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Dinghy examples with « Gene-Hull Dinghy 3.0 »

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« Gene-Hull Dinghy » spreadsheet application, in its new proposed version 3.0, is in line and upgraded from the previous version 2.42

Gene-Hull Dinghy 3.0 is here below illustrated by the generation of some typical examples proposed as a starting point for a project, illustrating the variety of possible designs.

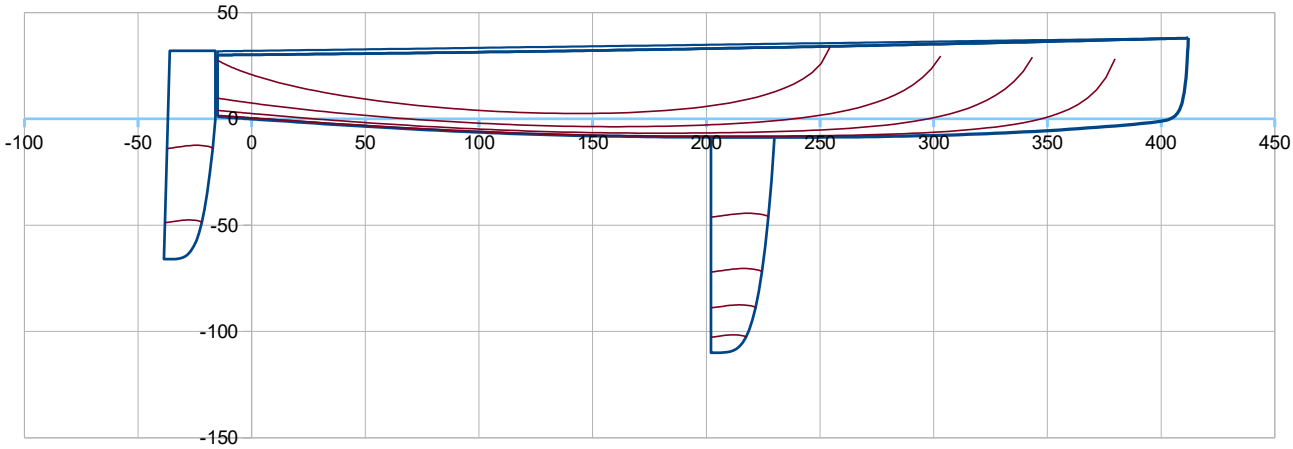
The corresponding hulls input data are stored in the « Hulls storage » sheet of the application, inc. the input data for the daggerboard, the rudder, the sailplan, the mass spreadsheet and the loading. So you can reproduce them by copy/paste the corresponding data from the « Hulls storage » sheet.

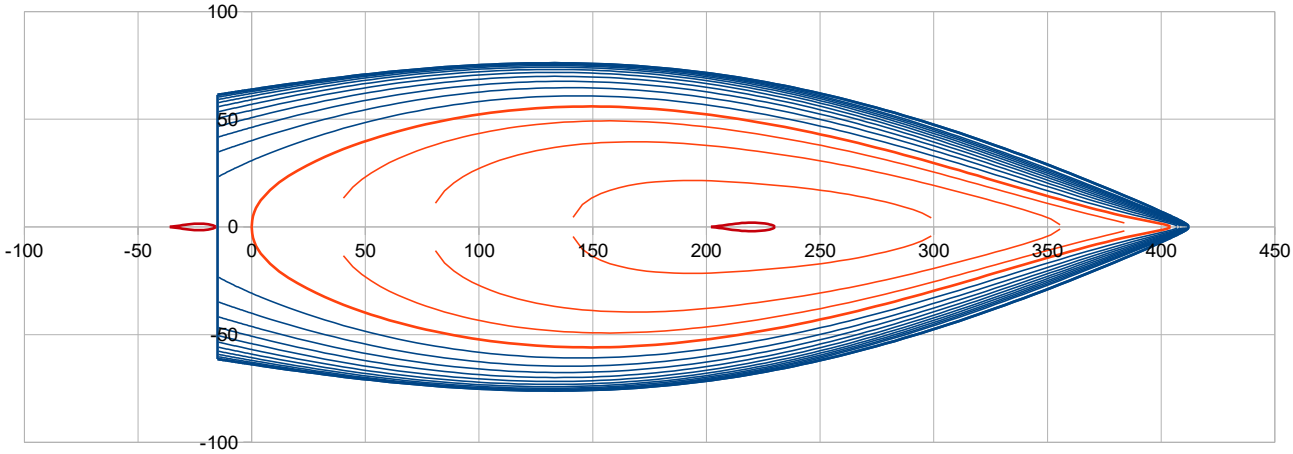
Examples with Gene-Hull Dinghy 3,0 :

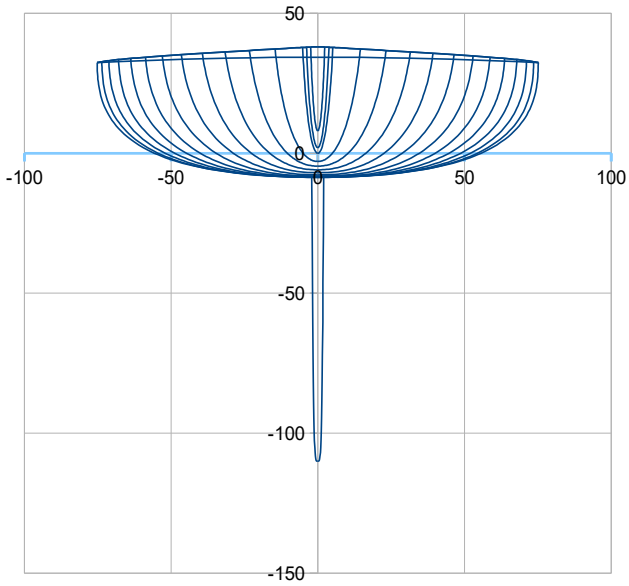
- **D1,1, D1,2, D1,3, D1,4, D1,5, D1,6 :** a serie of dinghies by progressively decreasing the waterline beam.
- **D2,1 , D2,2, D2,3 :** a serie with hard chine line and 3 shapes of chine section (concav, straight, convex)
- **D3 :** a version with tumblehome shape sections
- **D4 :** a version with scow bow
- **D5 :** a rowing/sailing version
- **D 505 :** inspired by the famous 505
- **D6 :** inspired by traditionnal APBY 14' catboat (Arey's Pond Boat Yard)

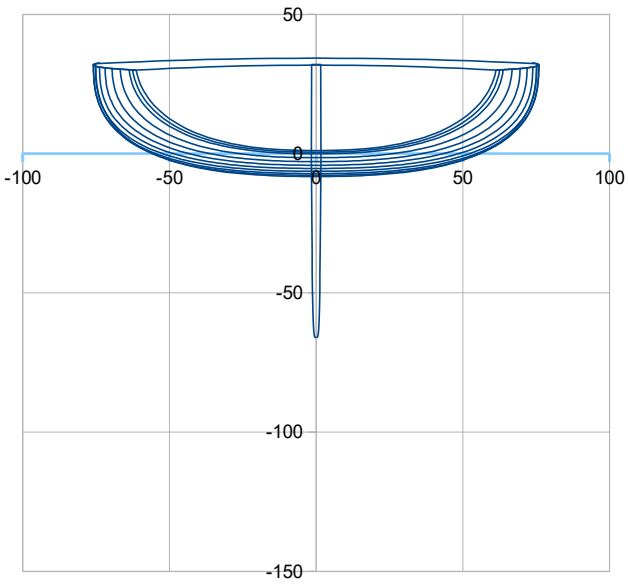
Dinghy D1,1

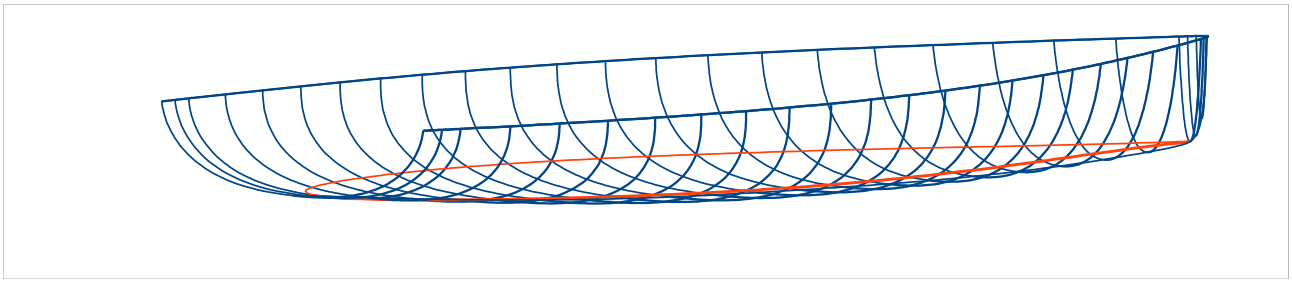
Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 1,12 m** ; Draft 1,10 m ; Displacement of design : 161 kg (Dinghy 61 kg + average load 100 kg) ; LCB hull 46,64 %Lwl ; Cp hull : 0,544 ; Sw : 3,75 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4			
>> ft	*14,01*		*13,25*						
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0		
>> ft	*4,99*								
Bwl (m)	**1,12**	**at X (% Lwl)**	**37,0**	> Bwl / Boa	0,736				
>> ft	*3,67*				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,086**	**at X (%Lwl)**	**57**			**0,30**	**0,32**	**0,38**	
>> ft	*0,28*				*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14883**	**at LCB (m)**	**1,884**	**LCB (%Lwl)**	**46,64**	**ZCB (m)**	**-0,031**		
>> lbs	*336*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,10*		
Cp	**0,544**								
Sf (m2)	**2,98**	**at LCF (m)**	**1,728**	**LCF (%Lwl)**	**42,77**	>>> LCB – LCF (%Lwl)	3,87		
>> ft2	*32,04*	*>> ft*	*5,67*						
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)							
Sw (m2)	**3,03**	>Sw/D^(2/3)	10,78						
>> ft2	*32,59*								
Shull (m2)	**6,65**	**at X (m)**	**1,818**	**Z (m)**	**0,054**				
>> ft2	*71,59*	*>> ft*	*5,96*	*>> ft*	*0,18*				
Sdeck (m2)	**4,89**	**at X (m)**	**1,620**	**Z (m)**	**0,34**				
>> ft2	*52,62*	*>> ft*	*5,31*	*>> ft*	*1,11*				

B1.2 Daggerboard

Vol. keel(m3)	**0,00502**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,485**	
		>> ft	*7,09*			*>> ft*	*-1,59*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,17*		*>> ft2*	*2,49*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,34**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**
>> ft2	*2,59*					*>> ft2*	*1,24*

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15715**	**at LCB (m)**	**1,848**	**LCB (%Lwl)**	**45,75**	**at ZCB (m)**	**-0,047**
(kg)	**161**	*>> ft*	*6,06*			*>> ft*	*-0,16*
>> lbs	*355*						
Sw (m2)	**3,75**	>Sw/D^(2/3)	12,87	Lwl/D^(1/3)	7,49		
>> ft2	*40,35*			***DLR***	***68***	*M(lbs/2240)/(Lwl(ft)/100)^3*	

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**161**	**at Xg (m)**	**1,672**	**Xg (%Lwl)**	**41,40**	**at Zg (m)**	**0,579**
Light boat	61,2		1,758				0,463

Sailplan :

C - Sailplan – early stage definition

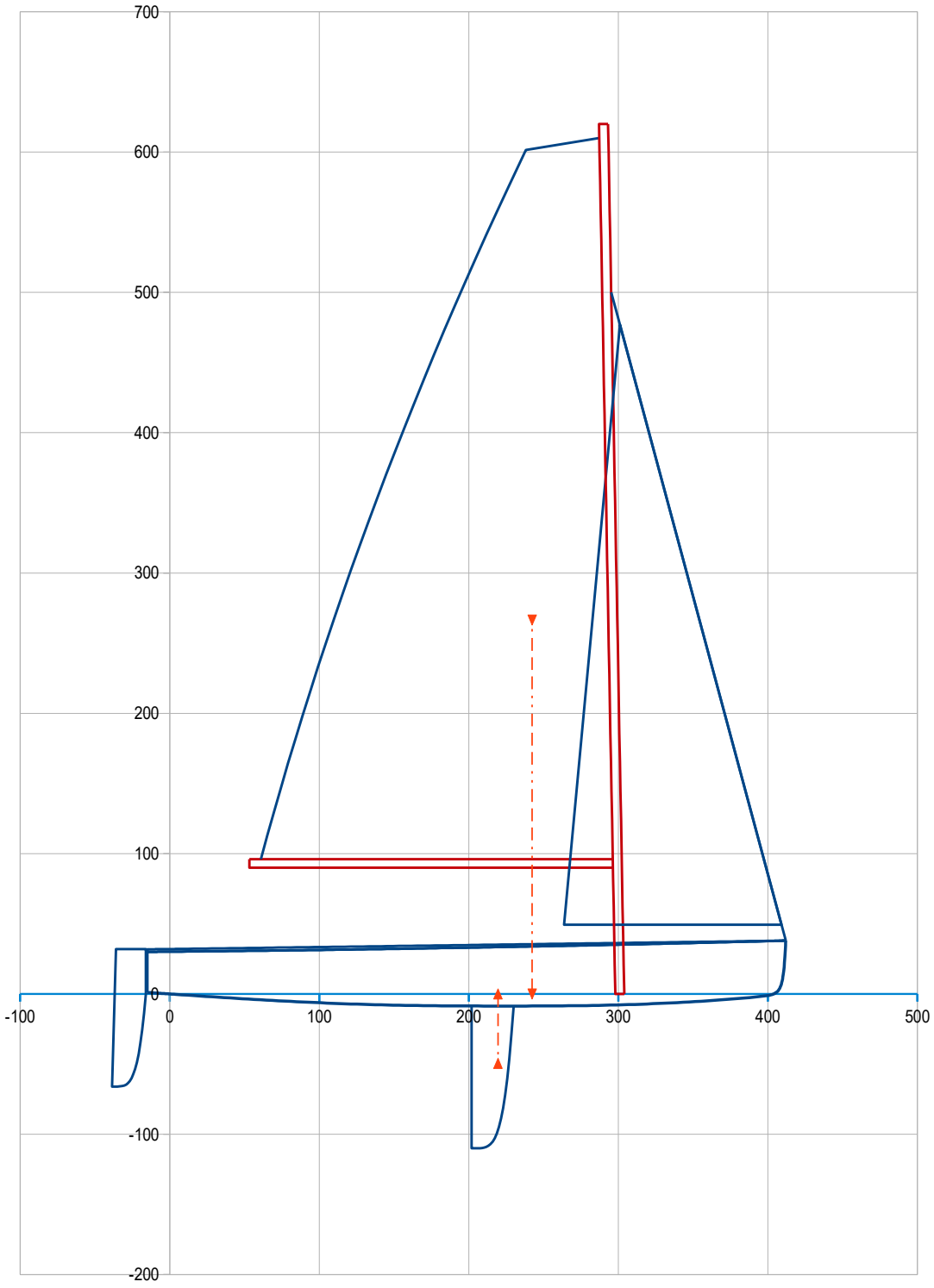
Data to enter		>> in feet
Xmast (m)	3,04	9,97
Zmast (m)	6,20	20,34
Zboom (m)	0,96	3,15
Lboom (m)	2,43	7,97
Z jib (m)	5,00	16,40
Jib overlap	130	%
Mast rake(°)	1,00	

(No jib : put Z jib = 0)

Results for the Sailplan

Main sail (m2)	7,79	Jib (m2)	3,25	>> SA (m2)	11,0
Lead Xv – Xd (%)	6,8				
Sdaggerboard/Sv (%)	2,09			Spi (m2) ~	18,4
Srudder/Sv (%)	1,05				
Sv/Sw	2,94				

For Gene-VPP :	SA (m2)	ZCE (m)	Zdeck (m)	Zmast (m)	Main (m2)	Spi (m2)	ZCE spi (m)
(Main + Fore triangle)	10,28	2,72	0,35	6,10	7,79	18,4	2,73



Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,65		**4,00**	26,60	1,818	48,358	0,054	1,444
Transom assuming at unit mass kg/m2		0,28		**4,00**	1,14	-0,150	-0,170	0,175	0,198
Deck - benches									
assuming at average unit mass kg/m2		4,89		**3,00**	14,67	1,620	23,756	0,338	4,949
Daggerboard :									
Daggerboard, assuming at kg/m3		0,005023		**500,00**	2,51	2,161	5,427	-0,485	-1,218
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,143	0,358
Rudder :									
Rudder, assuming kg/m3		0,003298		**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**61,2**	**1,76**	107,576	**0,46**	28,318

At heel angle 1° and with a crew of 120 kg centered (Y = 0) , at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*61,19*	*1,758*	*0,463*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**181,19**	**1,667**	**0,587**	**0,000**	**Crew at center**
Disp. (m3)	**0,17677**		**0,421**	**0,662**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

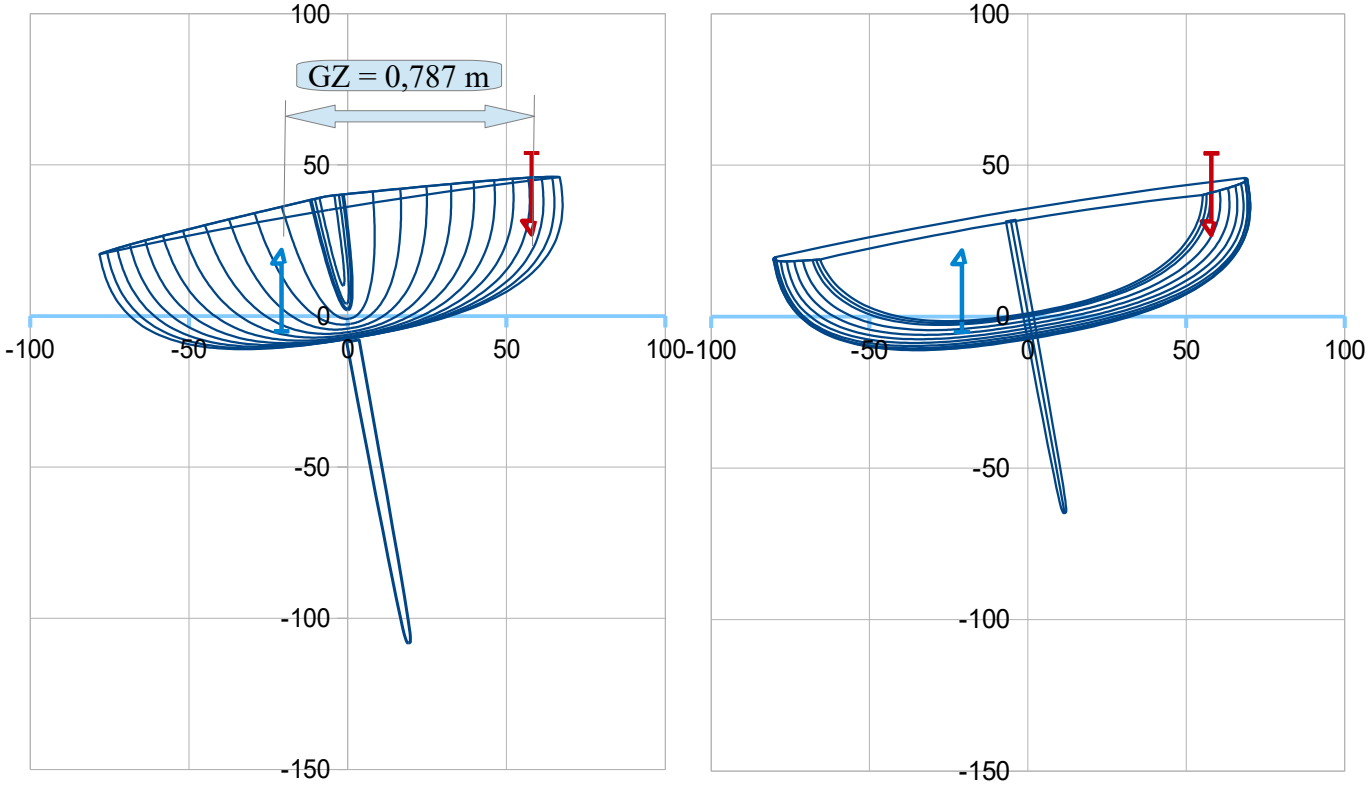
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17677**	**/ Disp. (m3)**	**0,17677**	**Relevant only when heel = 0°**		DLR	75
Height (cm)	**-0,4085**	**Xc heel (m)**	**1,667**	**/ Xg (m)**	**1,667**	Lwl (m)	4,06	Z fore (cm)	1,9
Trim (°)	**0,600**	Yc heel (m)	-0,023	Yg heel (m)	0,655	Bwl (m)	1,15	Z aft (cm)	-2,3
		Zc heel (m)	-0,047	**> GZ (m)**	**0,678**	Tc (m)	0,09	Trim (°)	0,60
		Sw heel(m2)	**4,00**	**RM (kN.m)**	**1,206**	Cp Hull	0,554	LCB Hull (%)	45,30
		Bwl heel (m)	**1,15**	**FB mini (cm)**	**26,6**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**1,81**	**Obliquity (°)**	**0,4**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,013		
						> GM1° (m)	**0,75**		

