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Dinghy 13 investigation with hull bi-convex option

V7 : « Convex-hard-concav-hard chine » variant with another sheer line (Bmax not at transom)

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Common data : Lhull : 3,97 m (13 ft) ; Bhull : 1,60 m (at sheer line) , 1,70 m (overall, with the roudned benches to ease the hiking posture) ; Light weight assumed ~ 59 kg (with a 8 m2 sail)

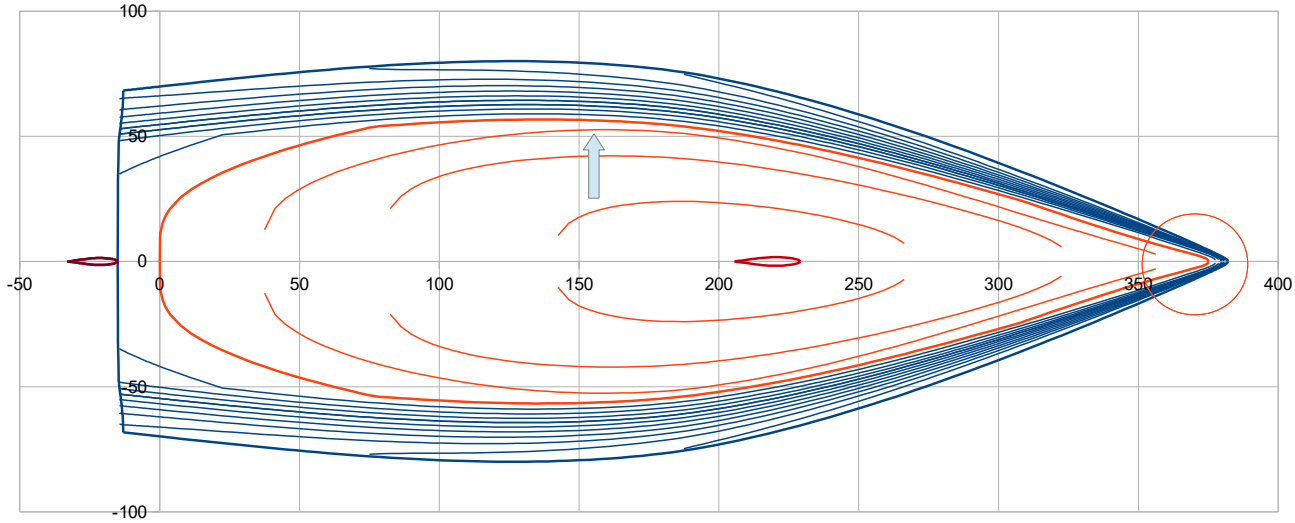
Convex-hard-concav-hard chine **V7 with Bmax at 34% Lwl, inspired by NS14 hull :**

>>> *w*ith the design « payload » 95 kg (a heavy helmsman case) :

Lwl : 3,75 m ; **Bwl : 1,13 m ;** Cp : 55,0 % ; LCB : 47,2 % Lwl ; Total Sw (at 10° heel) : 3,13 m2

Stability (with payload 95 kg at center) : **GM0,1° = 99,3 cm** ; GZ at 20° heel = 11,7 cm

