As for 2019-07-02

Dinghy hull investigation, for more RM and stability margin

V8 : comparison of some *Convex-concav-hard chine* versions within the NS14 class rules

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In this V8 document, we test and compare 4 hull versions (with various combinations of convex-concav arrangement as previously investigated) for a NS14 and within their class rules : file:///C:/Users/Jean-François/Documents/Yacht/Gene-Hull/Versions%202.4/Test%20Dinghy/NS14/NS14ClassRules_September2017.pdf

Common data for the 4 versions :

Loa : 4,27 m (NS14 Rules 4.2 : 4,25 to 4,30 m)

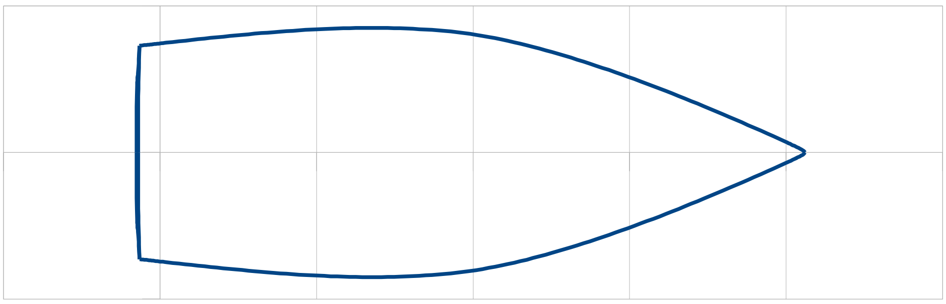
Bhull : 1,70 m (at 34% Lwl from aft)
>>> Boa (inc. the benches roudness) : 1,78 m (NS14 Rules 4.3 : 1,60 to 1,83 m)

Hull draft (with reference payload 130 kg) : 11,2 cm (at 55% Lwl from aft)

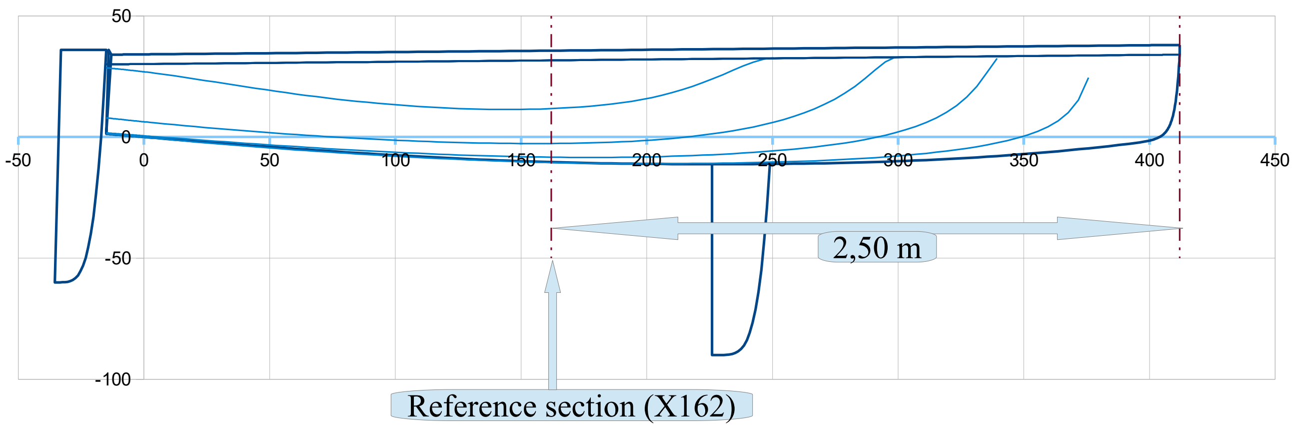
Displacement : 214 kg including ,

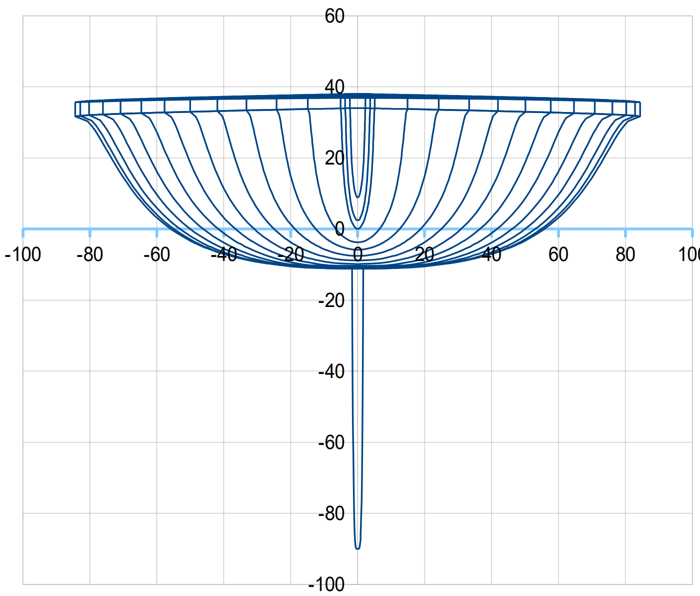
- Bare hull with permanent fittings 67 kg (Rule 5,1 : > 64 kg)
- Removable fittings : 17 kg
- Payload : 130 kg

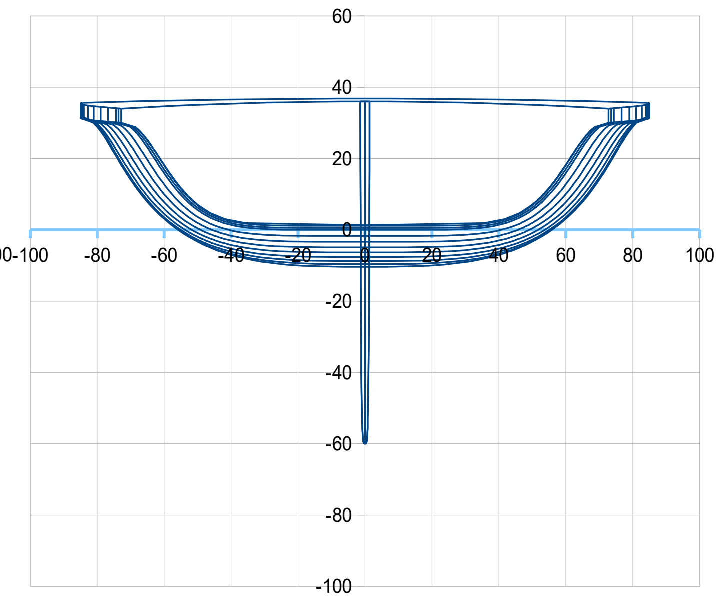
Same sheer line top view

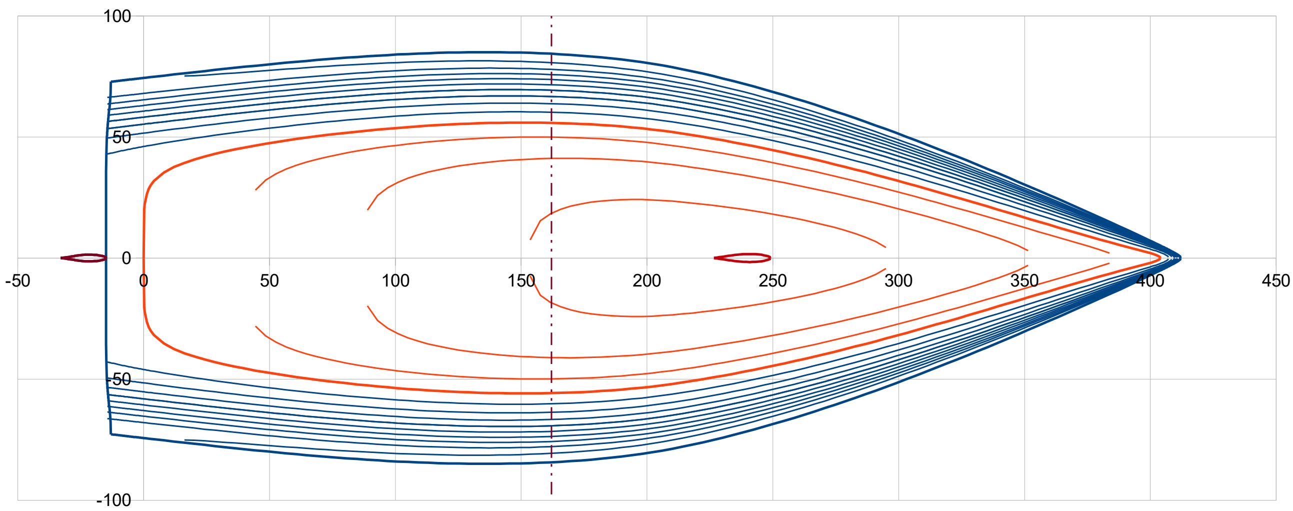


Hull test 1 : inspired by the *Tequila 96* hull, with elliptical sections at fore stations becoming flatter U towards the aft + sligthly concav on the upper part.