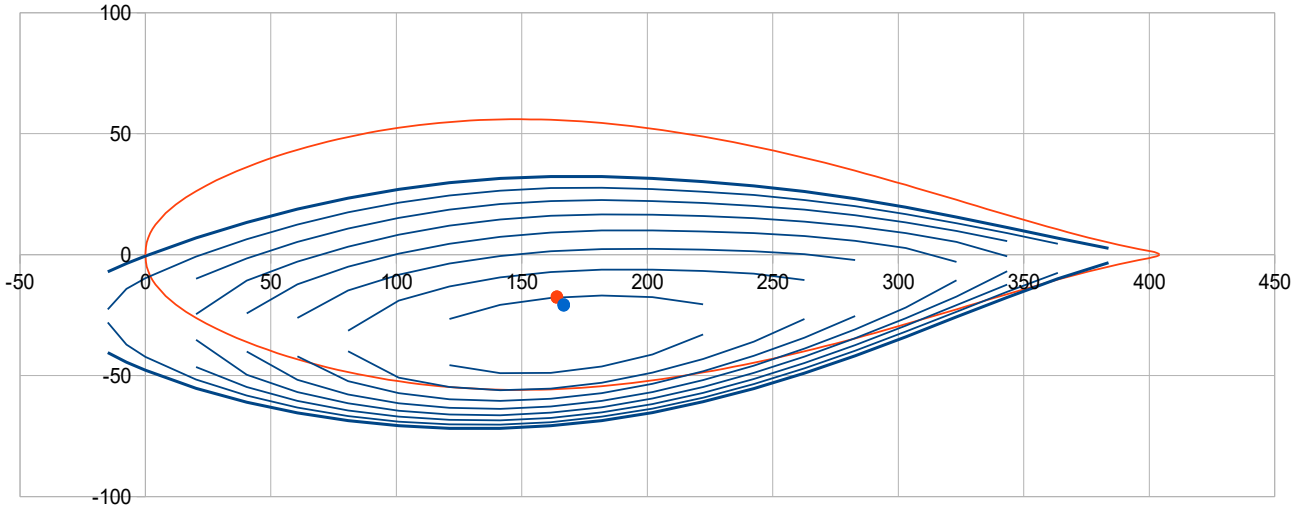
>>> GM1°/ X40% Z65 = 0,75 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m (as input above), for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		Results			
Heel (°)	10	Disp. (m3)	0,17677	/ Disp. (m3)	0,17677
Height (cm)	1,0225	Xc heel (m)	1,667	/ Xg (m)	1,667
Trim (°)	0,287	Yc heel (m)	-0,208	Yg heel (m)	0,579
		Zc heel (m)	-0,051	> GZ (m)	0,787
		Sw heel(m2)	3,71	RM (kN.m)	1,399
		Bwl heel (m)	1,03	FB mini (cm)	18,3
		LCB – LCF (%Lwl)	0,67	Obliquity (°)	3,9

>>> Trim 0,29° ; GZ 0,787 m ; RM 1,399 KN.m ; Sw 3,71 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D1,1 :

A - Data to enter

1.1 Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,0860	0,28
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0110	0,04
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	2,59
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,57
Type	0	Bratio aft	0,73
Zhc fore (m)	0,25	Pch1 Fore	1,00
Zhc mid (m)	0,20	Pch2 Fore	0,88
Zhc aft (m)	0,20	Pch1 Aft	0,70
Po hc z	3	Pch2 Aft	0,88

Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

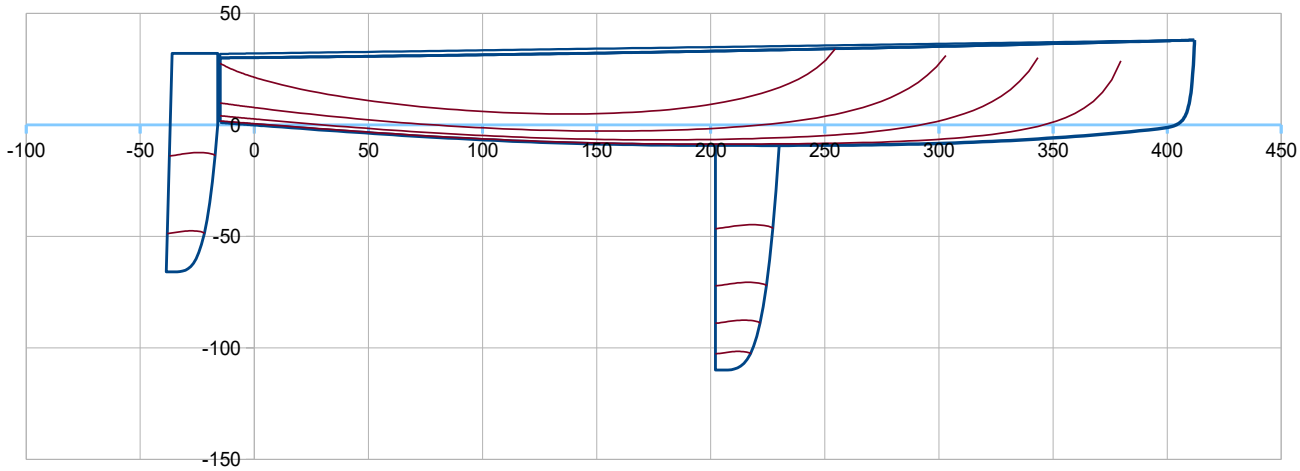
	PE1	C PE1	PE2
Fore	2,000	2,000	2,000
Mid	2,700	1,000	2,880
Aft	2,000	1,000	2,700

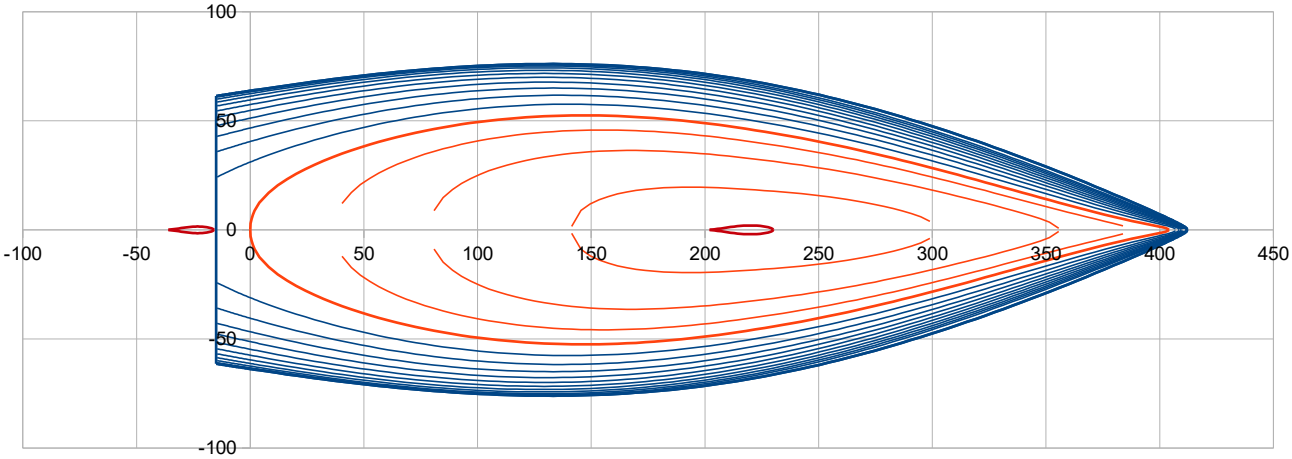
1.2 Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

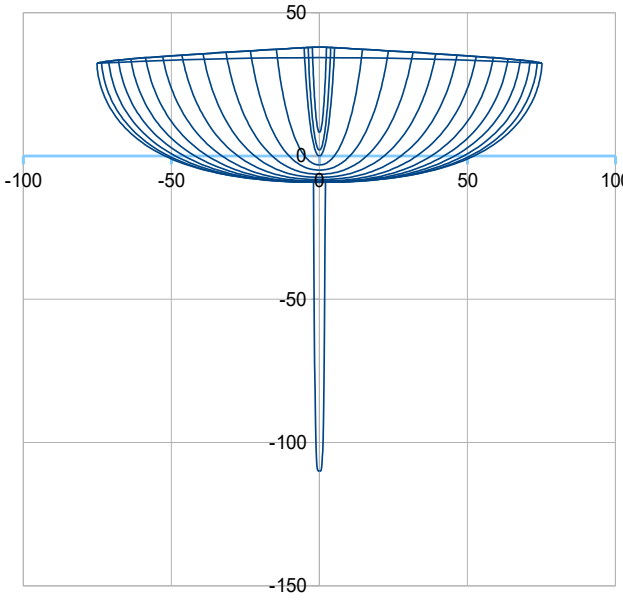
1.3 Rudder dat Suspended		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

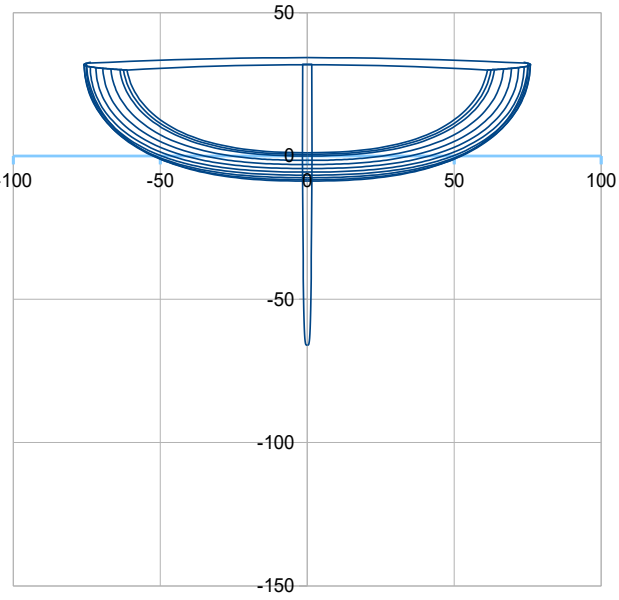
Dinghy D1,2

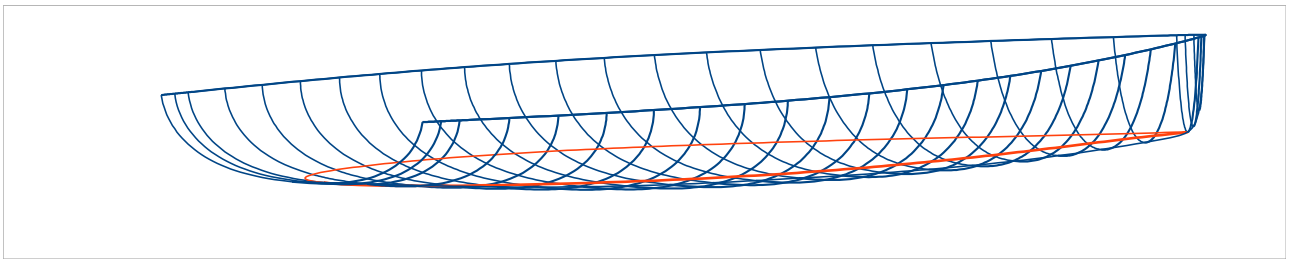
Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 1,05 m** ; Draft 1,10 m ; Displacement of design : 161 kg (Dinghy 61 kg + average load 100 kg) ; LCB hull 46,73 %Lwl ; Cp hull : 0,549 ; Sw : 3,60 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4		
>> ft	*14,01*		*13,25*					
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0	
>> ft	*4,99*							
Bwl (m)	**1,05**	**at X (% Lwl)**	**36,0**	> Bwl / Boa	0,691			
>> ft	*3,44*			**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,092**	**at X (%Lwl)**	**57**		**0,30**	**0,32**	**0,38**	
>> ft	*0,30*			*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14872**	**at LCB (m)**	**1,888**	**LCB (%Lwl)**	**46,73**	**ZCB (m)**	**-0,033**	
>> lbs	*336*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,11*	
Cp	**0,549**							
Sf (m2)	**2,82**	**at LCF (m)**	**1,727**	**LCF (%Lwl)**	**42,75**	>>> LCB – LCF (%Lwl)	3,98	
>> ft2	*30,39*	*>> ft*	*5,67*					
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)						
Sw (m2)	**2,89**	>Sw/D^(2/3)	10,28					
>> ft2	*31,07*							
Shull (m2)	**6,56**	**at X (m)**	**1,820**	**Z (m)**	**0,057**			
>> ft2	*70,60*	*>> ft*	*5,97*	*>> ft*	*0,19*			
Sdeck (m2)	**4,89**	**at X (m)**	**1,620**	**Z (m)**	**0,34**			
>> ft2	*52,62*	*>> ft*	*5,31*	*>> ft*	*1,11*			

B1.2 Daggerboard

Vol. keel(m3)	**0,00499**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,489**	
		>> ft	*7,09*			*>> ft*	*-1,60*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,14*		*>> ft2*	*2,47*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,35**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15701**	**at LCB (m)**	**1,851**	**LCB (%Lwl)**	**45,83**	**at ZCB (m)**	**-0,049**	
(kg)	**161**	*>> ft*	*6,07*			*>> ft*	*-0,16*	
>> lbs	*355*							
Sw (m2)	**3,60**	>Sw/D^(2/3)	12,39	Lwl/D^(1/3)	7,49			
>> ft2	*38,80*			***DLR***	***68***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**161**	**at Xg (m)**	**1,635**	**Xg (%Lwl)**	**40,47**	**at Zg (m)**	**0,581**
Light boat	60,8		1,759				0,466

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,56		**4,00**	26,23	1,820	47,742	0,057	1,485
Transom assuming at unit mass kg/m2		0,28		**4,00**	1,13	-0,150	-0,170	0,175	0,198
Deck - benches									
assuming at average unit mass kg/m2		4,89		**3,00**	14,67	1,620	23,756	0,338	4,949
Daggerboard :									
Daggerboard, assuming at kg/m3		0,004993		**500,00**	2,50	2,161	5,395	-0,489	-1,220
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,146	0,365
Rudder :									
Rudder, assuming kg/m3		0,003298		**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**60,8**	**1,76**	106,928	**0,47**	28,365

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*60,80*	*1,759*	*0,466*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**180,80**	**1,667**	**0,588**	**0,000**	**Crew at center**
Disp. (m3)	**0,17639**		**0,422**	**0,664**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

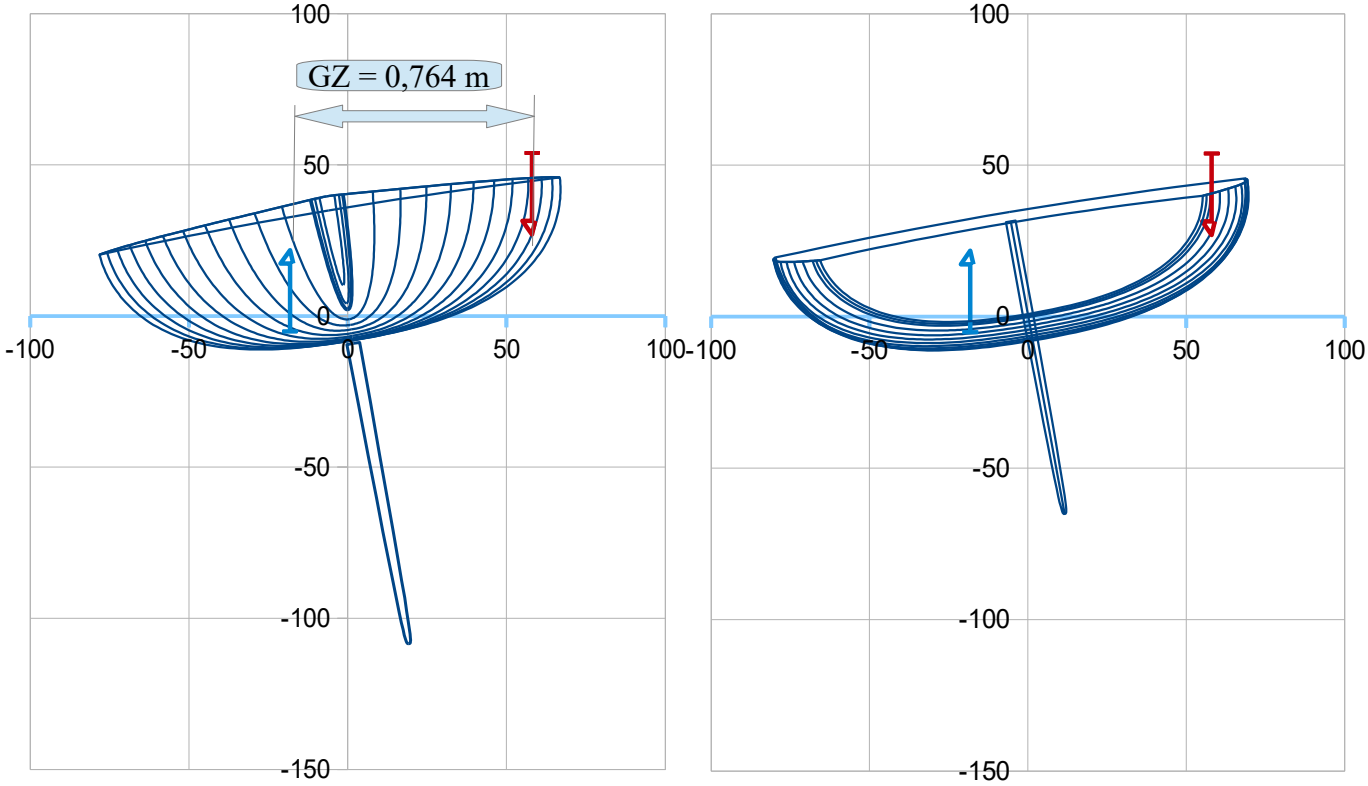
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17639**	**/ Disp. (m3)**	**0,17639**	**Relevant only when heel = 0°**		DLR	75
Height (cm)	**-0,4160**	**Xc heel (m)**	**1,667**	**/ Xg (m)**	**1,667**	Lwl (m)	4,06	Z fore (cm)	2,0
Trim (°)	**0,630**	Yc heel (m)	-0,020	Yg heel (m)	0,656	Bwl (m)	1,09	Z aft (cm)	-2,5
		Zc heel (m)	-0,049	**> GZ (m)**	**0,676**	Tc (m)	0,10	Trim (°)	0,63
		Sw heel(m2)	**3,86**	**RM (kN.m)**	**1,199**	Cp Hull	0,559	LCB Hull (%)	45,30
		Bwl heel (m)	**1,09**	**FB mini (cm)**	**26,4**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**1,99**	**Obliquity (°)**	**0,4**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,010		
						> GM1° (m)	**0,55**		

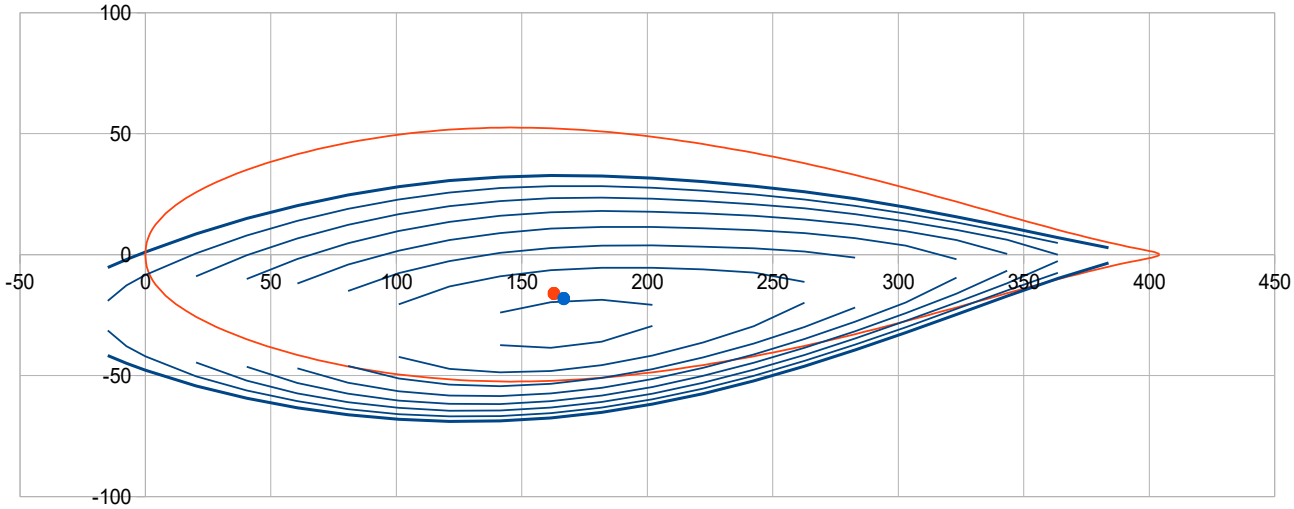
>>> GM1°/ X40% Z65 = 0,55 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		**Results**			
Heel (°)	**10**	**Disp. (m3)**	**0,17639**	**/ Disp. (m3)**	**0,17639**
Height (cm)	**0,8730**	**Xc heel (m)**	**1,667**	**/ Xg (m)**	**1,667**
Trim (°)	**0,330**	Yc heel (m)	-0,182	Yg heel (m)	0,580
		Zc heel (m)	-0,051	**> GZ (m)**	**0,762**
		Sw heel(m2)	**3,66**	**RM (kN.m)**	**1,352**
		Bwl heel (m)	**1,01**	**FB mini (cm)**	**18,0**
		LCB – LCF (%Lwl)	**0,97**	**Obliquity (°)**	**3,7**

>>> Trim 0,33° ; GZ 0,762 m ; RM 1,352 KN.m ; Sw 3,66 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D1,2 :

1.1 Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,0920	0,30
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0115	0,04
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	2,59
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,57
Type	0	Bratio aft	0,73
Zhc fore (m)	0,25	Pch1 Fore	1,00
Zhc mid (m)	0,20	Pch2 Fore	0,88
Zhc aft (m)	0,20	Pch1 Aft	0,70
Po hc z	3	Pch2 Aft	0,88

Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

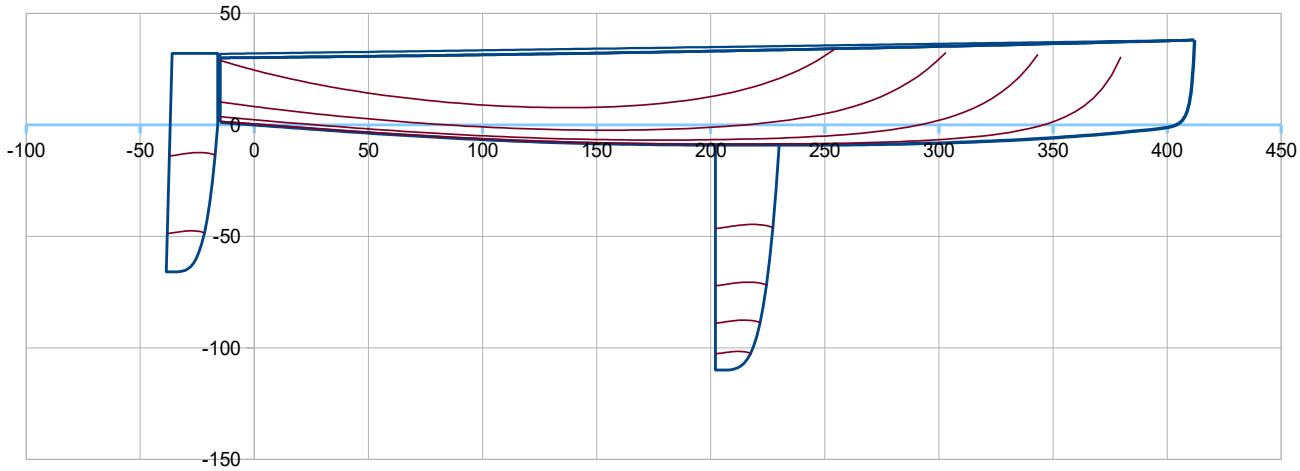
	PE1	C PE1	PE2
Fore	2,000	2,000	2,000
Mid	2,000	1,000	2,870
Aft	2,000	1,000	2,700