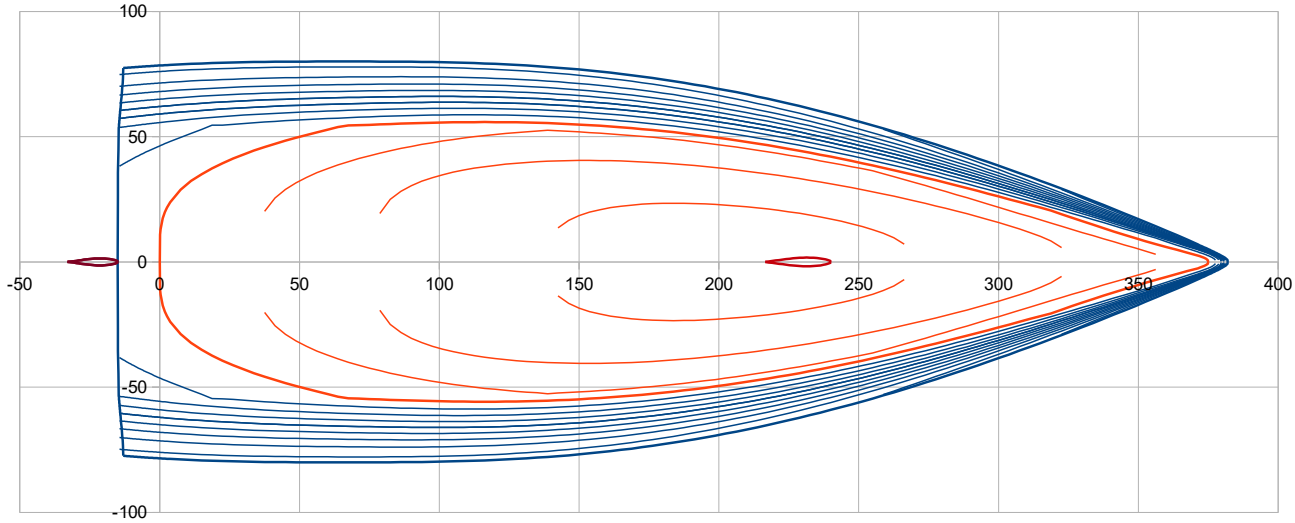
V7



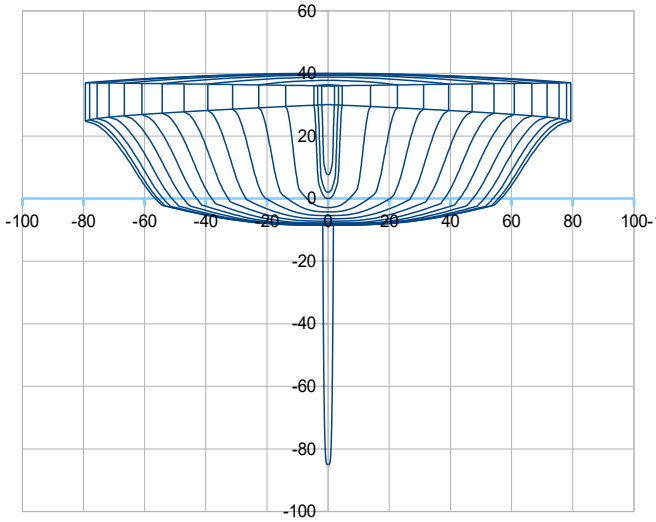
Comparison with NS14 :

Comment : for the fore waterlines, I prefer keeping straight lines (without inflexion) and a bit of roundness at bow very end, it is supposed to be better at « Froude < 0,4 » speeds (the bow wave is more forward >> longer effective Lwl) and downwind at high speed (more volume to prevent nose-down occurence)