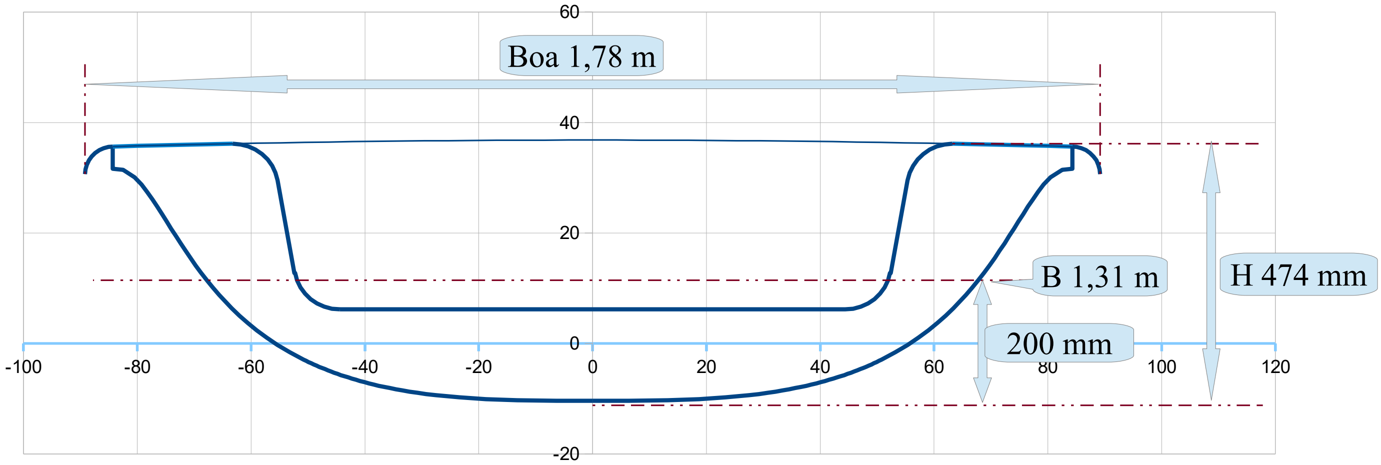






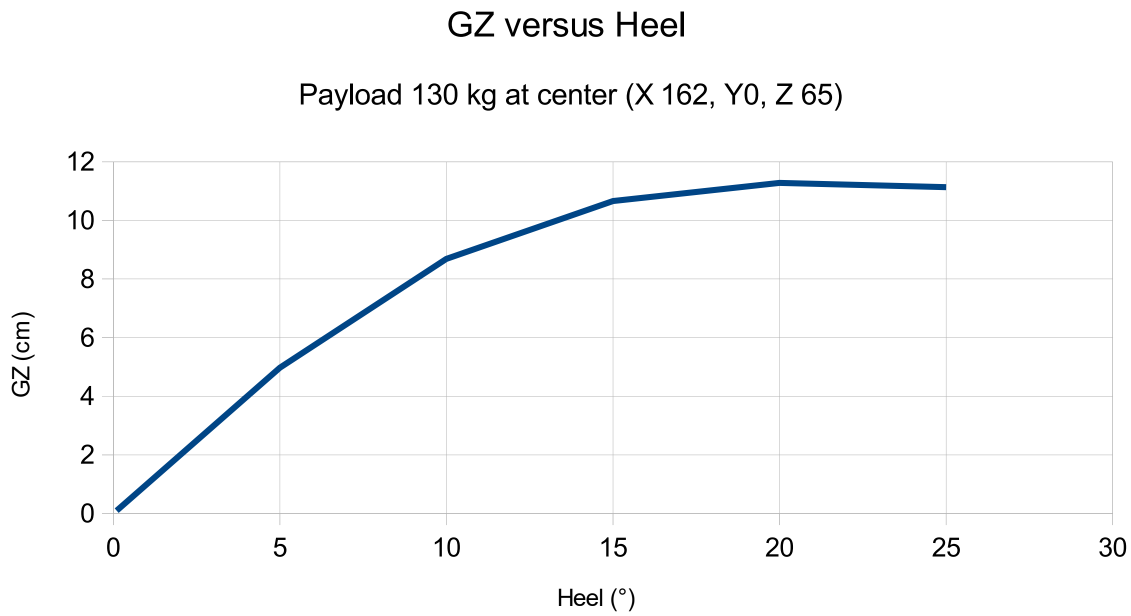


Cross section at 2,50 m aft of the Fore perpendicular (= X162 in the drawing coordinates), the reference section according the Rules – chapter 4.



- *Boa (from all sections) = 1,78 m according to Rule 4.3 : 1,60 to 1,83 m*
- *Bwl : 1,12 m (as drawn with 130 kg payload)*
- ***B = 1,31 m** at H 200 according to **Rule 4.3 : ≥ 1,22 m** at H 200 mm from the keel centerline*
- *Hull convexity (no hollow) below the reference point at H 200 according to Rule 4.5 : « …… Additionally, a taut tape containing the vertical transverse section of the hull below the 2.50m measurement point defined in rule 4.3 shall show no separation from the hull. »*
- *H = 474 mm according to Rule 4,4 : ≥ 450 mm*

Stability with reference payload 130 kg at center and Z 65 cm / waterline :

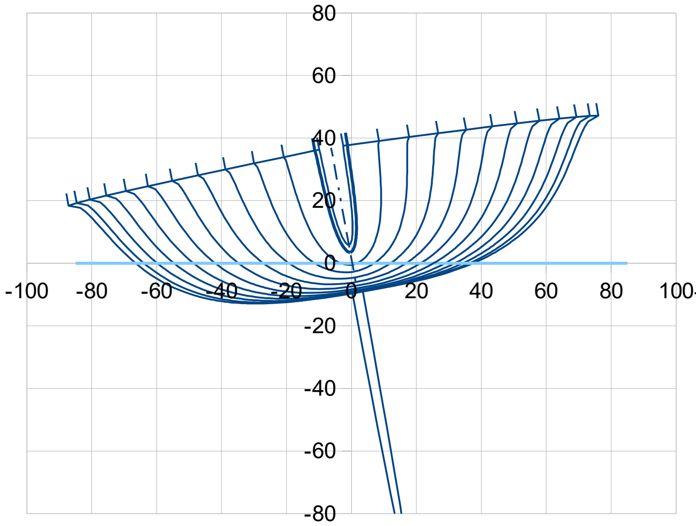


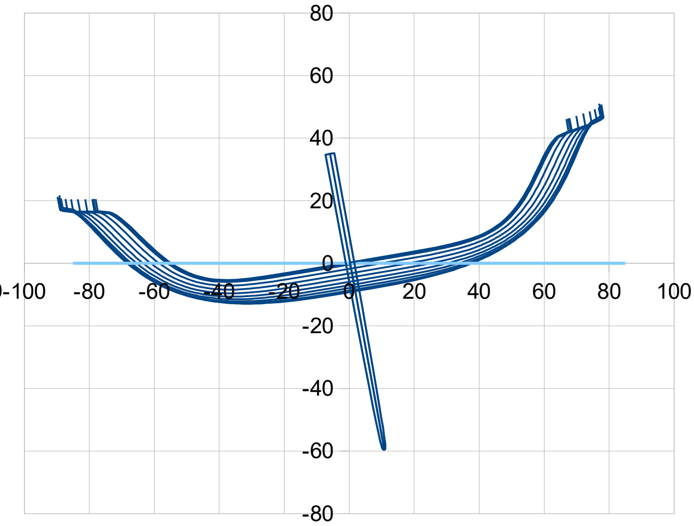
Initial stability >>> GM (0,1°) : 60,2 cm

Reserve stability >>> Gz max at 20° : 11,3 cm

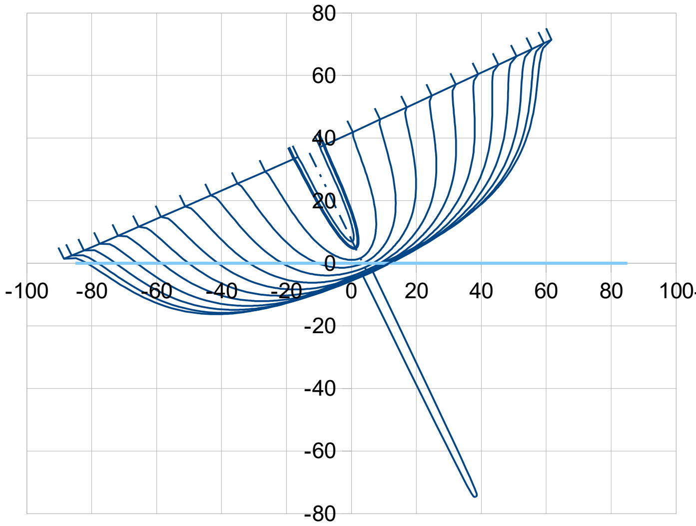
>>> Aera under GZ for 0°-25° : 205,8 cm.°

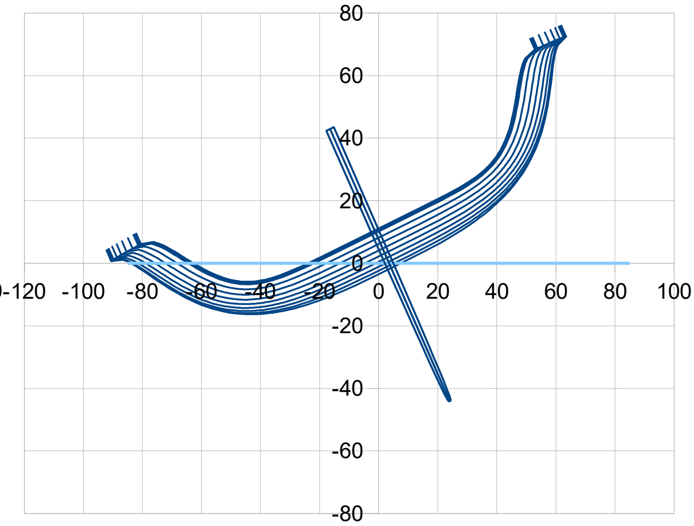
At 10° heel angle :