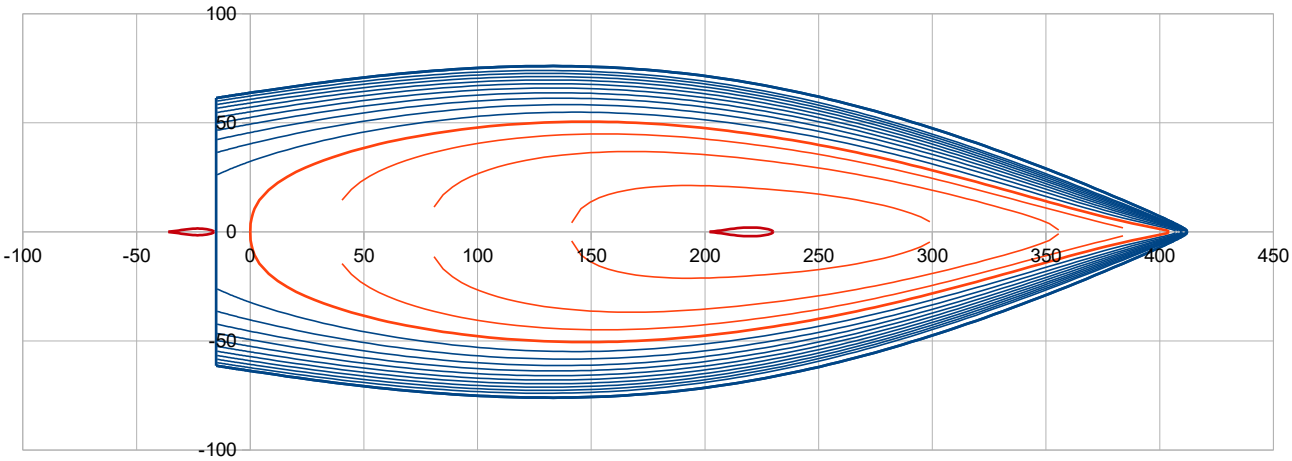
1.2 Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

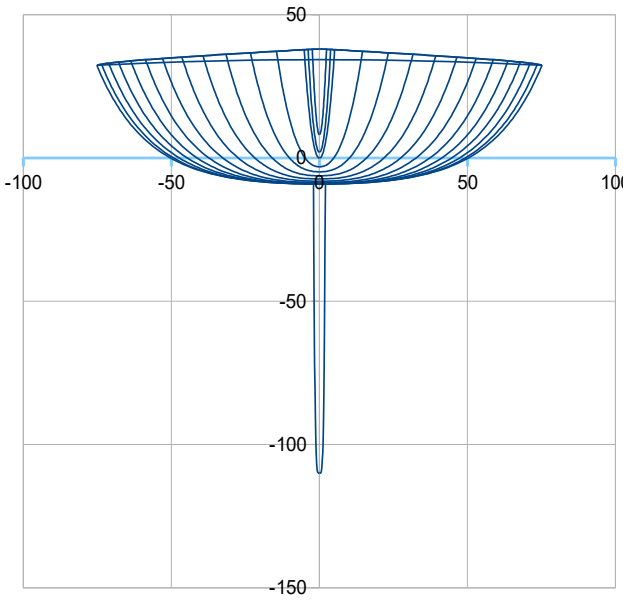
1.3 Rudder data	Suspended	
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

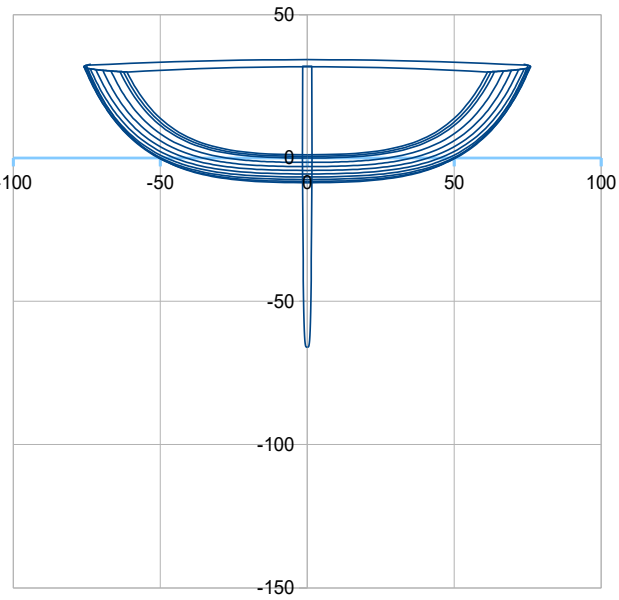
Dinghy D1,3

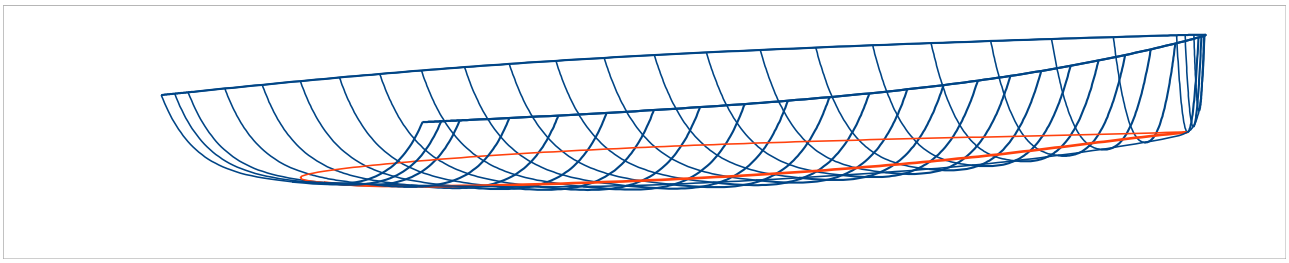
Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 1,01 m** ; Draft 1,10 m ; Displacement of design : 160 kg (Dinghy 60 kg + average load 100 kg) ; LCB hull 46,74 %Lwl ; Cp hull : 0,555- ; Sw : 3,56 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4		
>> ft	*14,01*		*13,25*					
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0	
>> ft	*4,99*							
Bwl (m)	**1,01**	**at X (% Lwl)**	**37,0**	> Bwl / Boa	0,665			
>> ft	*3,32*			**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,091**	**at X (%Lwl)**	**57**		**0,30**	**0,32**	**0,38**	
>> ft	*0,30*			*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14822**	**at LCB (m)**	**1,888**	**LCB (%Lwl)**	**46,74**	**ZCB (m)**	**-0,033**	
>> lbs	*335*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,11*	
Cp	**0,556**							
Sf (m2)	**2,78**	**at LCF (m)**	**1,721**	**LCF (%Lwl)**	**42,60**	>>> LCB – LCF (%Lwl)	4,14	
>> ft2	*29,91*	*>> ft*	*5,65*					
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)						
Sw (m2)	**2,84**	>Sw/D^(2/3)	10,15					
>> ft2	*30,61*							
Shull (m2)	**6,47**	**at X (m)**	**1,826**	**Z (m)**	**0,059**			
>> ft2	*69,60*	*>> ft*	*5,99*	*>> ft*	*0,19*			
Sdeck (m2)	**4,89**	**at X (m)**	**1,620**	**Z (m)**	**0,34**			
>> ft2	*52,62*	*>> ft*	*5,31*	*>> ft*	*1,11*			

B1.2 Daggerboard

Vol. keel(m3)	**0,00500**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,488**	
		>> ft	*7,09*			*>> ft*	*-1,60*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,15*		*>> ft2*	*2,48*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,34**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15652**	**at LCB (m)**	**1,852**	**LCB (%Lwl)**	**45,83**	**at ZCB (m)**	**-0,049**	
(kg)	**160**	*>> ft*	*6,08*			*>> ft*	*-0,16*	
>> lbs	*354*							
Sw (m2)	**3,56**	>Sw/D^(2/3)	12,27	Lwl/D^(1/3)	7,50			
>> ft2	*38,35*			***DLR***	***68***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**160**	**at Xg (m)**	**1,636**	**Xg (%Lwl)**	**40,49**	**at Zg (m)**	**0,582**
Light boat	60,4		1,761				0,470

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,47		**4,00**	25,87	1,826	47,227	0,059	1,530
Transom assuming at unit mass kg/m2		0,28		**4,00**	1,12	-0,150	-0,168	0,174	0,194
Deck - benches									
assuming at average unit mass kg/m2		4,89		**3,00**	14,67	1,620	23,756	0,338	4,949
Daggerboard :									
Daggerboard, assuming at kg/m3		0,005000		**500,00**	2,50	2,161	5,403	-0,488	-1,219
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,145	0,363
Rudder :									
Rudder, assuming kg/m3		0,003298		**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**60,4**	**1,76**	106,423	**0,47**	28,404

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*60,42*	*1,761*	*0,470*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**180,42**	**1,667**	**0,590**	**0,000**	**Crew at center**
Disp. (m3)	**0,17602**		**0,423**	**0,665**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

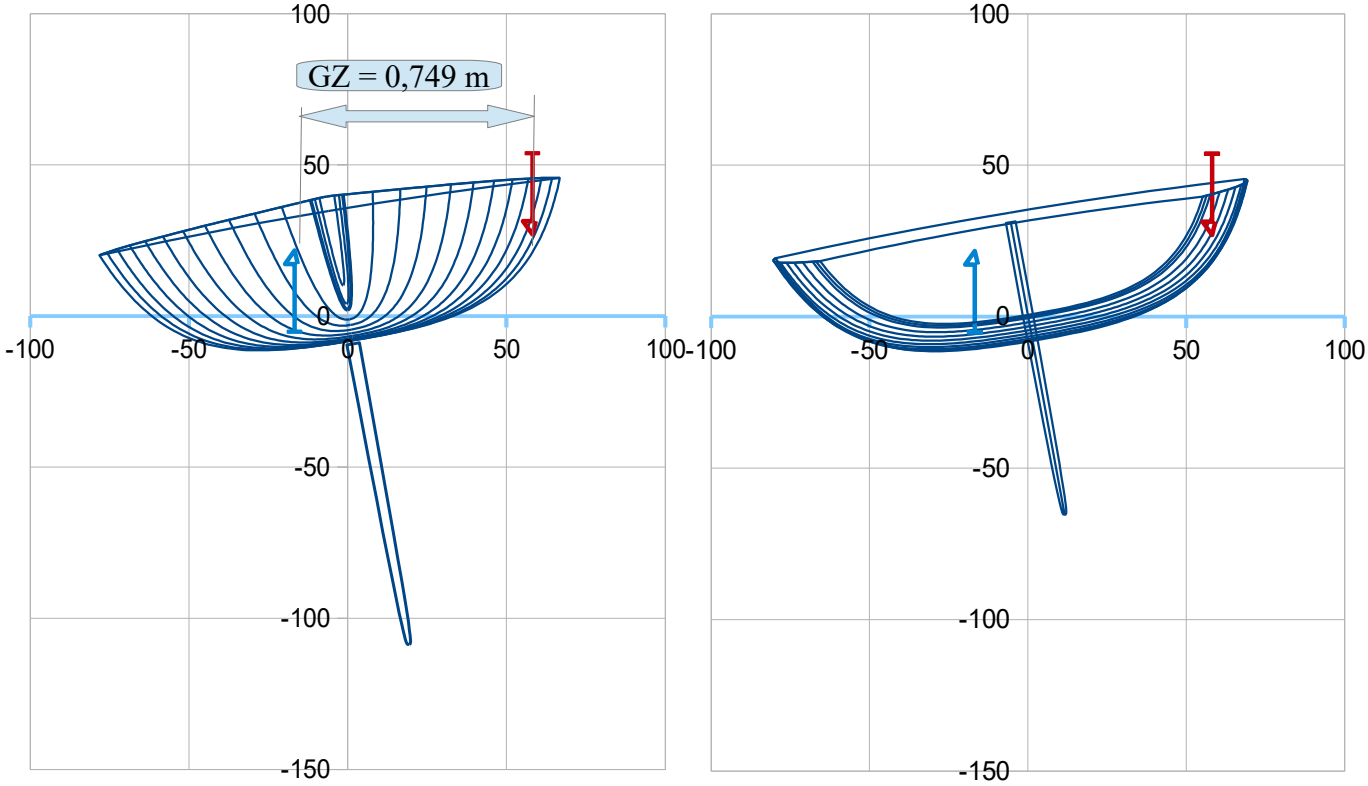
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17602**	**/ Disp. (m3)**	**0,17602**	**Relevant only when heel = 0°**		DLR	75
Height (cm)	**-0,4300**	**Xc heel (m)**	**1,667**	**/ Xg (m)**	**1,667**	Lwl (m)	4,06	Z fore (cm)	2,0
Trim (°)	**0,625**	Yc heel (m)	-0,018	Yg heel (m)	0,658	Bwl (m)	1,04	Z aft (cm)	-2,4
		Zc heel (m)	-0,049	**> GZ (m)**	**0,676**	Tc (m)	0,09	Trim (°)	0,63
		Sw heel(m2)	**3,81**	**RM (kN.m)**	**1,196**	Cp Hull	0,569	LCB Hull (%)	45,29
		Bwl heel (m)	**1,04**	**FB mini (cm)**	**26,4**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**2,02**	**Obliquity (°)**	**0,3**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,008		
						> GM1° (m)	**0,45**		

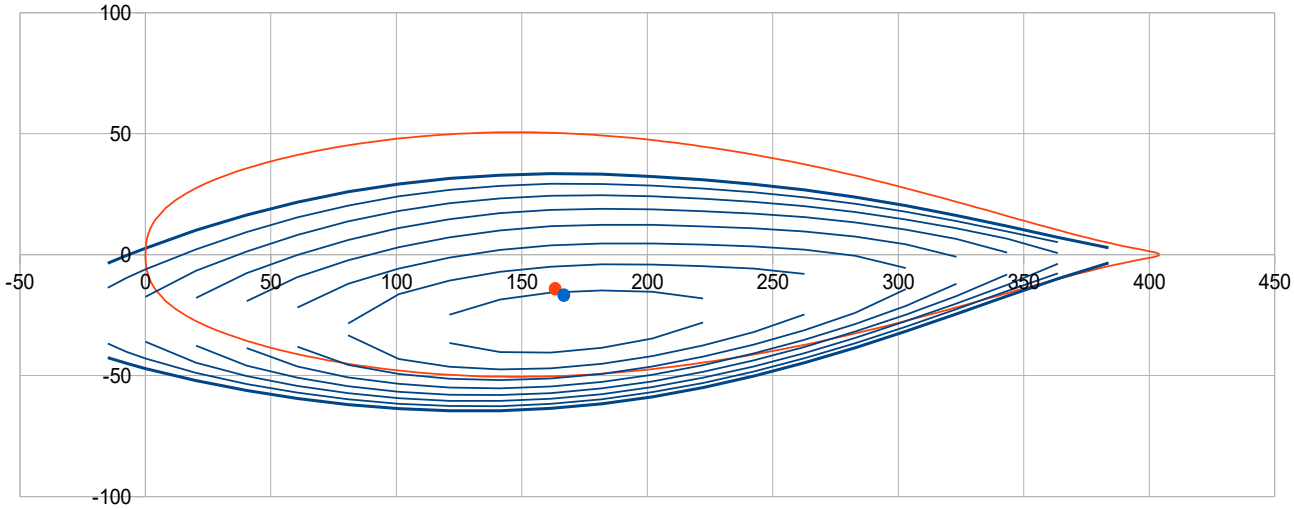
>>> GM1°/ X40% Z65 = 0,45 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		**Results**			
Heel (°)	**10**	**Disp. (m3)**	**0,17602**	**/ Disp. (m3)**	**0,17602**
Height (cm)	**0,6845**	**Xc heel (m)**	**1,667**	**/ Xg (m)**	**1,667**
Trim (°)	**0,357**	Yc heel (m)	-0,168	Yg heel (m)	0,581
		Zc heel (m)	-0,052	**> GZ (m)**	**0,749**
		Sw heel(m2)	**3,60**	**RM (kN.m)**	**1,326**
		Bwl heel (m)	**0,97**	**FB mini (cm)**	**17,8**
		LCB – LCF (%Lwl)	**0,85**	**Obliquity (°)**	**3,3**

>>> Trim 0,36° ; GZ 0,749 m ; RM 1,326 KN.m ; Sw 3,60 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D1,3 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,0905	0,30
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0115	0,04
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	
Option Hard Chine		
Type	0	
Zhc fore (m)	0,15	
Zhc mid (m)	0,09	
Zhc aft (m)	0,12	
Po hc z	3	
Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

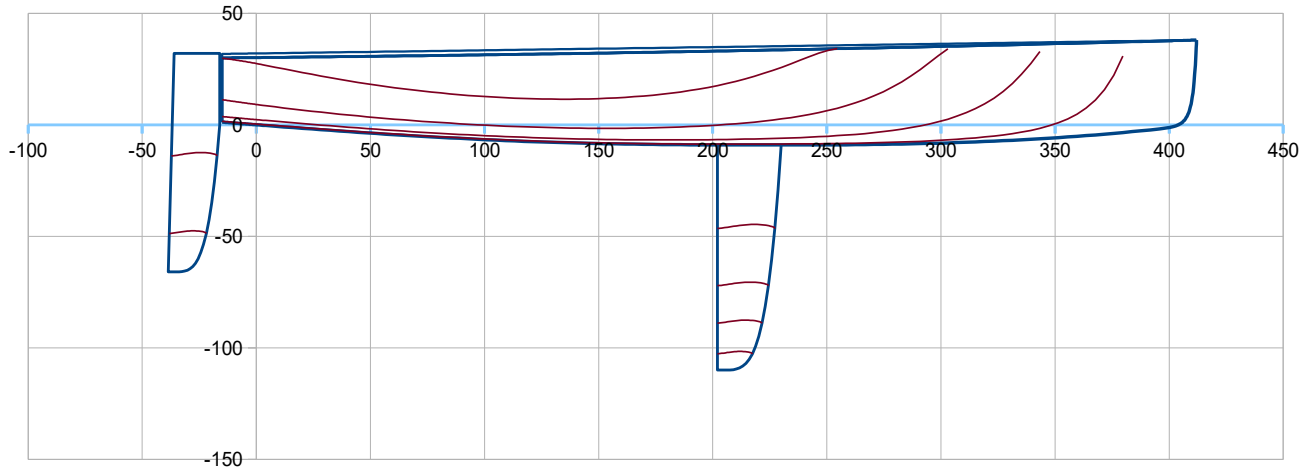
	PE1	C PE1	PE2
Fore	1,000	1,000	2,000
Mid	1,000	1,000	4,430
Aft	1,000	1,000	4,400

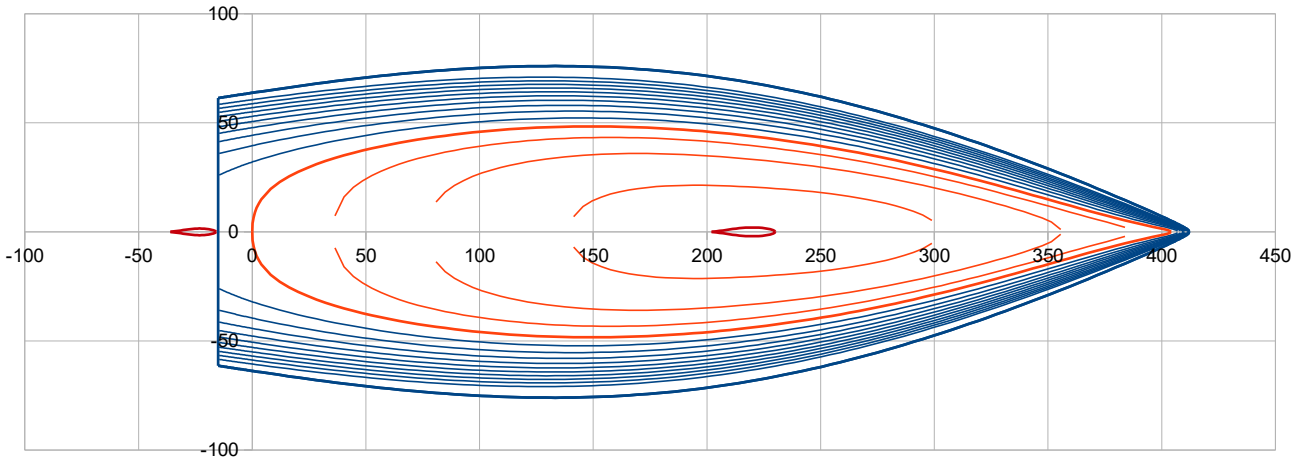
Bratio fore	0,57
Bratio aft	0,73
Pch1 Fore	1,00
Pch2 Fore	0,88
Pch1 Aft	0,70
Pch2 Aft	0,88

