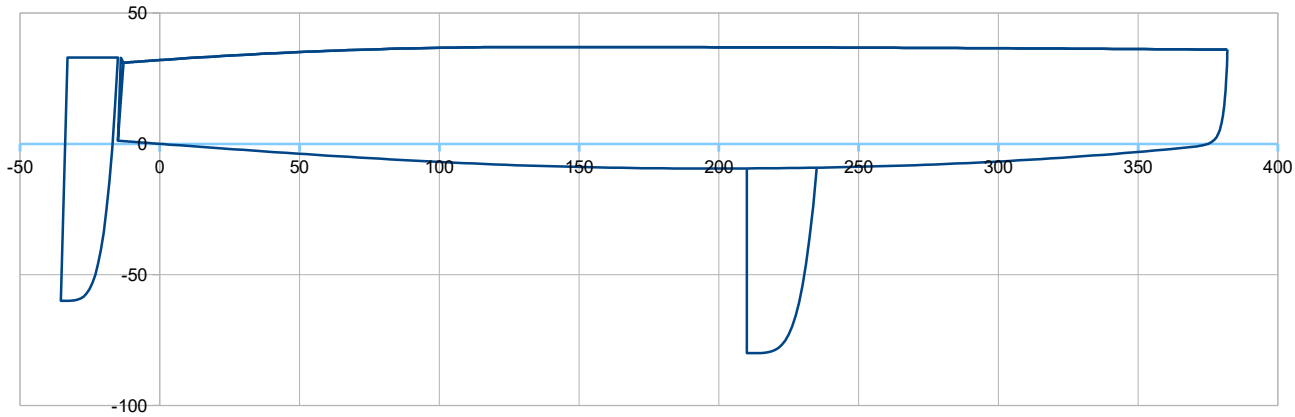
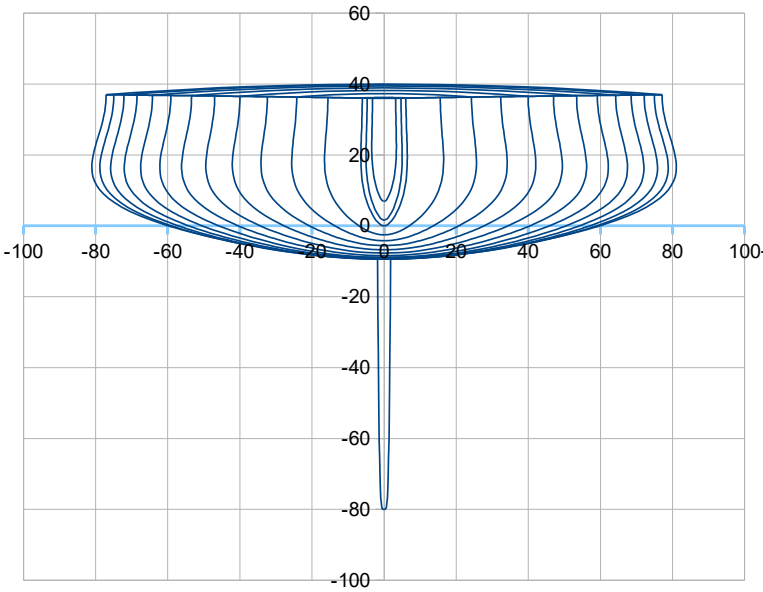
# Dinghy 13 'Bump' version

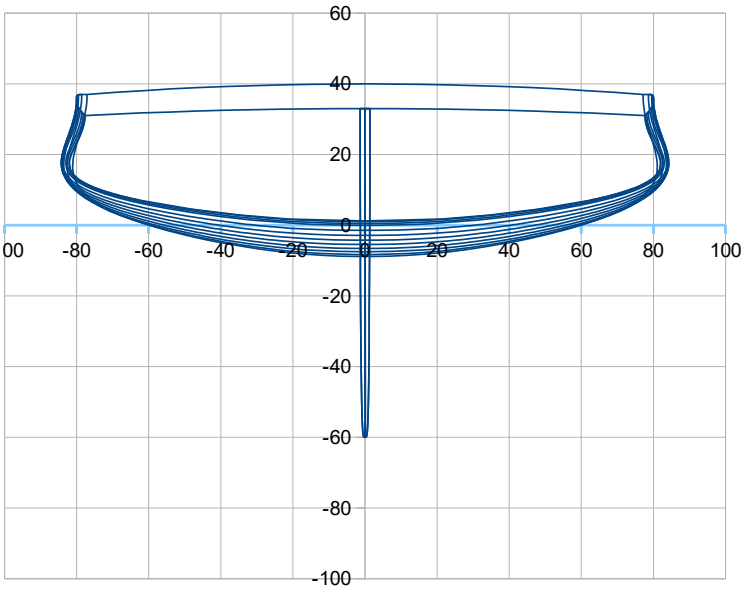
*Jean-François Masset - May 2019* jfcmasset@outlook.fr