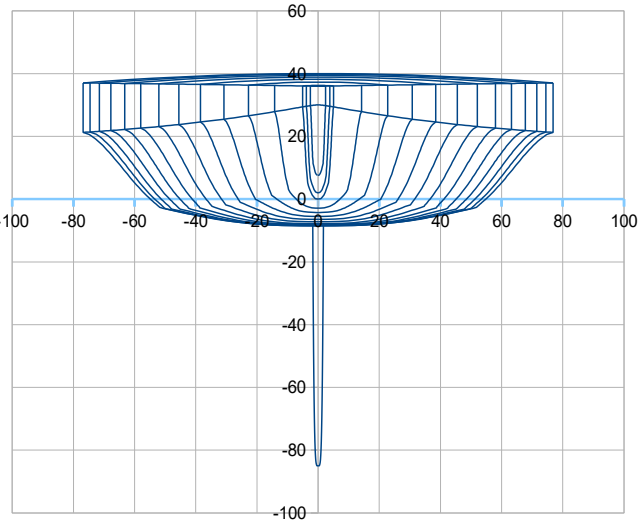
Comparison with previous V6

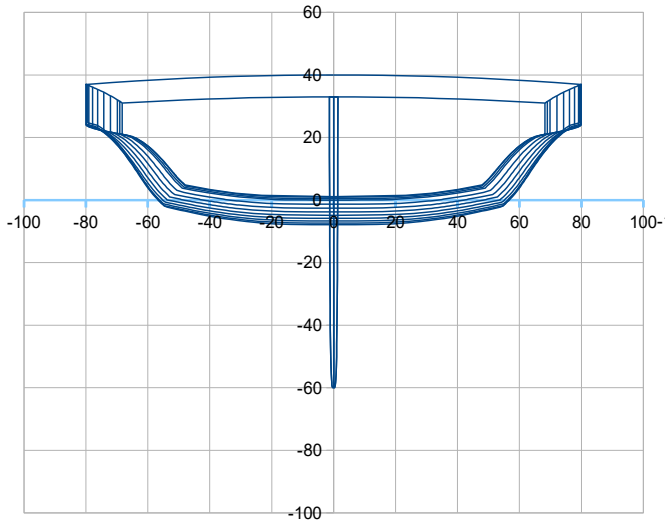


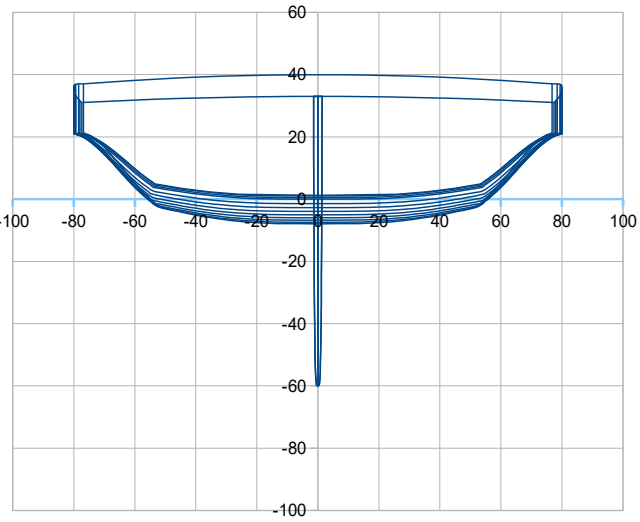
V7