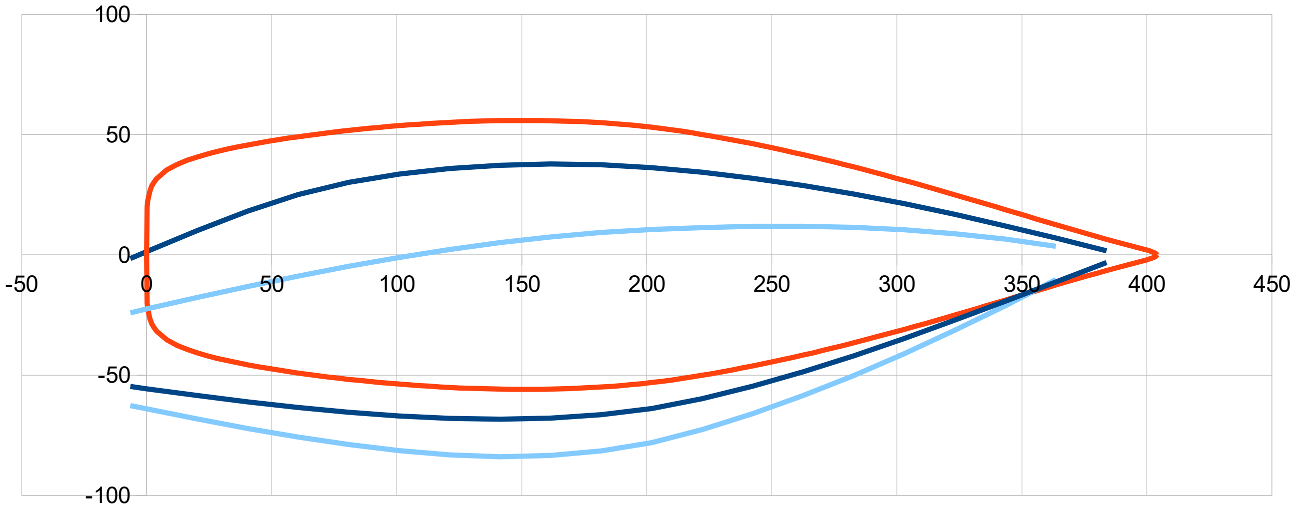


At 25° heel angle

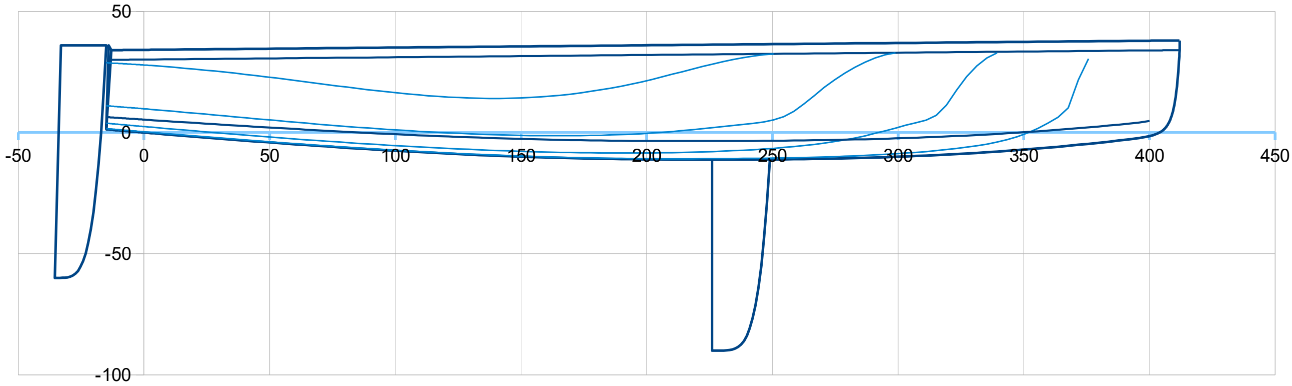


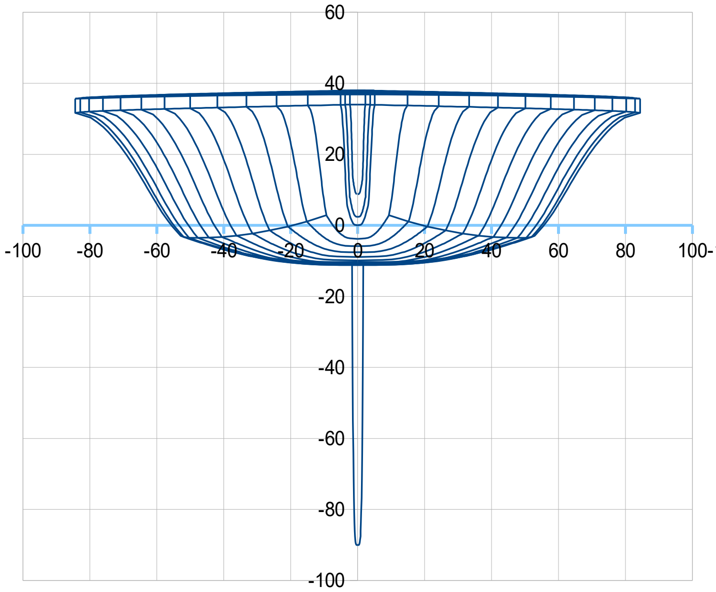


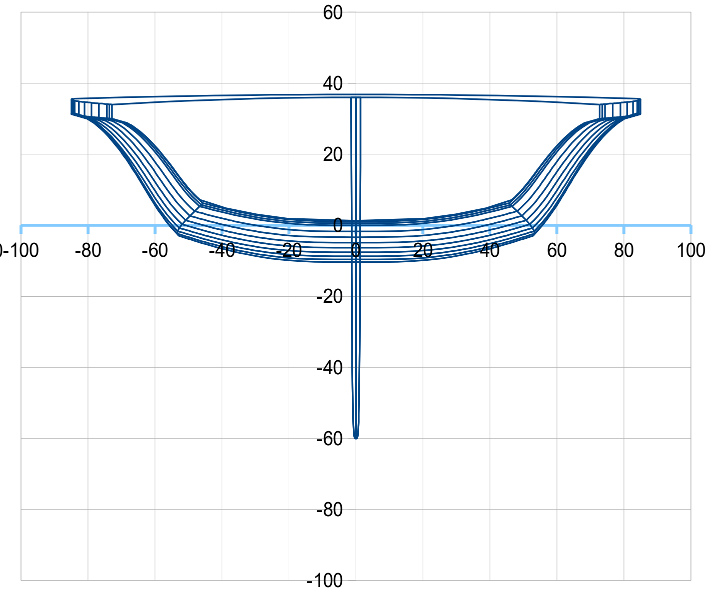
Floatation surface at 0°, 10° and 25° :

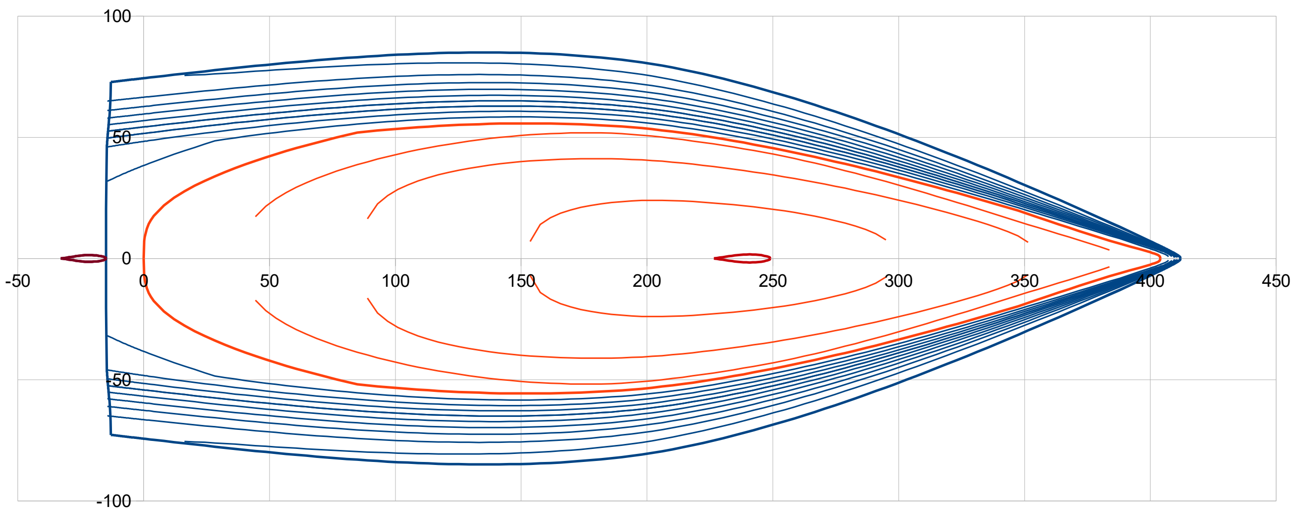


Hull Test2 : from the previous version with introduction of a lower hard chine

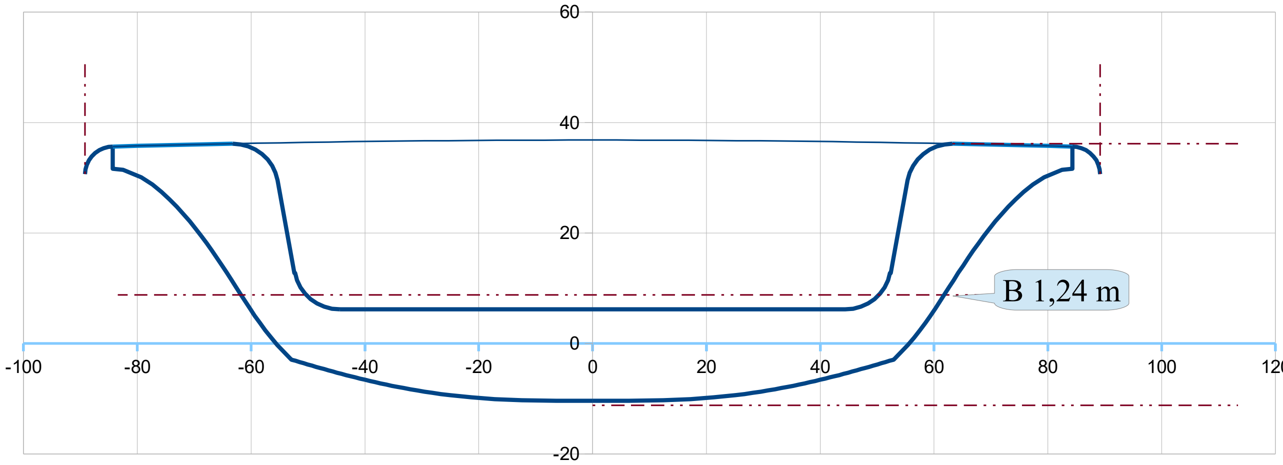






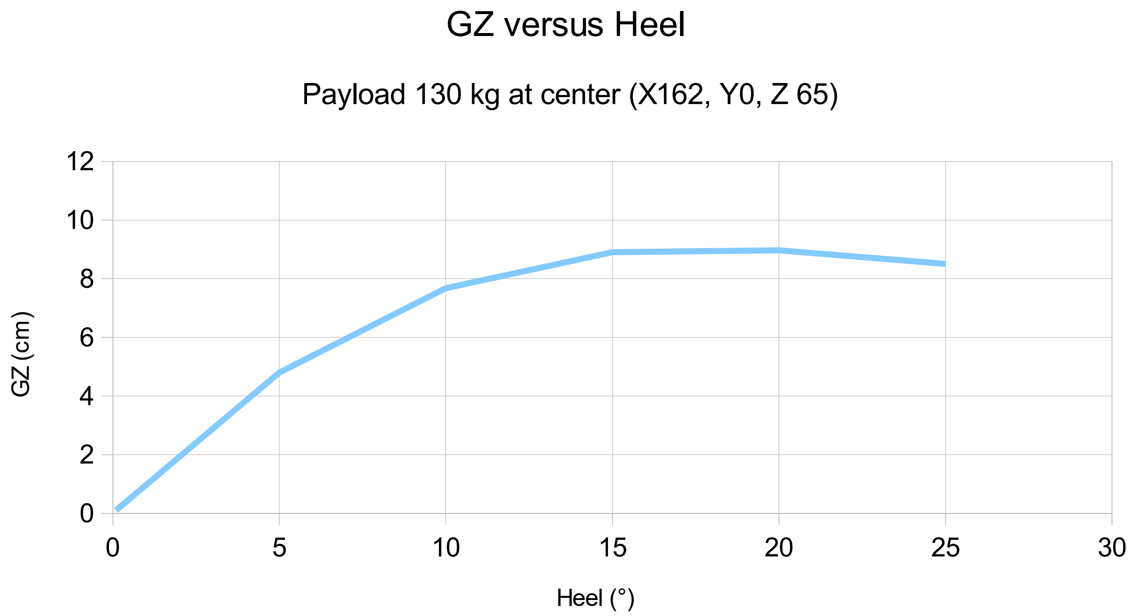


Cross section at 2,50 m aft of the Fore perpendicular (= X162 in the drawing coordinates), the reference section according the Rules – chapter 4.