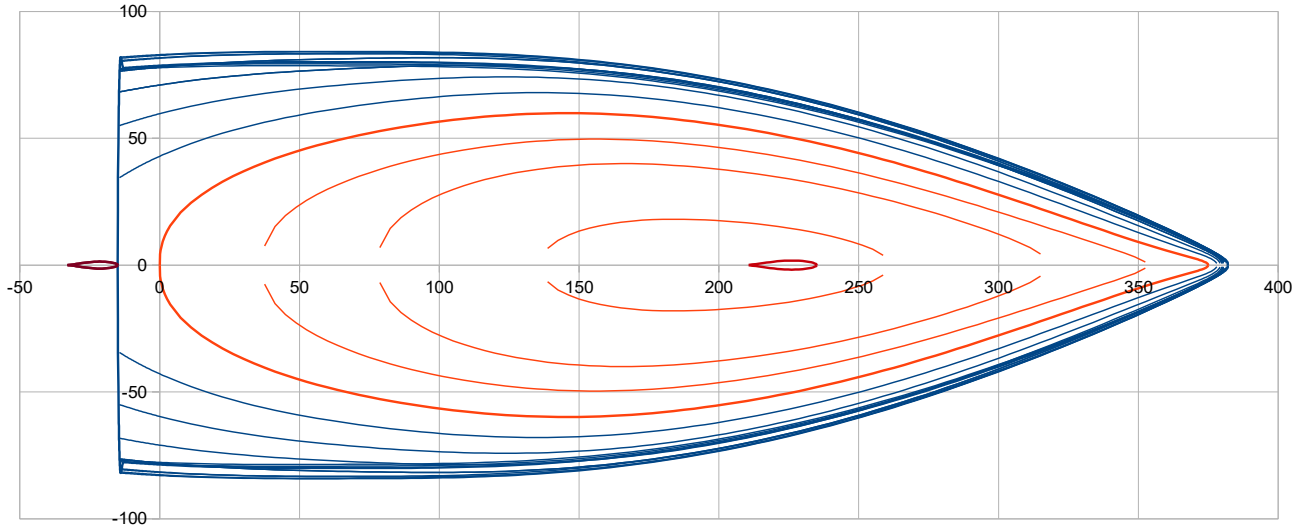
Lhull : 3,97 m (13 ft) ; Bhull : 1,60 m (at sheer line) ; Light weight assumed 61 kg (with a 8 m2 sail)
With the design « payload » 95 kg (a heavy helmsman case) :

