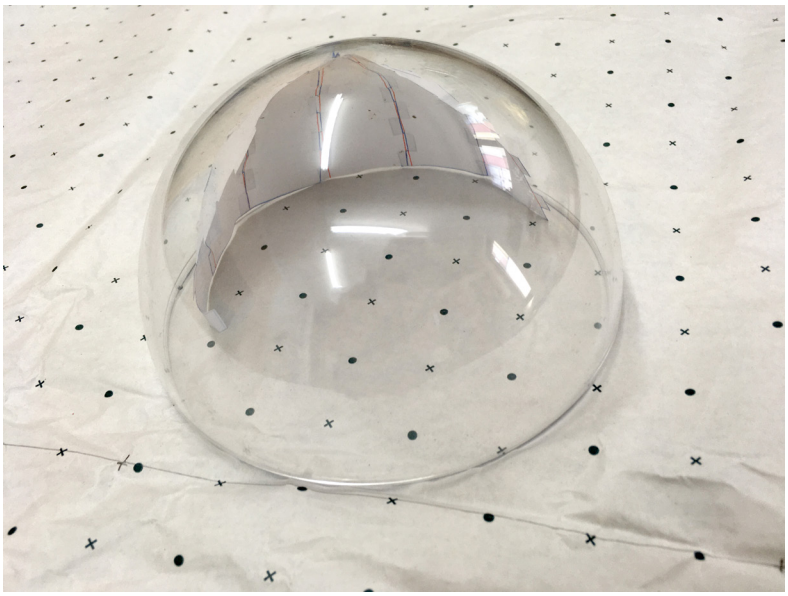
Point from opening	Distance from opening (cm) (arc length)	Gore width	Mid point
0 (Bottom Edge)	1.0	132.8	66.45
1	20.6	132.5	66.25
2	40.3	131.3	65.65
3	59.9	129.3	64.65
4	79.5	126.5	63.25
5	99.2	122.9	61.45
6	118.8	118.6	59.3
7	138.4	113.6	56.8
8	158.1	107.9	53.95
9	177.7	101.5	50.75
10	197.3	94.6	47.3
11	217.0	87.0	43.5
12	236.6	78.9	39.45
13	256.3	70.4	35.2
14	275.9	61.4	30.7
15	295.5	52.1	26.05
16	315.2	42.5	21.25
17	334.8	32.6	16.3
18	354.4	22.5	11.25
19	374.1	12.3	6.15
20 (Top Edge)	393.7	2.0	1