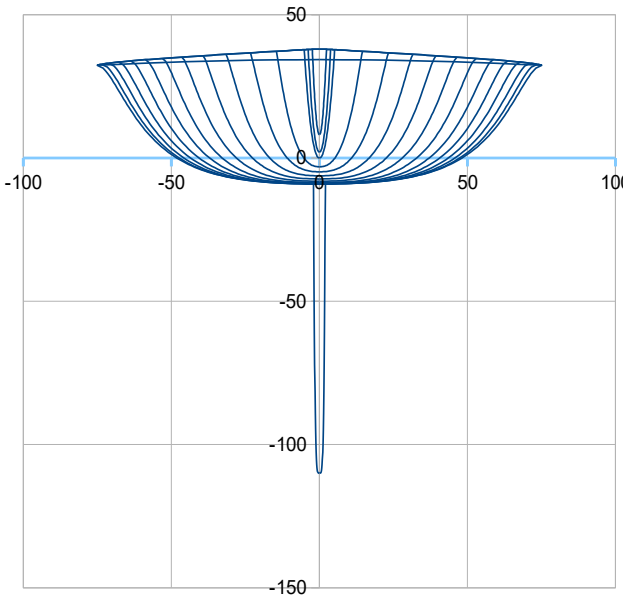
A2 – Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	
A3 – Rudder		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

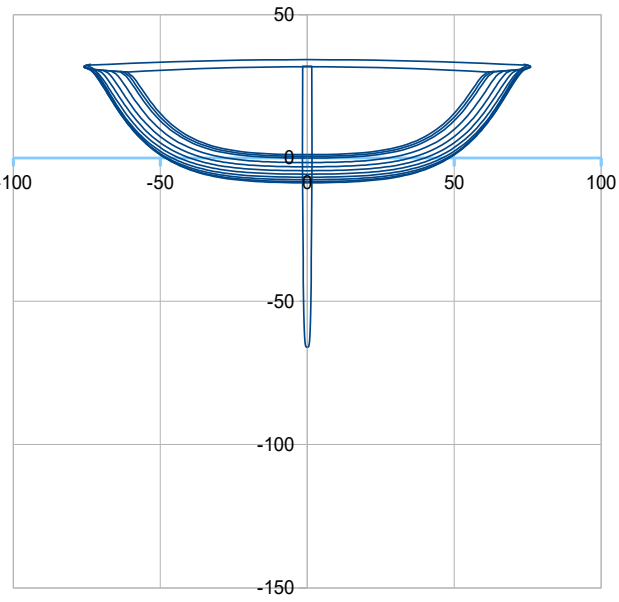
Dinghy D1,4

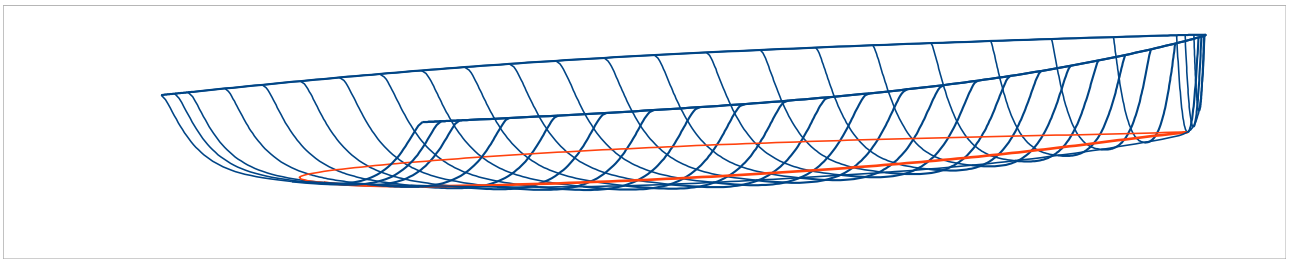
Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 0,97 m** ; Draft 1,10 m ; Displacement of design : 160 kg (Dinghy 60 kg + average load 100 kg) ; LCB hull 47,13 %Lwl ; Cp hull : 0,568 ; Sw : 3,51 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4		
>> ft	*14,01*		*13,25*					
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0	
>> ft	*4,99*							
Bwl (m)	**0,97**	**at X (% Lwl)**	**37,0**	> Bwl / Boa	0,636			
>> ft	*3,17*			**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,091**	**at X (%Lwl)**	**57**		**0,30**	**0,32**	**0,38**	
>> ft	*0,30*			*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14776**	**at LCB (m)**	**1,904**	**LCB (%Lwl)**	**47,13**	**ZCB (m)**	**-0,034**	
>> lbs	*334*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,11*	
Cp	**0,568**							
Sf (m2)	**2,73**	**at LCF (m)**	**1,737**	**LCF (%Lwl)**	**42,99**	>>> LCB – LCF (%Lwl)	4,14	
>> ft2	*29,34*	*>> ft*	*5,70*					
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)						
Sw (m2)	**2,80**	>Sw/D^(2/3)	10,00					
>> ft2	*30,09*							
Shull (m2)	**6,44**	**at X (m)**	**1,831**	**Z (m)**	**0,064**			
>> ft2	*69,28*	*>> ft*	*6,01*	*>> ft*	*0,21*			
Sdeck (m2)	**4,89**	**at X (m)**	**1,620**	**Z (m)**	**0,34**			
>> ft2	*52,62*	*>> ft*	*5,31*	*>> ft*	*1,11*			

B1.2 Daggerboard

Vol. keel(m3)	**0,00500**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,488**	
		>> ft	*7,09*			*>> ft*	*-1,60*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,15*		*>> ft2*	*2,48*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,34**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15606**	**at LCB (m)**	**1,867**	**LCB (%Lwl)**	**46,20**	**at ZCB (m)**	**-0,050**	
(kg)	**160**	*>> ft*	*6,12*			*>> ft*	*-0,16*	
>> lbs	*353*							
Sw (m2)	**3,51**	>Sw/D^(2/3)	12,12	Lwl/D^(1/3)	7,50			
>> ft2	*37,83*			***DLR***	***68***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**160**	**at Xg (m)**	**1,637**	**Xg (%Lwl)**	**40,52**	**at Zg (m)**	**0,583**
Light boat	60,3		1,764				0,473

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,44		**4,00**	25,74	1,831	47,143	0,064	1,638
Transom assuming at unit mass kg/m2		0,27		**4,00**	1,09	-0,150	-0,163	0,174	0,189
Deck - benches									
assuming at average unit mass kg/m2		4,89		**3,00**	14,67	1,620	23,756	0,338	4,949
Daggerboard :									
Daggerboard, assuming at kg/m3		0,005000		**500,00**	2,50	2,161	5,403	-0,488	-1,219
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,145	0,363
Rudder :									
Rudder, assuming kg/m3		0,003298		**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**60,3**	**1,76**	106,344	**0,47**	28,507

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*60,27*	*1,764*	*0,473*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**180,27**	**1,668**	**0,591**	**0,000**	**Crew at center**
Disp. (m3)	**0,17588**		**0,424**	**0,666**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

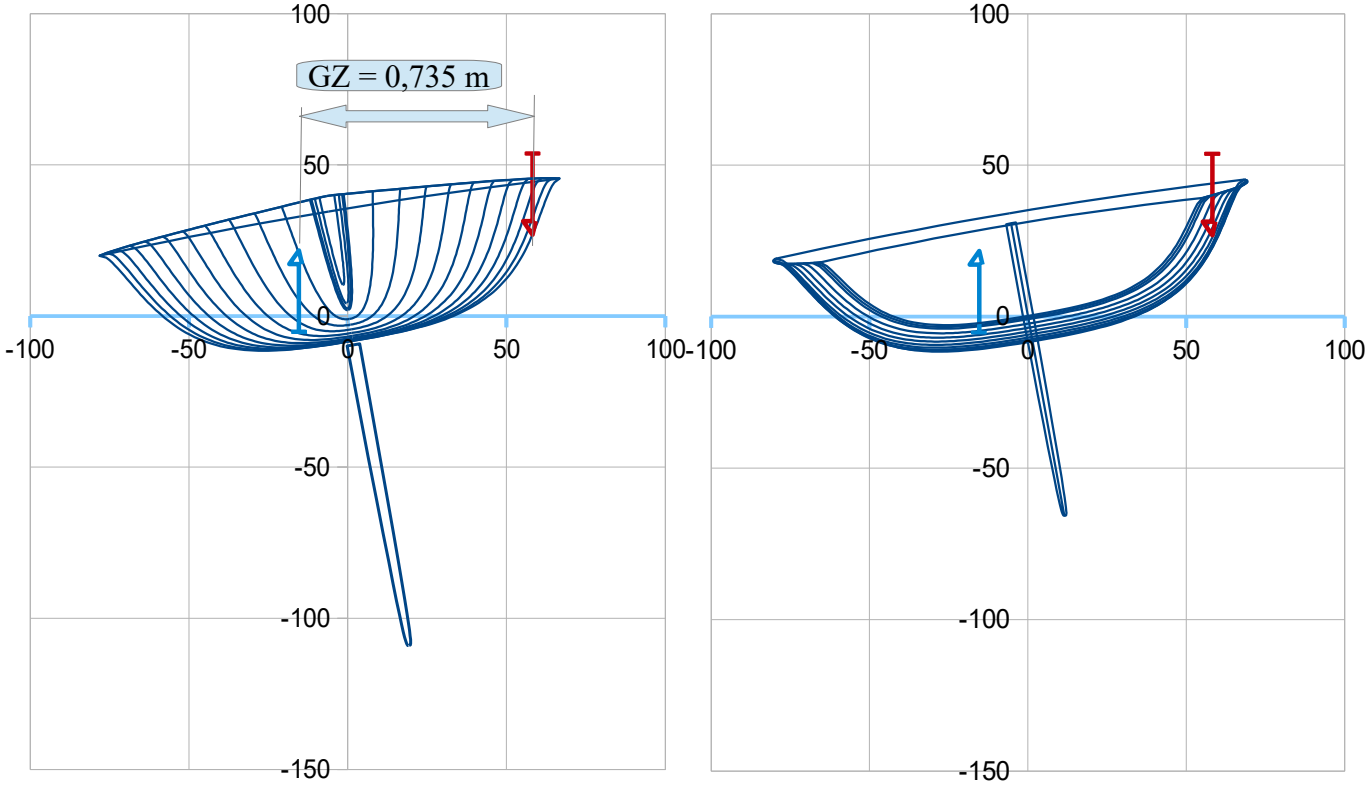
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17588**	**/ Disp. (m3)**	**0,17588**	**Relevant only when heel = 0°**		DLR	75
Height (cm)	**-0,4377**	**Xc heel (m)**	**1,668**	**/ Xg (m)**	**1,668**	Lwl (m)	4,05	Z fore (cm)	2,1
Trim (°)	**0,667**	Yc heel (m)	-0,017	Yg heel (m)	0,658	Bwl (m)	1,00	Z aft (cm)	-2,6
		Zc heel (m)	-0,049	**> GZ (m)**	**0,675**	Tc (m)	0,09	Trim (°)	0,67
		Sw heel(m2)	**3,75**	**RM (kN.m)**	**1,193**	Cp Hull	0,584	LCB Hull (%)	45,43
		Bwl heel (m)	**1,00**	**FB mini (cm)**	**26,3**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**1,77**	**Obliquity (°)**	**0,3**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,006		
						> GM1° (m)	**0,36**		

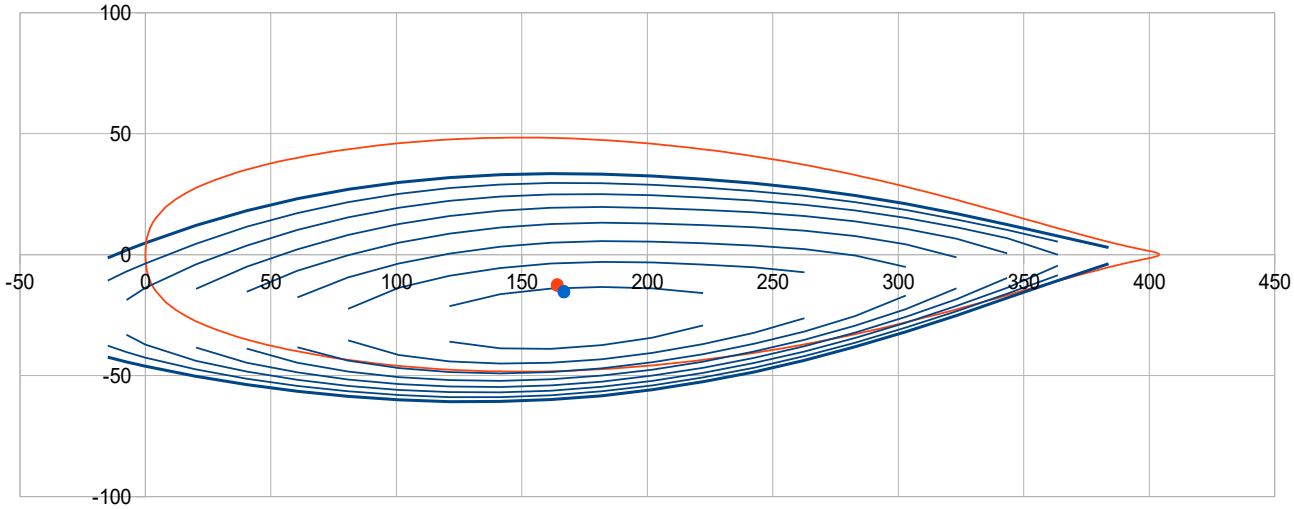
>>> GM1°/ X40% Z65 = 0,36 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		**Results**			
Heel (°)	**10**	**Disp. (m3)**	**0,17588**	**/ Disp. (m3)**	**0,17588**
Height (cm)	**0,5435**	**Xc heel (m)**	**1,668**	**/ Xg (m)**	**1,668**
Trim (°)	**0,435**	Yc heel (m)	-0,154	Yg heel (m)	0,582
		Zc heel (m)	-0,052	**> GZ (m)**	**0,735**
		Sw heel(m2)	**3,58**	**RM (kN.m)**	**1,301**
		Bwl heel (m)	**0,94**	**FB mini (cm)**	**17,5**
		LCB – LCF (%Lwl)	**0,66**	**Obliquity (°)**	**2,9**

>>> Trim 0,44° ; GZ 0,735 m ; RM 1,301 KN.m ; Sw 3,58 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D1,4 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,0905	0,30
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0120	0,04
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	2,59
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,57
Type	0	Bratio aft	0,73
Zhc fore (m)	0,25	Pch1 Fore	1,00
Zhc mid (m)	0,20	Pch2 Fore	0,88
Zhc aft (m)	0,20	Pch1 Aft	0,70
Po hc z	3	Pch2 Aft	0,88

Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

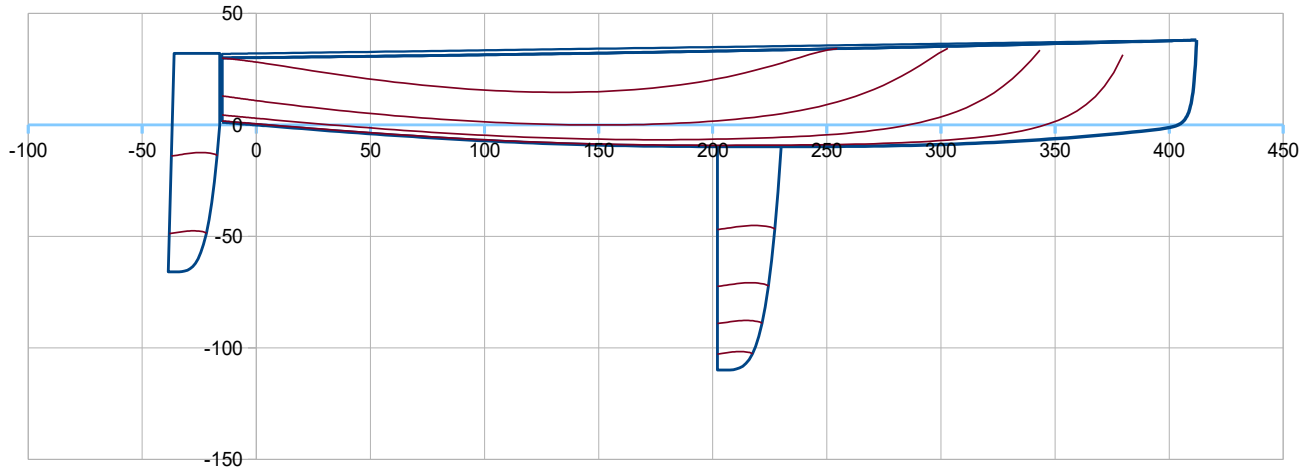
	PE1	C PE1	PE2
Fore	1,000	1,000	2,000
Mid	0,500	1,000	6,530
Aft	0,600	1,000	6,000

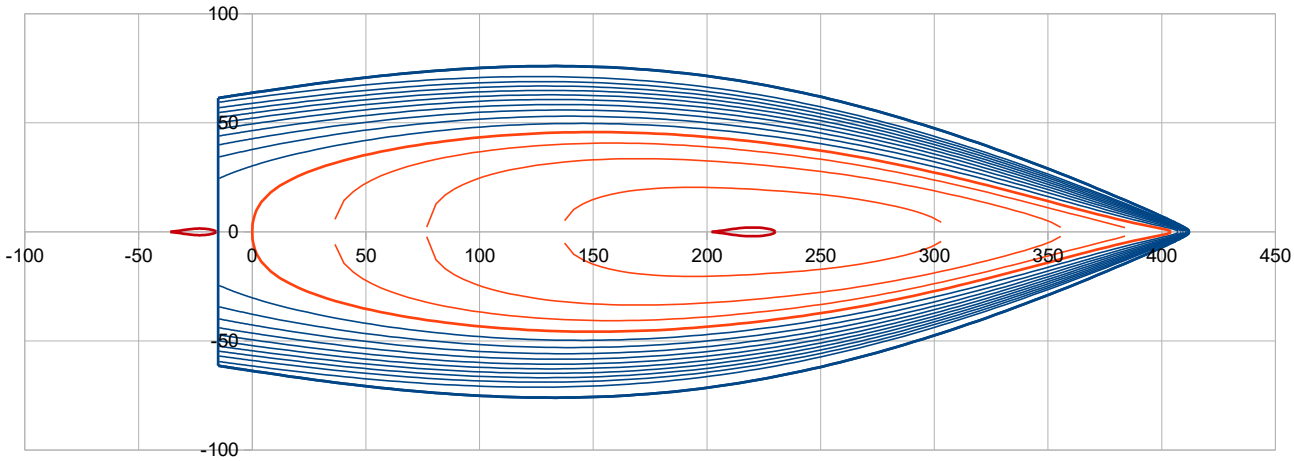
A2 – Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

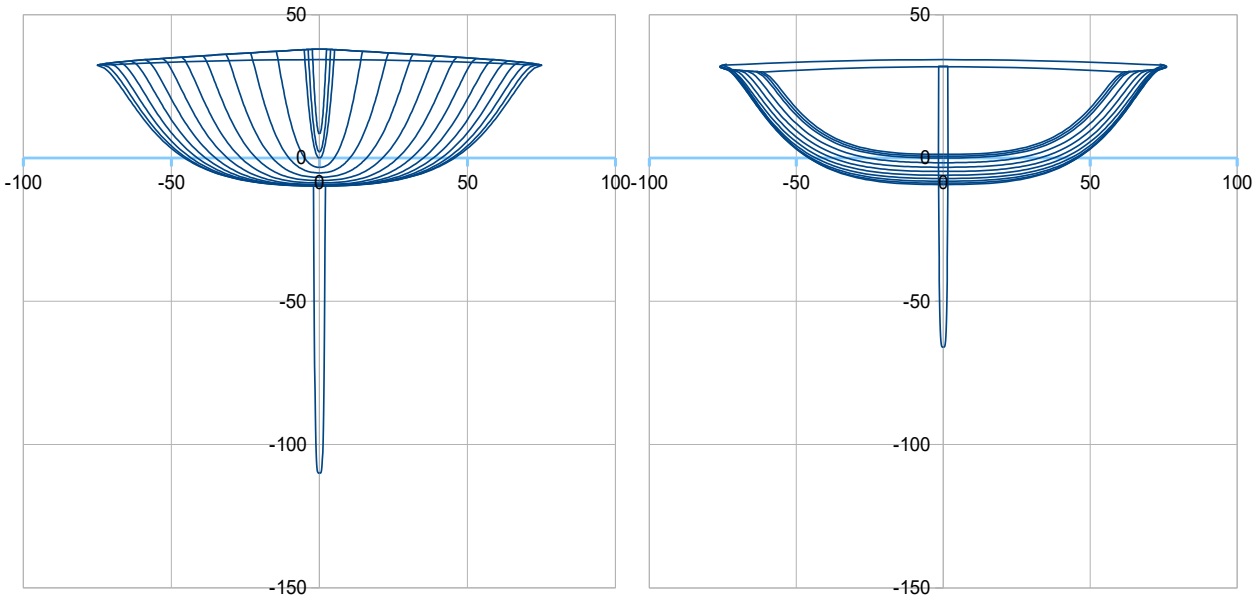
A3 – Rudder		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

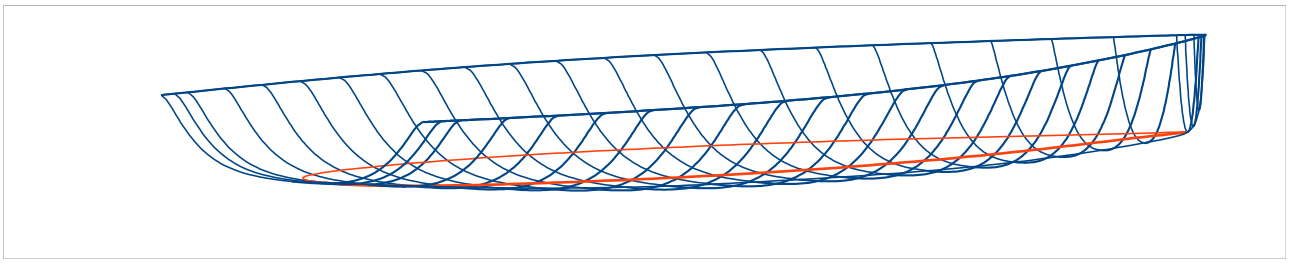
Dinghy D1,5

Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 0,91 m** ; Draft 1,10 m ; Displacement of design : 160 kg (Dinghy 60 kg + average load 100 kg) ; LCB hull 47,21 %Lwl ; Cp hull : 0,566 ; Sw : 3,37 m2