>>> Lwl : 3,75 m ; Bwl : 1,20 m >>> Bwl / Bhull = 0,749

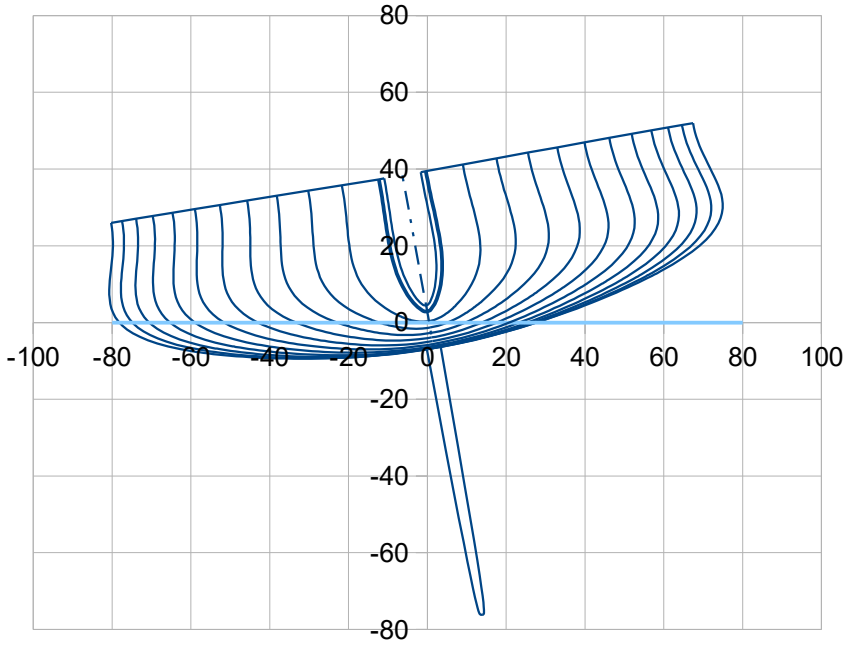


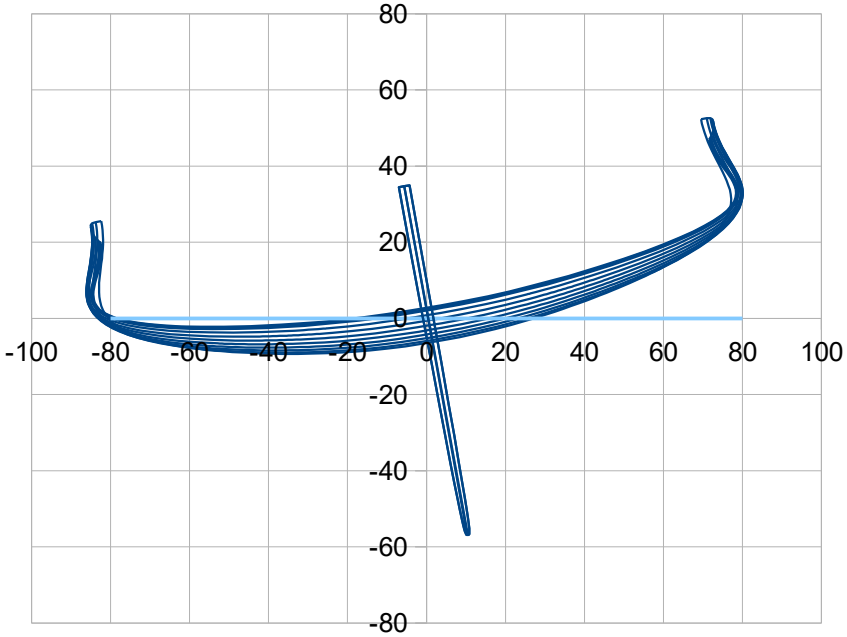



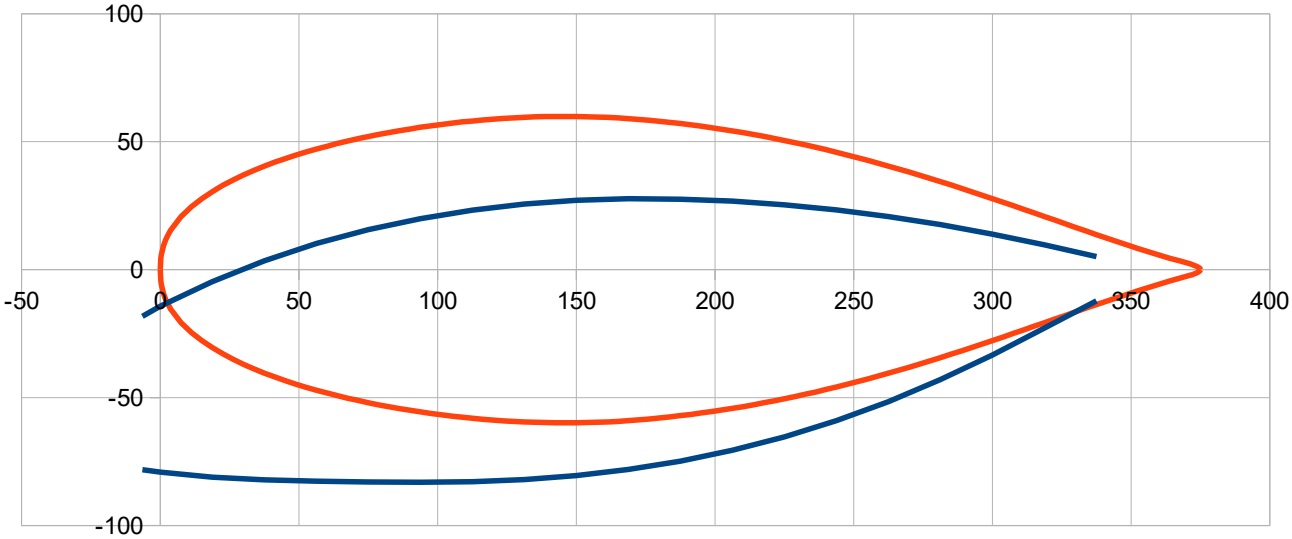



With 10° heel angle :