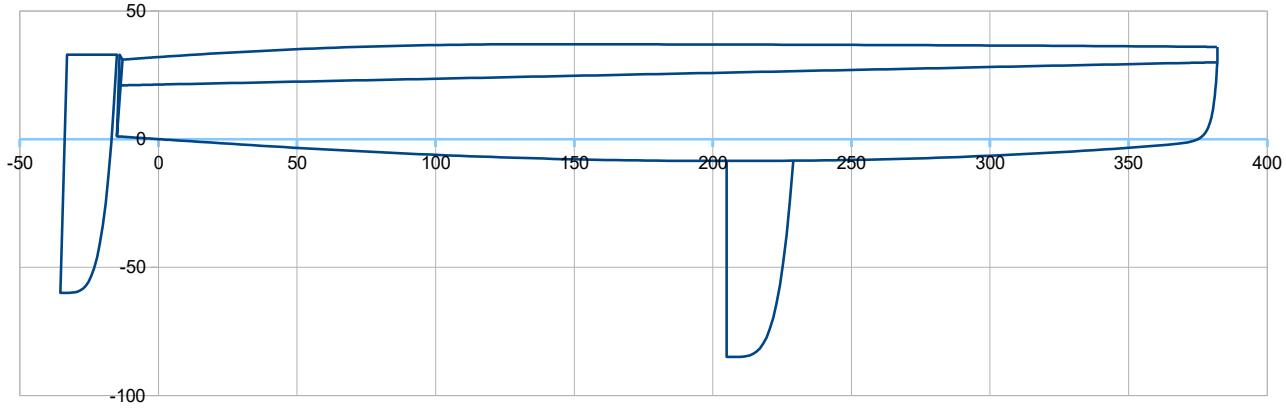
previous V6



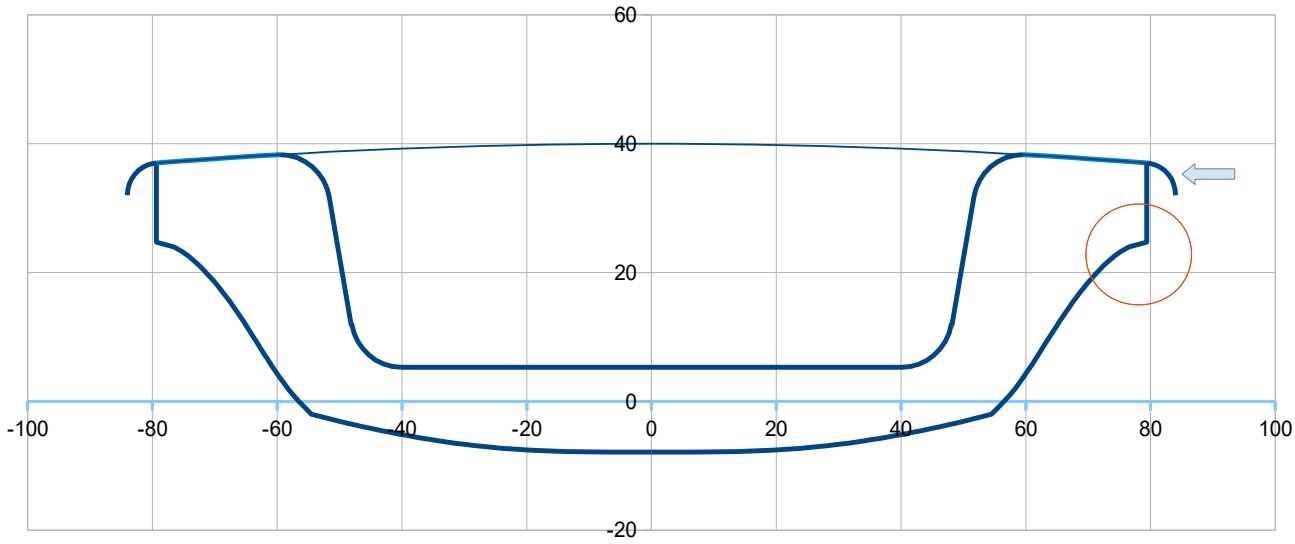




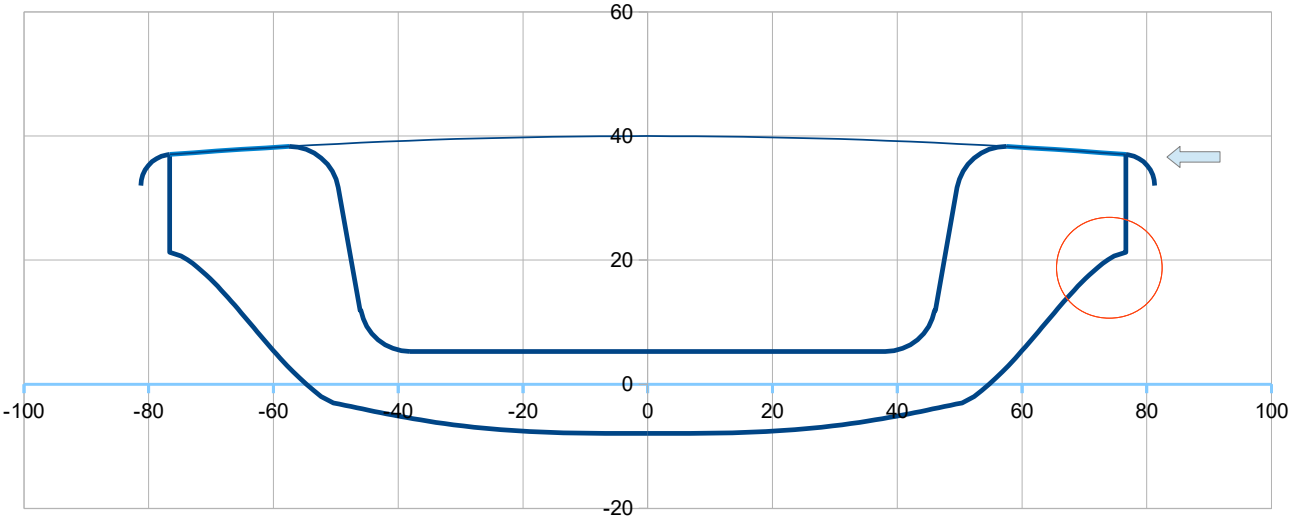
V7



Section at X 150 (helmsman average position)

