Parafoil

(1982/3) Making a parafoil is generally not so difficult, but a precise work. To be important:

1. the profile of the kite
2. place, size and number of keels
3. toming the kite

Before we arrive at the construction of the profile, we will first have to decide how much we want to make the kite. Now it is not so important for a parafoil which dimensions we choose. The kite can be wider than deep or just the other way deeper than broad, or just square. The builder can design this entirely to his own taste. It is advisable not to exceed a ratio of 1: 1.5 for the width and depth ratios. Let's choose as an example for a kite of 1.5 xl, 5 mtr. so 2.25 m².

Constructing the profile

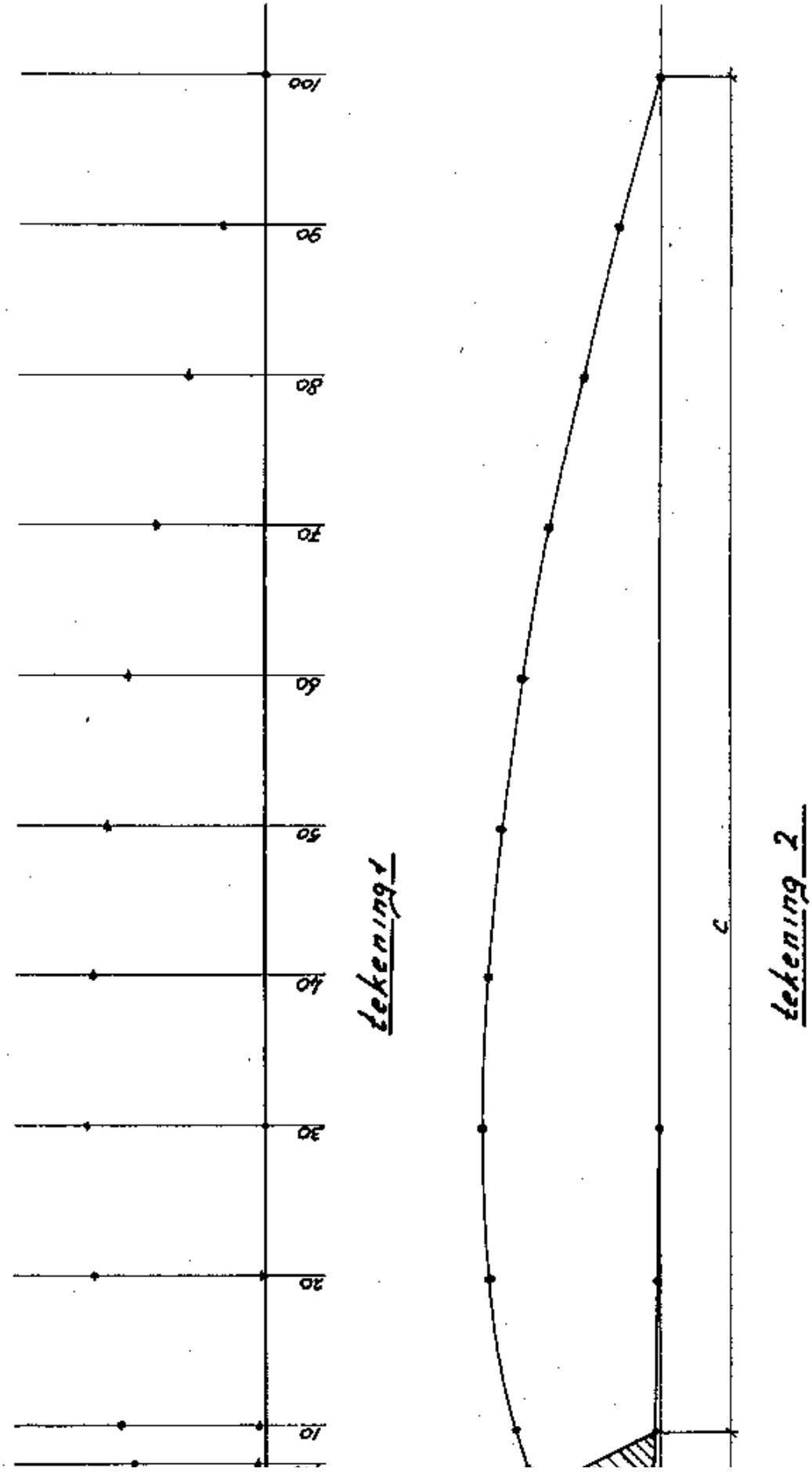
The profile of a parafoil is nothing other than the Clarck-y profile. The coordinates are shown in the table below. We divide the numbers listed in table 1 by 100 and multiply this by the depth of the kite.