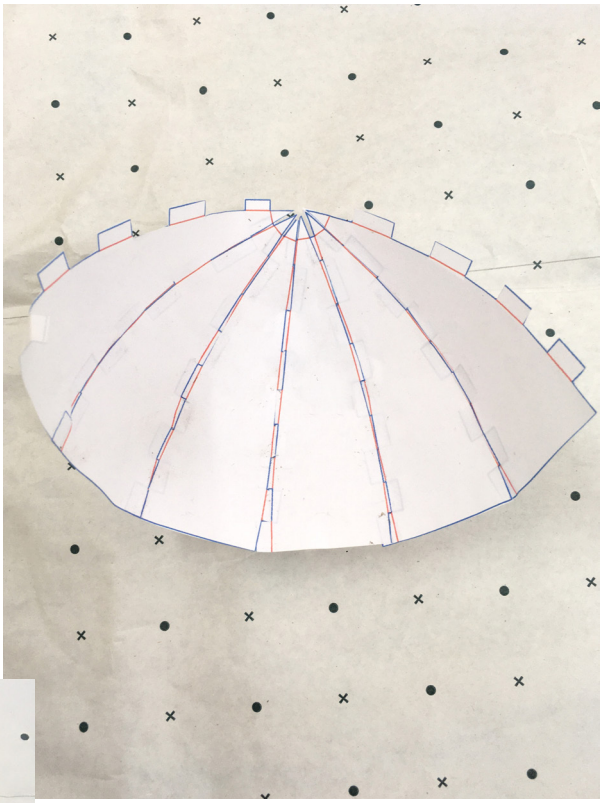


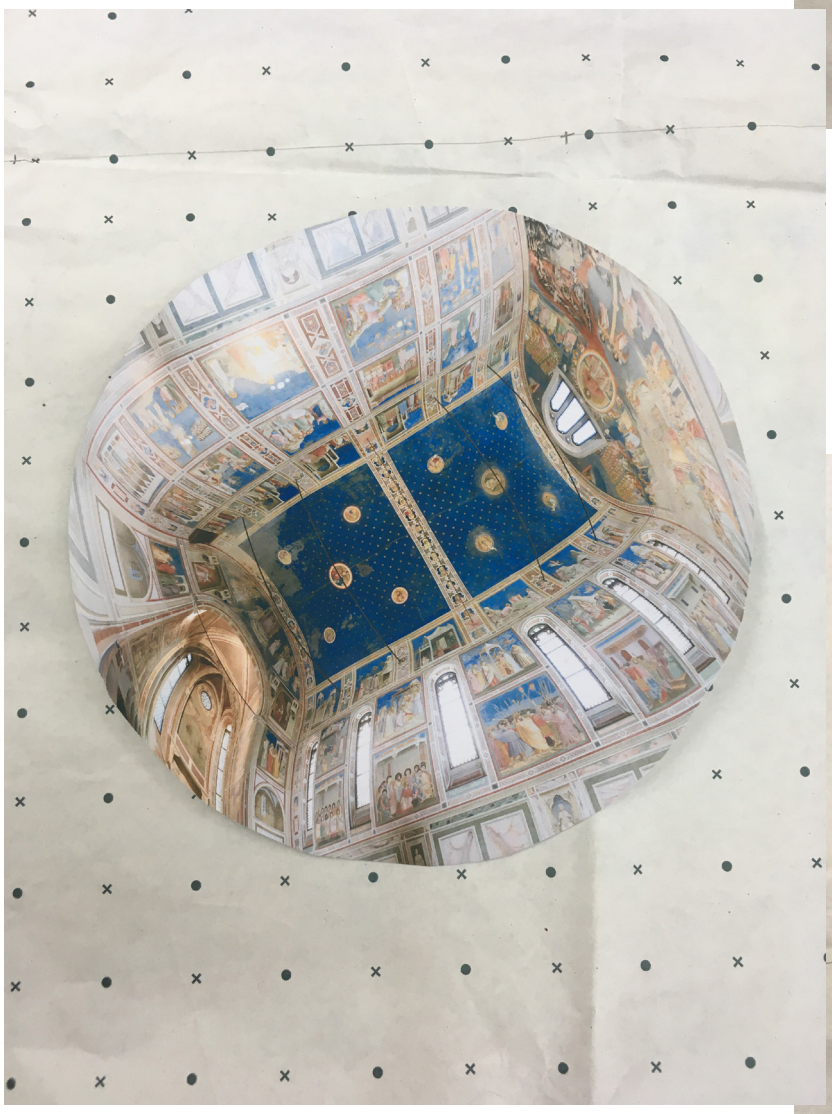


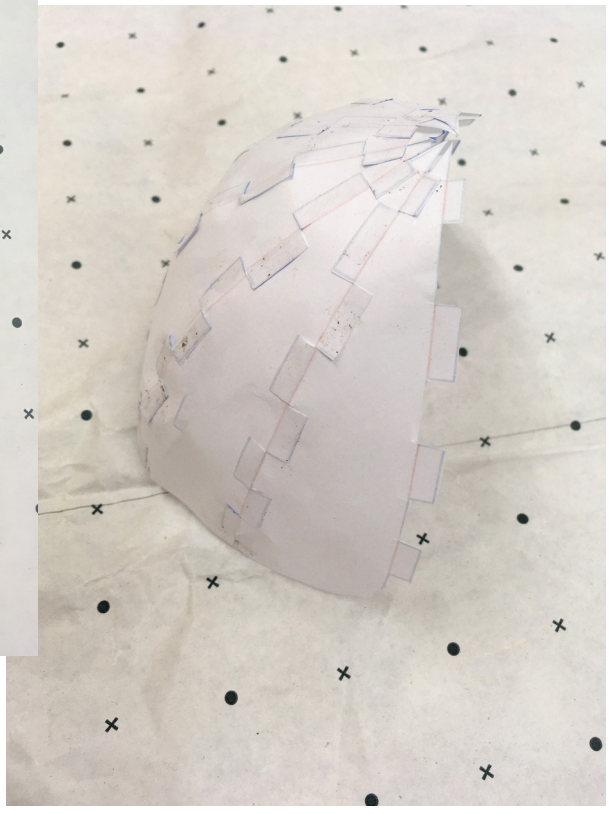
8929 x 24463
30°
136
24 gores
15° Angle.
65 cm-1 gore.
C = 1571 cms.
1 gore = 131 cm.
width
D = 500 cm.
R = 250
Gores = 12.
Angle = 30°
H = 393
W = 131
47 metres
fabric.
41m
1-10% of area.
£60. files
0.71 em
~4% of
each
gore
- Resize
- chk + load.