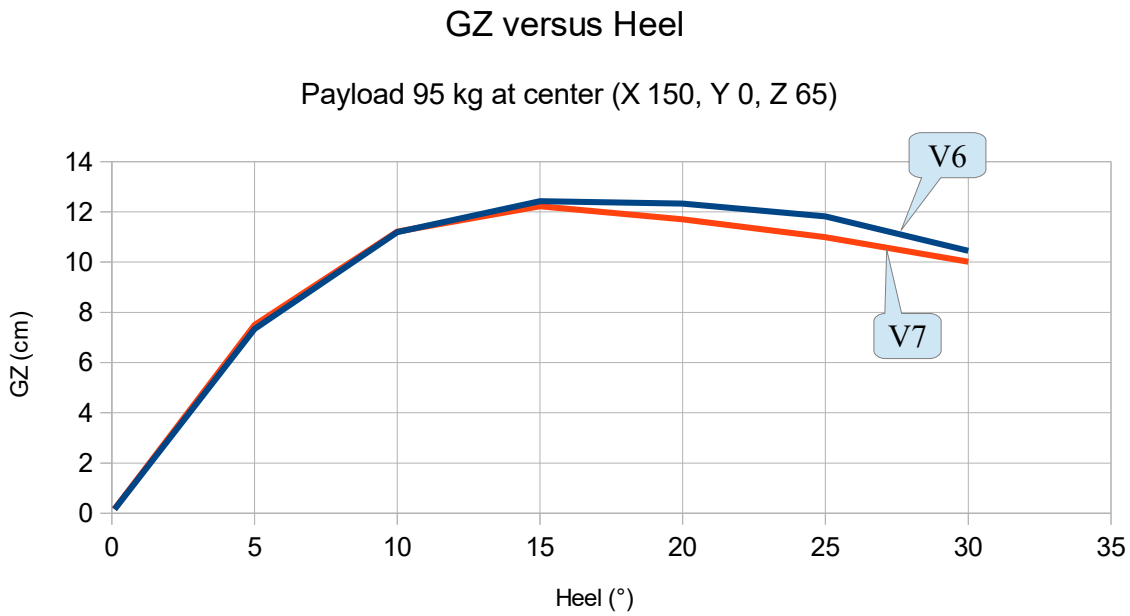


Comparison with previous V6



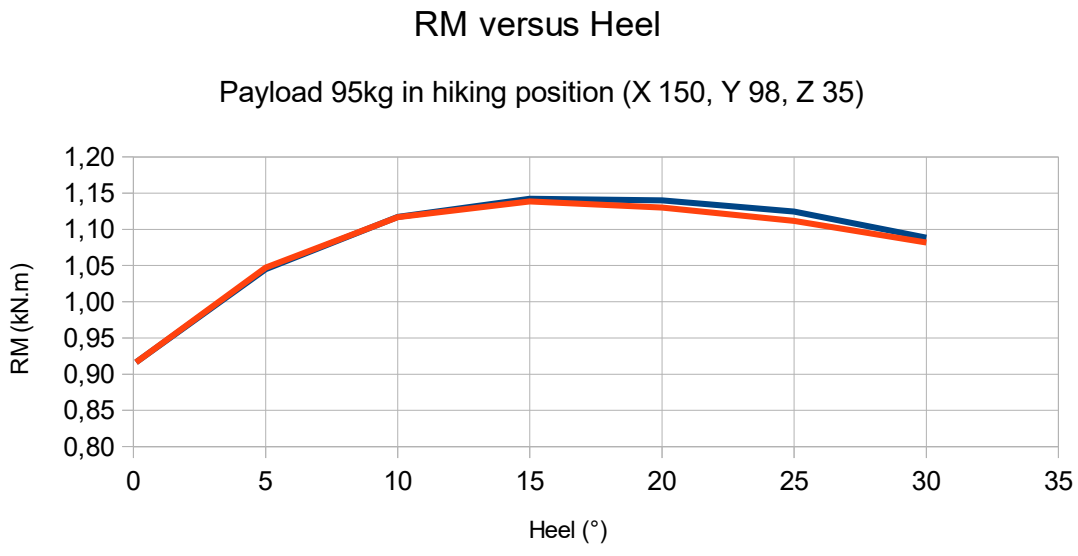
Comment : the hull beam is a bit wider at X150 for the V7 version (due to the sheer line variant with Bmax more forward), and I put more concavity for a better water release at planning speed

Stability issue when considering the « payload » in the center :
e.g. the (heavy) helmsman (95 kg) 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.

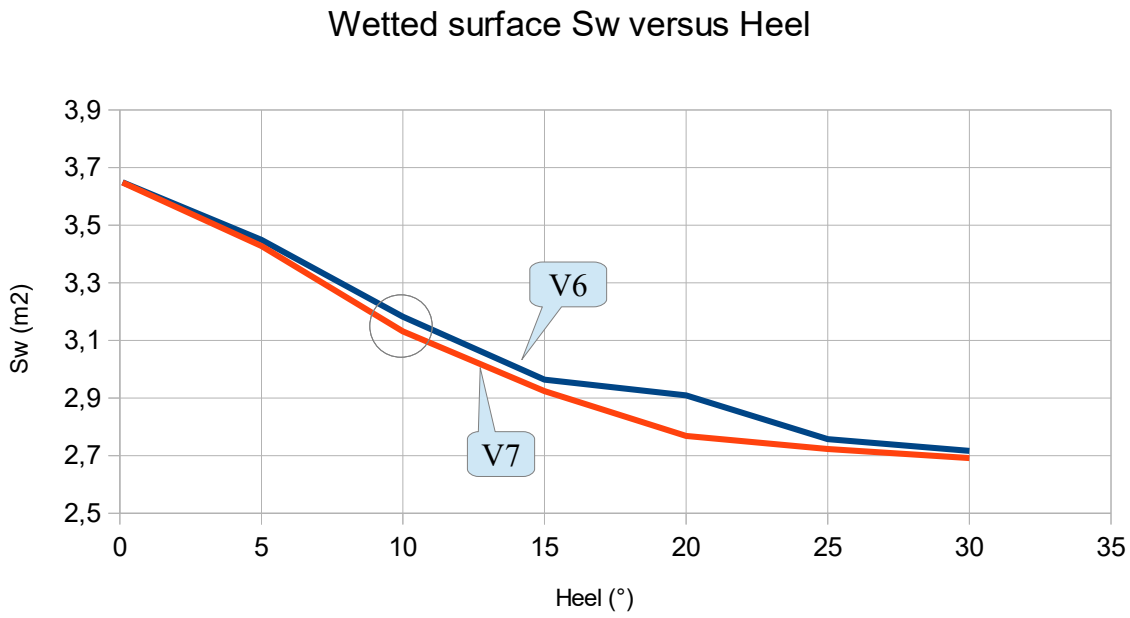


Initial stability >>> GM (0,1°) comparison :
V7 : 99,3 cm / V6 : 93,9 cm >>> + 6 %
Reserve stability >>> Aera under GZ for 0°-25° comparison :
V7 : 240,7 cm.° / V6 : 246,0 cm.° >>> - 2 %

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)