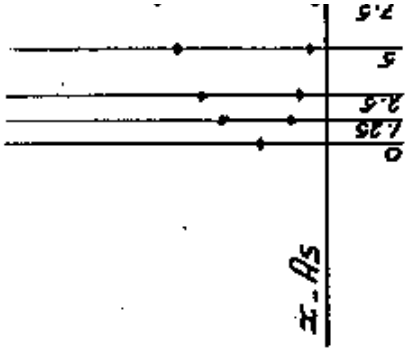
Table 1

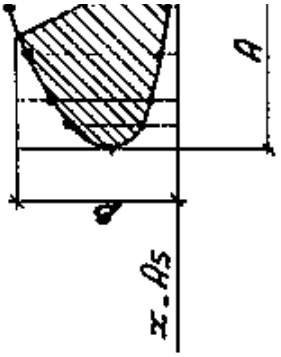
X axis	upwards	down
0	3.5	3.5
1.25	5.45	1.93
2.5	6.5	1.47
5	7.9	0.93
7.5	8.85	0.63
10	9.6	0.42
20	11.36	0.03
30	11.7	0
40	11.4	0
50	10.52	0
60	9.15	0
70	7.35	0
80	5.22	0
90	2.8	0
100	0	0

We have chosen a depth of 1.5 meters. so the center line or X-axis is 1.5 meters. long. For the expansion it is easy to work in mm, I myself use mm paper, which is for sale in the bookshop. From zero, we will now first expand the distribution of the X-axis (see text.1). The first data from the table after 0 is 1.25. This we now divide by 100 and then multiply it by the total length of the center line.
(1.25 / 100) x 1500 = 18.75 mm
Now we put this on the center line, measured from 0. And so we continue with 2,5, 5 etc. until we have reached 100. We have to make sure that the Xas at the Clarek-y profile is the bottom of the profile. This means that the data must be plotted from both upwards and downwards, above the X axis. So we set as 0 on the X-axis:
(3.5 / 100) x 1500 = 52.5 mm
This is one and the same point for both upwards and downwards. At 1.25 we set up
(5.45 / 100) x 1500 = 81.75 mm,
and for down (1.93 / 100) x 1500 = 28.95 mm.

The same applies to the other points on the X-axis. We connect the points thus found and constructed the profile. The air inlet (tek.2) is the only thing that we still have to apply. Size 10% and size B 7.5% of the total depth resp. 150 mm and 112.5 mm, the remaining nose (shaded part) does not participate. The remaining base of 1350 mm size C is now the new datum that we assume with our further calculations.