Shaping the design.





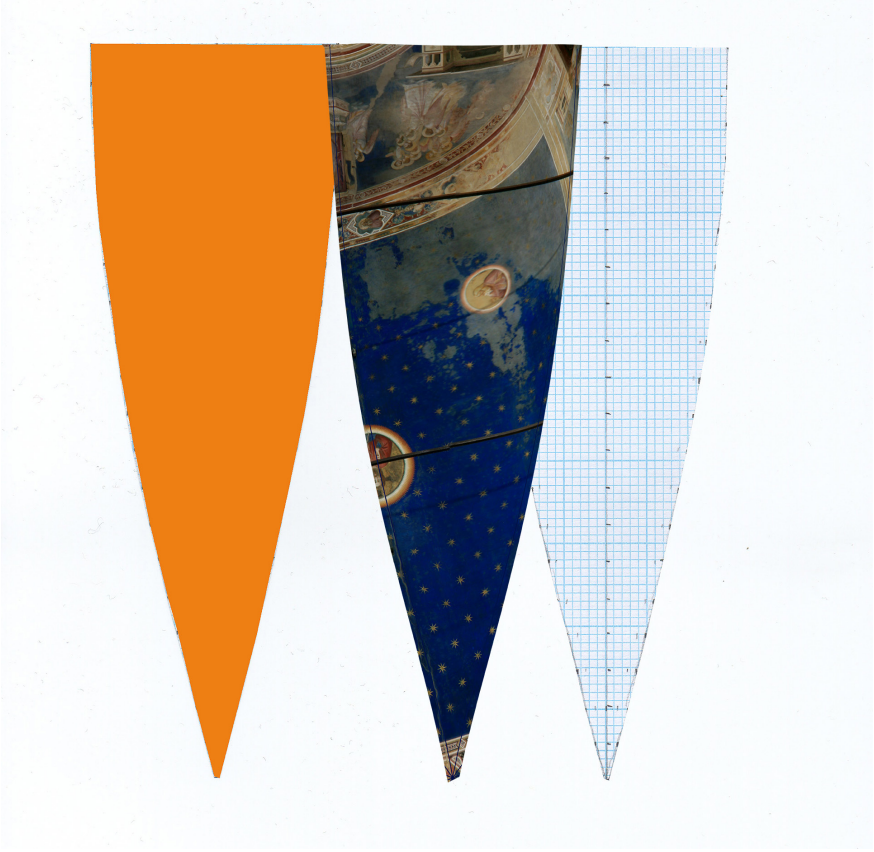




Test images.

Getting the image ready for printing.

Using Photoshop divide the circular image into 12 sections and then, using measurements from calculations shape sections into gores for printing onto fabric. The printing process in this case involves converting psd image files (as tiffs) into specialist CAD files and sublimation printing.



Sewing the parachute.