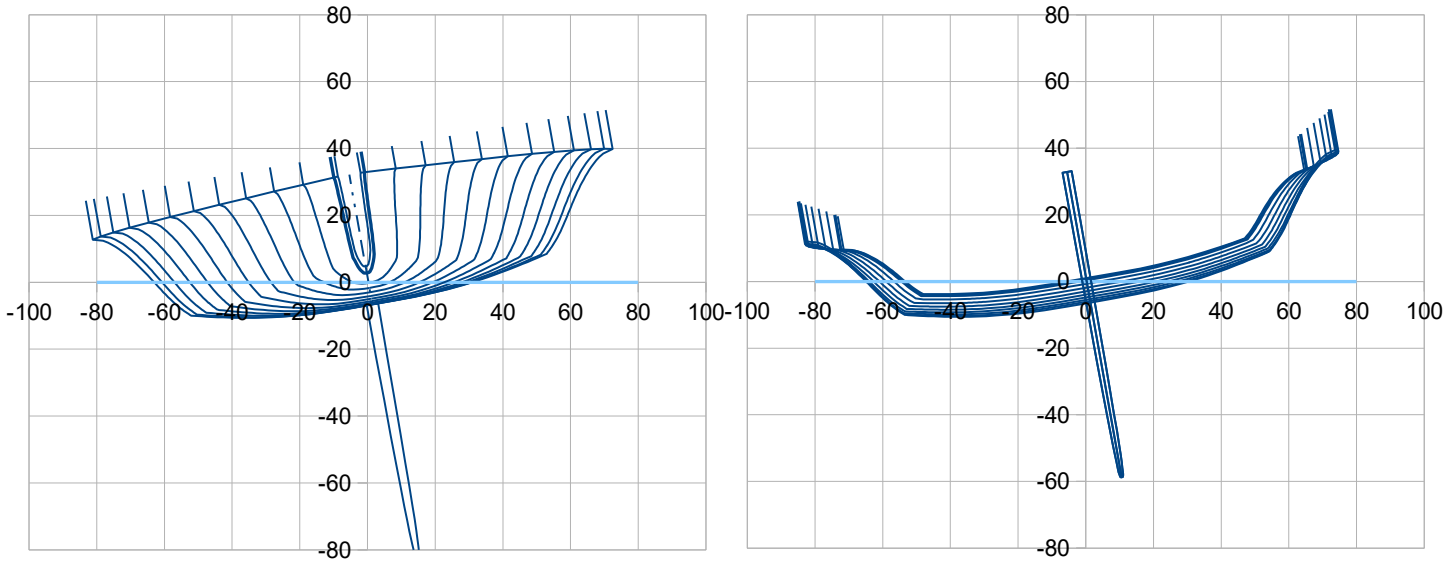
Wetted surface



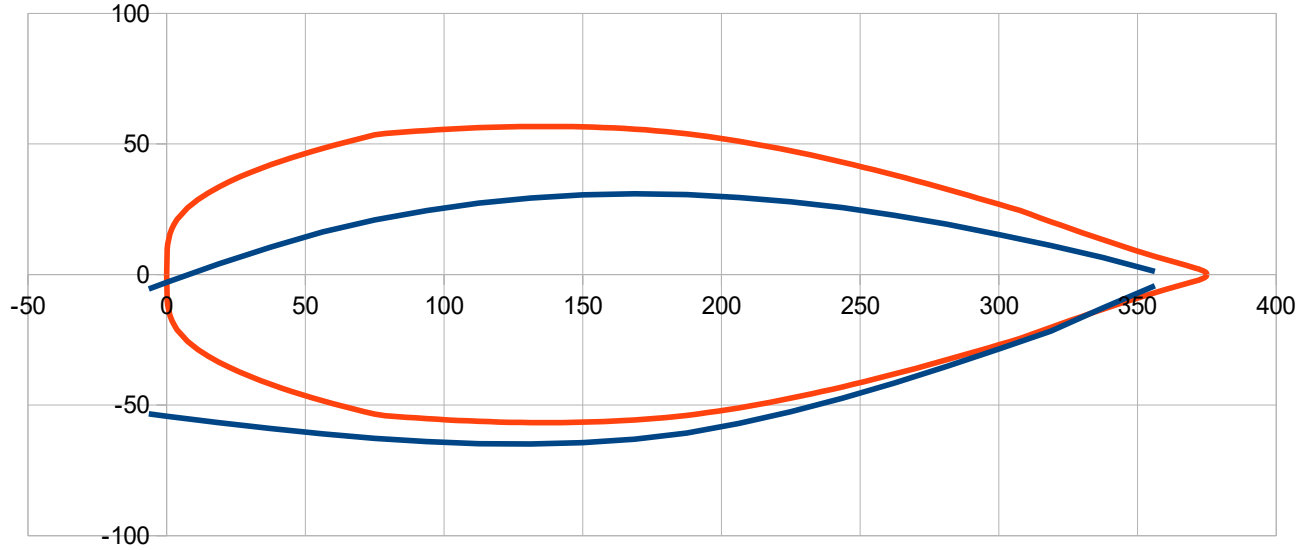
>>> The wetted surface at 0° heel is equal, but 2% less at 10° heel angle (which can be easy to manage by the helmsman on a dinghy by light winds).