- *Bwl : 1,11 m (as drawn with 130 kg payload)*
- ***B = 1,24 m** according to **Rule 4.3 : ≥ 1,22 m** at H 200 mm from the keel centerline*
- *Hull convexity (no hollow) below the reference point at H 200 (the concavity starts above these points) according to Rule 4.5 : « …... Additionally, a taut tape containing the vertical transverse section of the hull below the 2.50m measurement point defined in rule 4.3 shall show no separation from the hull. »*
  >>> necessity to maintain straight or slightly concex the line from the hard chine points to the reference points

Stability with reference payload 130 kg at center and Z 65 cm / waterline :

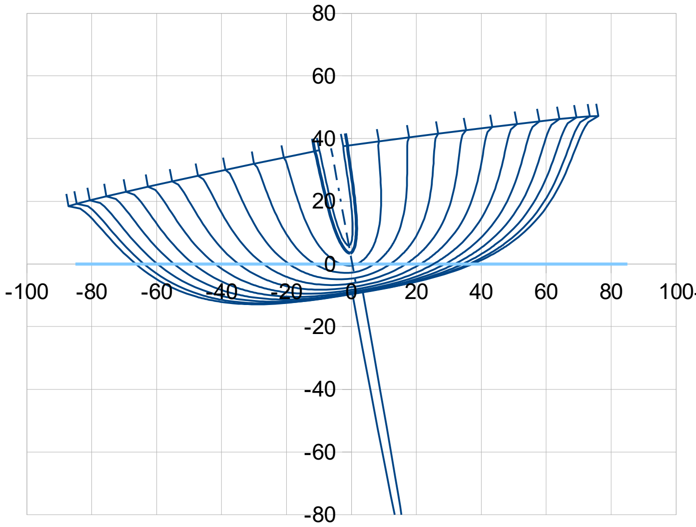


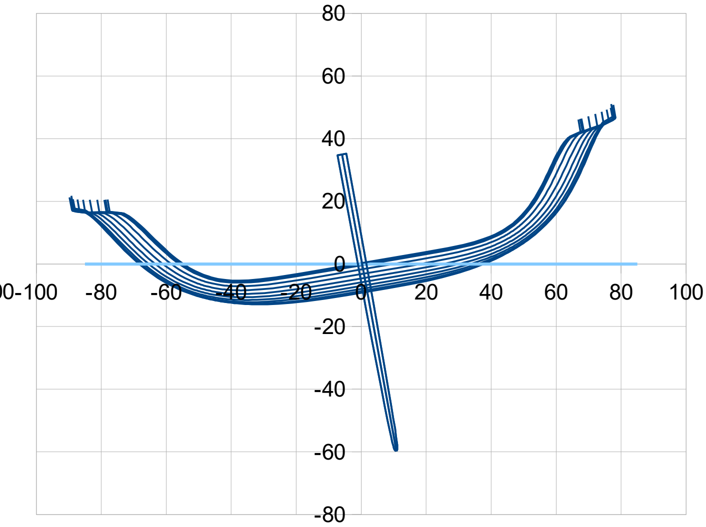
Initial stability >>> GM (0,1°) : 60,6 cm

Reserve stability >>> Gz max at 20° : 9,0 cm

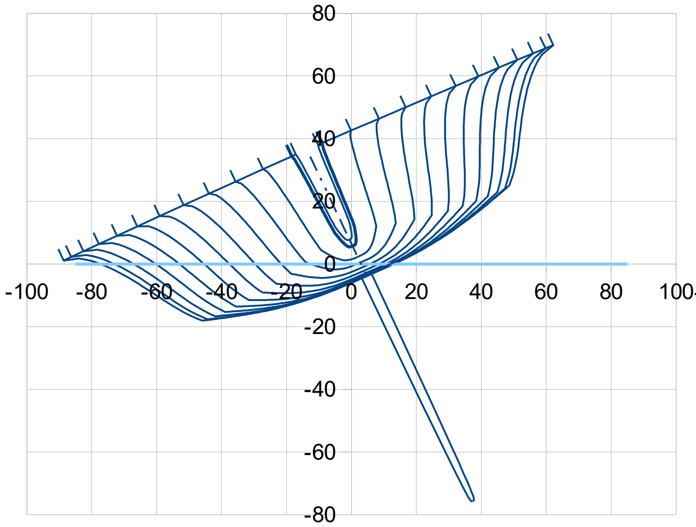
>>> Aera under GZ for 0°-25° : 173,1 cm.°

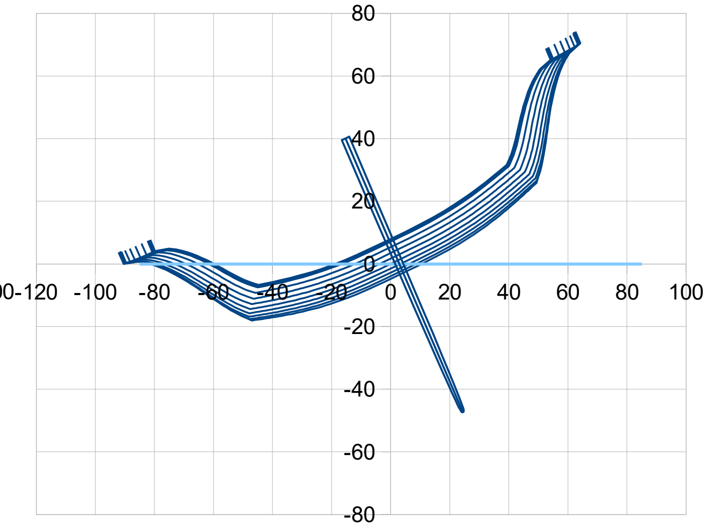
At 10° heel angle :