B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4		
>> ft	*14,01*		*13,25*					
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0	
>> ft	*4,99*							
Bwl (m)	**0,91**	**at X (% Lwl)**	**37,0**	> Bwl / Boa	0,602			
>> ft	*3,00*			**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,098**	**at X (%Lwl)**	**57**		**0,30**	**0,32**	**0,38**	
>> ft	*0,32*			*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14765**	**at LCB (m)**	**1,907**	**LCB (%Lwl)**	**47,21**	**ZCB (m)**	**-0,036**	
>> lbs	*334*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,12*	
Cp	**0,566**							
Sf (m2)	**2,57**	**at LCF (m)**	**1,740**	**LCF (%Lwl)**	**43,08**	>>> LCB – LCF (%Lwl)	4,13	
>> ft2	*27,68*	*>> ft*	*5,71*					
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)						
Sw (m2)	**2,66**	>Sw/D^(2/3)	9,52					
>> ft2	*28,62*							
Shull (m2)	**6,39**	**at X (m)**	**1,832**	**Z (m)**	**0,068**			
>> ft2	*68,73*	*>> ft*	*6,01*	*>> ft*	*0,22*			
Sdeck (m2)	**4,89**	**at X (m)**	**1,620**	**Z (m)**	**0,34**			
>> ft2	*52,62*	*>> ft*	*5,31*	*>> ft*	*1,11*			

B1.2 Daggerboard

Vol. keel(m3)	**0,00497**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,492**	
		>> ft	*7,09*			*>> ft*	*-1,61*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,12*		*>> ft2*	*2,46*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,35**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15592**	**at LCB (m)**	**1,869**	**LCB (%Lwl)**	**46,27**	**at ZCB (m)**	**-0,052**	
(kg)	**160**	*>> ft*	*6,13*			*>> ft*	*-0,17*	
>> lbs	*352*							
Sw (m2)	**3,37**	>Sw/D^(2/3)	11,65	Lwl/D^(1/3)	7,51			
>> ft2	*36,32*			***DLR***	***68***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**160**	**at Xg (m)**	**1,637**	**Xg (%Lwl)**	**40,52**	**at Zg (m)**	**0,585**
Light boat	60,0		1,766				0,477

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,39		**4,00**	25,54	1,832	46,807	0,068	1,731
Transom assuming at unit mass kg/m2		0,26		**4,00**	1,05	-0,150	-0,158	0,176	0,185
Deck - benches									
assuming at average unit mass kg/m2		4,89		**3,00**	14,67	1,620	23,756	0,338	4,949
Daggerboard :									
Daggerboard, assuming at kg/m3			0,004966	**500,00**	2,48	2,161	5,365	-0,492	-1,222
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,149	0,372
Rudder :									
Rudder, assuming kg/m3			0,003298	**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**60,0**	**1,77**	105,975	**0,48**	28,602

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*60,02*	*1,766*	*0,477*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**180,02**	**1,669**	**0,592**	**0,000**	**Crew at center**
Disp. (m3)	**0,17563**		**0,426**	**0,667**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

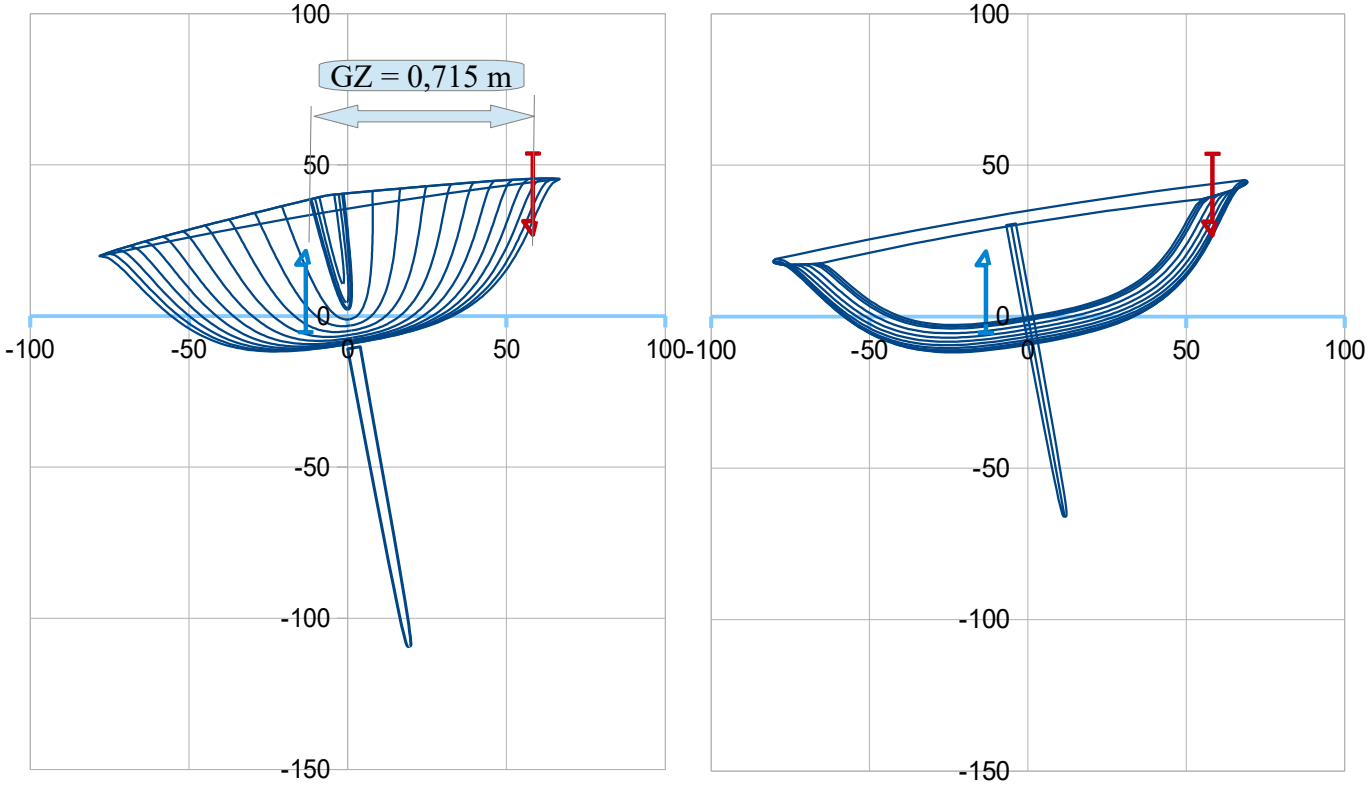
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17563**	**/ Disp. (m3)**	**0,17563**	**Relevant only when heel = 0°**		DLR	75
Height (cm)	**-0,4543**	**Xc heel (m)**	**1,668**	**/ Xg (m)**	**1,669**	Lwl (m)	4,05	Z fore (cm)	2,3
Trim (°)	**0,717**	Yc heel (m)	-0,014	Yg heel (m)	0,659	Bwl (m)	0,94	Z aft (cm)	-2,8
		Zc heel (m)	-0,051	**> GZ (m)**	**0,673**	Tc (m)	0,10	Trim (°)	0,72
		Sw heel(m2)	**3,60**	**RM (kN.m)**	**1,189**	Cp Hull	0,582	LCB Hull (%)	45,45
		Bwl heel (m)	**0,94**	**FB mini (cm)**	**26,1**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**1,82**	**Obliquity (°)**	**0,3**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,004		
						> GM1° (m)	**0,21**		

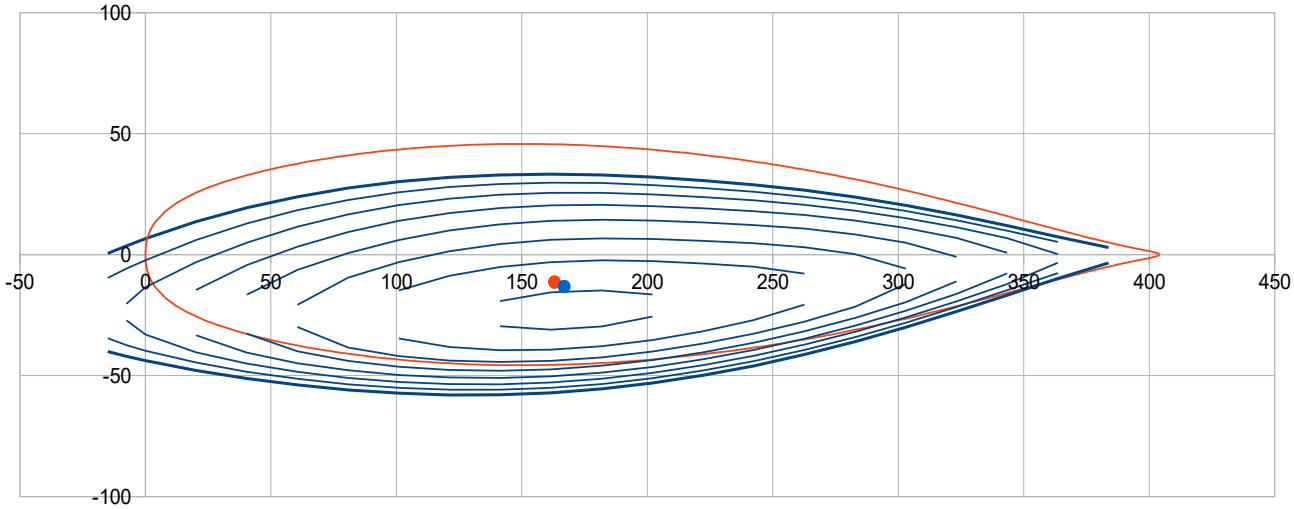
>>> GM1°/ X40% Z65 = 0,21 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		**Results**			
Heel (°)	**10**	**Disp. (m3)**	**0,17563**	**/ Disp. (m3)**	**0,17563**
Height (cm)	**0,4290**	**Xc heel (m)**	**1,669**	**/ Xg (m)**	**1,669**
Trim (°)	**0,505**	Yc heel (m)	-0,132	Yg heel (m)	0,583
		Zc heel (m)	-0,054	**> GZ (m)**	**0,715**
		Sw heel(m2)	**3,49**	**RM (kN.m)**	**1,262**
		Bwl heel (m)	**0,91**	**FB mini (cm)**	**17,2**
		LCB – LCF (%Lwl)	**0,96**	**Obliquity (°)**	**2,6**

>>> Trim 0,51° ; GZ 0,715 m ; RM 1,262 KN.m ; Sw 3,49 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D1,5 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,0975	0,32
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0125	0,04
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	2,59
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,57
Type	0	Bratio aft	0,73
Zhc fore (m)	0,25	Pch1 Fore	1,00
Zhc mid (m)	0,20	Pch2 Fore	0,88
Zhc aft (m)	0,20	Pch1 Aft	0,70
Po hc z	3	Pch2 Aft	0,88

Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

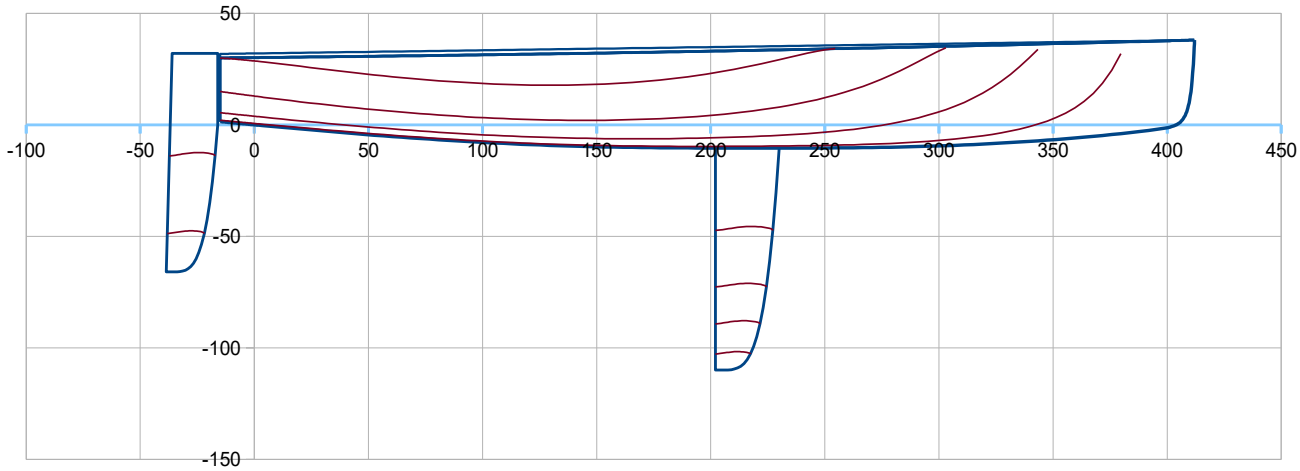
	PE1	C PE1	PE2
Fore	1,000	1,000	2,000
Mid	0,500	1,000	5,200
Aft	0,600	1,000	5,000

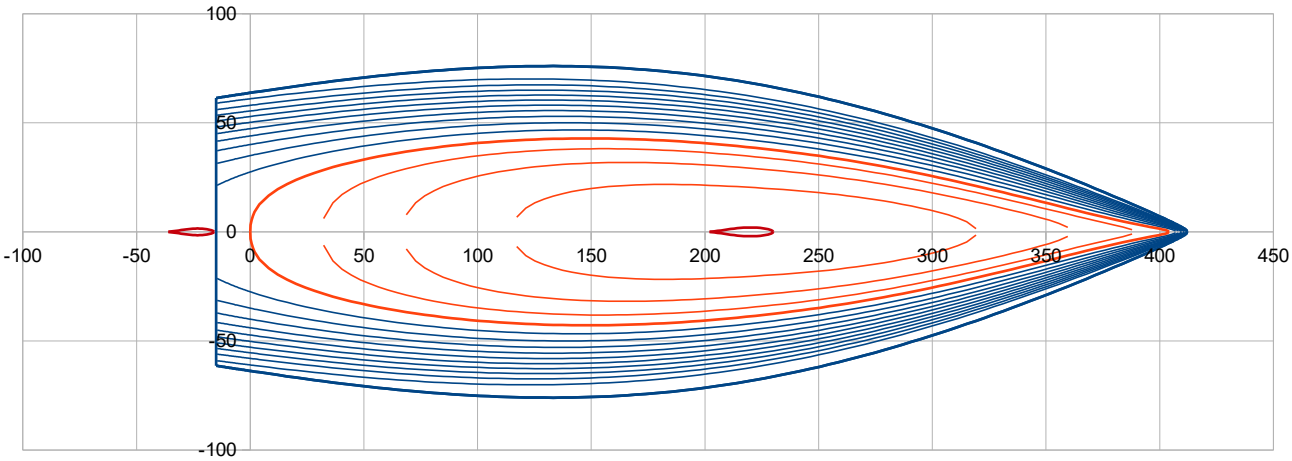
A2 – Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

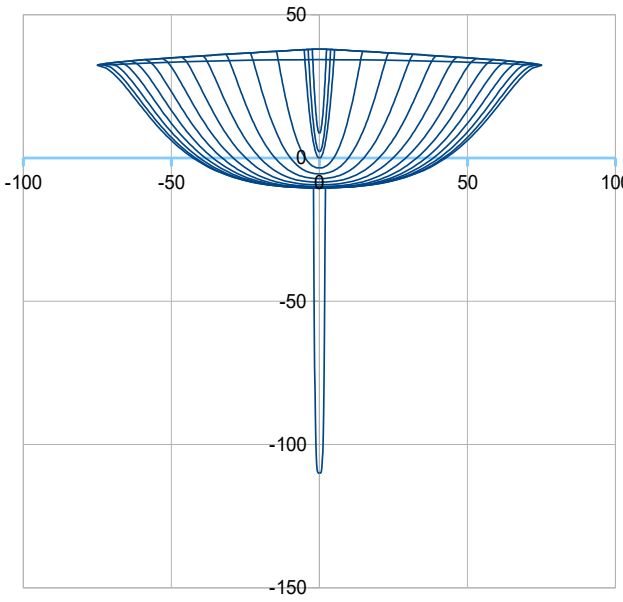
A3 – Rudder		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

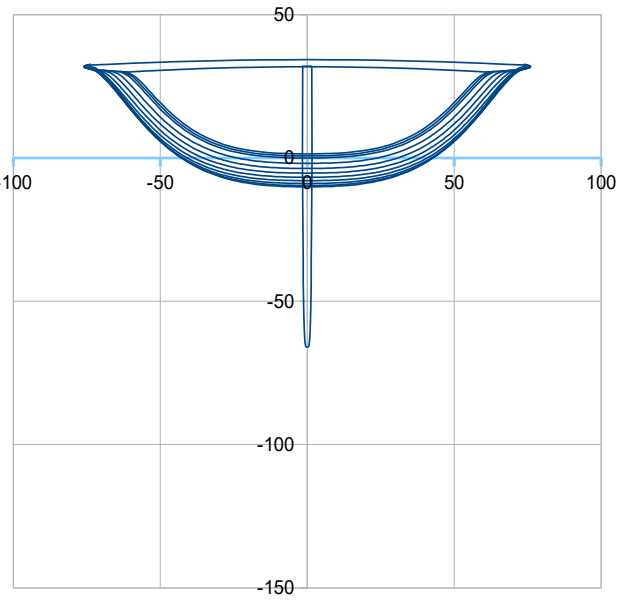
Dinghy D1,6

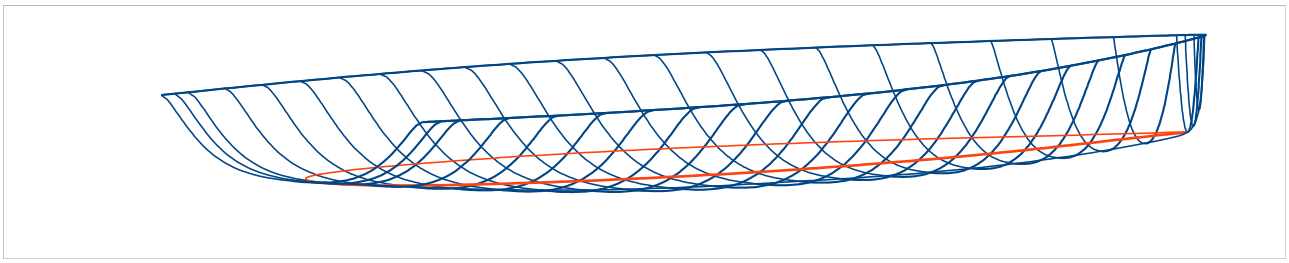
Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 0,86 m** ; Draft 1,10 m ; Displacement of design : 160 kg (Dinghy 60 kg + average load 100 kg) ; LCB hull 46,89 %Lwl ; Cp hull : 0,572 ; Sw : 3,23 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4		
>> ft	*14,01*		*13,25*					
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0	
>> ft	*4,99*							
Bwl (m)	**0,86**	**at X (% Lwl)**	**37,0**	> Bwl / Boa	0,564			
>> ft	*2,81*			**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,105**	**at X (%Lwl)**	**57**		**0,30**	**0,32**	**0,38**	
>> ft	*0,34*			*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14740**	**at LCB (m)**	**1,894**	**LCB (%Lwl)**	**46,89**	**ZCB (m)**	**-0,038**	
>> lbs	*333*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,13*	
Cp	**0,572**							
Sf (m2)	**2,41**	**at LCF (m)**	**1,742**	**LCF (%Lwl)**	**43,11**	>>> LCB – LCF (%Lwl)	3,79	
>> ft2	*25,95*	*>> ft*	*5,71*					
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)						
Sw (m2)	**2,52**	>Sw/D^(2/3)	9,03					
>> ft2	*27,11*							
Shull (m2)	**6,34**	**at X (m)**	**1,833**	**Z (m)**	**0,073**			
>> ft2	*68,27*	*>> ft*	*6,02*	*>> ft*	*0,24*			
Sdeck (m2)	**4,89**	**at X (m)**	**1,620**	**Z (m)**	**0,34**			
>> ft2	*52,62*	*>> ft*	*5,31*	*>> ft*	*1,11*			

B1.2 Daggerboard

Vol. keel(m3)	**0,00493**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,496**	
		>> ft	*7,09*			*>> ft*	*-1,63*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,47**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,08*		*>> ft2*	*2,44*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,36**	*CLR = Center of Lateral Resistance*				
>> ft	*7,21*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15563**	**at LCB (m)**	**1,857**	**LCB (%Lwl)**	**45,97**	**at ZCB (m)**	**-0,054**	
(kg)	**160**	*>> ft*	*6,09*			*>> ft*	*-0,18*	
>> lbs	*352*							
Sw (m2)	**3,23**	>Sw/D^(2/3)	11,17	Lwl/D^(1/3)	7,51			
>> ft2	*34,78*			***DLR***	***67***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**160**	**at Xg (m)**	**1,638**	**Xg (%Lwl)**	**40,53**	**at Zg (m)**	**0,587**
Light boat	59,8		1,767				0,480

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,34		**4,00**	25,37	1,833	46,514	0,073	1,844
Transom assuming at unit mass kg/m2		0,25		**4,00**	1,01	-0,150	-0,151	0,178	0,179
Deck - benches									
assuming at average unit mass kg/m2		4,89		**3,00**	14,67	1,620	23,756	0,338	4,949
Daggerboard :									
Daggerboard, assuming at kg/m3			0,004931	**500,00**	2,47	2,161	5,328	-0,496	-1,224
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,152	0,381
Rudder :									
Rudder, assuming kg/m3			0,003298	**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**59,8**	**1,77**	105,652	**0,48**	28,716

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,56 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*59,78*	*1,767*	*0,480*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**179,78**	**1,669**	**0,594**	**0,000**	**Crew at center**
Disp. (m3)	**0,17540**		**0,427**	**0,667**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