At 10° heel angle :

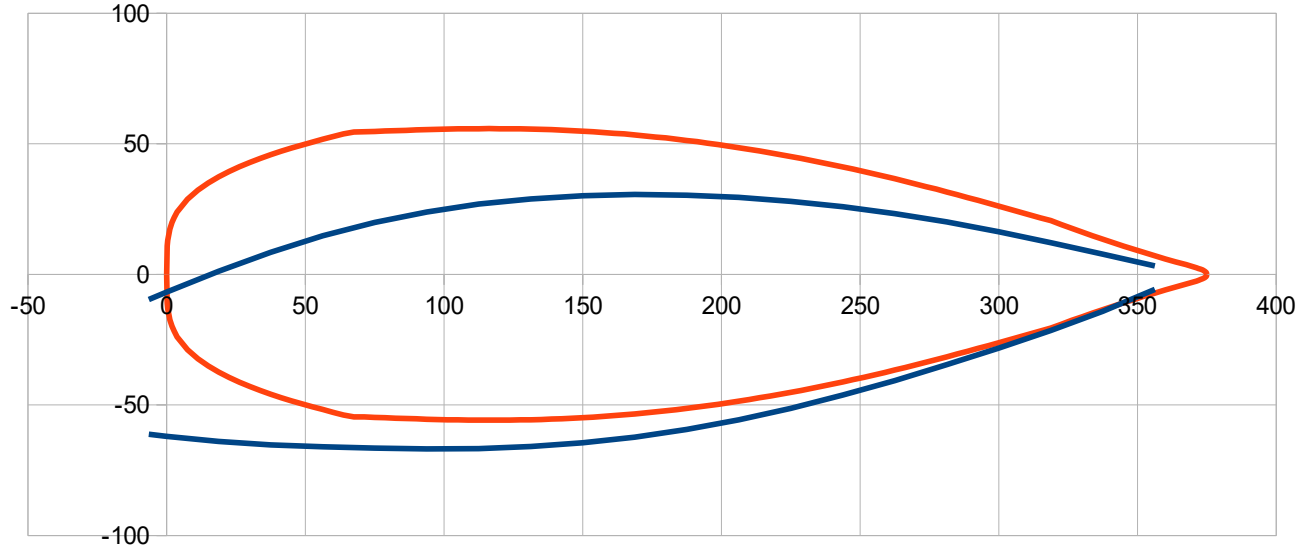
V7



V7 floatation surface at 0° and 10° heel angle

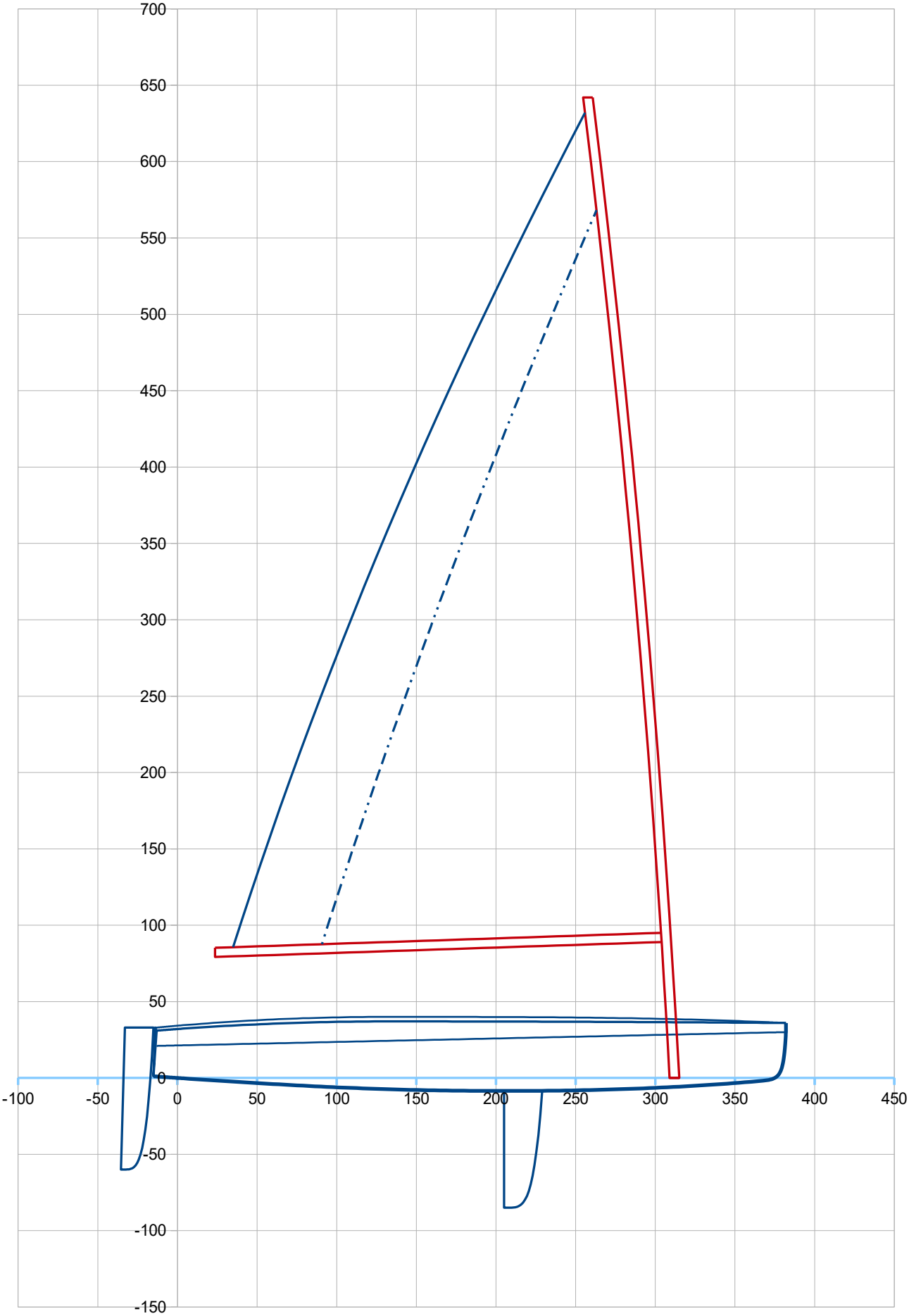


Comparison with previous V6



>>> the average obliquity of the floatation surface is a bit less : 4,0° for V7 / 4,8° for V8

V7 Sailplan (with sail 8 m2 and small sail option 6 m2) : the mast is back 30 cm / V6



V7 Hydrostatics (upright, displacement 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)**	**34,0**						
>> ft	*5,25*								
Bwl (m)	**1,13**	**at X (% Lwl)**	**36,0**	> Bwl / B	0,709				
>> ft	*3,72*					**Freeboards (m) >**	**Aft**	**Midship**	**Fore**
Tc (m)	**0,085**	**at X (%Lwl)**	**50**				**0,31**	**0,37**	**0,36**
>> ft	*0,28*					*>> ft*	*1,02*	*1,21*	*1,18*
Displacement at H0 (m3)		**0,14559**	**at Xc (m)**	**1,772**	**Xc (%Lwl)**		**47,24**	**Zc (m)**	**-0,030**
	>> lbs	*329*	*w. seawater*	*1025*	*kg/m3*			*>> ft*	*-0,10*
Disp at h (cm)	-0,263061339	0,13784	at Xc (m)	1,780	Xc (%Lwl)		47,46	Zc (m)	-0,002
Disp at h (cm)	0,263061339	0,15355	at Xc (m)	1,762	Xc (%Lwl)		47,00	Zc (m)	-0,059
Cp (%)	**54,96**								
Sf (m2)	**3,01**	**at Xf (m)**	**1,604**	**Xf (%Lwl)**	**42,77**		>>> Xc – Xf (%Lwl)		4,47
>> ft2	*32,36*	*>> ft*	*5,26*						