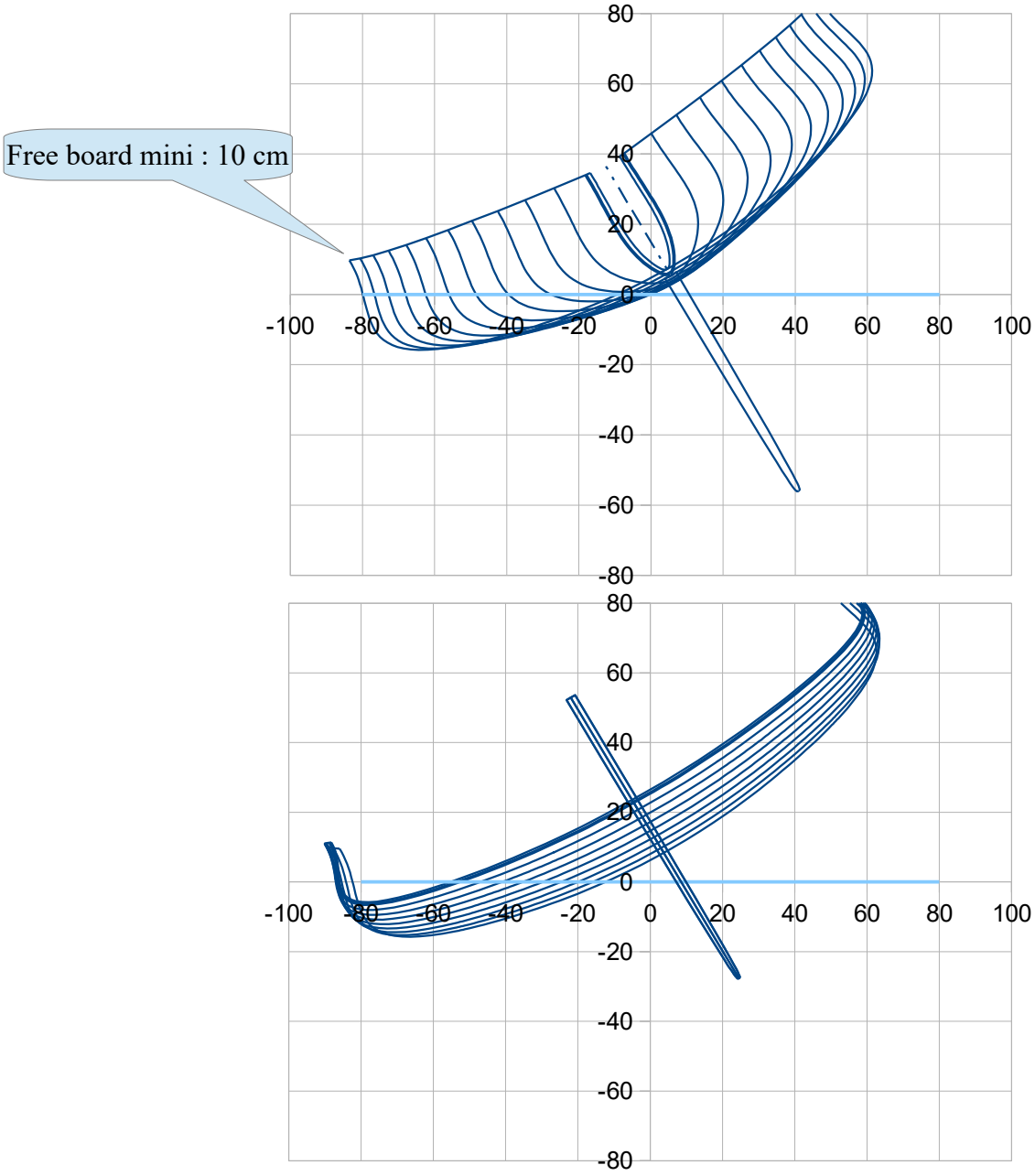



>>> waterlines have some similarities with Scow ones, although with a more classic bow.