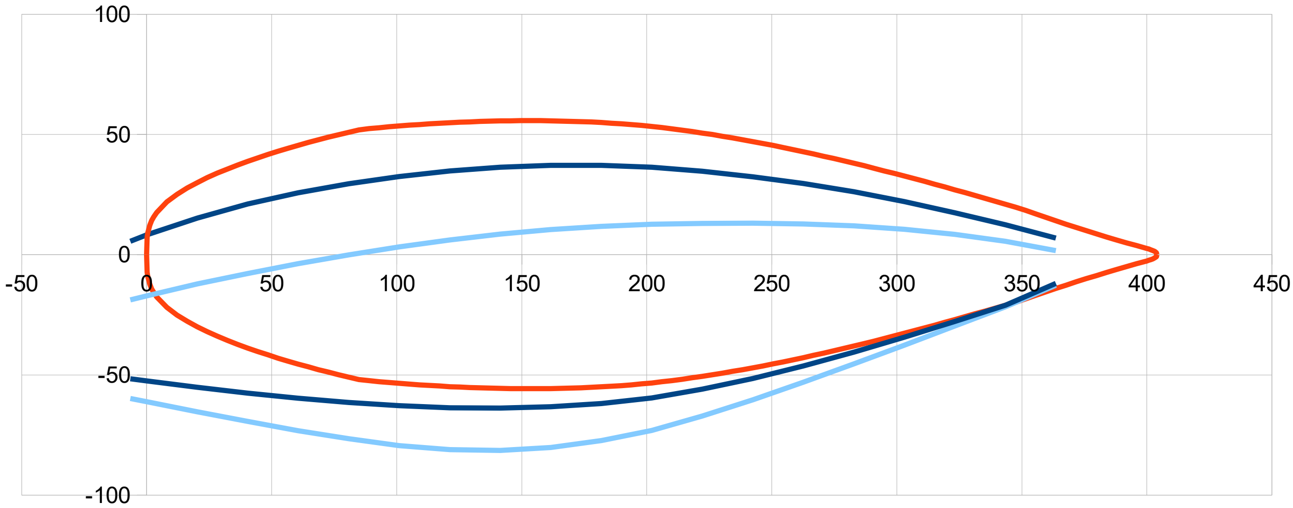


At 25° heel angle

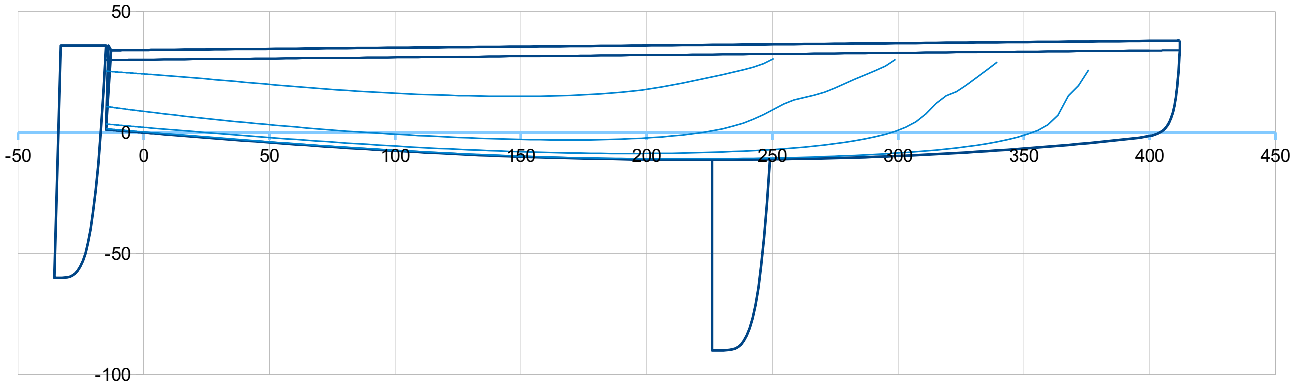


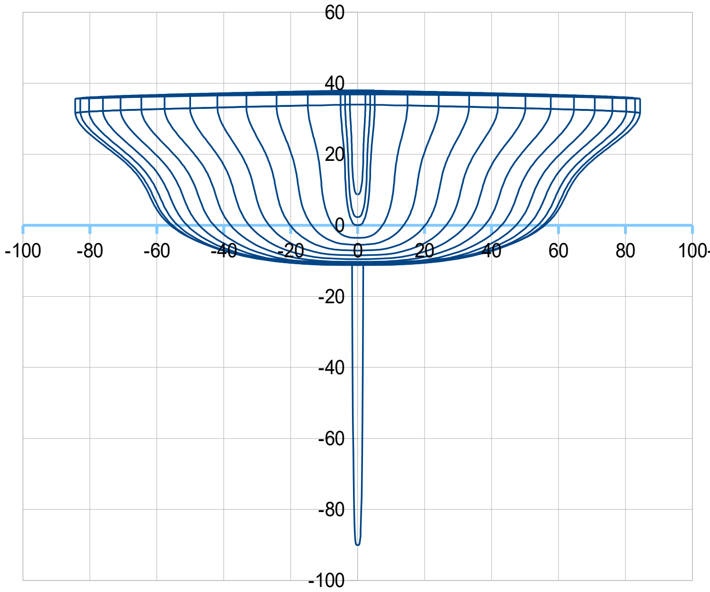


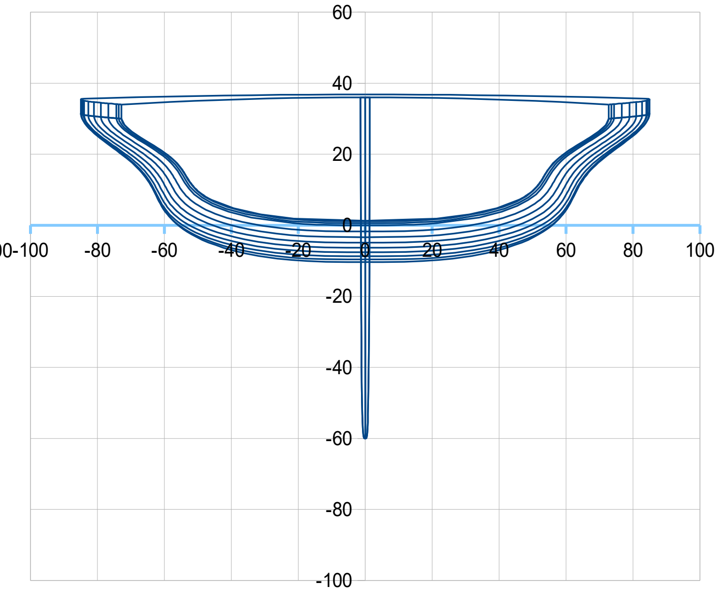
Floatation surface at 0°, 10° and 25° :

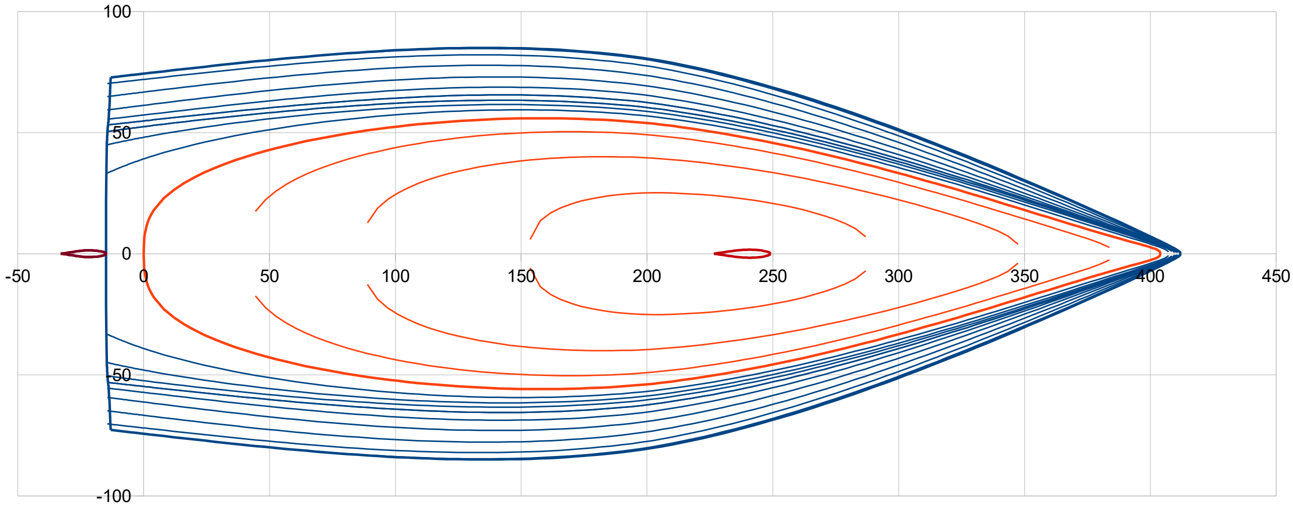


Hull Test3 : here I introduce the bi-convex option with a soft transition :

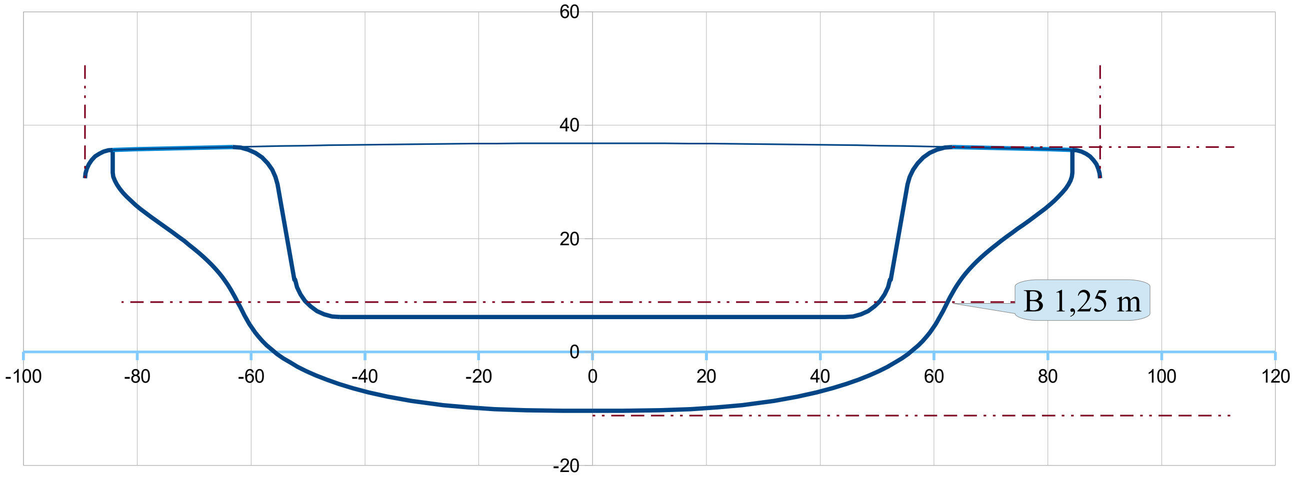






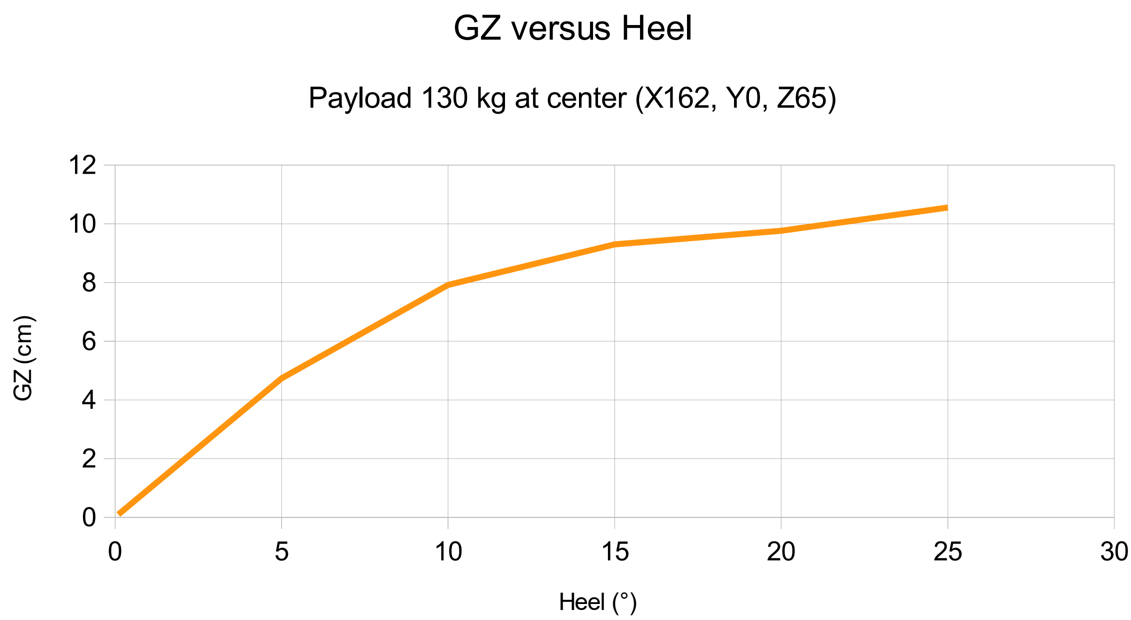


***Cross section at 2,50 m aft of the Fore perpendicular** (= X162 in the drawing coordinates), the reference section according the Rules – chapter 4.*



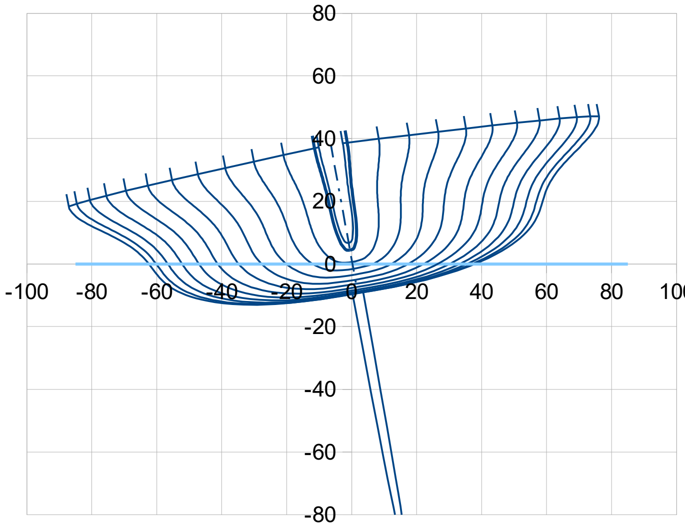
- *Bwl : 1,12 m (as drawn with 130 kg payload)*
- ***B = 1,25 m** according to **Rule 4.3 : ≥ 1,22 m** at H 200 mm from the keel centerline*
- *Hull convexity (no hollow) below the reference point at H 200 (the concavity starts above these points) according to Rule 4.5 : « …… Additionally, a taut tape containing the vertical transverse section of the hull below the 2.50m measurement point defined in rule 4.3 shall show no separation from the hull. »*
  >>> necessity to maintain straight or slightly concex the line from the hard chine points to the reference points, which put high the soft concav transition and reduce the upper volume on which we rely to delay a capsize.