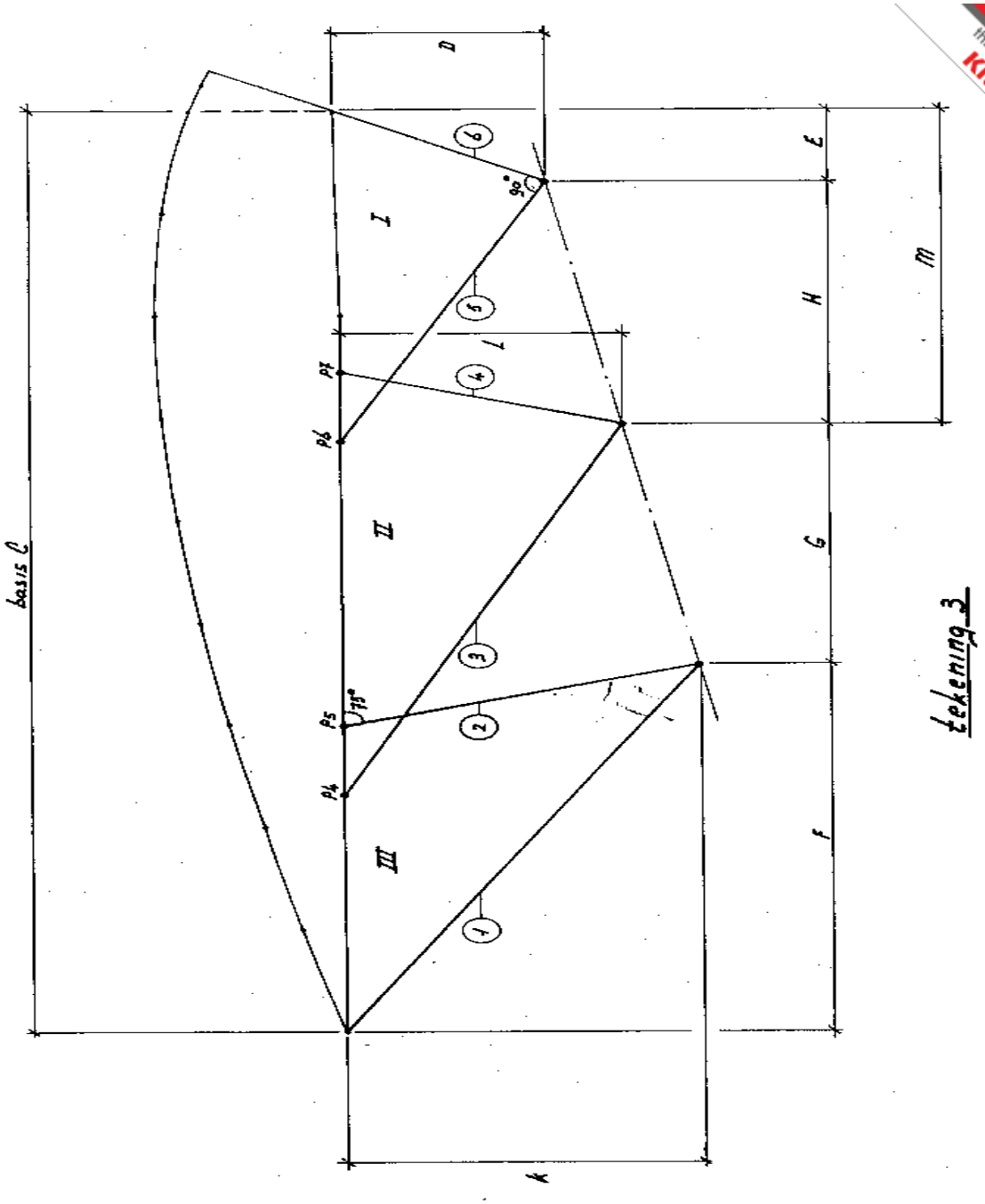
Position, dimensions and number of keels
The number of keels of a parafoil is also determined by the width and depth of the kite. We start with the depth. Divide the original depth (measure in mm) by 500 For results between

> 0.0 and <2.1 2 keels
> 2.1 and <3.1 3 keels
> 3.1 and <4.1 4 keels
> 4.1 and <5.1 5 keels

In our case, the original depth gauge is 1500 mm. So we divide this by 500, the result is then 3. This number is smaller than 3.1 but larger than 2.1, so the number of keels in depth is 3 pieces.