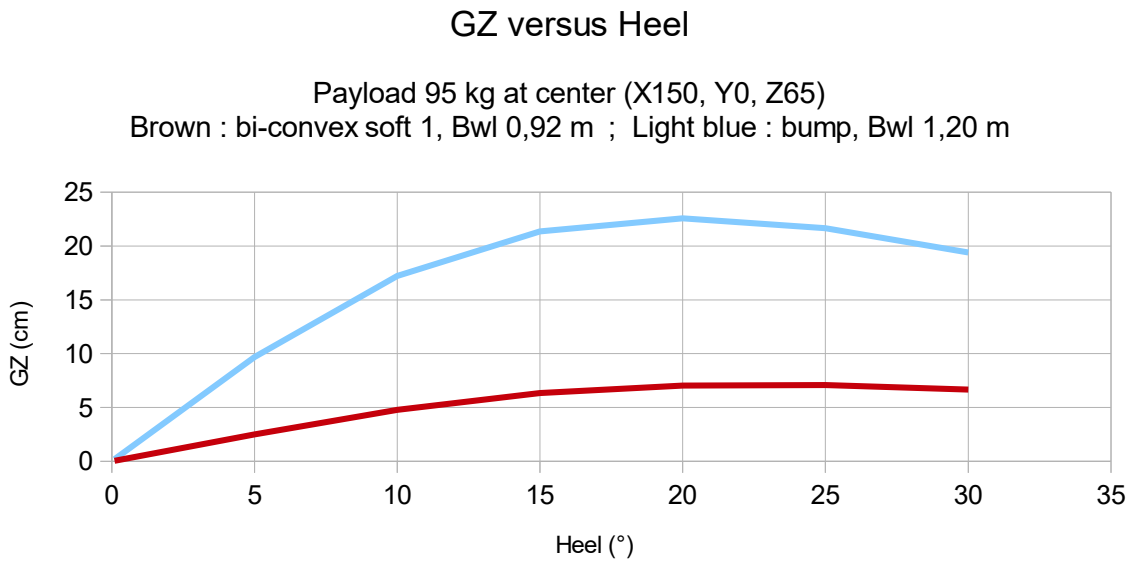
With 30° heel angle : thanks to the volume given by the bump effect, the minimum free-board is still 10 cm :



**Stability issue when considering the « payload » in the center :**

e.g. the helmsman squatted in the boat center under the boom, with his center of gravity at Z +65 cm. It is typically the tack or gybe configuration. Here for the stability comparison it is assumed that the helsman is (temporarly) fixed like a statue in the center of the boat. and we look at the righting arm GZ evolution for heel up to 25°, due to external action (waves, dynamics of a manoeuver) and/or due to a transversal offset of the payload.

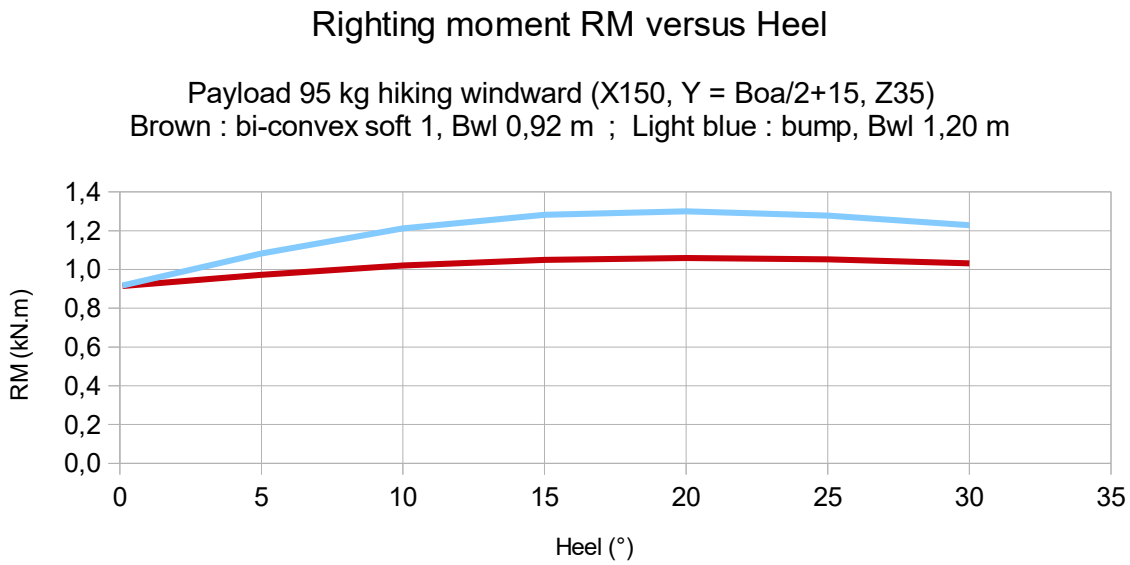
>>> Comparison with the previous *Bi-convex soft 1* version :