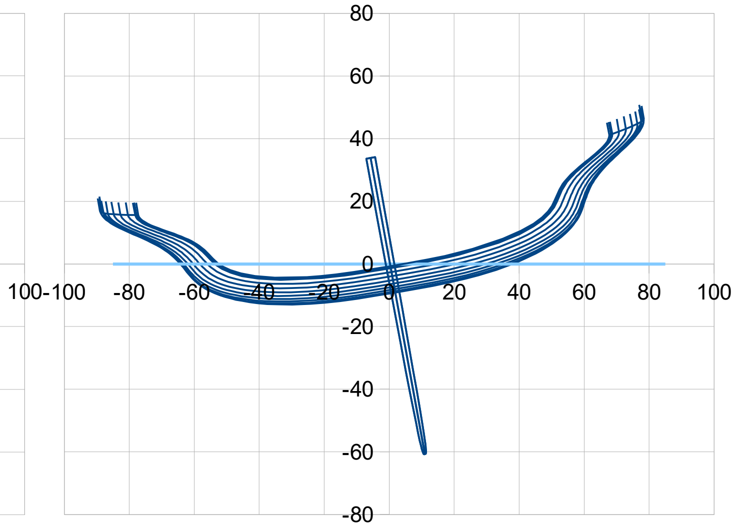
Stability with reference payload 130 kg at center and Z 65 cm / waterline :



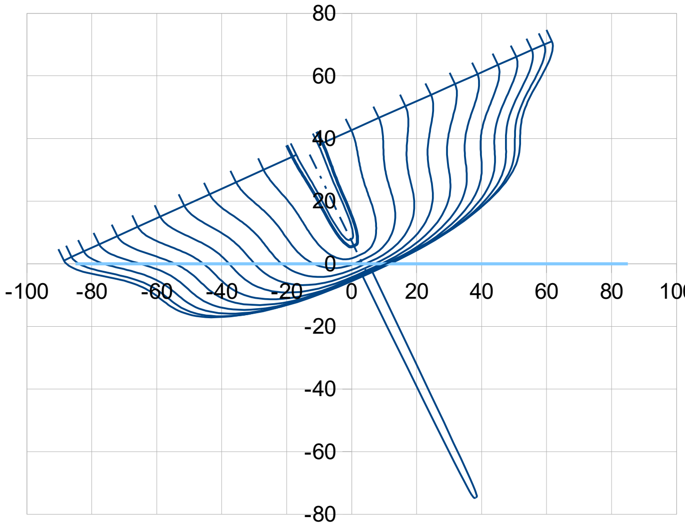
Initial stability >>> GM (0,1°) : 58,5 cm
Reserve stability >>> Gz at 25° : 10,6 cm *(from 15°, the upper volume goes into action and allows the righting moment to continue increase and to help prevent a capsize)*
>>> Aera under GZ for 0°-25° : 184,3 cm.°

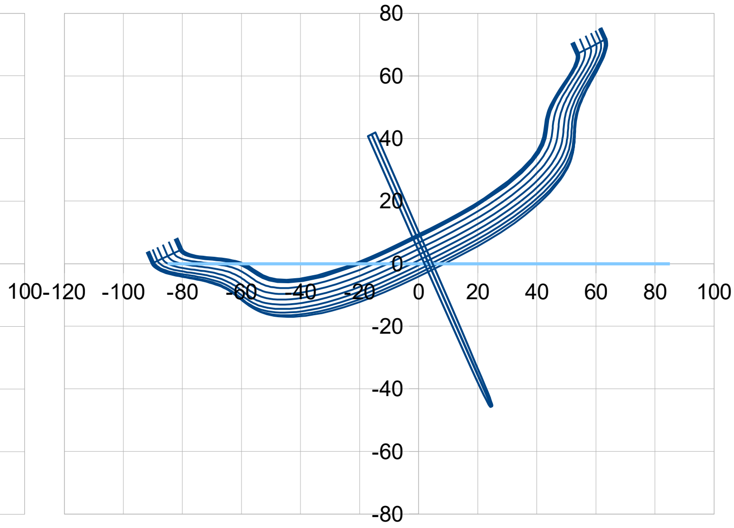
At 10° heel angle :



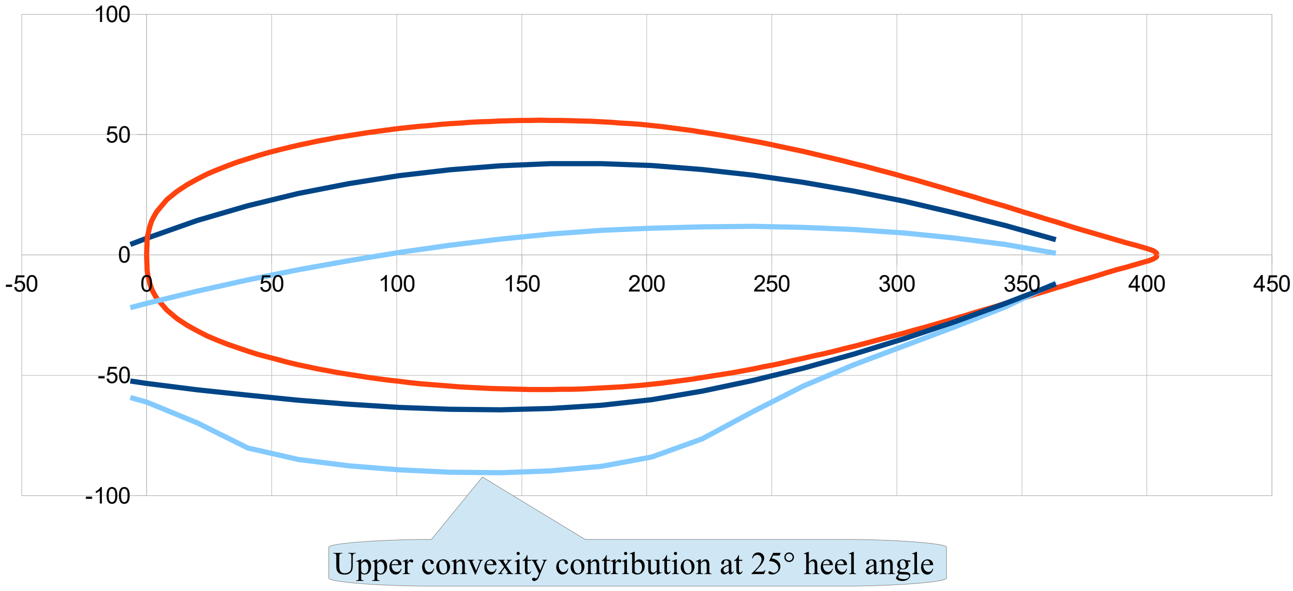


At 25° heel angle

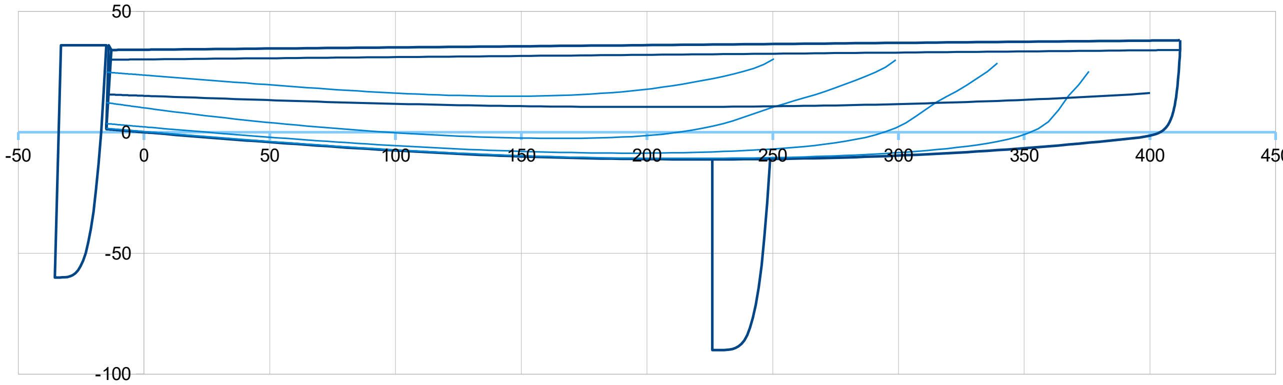


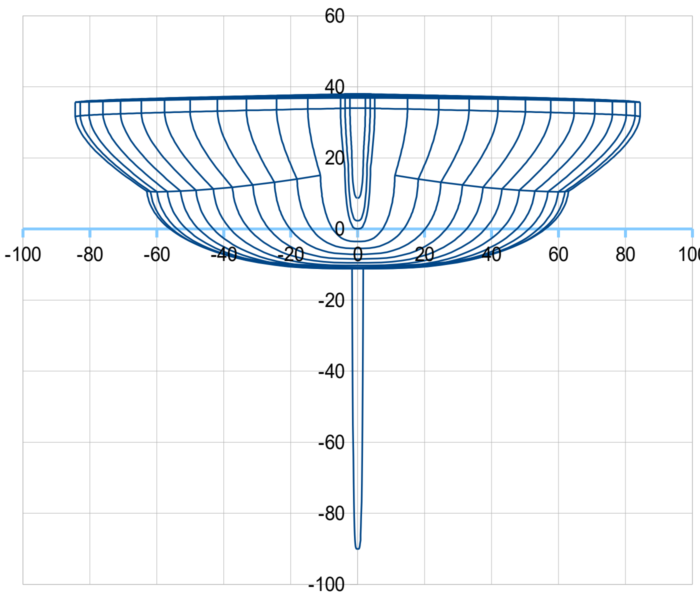


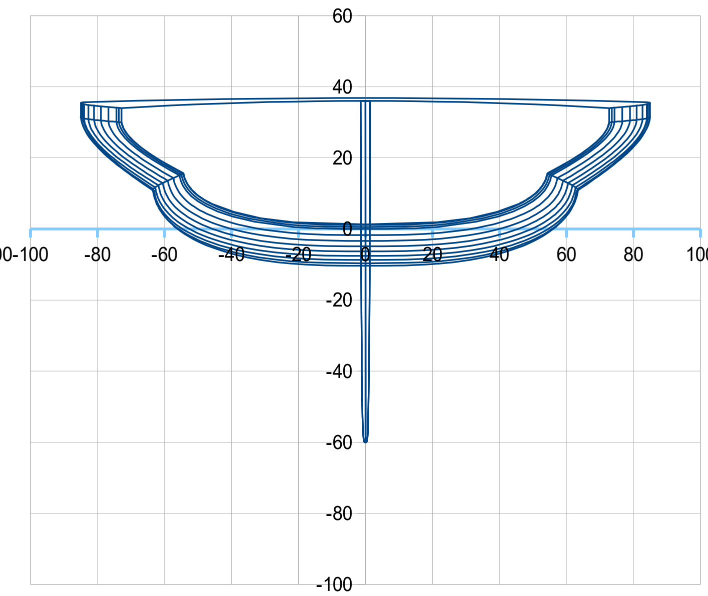
Floatation surface at 0°, 10° and 25° :