We start with keel 1 (text 3).
Size D = 15% of 1350 mm (dimension C) = 202.5 mm
Size E = 8% of 1350 mm = 108 mm

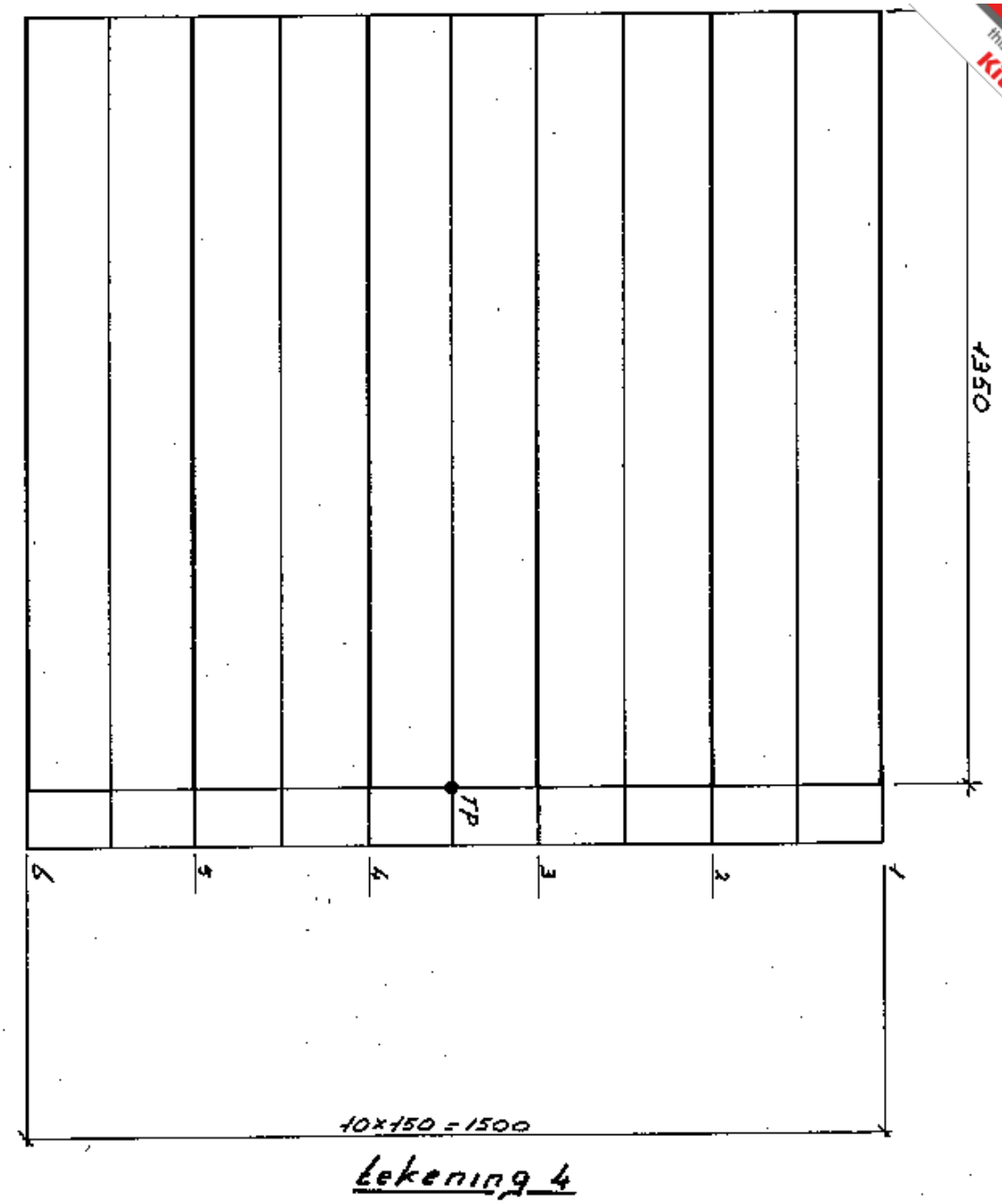
If we stake out these measures we find point P1.
Size K = 25% of 1350 mm = 337.5 mm
Size F = 40% of 1350 mm = 540 mm