>>> a lot more stability tolerance with the *Bump* option, e.g. at 25° heel angle, a dY offset tolerance for the 95 kg of 39,2 cm / 12,6 cm for the *Bi-convex soft 1*

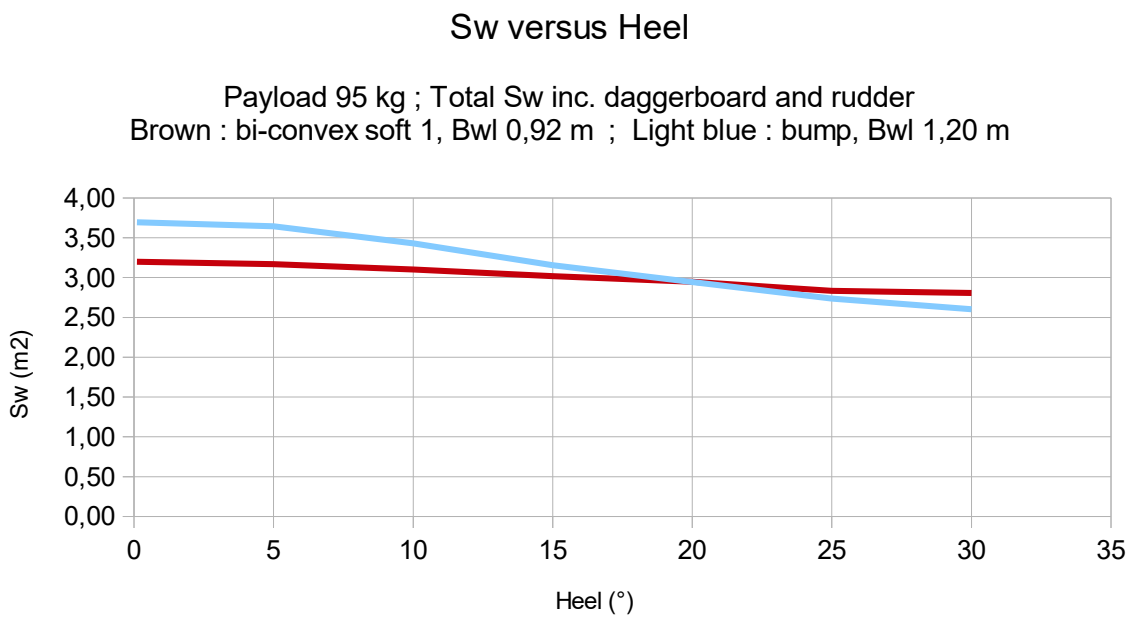
**Righting moment when the « payload » is hiking at windward** :

e.g. the helmsman is hiking with its center of gravity estimated at about Y = B/2 + 15 cm and Z = 35 cm (and X still at 150 cm).




>>> 20% more RM at 10° heel angle thanks to the *Bump* effect

**The wetted surface Sw :**




>>> + 15 % Sw for the *Bump* option at low heel angles. The difference becoming 0 at 20° , it is the « Imoca » trend for such hull.

Hydrostatics when upright with payload 95 kg :