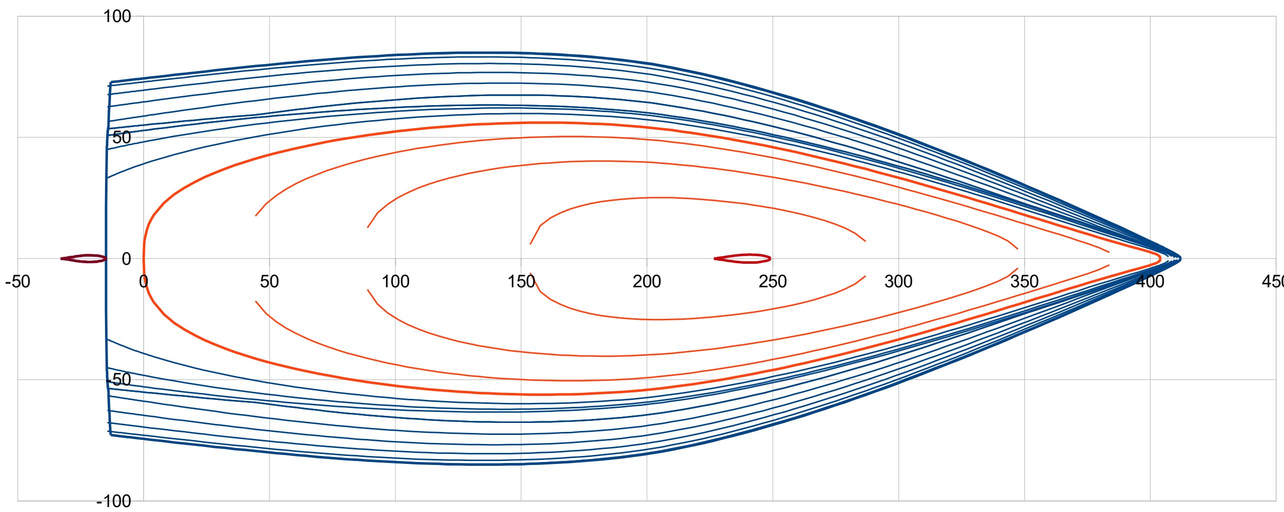


Hull Test4 : the bi-convex option with a hard transition is investigated to maximise the upper volume within the frame of the class rules

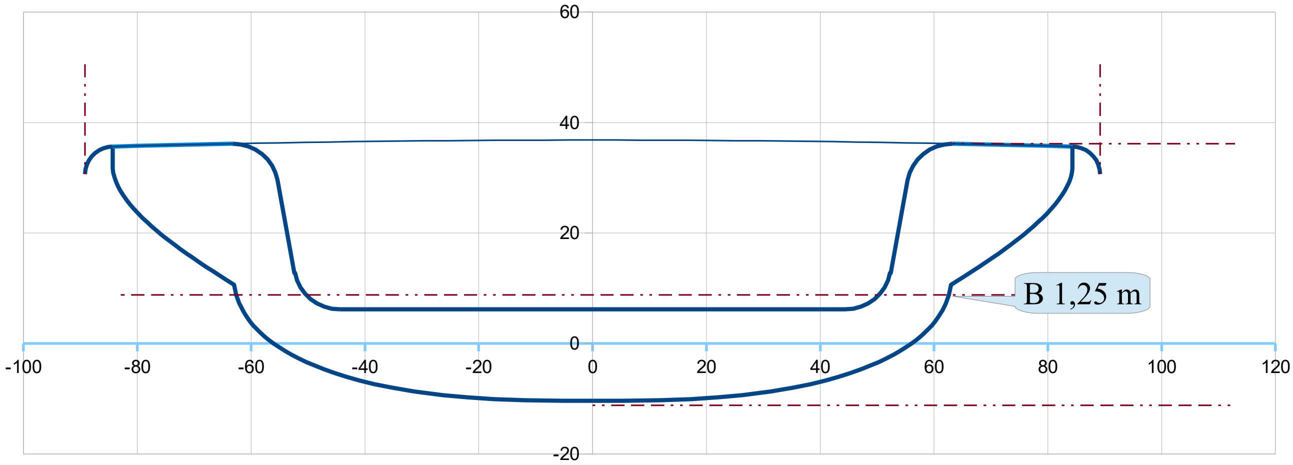






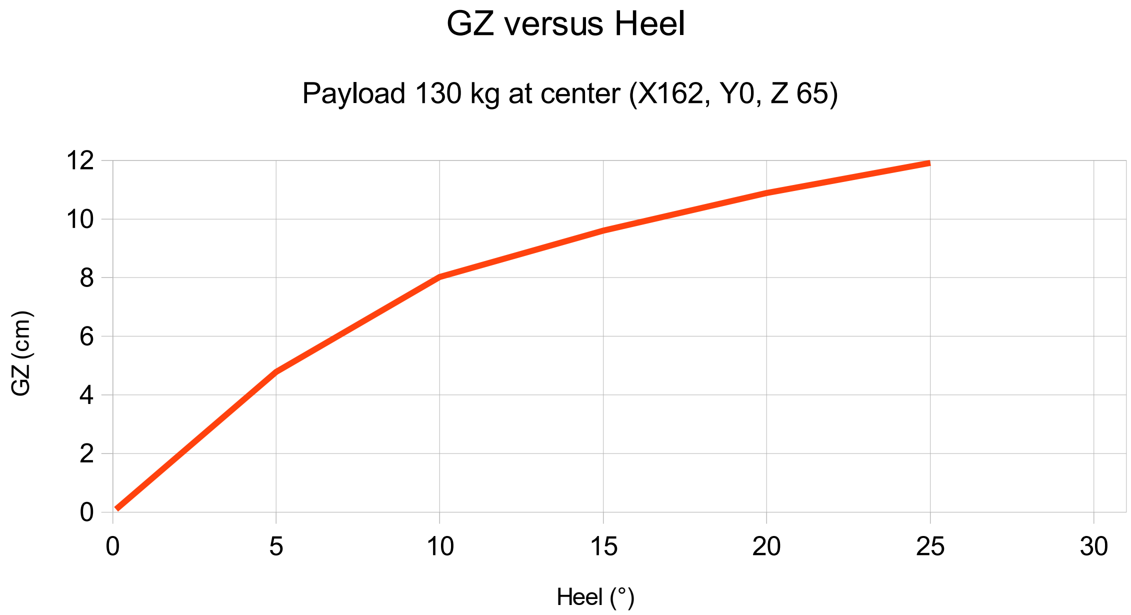


Cross section at 2,50 m aft of the Fore perpendicular *(= X162 in the drawing coordinates), the reference section according the Rules – chapter 4.*



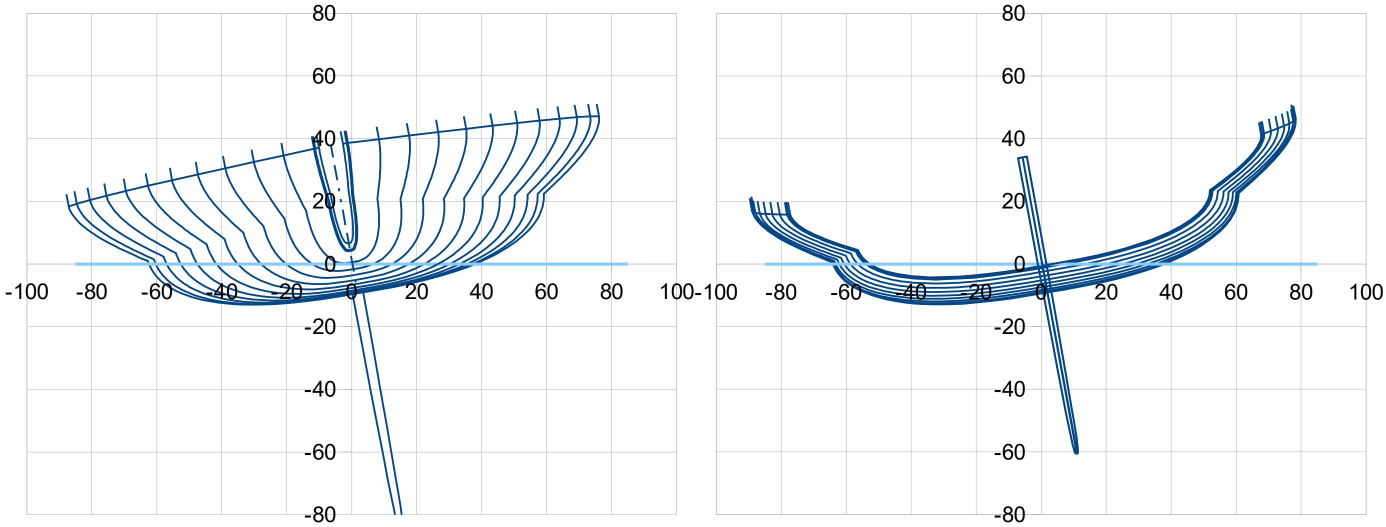
- *Bwl : 1,12 m (as drawn with 130 kg payload)*
- ***B = 1,25 m** according to **Rule 4.3 : ≥ 1,22 m** at H 200 mm from the keel centerline*
- *Hull convexity (no hollow) below the reference point at H 200 (the concavity starts above these points) according to Rule 4.5 : « …… Additionally, a taut tape containing the vertical transverse section of the hull below the 2.50m measurement point defined in rule 4.3 shall show no separation from the hull. »*
  >>> necessity to maintain straight or slightly concex the line from the hard chine points to the reference points, which put high the soft concav transition and reduce the upper volume on which we rely to delay a capsize.