Turn off these measures and thus construct point P3. Now draw a helpline through points P1 and P3. What we have to design now is the middle fin. The kite we have chosen is made with three fins, so we divide the remaining size (G + H) in this case by 2. In the case of 4 fins one has to divide by 3, in 5 fins by 4 etc ... As we can expand the remaining measure by 2 parts so that point P2. We can also calculate size M and size L, this is important if we have to perform the -koming, which will be discussed in the next chapter.

Size C - (E + F) = (G + H) and (G + H) / 2 + E = size M
1350 - (108 + 540) = 702 and 702: 2 + 108 = 459 mm
K = 25% D = 15%. Size L = (25 + 15) / 2 = 20% of size C
size L is 270 mm.

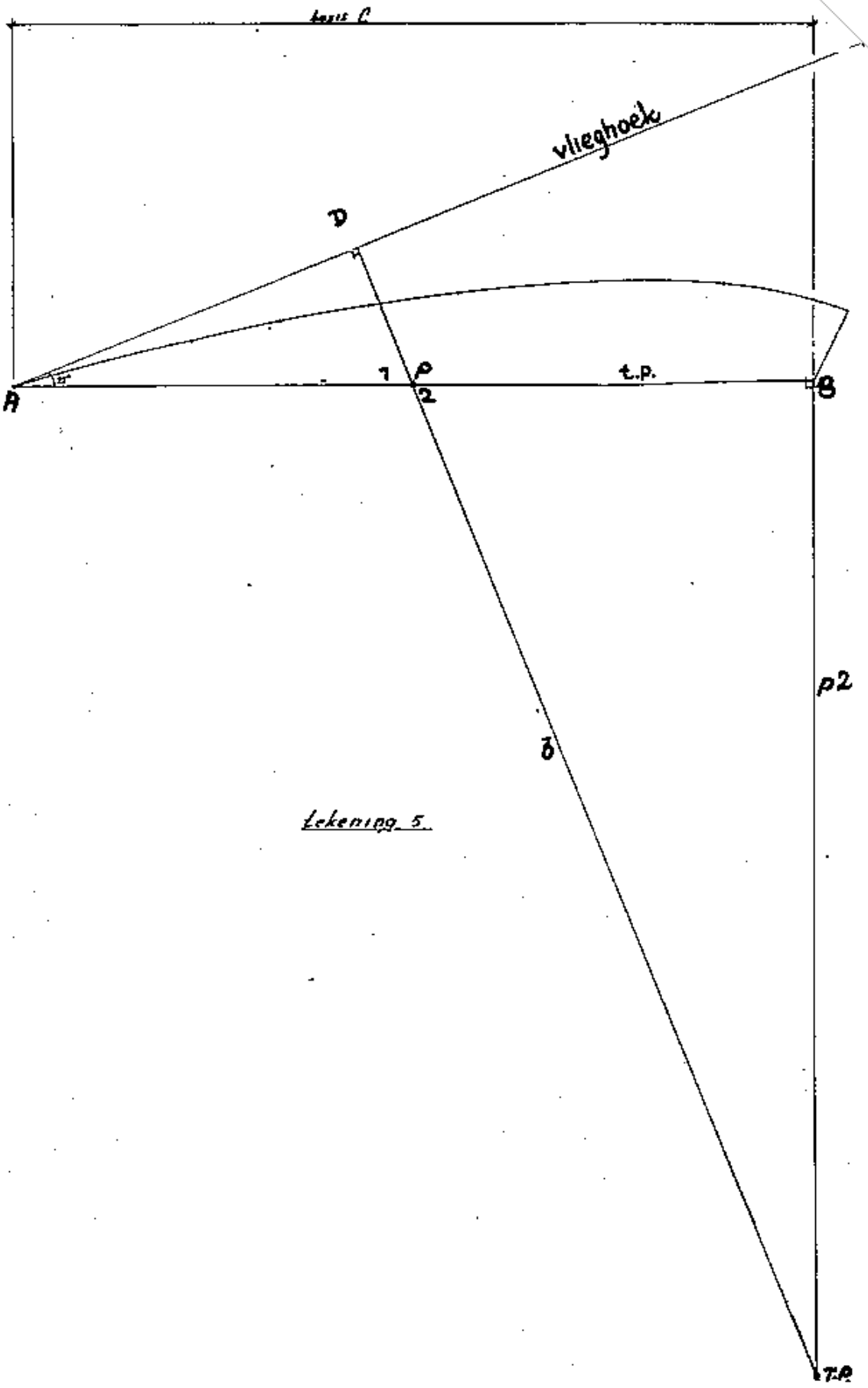
We can draw the line segments (1) and (6) without any problem. Line segment (5) is at 90 ° on line (6). Line segment (2) is at an angle of 75% on basis C. By drawing the relevant line segments we find points P5 and P6. Between P4 and P5 and between P6 and P7 we keep 100 mm and we can now resp. line segments (3) and (4).
How many rows we now take is hitching from the designer himself. We can choose whether we make a 6.8 or 10 cell parapoil. Here we opt for 10 cells of 150 mm width (tek.4) for convenience. On the numbered lines comes a row of keels, so the number of keels is 6 rows of 3 keels; a total of 18 keels.