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **2.1 Hull** | | | | | | | | | |
| **Loa (m)** | **3,97** | **Lwl (m)** | **3,75** | >Hull speed | 4,7 | (at Fn 0,4) | | | |
| *>> ft* | *13,02* | | *12,30* | | | | | | |
| **B (m)** | **1,60** | **at X (% Lwl)** | **18,0** | at sheer line | | | | | |
| *>> ft* | *5,25* | | | | | | | | |
| **Bwl (m)** | **1,20** | **at X (% Lwl)** | **39,0** | > Bwl / B | 0,749 | | | | |
| *>> ft* | *3,93* | | | | **Freeboards (m) >** | | **Aft** | **Midship** | **Fore** |
| **Tc (m)** | **0,094** | **at X (%Lwl)** | **50** | | | | **0,31** | **0,37** | **0,36** |
| *>> ft* | *0,31* | | | | | *>> ft* | *1,02* | *1,21* | *1,18* |
| **Displacement at H0 (m3)** | | **0,14805** | **at Xc (m)** | **1,768** | **Xc (%Lwl)** | | **47,16** | **Zc (m)** | **-0,032** |
| | *>> lbs* | *335* | *w. seawater* | *1025* | *kg/m3* | | | *>> ft* | *-0,10* |
| Disp at h (cm) | -0,376368726 | 0,13674 | at Xc (m) | 1,778 | Xc (%Lwl) | | 47,42 | Zc (m) | -0,004 |
| Disp at h (cm) | 0,376368726 | 0,15982 | at Xc (m) | 1,758 | Xc (%Lwl) | | 46,88 | Zc (m) | -0,059 |
| **Cp (%)** | **54,25** | | | | | | | | |
| **Sf (m2)** | **3,08** | **at Xf (m)** | **1,634** | **Xf (%Lwl)** | **43,57** | | >>> Xc – Xf (%Lwl) | | 3,59 |
| *>> ft2* | *33,17* | *>> ft* | *5,36* | | | | | | |
| **Angle immersed sheer li (°)** | | **25,6** | at section C4 (40% Lwl) | | | | | | |
| **Sw (m2)** | **3,11** | >Sw/D^(2/3) | 11,10 | | | | | | |
| *>> ft2* | *33,43* | | | | | | | | |
| **Shull (m2)** | **7,29** | **at X (m)** | **1,600** | **Z (m)** | **0,056** | | | | |
| *>> ft2* | *78,45* | *>> ft* | *5,25* | *>> ft* | *0,18* | | | | |
| **Sdeck (m2)** | **4,82** | **at X (m)** | **1,459** | | | | | | |
| *>> ft2* | *51,86* | *>> ft* | *4,79* | | | | | | |
| **2.2 Daggerboard** | | | | | | | | | |
| **Volume (m3)** | **0,00282** | **at X (m)** | **2,226** | **X (%Lwl)** | **59,36** | **Z (m)** | **-0,37** | | |
| **Draft oa (m)** | **0,80** | | **Sw (m2)** | **0,30** | | **Sxz (m2)** | **0,14** | | |
| *>> ft* | *2,62* | | *>> ft2* | *3,24* | | *>> ft2* | *1,56* | | |
| **CLR (m)** | **2,288** | **CLR (%Lwl)** | **61,00** | method : keel profile extended to the waterline, 25% c at 45% draft oa | | | | | |
| *>> ft* | *7,50* | | | | | | | | |
| **2.3 Rudder(s)** | | | | | | | | | |
| **Number** | **1** | | | | | | | | |
| **Volume (m3)** | **0,00143** | **at X (m)** | **-0,246** | **X (%Lwl)** | **-6,57** | **Z (m)** | **-0,054** | | |
| **Sw (m2)** | **0,18** | *>> ft* | *-0,81* | | | **Sxz (m2)** | **0,09** | per rudder | |
| *>> ft2* | *1,92* | | | | | *>> ft2* | *0,92* | | |
| **2.4 Hull + Daggerboard + Rudder(s)** | | | | | | | | | |
| **Displacement at H0 (m3)** | | **0,15229** | **at Xc (m)** | **1,758** | **Xc (%Lwl)** | **46,88** | | **Zc (m)** | **-0,038** |
| | **Disp. (kg)** | **156,1** | *>> ft* | *0,54* | | | | *>> ft* | *-0,13* |
| | *>> lbs* | *344* | | | | | | | |
| | **Sw (m2)** | **3,58** | >Sw/D^(2/3) | 12,57 | Lwl/D^(1/3) | 7,02 | | | |
| | *>> ft2* | *38,58* | | | *DLR* | *82* | *M(lbs/2240)/(Lwl(ft)/100)^3* | | |
| **2.5 Data from the mass spreadsheet** | | | | | | | | | |
| **Boat with payload** | **M(kg)** | **156,1** | **at Xg (m)** | **1,564** | **Xc (%Lwl)** | **41,71** | **at Zg (m)** | **0,576** | |
| Light boat | | 61,1 | | 1,664 | | | | 0,461 | |