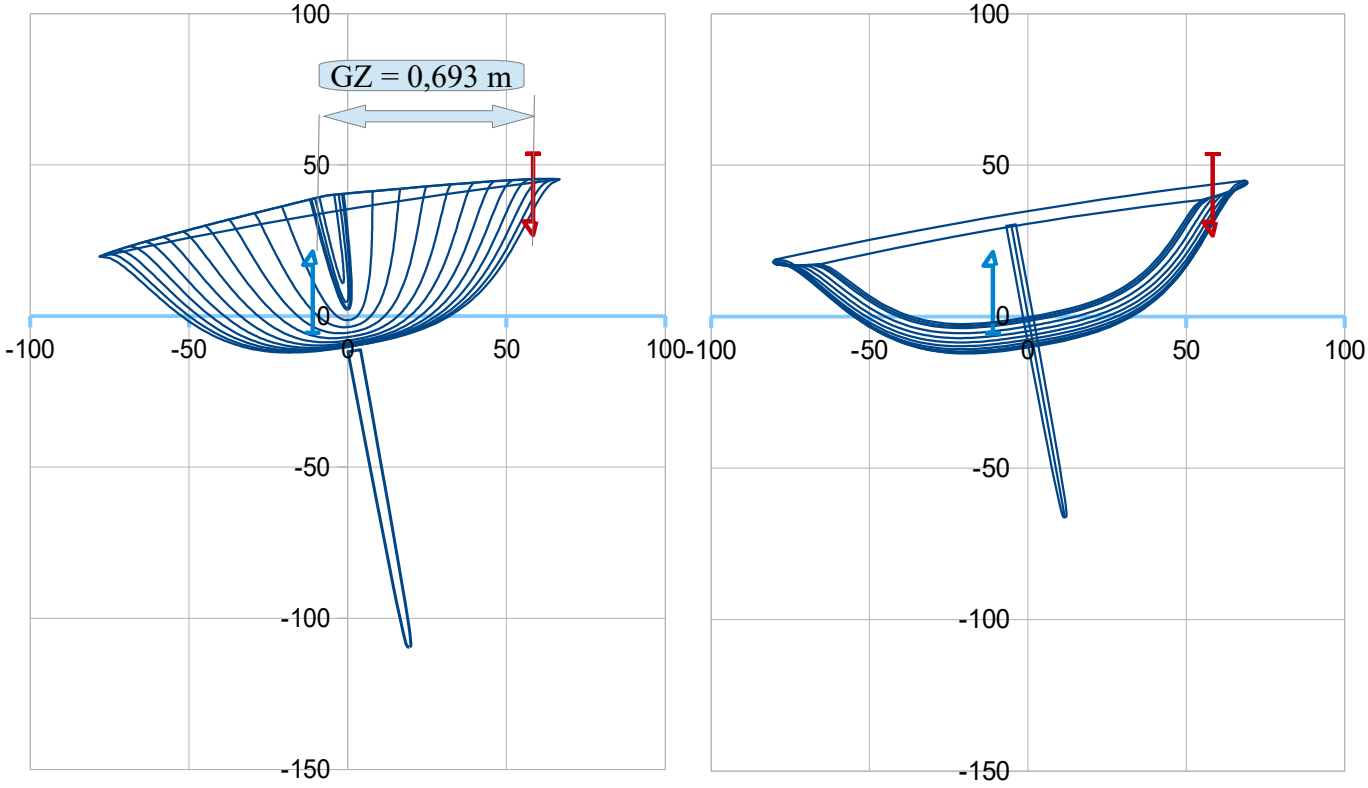
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17540**	**/ Disp. (m3)**	**0,17540**	**Relevant only when heel = 0°**		DLR	75
Height (cm)	**-0,5267**	**Xc heel (m)**	**1,669**	**/ Xg (m)**	**1,669**	Lwl (m)	4,06	Z fore (cm)	2,2
Trim (°)	**0,720**	Yc heel (m)	-0,011	Yg heel (m)	0,660	Bwl (m)	0,89	Z aft (cm)	-2,9
		Zc heel (m)	-0,054	**> GZ (m)**	**0,671**	Tc (m)	0,11	Trim (°)	0,72
		Sw heel(m2)	**3,45**	**RM (kN.m)**	**1,184**	Cp Hull	0,582	LCB Hull (%)	45,34
		Bwl heel (m)	**0,89**	**FB mini (cm)**	**26,0**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**1,73**	**Obliquity (°)**	**0,2**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,001		
						> GM1° (m)	**0,06**		

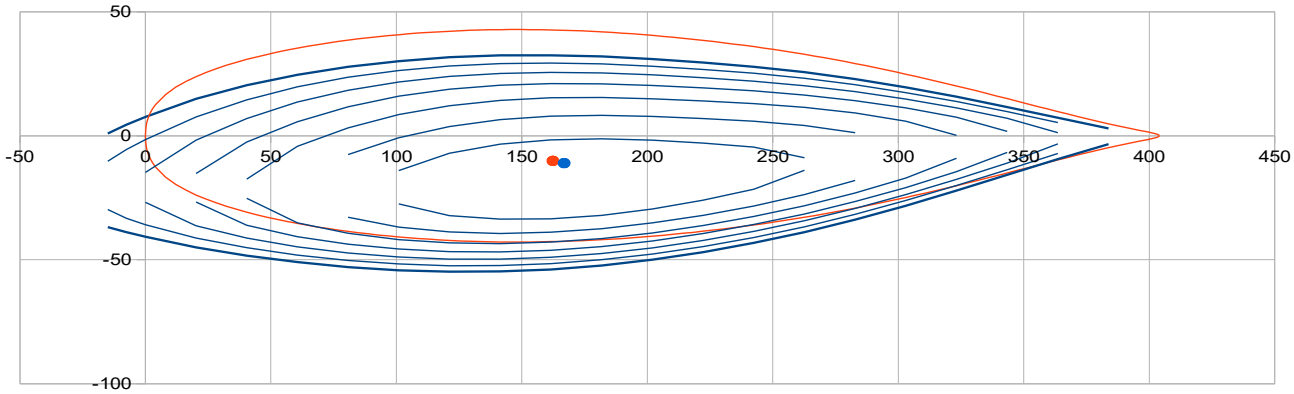
>>> GM1°/ X40% Z65 = 0,06 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		Results			
Heel (°)	10	Disp. (m3)	0,17540	/ Disp. (m3)	0,17540
Height (cm)	0,2655	Xc heel (m)	1,669	/ Xg (m)	1,669
Trim (°)	0,537	Yc heel (m)	-0,110	Yg heel (m)	0,583
		Zc heel (m)	-0,055	> GZ (m)	0,693
		Sw heel(m2)	3,39	RM (kN.m)	1,223
		Bwl heel (m)	0,87	FB mini (cm)	16,9
		LCB – LCF (%Lwl)	1,11	Obliquity (°)	2,3

>>> Trim 0,54° ; GZ 0,693 m ; RM 1,223 KN.m ; Sw 3,39 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D1,6 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,1045	0,34
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,3	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0142	0,05
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	2,59
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,57
Type	0	Bratio aft	0,73
Zhc fore (m)	0,25	Pch1 Fore	1,00
Zhc mid (m)	0,20	Pch2 Fore	0,88
Zhc aft (m)	0,20	Pch1 Aft	0,70
Po hc z	3	Pch2 Aft	0,88

Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05

Sections :			
	PE1	C PE1	PE2
Fore	1,000	1,000	2,000
Mid	0,500	1,000	4,170
Aft	0,600	1,000	4,150

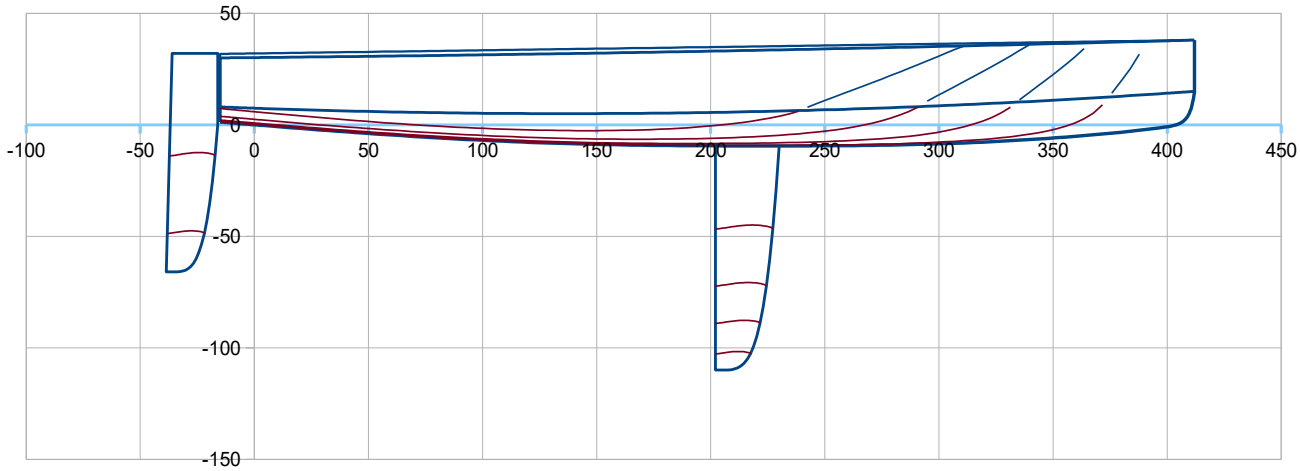
A2 – Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

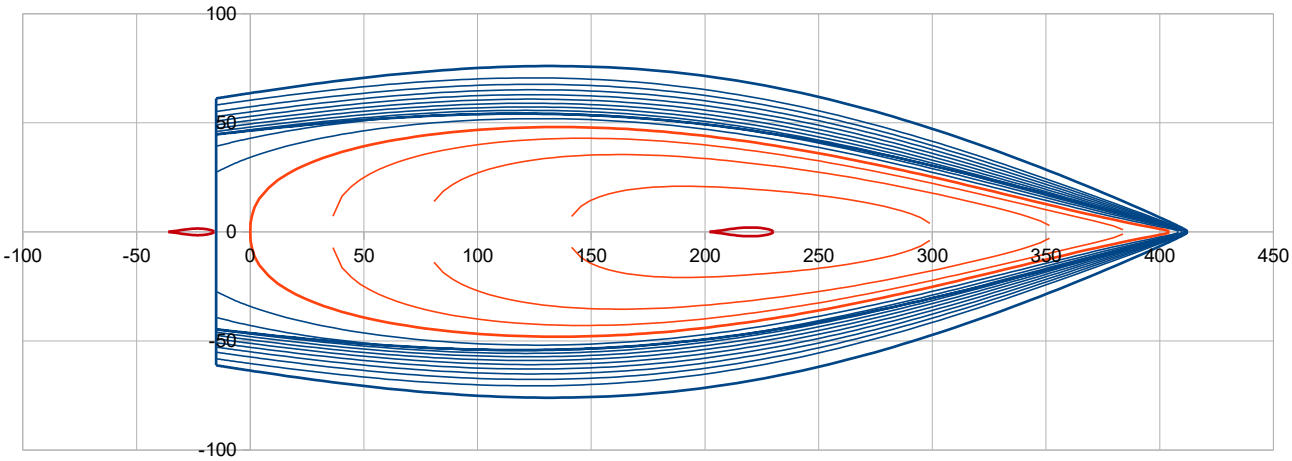
A3 – Rudder		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

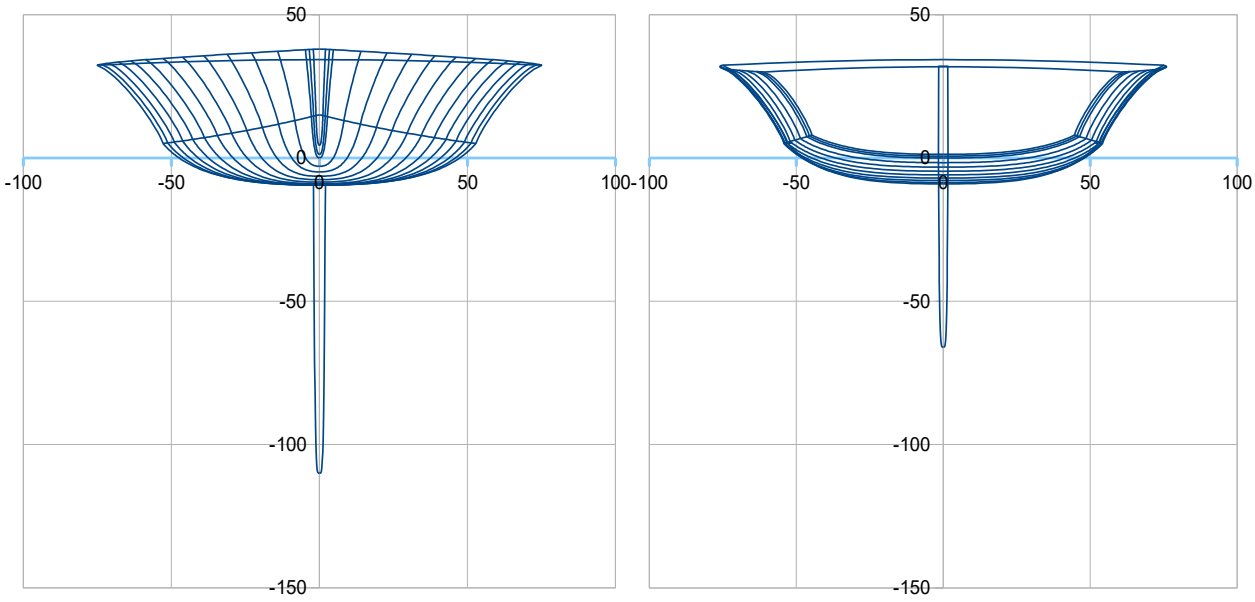
Serie D2 with a hard chine line

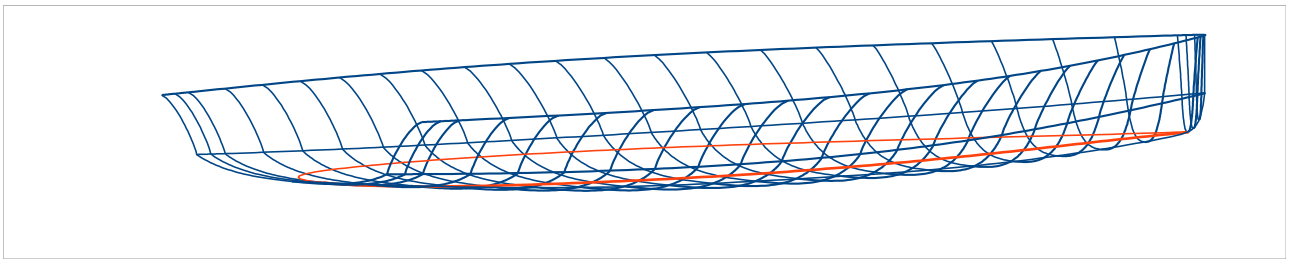
Dinghy D2,1

Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 0,96 m** ; Draft 1,10 m ; Displacement of design : 160 kg (Dinghy 60 kg + average load 100 kg) ; LCB hull 46,04 %Lwl ; Cp hull : 0,559 ; Sw : 3,44 m2









B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4			
>> ft	*14,01*		*13,25*						
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0		
>> ft	*4,99*								
Bwl (m)	**0,96**	**at X (% Lwl)**	**33,0**	> Bwl / Boa	0,632				
>> ft	*3,15*			**Freeboards (m) >**		**Aft**	**Midship**	**Fore**	
Tc (m)	**0,095**	**at X (%Lwl)**	**57**			**0,30**	**0,32**	**0,38**	
>> ft	*0,31*				*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14806**	**at LCB (m)**	**1,860**	**LCB (%Lwl)**	**46,04**	**ZCB (m)**	**-0,035**		
>> lbs	*335*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,12*		
Cp	**0,559**								
Sf (m2)	**2,64**	**at LCF (m)**	**1,681**	**LCF (%Lwl)**	**41,60**	>>> LCB – LCF (%Lwl)	4,44		
>> ft2	*28,37*	*>> ft*	*5,51*						
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)							
Sw (m2)	**2,72**	>Sw/D^(2/3)	9,72						
>> ft2	*29,28*								
Shull (m2)	**6,41**	**at X (m)**	**1,818**	**Z (m)**	**0,070**				
>> ft2	*69,03*	*>> ft*	*5,97*	*>> ft*	*0,23*				
Sdeck (m2)	**4,88**	**at X (m)**	**1,617**	**Z (m)**	**0,34**				
>> ft2	*52,49*	*>> ft*	*5,30*	*>> ft*	*1,11*				

B1.2 Daggerboard

Vol. keel(m3)	**0,00498**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,490**	
		>> ft	*7,09*			*>> ft*	*-1,61*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,13*		*>> ft2*	*2,47*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,35**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15634**	**at LCB (m)**	**1,825**	**LCB (%Lwl)**	**45,17**	**at ZCB (m)**	**-0,051**	
(kg)	**160**	*>> ft*	*5,99*			*>> ft*	*-0,17*	
>> lbs	*353*							
Sw (m2)	**3,44**	>Sw/D^(2/3)	11,84	Lwl/D^(1/3)	7,50			
>> ft2	*37,00*			***DLR***	***68***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**160**	**at Xg (m)**	**1,634**	**Xg (%Lwl)**	**40,46**	**at Zg (m)**	**0,585**
Light boat	60,1		1,758				0,476

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,41		**4,00**	25,65	1,818	46,646	0,070	1,788
Transom assuming at unit mass kg/m2		0,27		**4,00**	1,08	-0,150	-0,161	0,171	0,184
Deck - benches									
assuming at average unit mass kg/m2		4,88		**3,00**	14,63	1,617	23,651	0,338	4,937
Daggerboard :									
Daggerboard, assuming at kg/m3		0,004981		**500,00**	2,49	2,161	5,381	-0,490	-1,221
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,147	0,368
Rudder :									
Rudder, assuming kg/m3		0,003298		**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					60,1	1,76	105,723	0,48	28,644

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*60,12*	*1,758*	*0,476*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**180,12**	**1,666**	**0,592**	**0,000**	**Crew at center**
Disp. (m3)	**0,17573**		**0,426**	**0,666**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

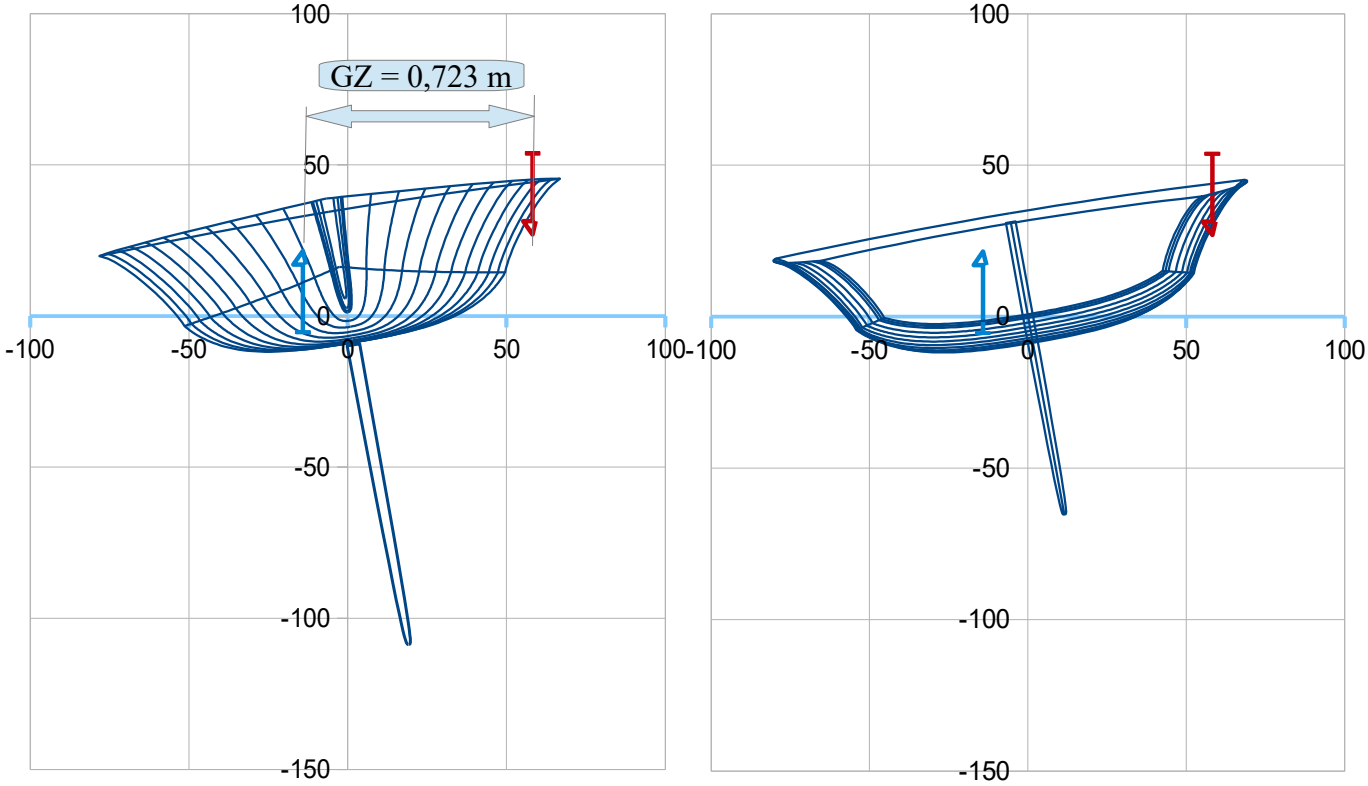
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17573**	**/ Disp. (m3)**	**0,17573**	**Relevant only when heel = 0°**		DLR	74
Height (cm)	**-0,4895**	**Xc heel (m)**	**1,666**	**/ Xg (m)**	**1,666**	Lwl (m)	4,08	Z fore (cm)	1,6
Trim (°)	**0,545**	Yc heel (m)	-0,016	Yg heel (m)	0,659	Bwl (m)	0,99	Z aft (cm)	-2,2
		Zc heel (m)	-0,051	**> GZ (m)**	**0,674**	Tc (m)	0,10	Trim (°)	0,55
		Sw heel(m2)	**3,68**	**RM (kN.m)**	**1,192**	Cp Hull	0,568	LCB Hull (%)	45,11
		Bwl heel (m)	**0,99**	**FB mini (cm)**	**26,7**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**2,77**	**Obliquity (°)**	**0,3**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,005		
						> GM1° (m)	**0,31**		