1. Cut out the gore pattern using measurements from calculations and cut the fabric to size.

2. Pin and stitch the seams using French fell seams, making sure the pattern matches up correctly.

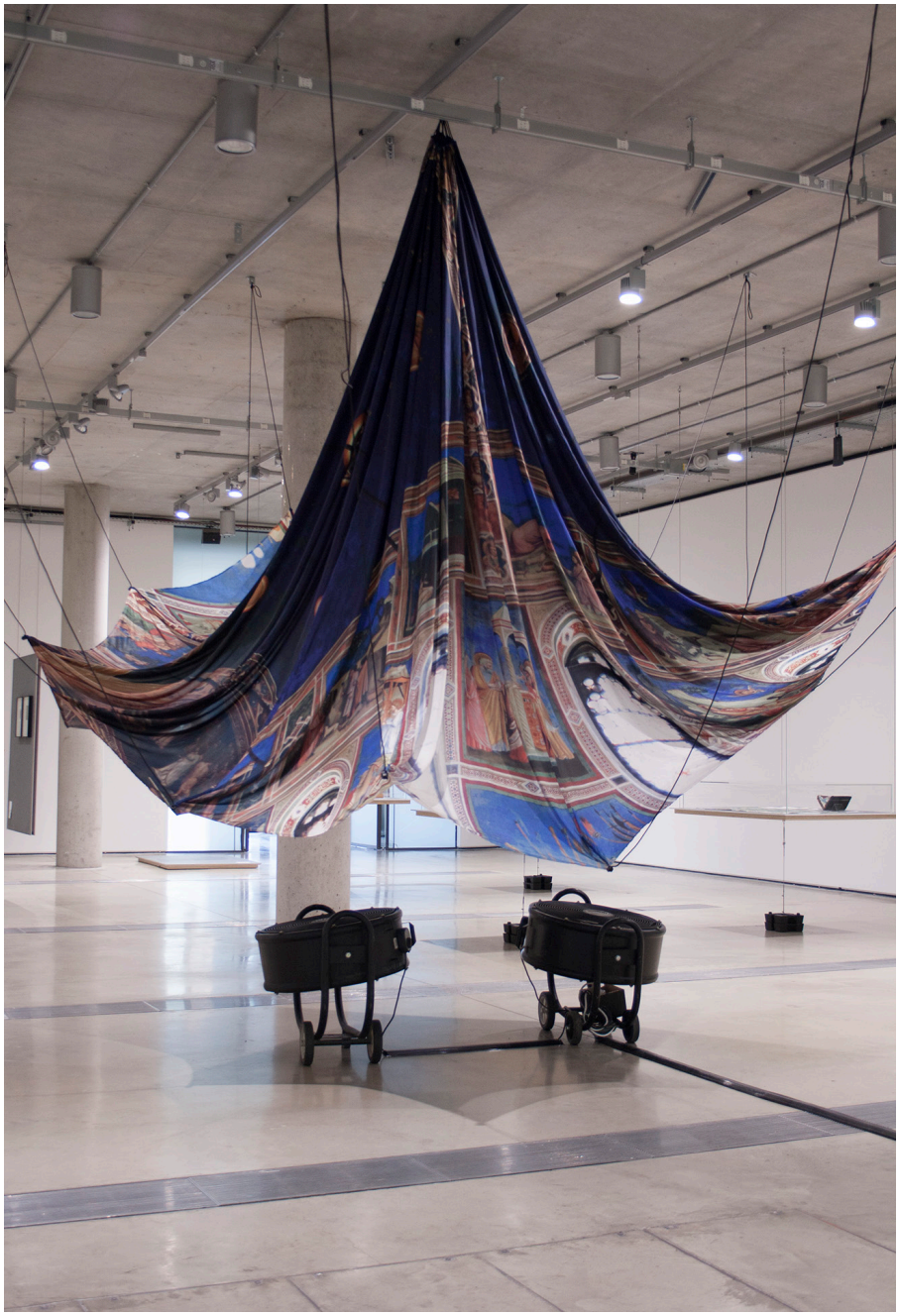
3. Attach webbing to each seam for strength, with top and bottom seams folded over, stitching to place in 4 parallel lines.

4. Press.

5. Once all the seams are joined together cut the vent in the top. This is important for stability and maintaining air pressure. The vent should be between 5 - 10 % of diameter of parachute, in this case it is 30cmD.

6. Select the cord for suspension lines and vent, in this case 5mm black polyester cord.

7. Attach cord at the vent and at the base along gore seams (6 pieces at vent, 12 lengths at base).



The parachute is now ready to fly.