Stability with reference payload 130 kg at center and Z 65 cm / waterline :

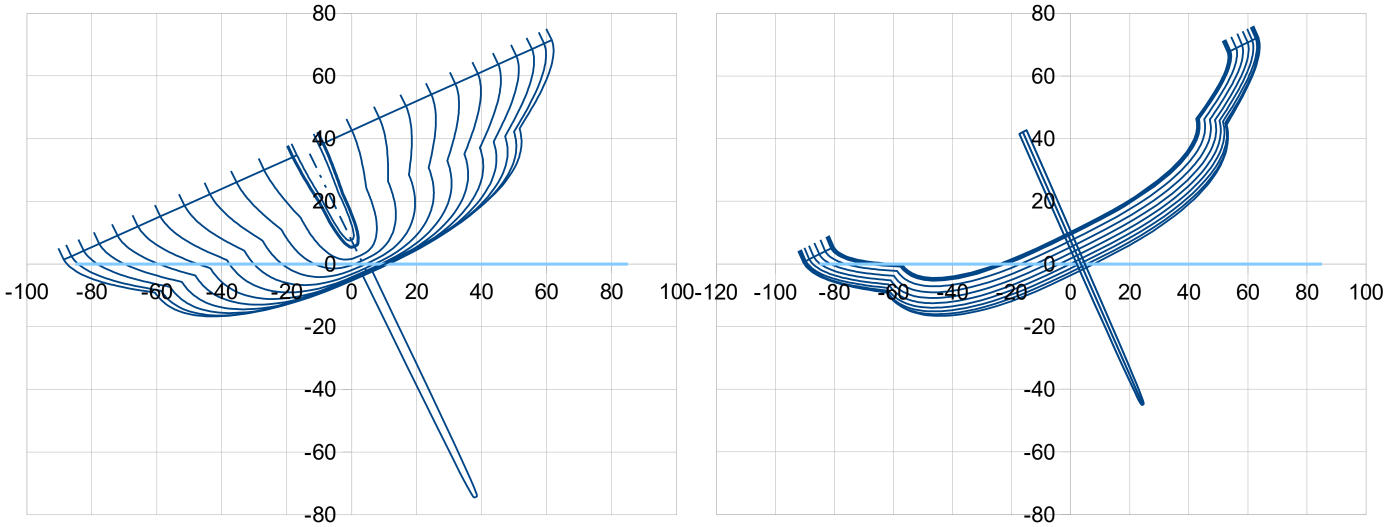


Initial stability >>> GM (0,1°) : 58,1 cm
Reserve stability >>> Gz at 25° : 11,9 cm *(from 15°, the upper volume goes into action and allows the righting moment to continue increase and to help prevent a capsize)*
>>> Aera under GZ for 0°-25° : 196,3 cm.°

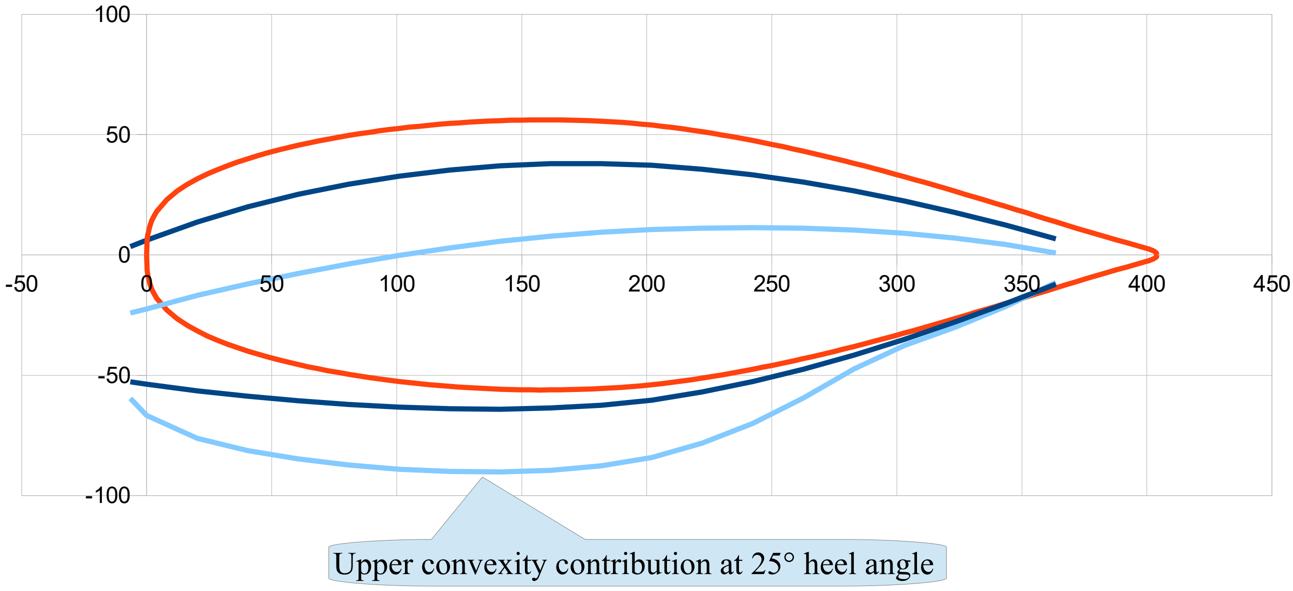
At 10° heel angle :



At 25° heel angle

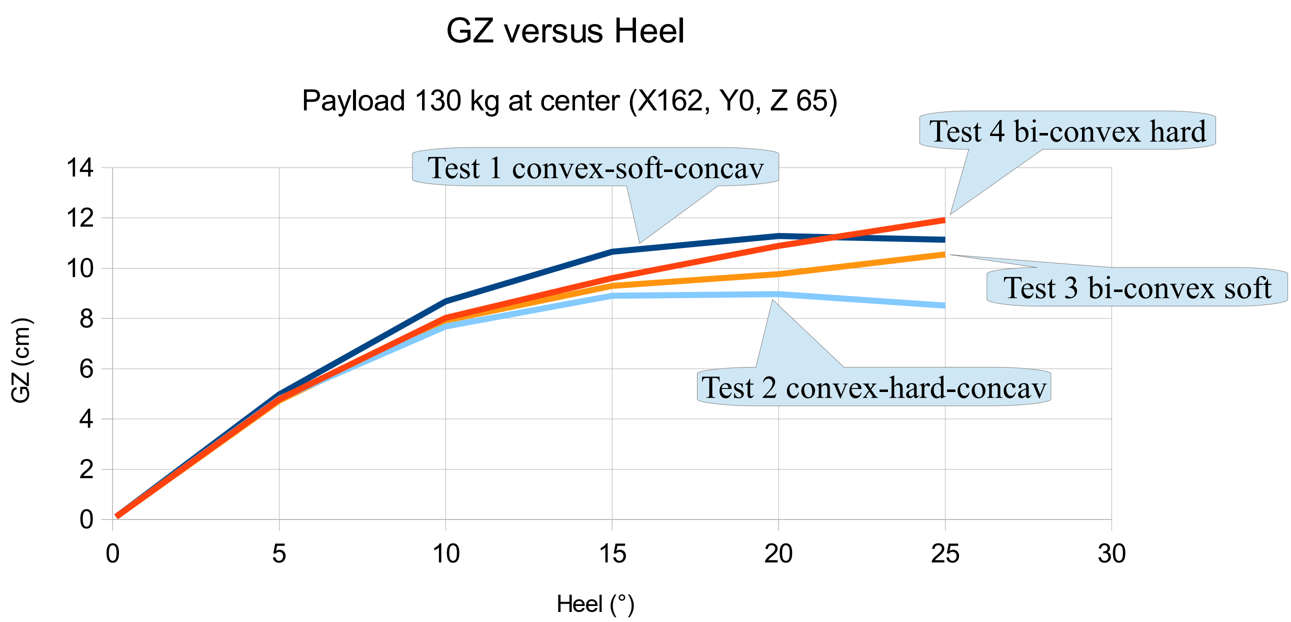


Floatation surface at 0°, 10° and 25° :



Comparison of the 4 versions

Stability issue (payload at center) :

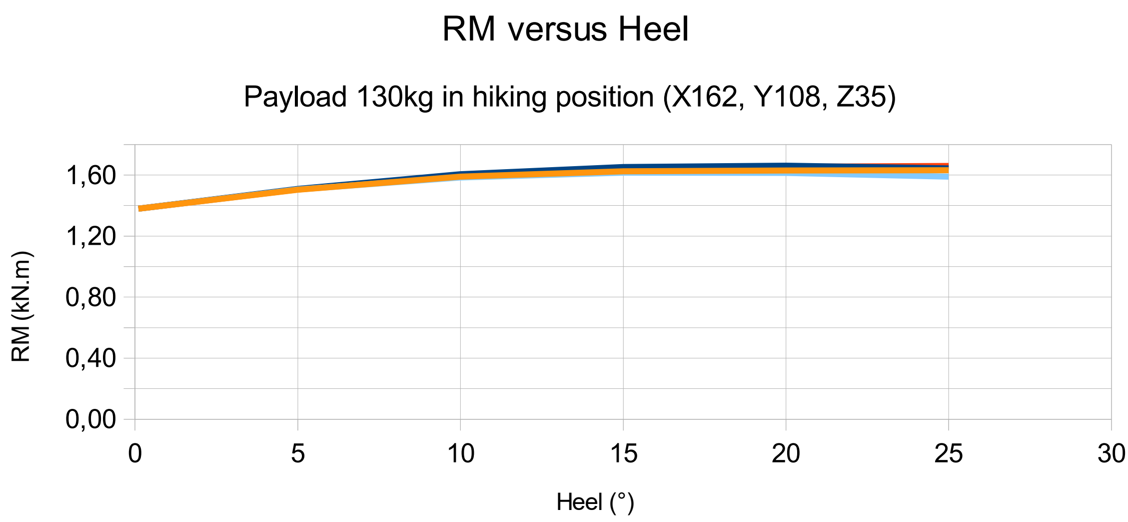


Versions comparison (the highest value is highlighted) :

	Hull Test 1	**Hull Test 2**	**Hull Test 3**	**Hull Test 4**
GM(0,1°) (cm)	60,2	60,6	58,5	58,1
GZmax within 0°-25° (cm)	11,3	9,0	10,6	11,9
Stability dynamic reserve within 0°-25° (cm.°)	205,8	173,1	184,3	196,3

As regard the righting moment and the wetted surface, no real diffrence between the versions :

Rigthing moment RM (payload in hiking position) : no real difference as Boa is the same



Wetted surface :