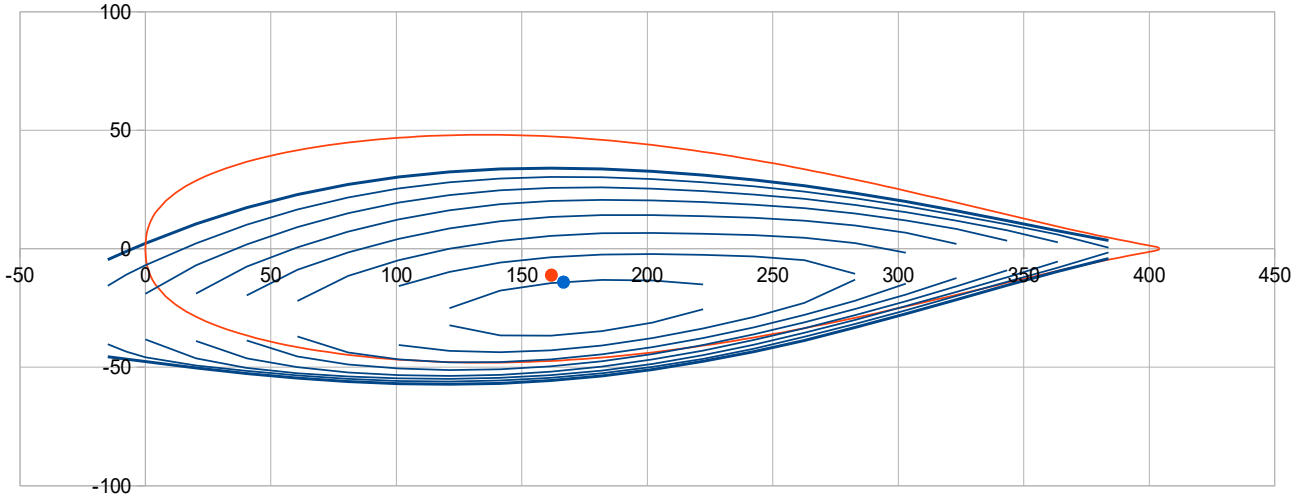
>>> GM1°/ X40% Z65 = 0,31 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		**Results**			
Heel (°)	**10**	**Disp. (m3)**	**0,17573**	**/ Disp. (m3)**	**0,17573**
Height (cm)	**0,4010**	**Xc heel (m)**	**1,666**	**/ Xg (m)**	**1,666**
Trim (°)	**0,253**	Yc heel (m)	-0,141	Yg heel (m)	0,582
		Zc heel (m)	-0,054	**> GZ (m)**	**0,723**
		Sw heel(m2)	**3,47**	**RM (kN.m)**	**1,278**
		Bwl heel (m)	**0,90**	**FB mini (cm)**	**17,8**
		LCB – LCF (%Lwl)	**1,20**	**Obliquity (°)**	**2,9**

>>> Trim 0,25° ; GZ 0,723 m ; RM 1,278 KN.m ; Sw 3,47 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D2,1 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,0945	0,31
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0125	0,04
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,57
Type	2	Bratio aft	0,73
Zhc fore (m)	0,15	Pch1 Fore	1,00
Zhc mid (m)	0,05	Pch2 Fore	0,88
Zhc aft (m)	0,08	Pch1 Aft	0,70
Po hc z	3	Pch2 Aft	0,88

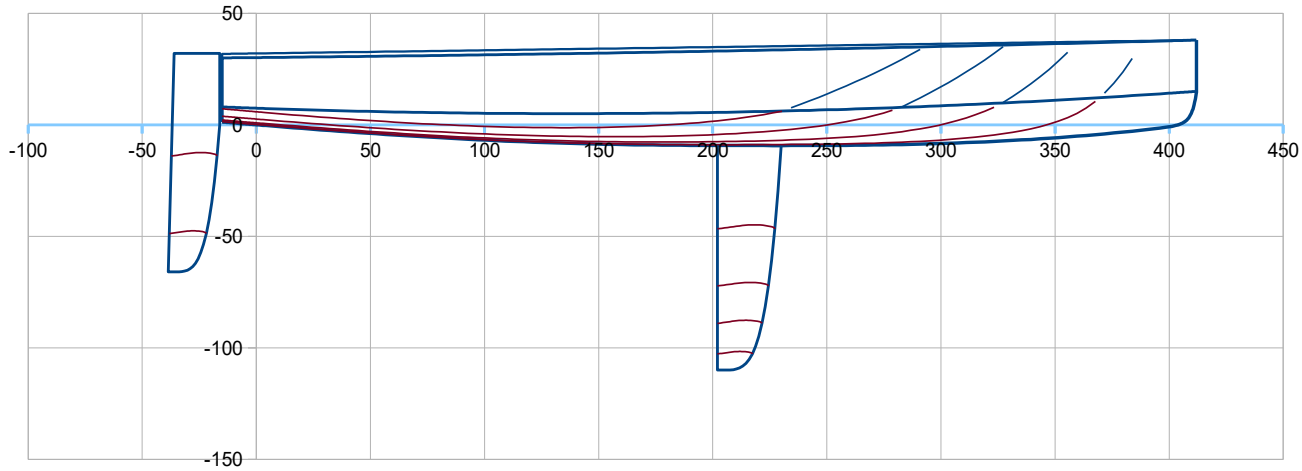
Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

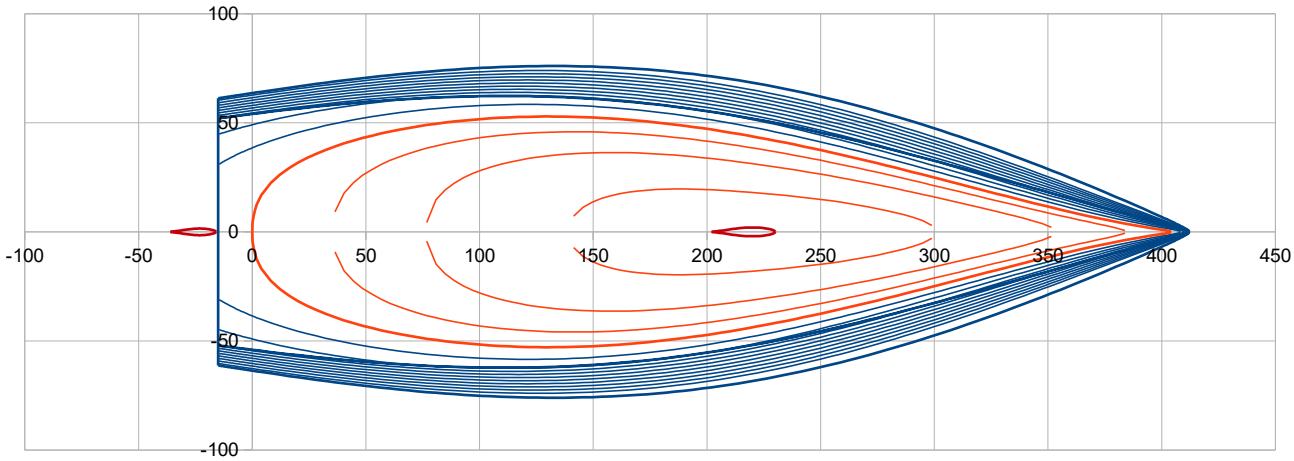
	PE1	C PE1	PE2
Fore	1,000	1,000	3,000
Mid	1,070	1,000	3,900
Aft	1,070	1,000	3,000

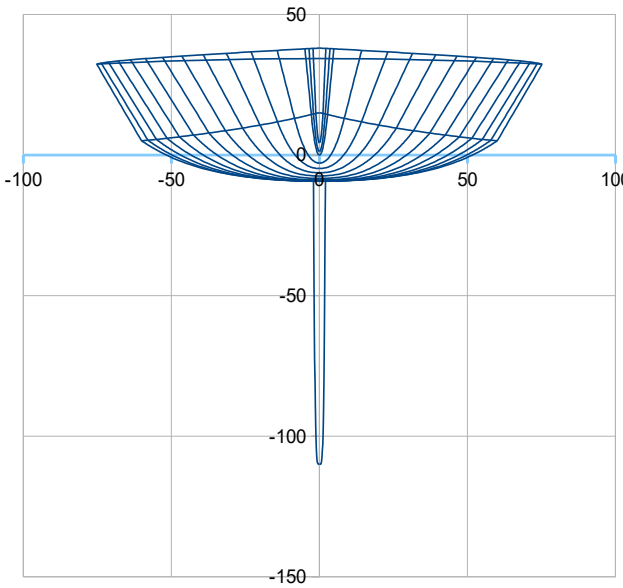
A2 – Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	
A3 – Rudder		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

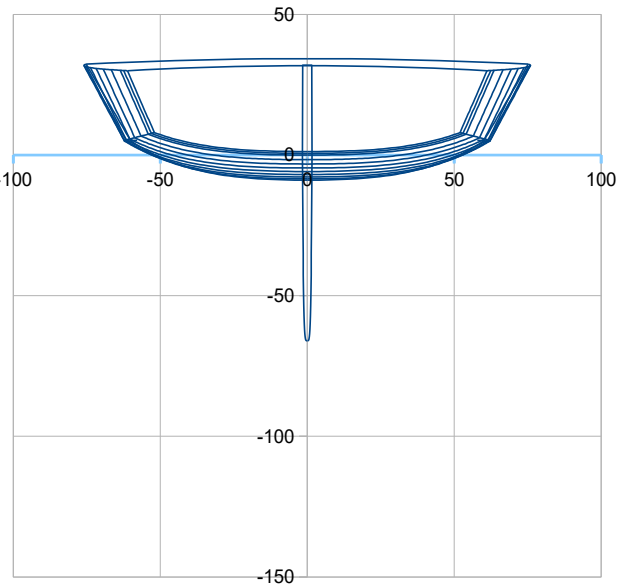
Dinghy D2,2

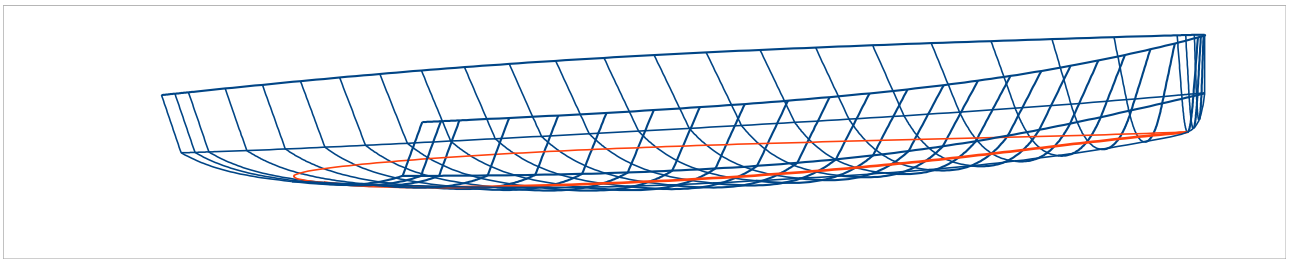
Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 1,06 m** ; Draft 1,10 m ; Displacement of design : 161 kg (Dinghy 61 kg + average load 100 kg) ; LCB hull 44,96 %Lwl ; Cp hull : 0,545 ; Sw : 3,59 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4		
>> ft	*14,01*		*13,25*					
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0	
>> ft	*4,99*							
Bwl (m)	**1,06**	**at X (% Lwl)**	**32,0**	> Bwl / Boa	0,696			
>> ft	*3,47*			**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,093**	**at X (%Lwl)**	**57**		**0,30**	**0,32**	**0,38**	
>> ft	*0,31*			*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14857**	**at LCB (m)**	**1,817**	**LCB (%Lwl)**	**44,96**	**ZCB (m)**	**-0,034**	
>> lbs	*336*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,11*	
Cp	**0,545**							
Sf (m2)	**2,81**	**at LCF (m)**	**1,638**	**LCF (%Lwl)**	**40,55**	>>> LCB – LCF (%Lwl)	4,41	
>> ft2	*30,27*	*>> ft*	*5,37*					
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)						
Sw (m2)	**2,88**	>Sw/D^(2/3)	10,25					
>> ft2	*30,96*							
Shull (m2)	**6,50**	**at X (m)**	**1,801**	**Z (m)**	**0,058**			
>> ft2	*70,01*	*>> ft*	*5,91*	*>> ft*	*0,19*			
Sdeck (m2)	**4,88**	**at X (m)**	**1,619**	**Z (m)**	**0,34**			
>> ft2	*52,58*	*>> ft*	*5,31*	*>> ft*	*1,11*			

B1.2 Daggerboard

Vol. keel(m3)	**0,00499**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,489**	
		>> ft	*7,09*			*>> ft*	*-1,61*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,14*		*>> ft2*	*2,47*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,35**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15685**	**at LCB (m)**	**1,784**	**LCB (%Lwl)**	**44,15**	**at ZCB (m)**	**-0,050**	
(kg)	**161**	*>> ft*	*5,85*			*>> ft*	*-0,16*	
>> lbs	*354*							
Sw (m2)	**3,59**	>Sw/D^(2/3)	12,36	Lwl/D^(1/3)	7,49			
>> ft2	*38,68*			***DLR***	***68***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**161**	**at Xg (m)**	**1,631**	**Xg (%Lwl)**	**40,37**	**at Zg (m)**	**0,426**
Light boat	60,6		1,748				0,468

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,50		**4,00**	26,02	1,801	46,851	0,058	1,521
Transom assuming at unit mass kg/m2		0,30		**4,00**	1,20	-0,150	-0,181	0,169	0,203
Deck - benches									
assuming at average unit mass kg/m2		4,88		**3,00**	14,65	1,619	23,729	0,338	4,946
Daggerboard :									
Daggerboard, assuming at kg/m3		0,004988		**500,00**	2,49	2,161	5,389	-0,489	-1,220
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,147	0,366
Rudder :									
Rudder, assuming kg/m3		0,003298		**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**60,6**	**1,75**	105,994	**0,47**	28,403

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*60,64*	*1,748*	*0,468*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**180,64**	**1,663**	**0,589**	**0,000**	**Crew at center**
Disp. (m3)	**0,17624**		**0,423**	**0,664**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17624**	**/ Disp. (m3)**	**0,17624**	**Relevant only when heel = 0°**		DLR	72
Height (cm)	**-0,5067**	**Xc heel (m)**	**1,663**	**/ Xg (m)**	**1,663**	Lwl (m)	4,12	Z fore (cm)	1,0
Trim (°)	**0,390**	Yc heel (m)	-0,020	Yg heel (m)	0,657	Bwl (m)	1,09	Z aft (cm)	-1,7
		Zc heel (m)	-0,049	**> GZ (m)**	**0,677**	Tc (m)	0,10	Trim (°)	0,39
		Sw heel(m2)	**3,86**	**RM (kN.m)**	**1,200**	Cp Hull	0,551	LCB Hull (%)	44,59
		Bwl heel (m)	**1,09**	**FB mini (cm)**	**27,2**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**3,32**	**Obliquity (°)**	**0,5**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,010		
						> GM1° (m)	**0,57**		

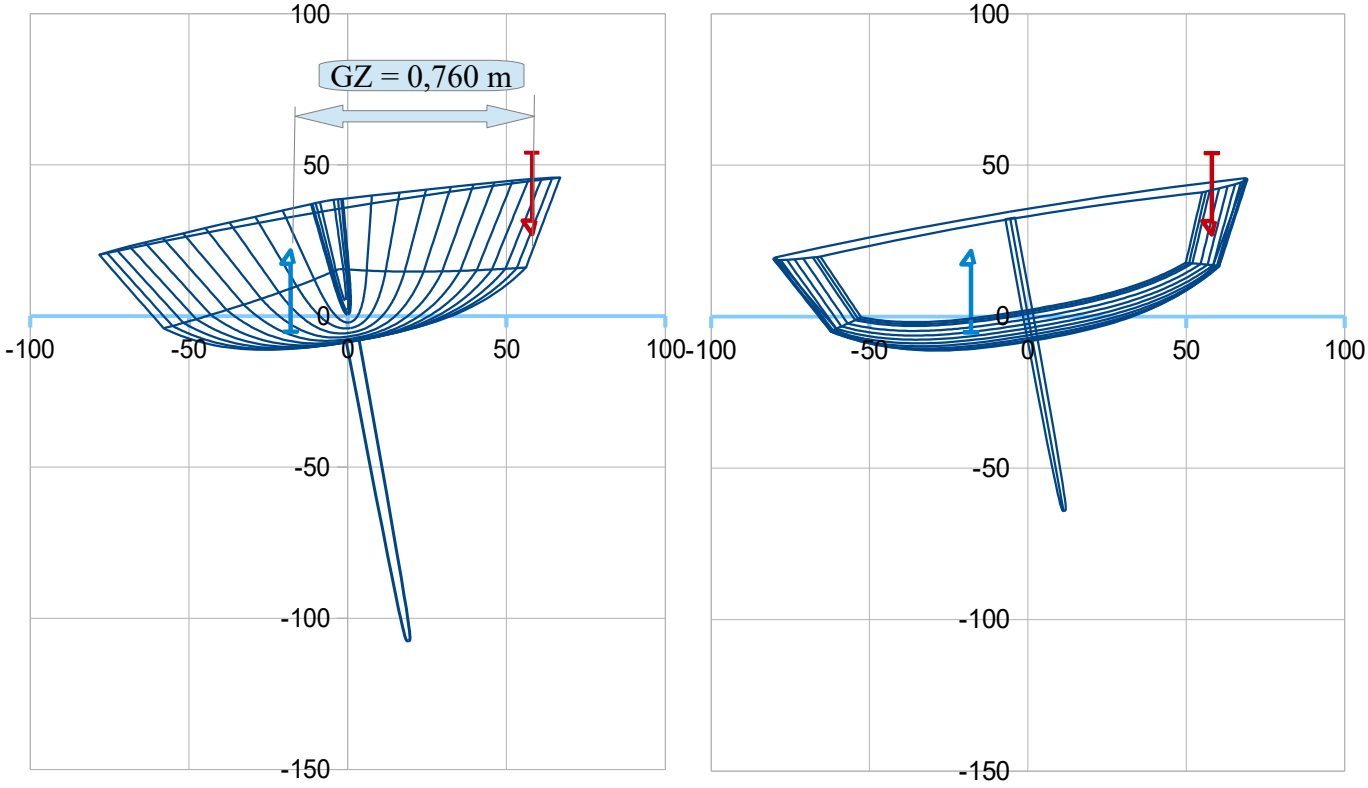
>>> GM1°/ X40% Z65 = 0,57 m

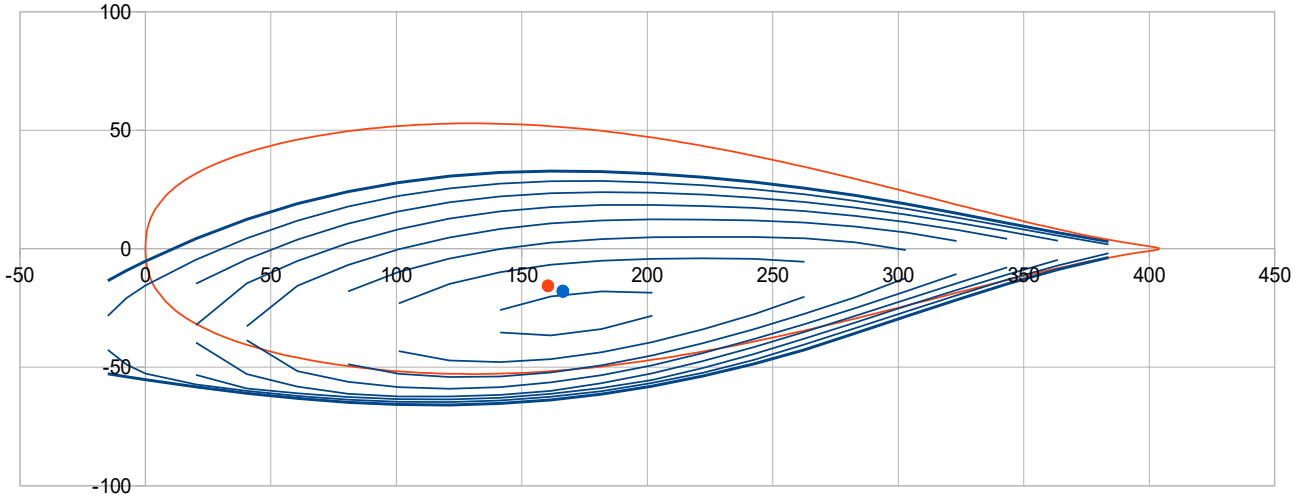
At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei

Data to enter : yellow cells		Results			
Heel (°)	10	Disp. (m3)	0,17624	/ Disp. (m3)	0,17624
Height (cm)	0,8117	Xc heel (m)	1,663	/ Xg (m)	1,663
Trim (°)	-0,030	Yc heel (m)	-0,180	Yg heel (m)	0,581
		Zc heel (m)	-0,052	> GZ (m)	0,760
		Sw heel(m2)	3,58	RM (kN.m)	1,347
		Bwl heel (m)	0,97	FB mini (cm)	18,7
		LCB – LCF (%Lwl)	1,44	Obliquity (°)	4,1

>>> Trim - 0,03° ; GZ 0,760 m ; RM 1,347 KN.m ; Sw 3,58 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D2,2 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	*13,25*
Maximum draft of the hull body :		
Tc (m)	0,0930	*0,31*
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	*13,52*
Zbow (m)	0,38	*1,25*
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	*-0,49*
Ztr aft (m)	0,0125	*0,04*
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,550
Type	2	Bratio aft	0,850
Zhc fore (m)	0,15	Pch1 Fore	1,00
Zhc mid (m)	0,05	Pch2 Fore	1,00
Zhc aft (m)	0,08	Pch1 Aft	1,00
Po hc z	3	Pch2 Aft	1,00

Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	*1,05*
Zsh aft (m)	0,30	*0,98*
Deck / central line rear end		
Zd mid (m)	0,34	*1,12*
Zd aft (m)	0,32	*1,05*