Angle immersed sheer li (°)		**25,0**	at section C4 (40% Lwl)						
Sw (m2)	**3,04**	>Sw/D^(2/3)	10,99						
>> ft2	*32,73*								
Shull (m2)	**6,77**	**at X (m)**	**1,629**	**Z (m)**	**0,066**				
>> ft2	*72,82*	*>> ft*	*5,35*	*>> ft*	*0,22*				
Sdeck (m2)	**4,75**	**at X (m)**	**1,486**						
>> ft2	*51,16*	*>> ft*	*4,87*						
2.2 Daggerboard									
Volume (m3)	**0,00281**	**at X (m)**	**2,171**	**X (%Lwl)**	**57,89**	**Z (m)**	**-0,39**		
Draft oa (m)	**0,85**		**Sw (m2)**	**0,31**		**Sxz (m2)**	**0,15**		
>> ft	*2,79*		*>> ft2*	*3,36*		*>> ft2*	*1,62*		
CLR (m)	**2,230**	**CLR (%Lwl)**	**59,47**	method : keel profile extended to the waterline, 25% c at 45% draft oa					
>> ft	*7,32*								
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)		**0,14982**	**at Xc (m)**	**1,760**	**Xc (%Lwl)**	**46,93**		**Zc (m)**	**-0,037**
	Disp. (kg)	**153,6**	*>> ft*	*0,54*				*>> ft*	*-0,12*
	>> lbs	*339*							
	Sw (m2)	**3,53**	>Sw/D^(2/3)	12,52	Lwl/D^(1/3)	7,06			
	>> ft2	*38,00*			*DLR*	*81*	*M(lbs/2240)/(Lwl(ft)/100)^3*		
2.5 Data from the mass spreadsheet									
Boat with payload	**M(kg)**	**153,6**	**at Xg (m)**	**1,560**	**Xc (%Lwl)**	**41,60**	**at Zg (m)**	**0,582**	
Light boat		58,6		1,657				0,471	