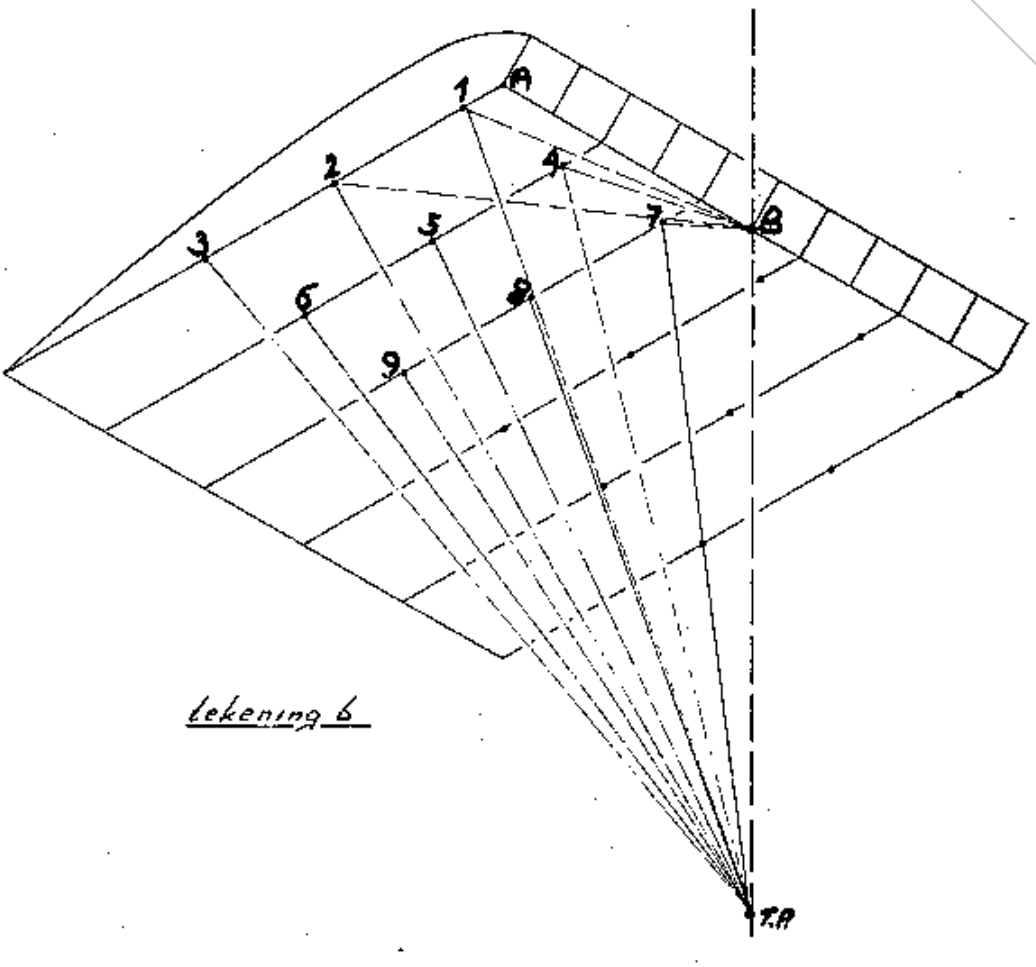
tekening 4

Toming of the kite

To determine the toming, we will have to use trigonometry and pythagoras. The tapping point is located above the front and the lower deck (text.4). We can calculate the distance between the toe point and the lower deck. Most pilots have a flight angle to the earth varying between 15 ° and 30 °.



Tekening 5.



tekening 6

In practice, I found that 22 ° is an excellent flight angle for a parafoil. Let's take a look at drawing 5. We share base C in point P, we get two equal pieces. From point A we draw the fly angle line at an angle of 22 °. Perpendicular to this line we draw a line 'b' through point P. From B we draw a line segment P2 perpendicular to the base C. Line part b and P2 now intersect in point TP Line part P2 we have to calculate now.
Base C = 1350 mm.
Angle A = 22 °
Angle B = 90 °
Angle D = 90 °
Angle Pl = angle P2
line segment tp = 675 mm
Angle TP = 180 ° - (90 + 68) = 22 °

P2 = (tp / (sin.angle tp)) = (P2 / (sin.angle P2)) = (675 / 0.374) = (P2 / 0.927) = 1673mm

In tek. 6 we assume that the bridle ropes start from the bottom of the kite. Later we also simply deduct the height of the keels from the calculated rope length.
In practice, I have found that this way of working works well and it saves us a lot of calculation work. We start with toom 1:

First we calculate the line lB of triangle 1-AB. Then we calculate the line l-TP from triangle 1-b-TP.
Line segment AB is calculated 750 mm.
Line segment lA is calculated 108 mm (see calculated keels).
Line segment lB = the root out ((108) ² + (750) ²) = 757.74 mm Line segment
B-TP is calculated 1673 mm.
Line segment lB is calculated 757.7 mm.
Line segment l-TP = the root out ((1673) ² + (757.74) ²) = 1836.6 mm.

From the number calculated here we deduct the height from the relevant keel. In this case Kiel I size D 202.5 mm (see text 3) 1836.6 - 202.5 = 1634, 1 mm. We can finish this at 1635 mm. We mention this size in table 2 which we compile ourselves.

Table 2

toom	length of rope
1	1635
2	1620
3	
4	
5	
6	
7	
8	
9	

We continue to calculate the line segments 2-B and 2-TP
AB = 750 mm and 2-A = 459 mm

2-B = the root out ((459) ² + (750) ²) = 879.3 mm
2-TP = the root out ((879.3) ² + (1673) ²) = 1889.9 mm

height Kiel II size L = 1889.9 - 270 1619.9 rounded 1620 mm.
So we continue with treble 3,4 etc. up to and including round 9.
Note that we have now only calculated half. The other side is the mirror image. In this way I have calculated the parafoils and other kites with compound steams.

If we design the parafoil according to the calculations mentioned in this story and do it exactly, it will certainly lead to success.