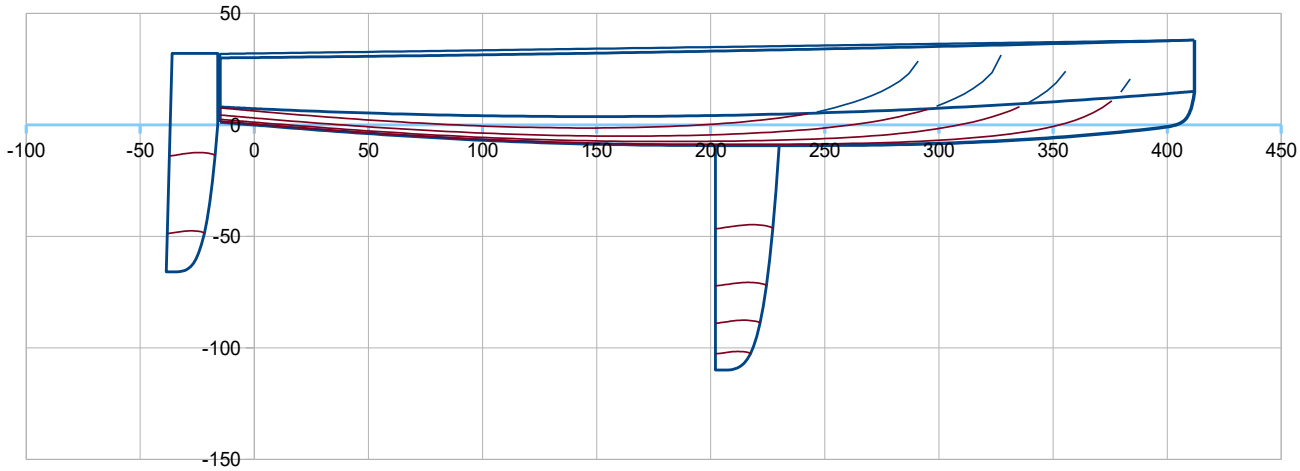
Sections :			
	PE1	C PE1	PE2
Fore	1,000	1,000	2,000
Mid	1,000	1,000	3,000
Aft	1,000	1,000	3,000

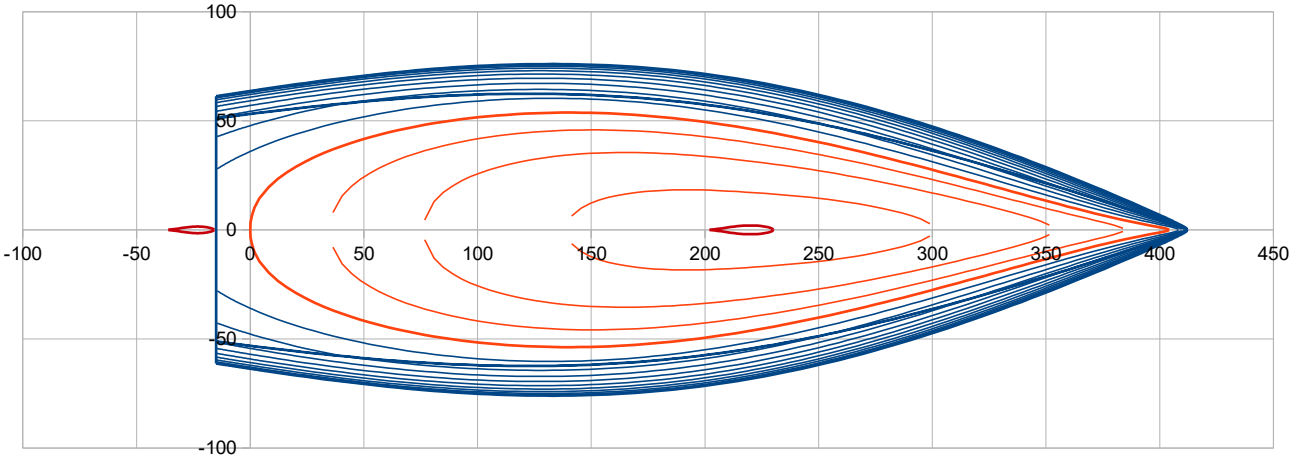
A2 – Daggerboard		
Xq aft (m)	2,02	*6,63*
C root (m)	0,28	*0,92*
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	*3,61*
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

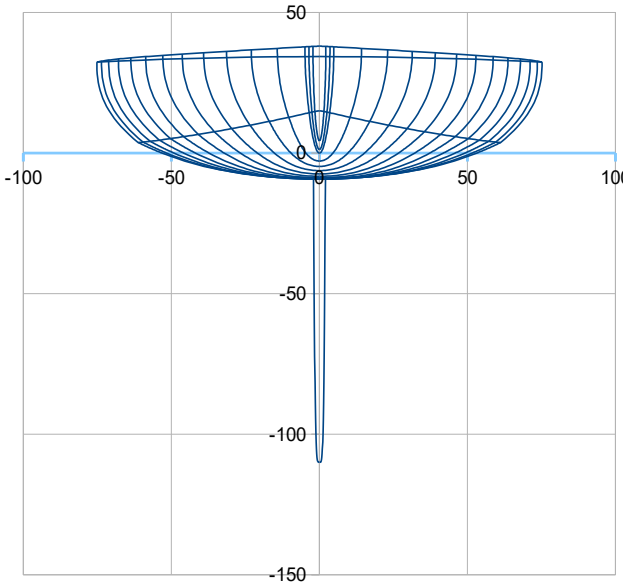
A3 – Rudder		
C root (m)	0,20	*0,66*
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	*2,17*
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

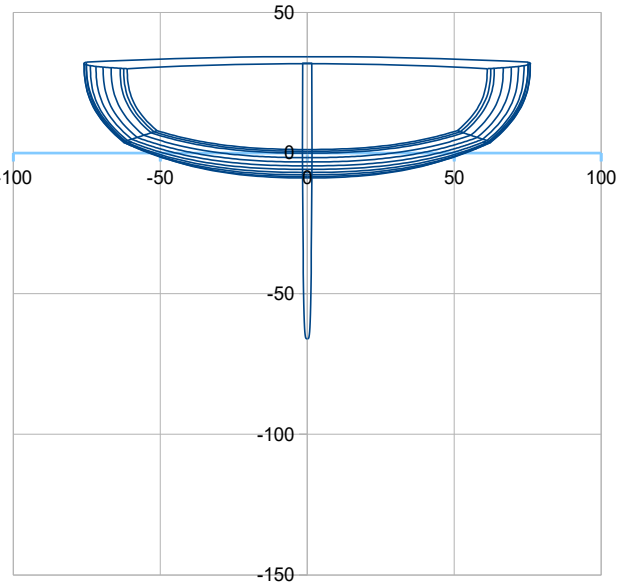
Dinghy D2,3

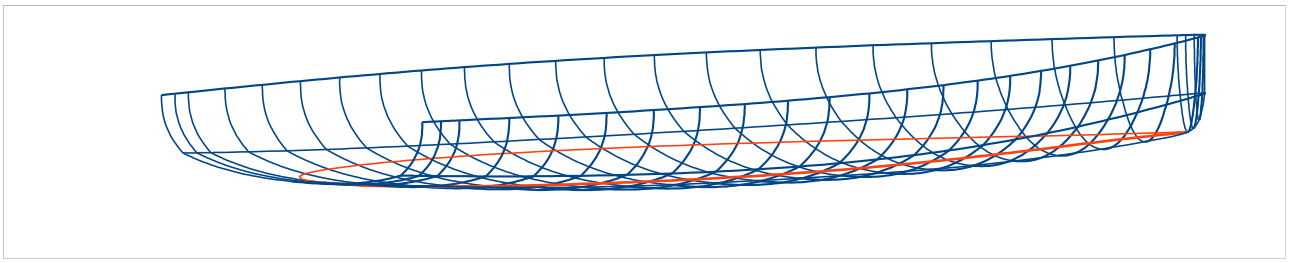
Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 1,08 m** ; Draft 1,10 m ; Displacement of design : 161 kg (Dinghy 61 kg + average load 100 kg) ; LCB hull 45,86 %Lwl ; Cp hull : 0,553 ; Sw : 3,66 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4		
>> ft	*14,01*		*13,25*					
Boa (m)	**1,52**	**at X (% Lwl)**	**33,0**	Bsheer (m)	1,52	at X (% Lwl)	33,0	
>> ft	*4,99*							
Bwl (m)	**1,08**	**at X (% Lwl)**	**35,0**	> Bwl / Boa	0,707			
>> ft	*3,53*			**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,093**	**at X (%Lwl)**	**57**		**0,30**	**0,32**	**0,38**	
>> ft	*0,30*			*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14844**	**at LCB (m)**	**1,853**	**LCB (%Lwl)**	**45,86**	**ZCB (m)**	**-0,033**	
>> lbs	*335*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,11*	
Cp	**0,553**							
Sf (m2)	**2,89**	**at LCF (m)**	**1,689**	**LCF (%Lwl)**	**41,81**	>>> LCB – LCF (%Lwl)	4,04	
>> ft2	*31,09*	*>> ft*	*5,54*					
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)						
Sw (m2)	**2,94**	>Sw/D^(2/3)	10,50					
>> ft2	*31,69*							
Shull (m2)	**6,65**	**at X (m)**	**1,808**	**Z (m)**	**0,054**			
>> ft2	*71,60*	*>> ft*	*5,93*	*>> ft*	*0,18*			
Sdeck (m2)	**4,88**	**at X (m)**	**1,618**	**Z (m)**	**0,34**			
>> ft2	*52,54*	*>> ft*	*5,31*	*>> ft*	*1,11*			

B1.2 Daggerboard

Vol. keel(m3)	**0,00499**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,489**	
		>> ft	*7,09*			*>> ft*	*-1,60*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,14*		*>> ft2*	*2,47*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,35**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15673**	**at LCB (m)**	**1,818**	**LCB (%Lwl)**	**45,00**	**at ZCB (m)**	**-0,049**	
(kg)	**161**	*>> ft*	*5,96*			*>> ft*	*-0,16*	
>> lbs	*354*							
Sw (m2)	**3,66**	>Sw/D^(2/3)	12,60	Lwl/D^(1/3)	7,49			
>> ft2	*39,41*			***DLR***	***68***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**161**	**at Xg (m)**	**1,632**	**Xg (%Lwl)**	**40,41**	**at Zg (m)**	**0,579**
Light boat	61,2		1,751				0,463

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,65		**4,00**	26,61	1,808	48,114	0,054	1,445
Transom assuming at unit mass kg/m2		0,31		**4,00**	1,22	-0,150	-0,183	0,170	0,208
Deck - benches									
assuming at average unit mass kg/m2		4,88		**3,00**	14,64	1,618	23,694	0,338	4,942
Daggerboard :									
Daggerboard, assuming at kg/m3			0,004990	**500,00**	2,50	2,161	5,392	-0,489	-1,220
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,146	0,366
Rudder :									
Rudder, assuming kg/m3			0,003298	**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**61,2**	**1,75**	107,222	**0,46**	28,328

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*61,24*	*1,751*	*0,463*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**181,24**	**1,664**	**0,587**	**0,000**	**Crew at center**
Disp. (m3)	**0,17682**		**0,421**	**0,662**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

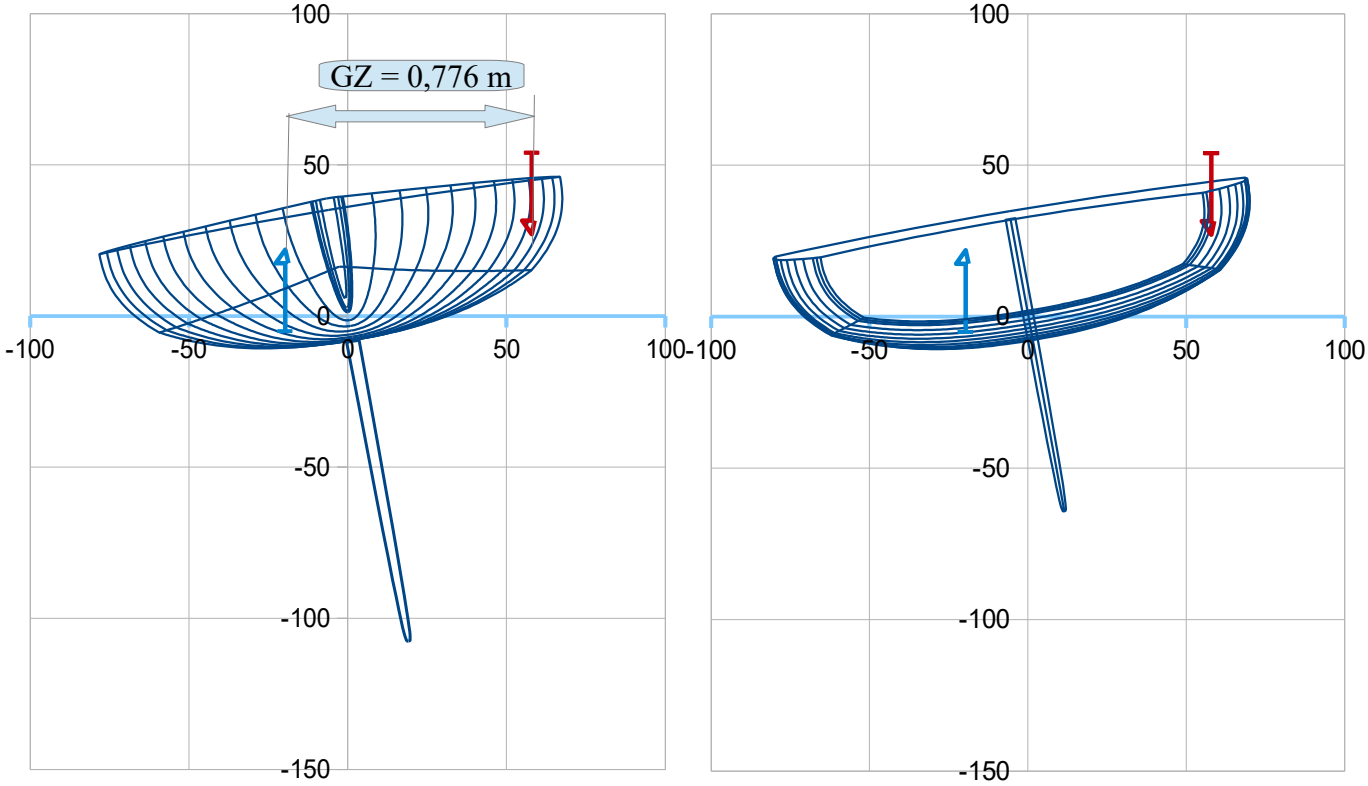
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17682**	**/ Disp. (m3)**	**0,17682**	**Relevant only when heel = 0°**		DLR	74
Height (cm)	**-0,4717**	**Xc heel (m)**	**1,664**	**/ Xg (m)**	**1,664**	Lwl (m)	4,09	Z fore (cm)	1,5
Trim (°)	**0,500**	Yc heel (m)	-0,022	Yg heel (m)	0,655	Bwl (m)	1,12	Z aft (cm)	-2,1
		Zc heel (m)	-0,048	**> GZ (m)**	**0,677**	Tc (m)	0,10	Trim (°)	0,50
		Sw heel(m2)	**3,94**	**RM (kN.m)**	**1,203**	Cp Hull	0,560	LCB Hull (%)	44,96
		Bwl heel (m)	**1,12**	**FB mini (cm)**	**26,9**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**2,62**	**Obliquity (°)**	**0,5**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,012		
						> GM1° (m)	**0,67**		

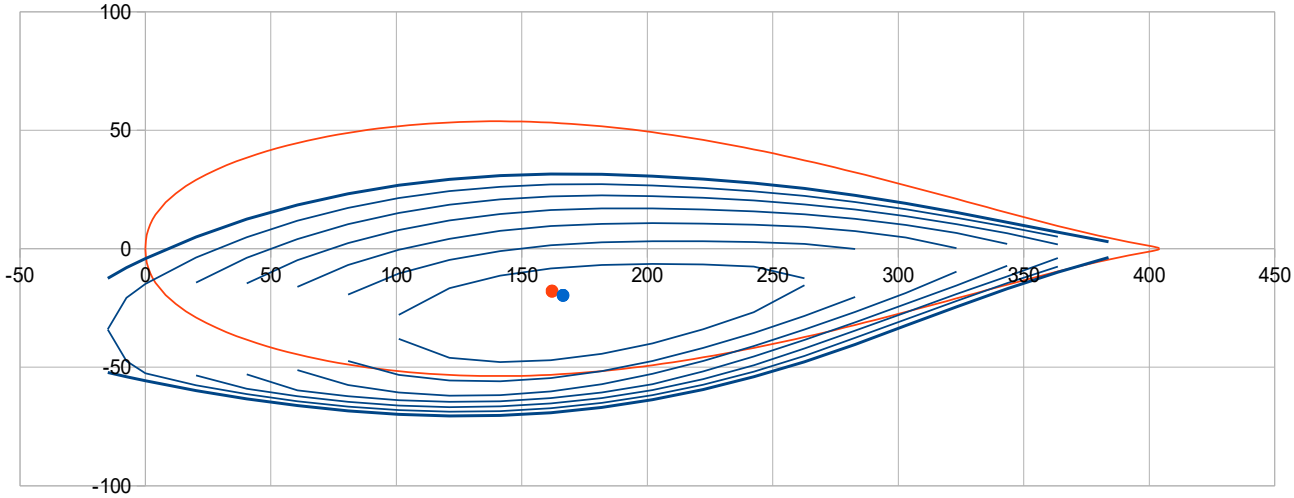
>>> GM1°/ X40% Z65 = 0,67 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		Results			
Heel (°)	10	Disp. (m3)	0,17682	/ Disp. (m3)	0,17682
Height (cm)	1,0445	Xc heel (m)	1,664	/ Xg (m)	1,664
Trim (°)	0,107	Yc heel (m)	-0,197	Yg heel (m)	0,579
		Zc heel (m)	-0,050	> GZ (m)	0,776
		Sw heel(m2)	3,68	RM (kN.m)	1,379
		Bwl heel (m)	1,01	FB mini (cm)	18,7
		LCB – LCF (%Lwl)	1,09	Obliquity (°)	4,2

>>> Trim 0,1° ; GZ 0,776 m ; RM 1,379 KN.m ; Sw 3,68 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D2,3 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,0925	0,30
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0125	0,04
Sheer line, in horizontal projection xy :		
Bg (m)	0,79	
X Bg (% Lwl)	50,0	
Alfa (°)	8,50	
Po sh y	2,00	
Cor Po sh	0,040	
Po Cor Po	1,50	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,710
Type	2	Bratio aft	0,835
Zhc fore (m)	0,15	Pch1 Fore	2,00
Zhc mid (m)	0,037	Pch2 Fore	1,00
Zhc aft (m)	0,08	Pch1 Aft	2,50
Po hc z	3	Pch2 Aft	1,00

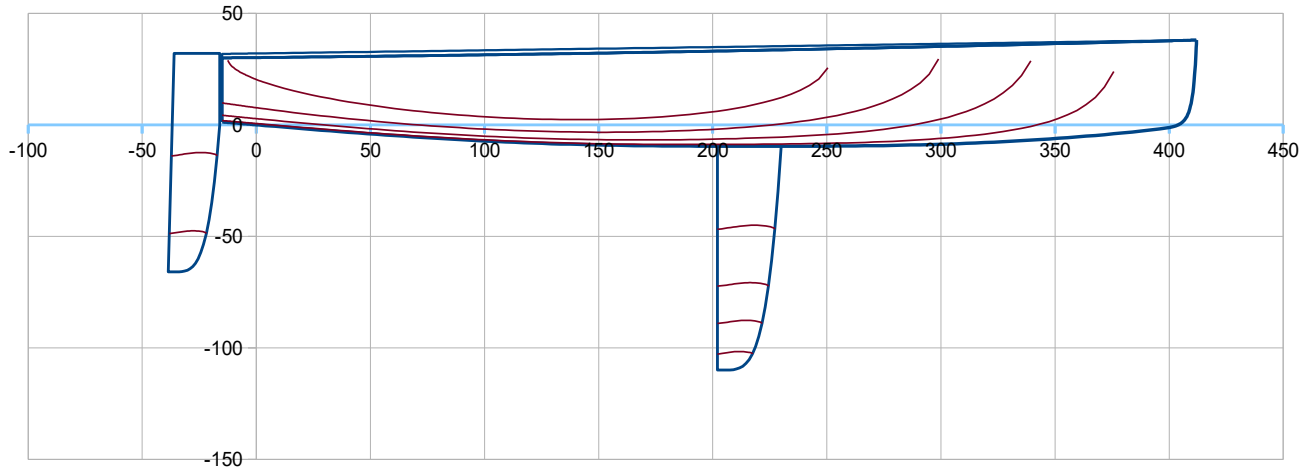
Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

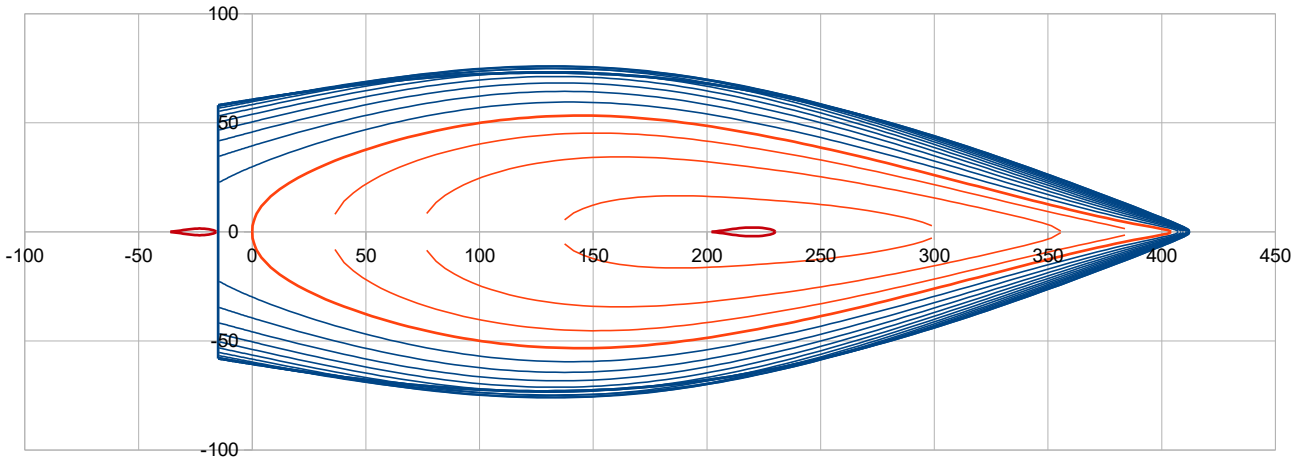
	PE1	C PE1	PE2
Fore	1,000	1,000	2,000
Mid	1,000	1,000	2,500
Aft	1,000	1,000	2,500

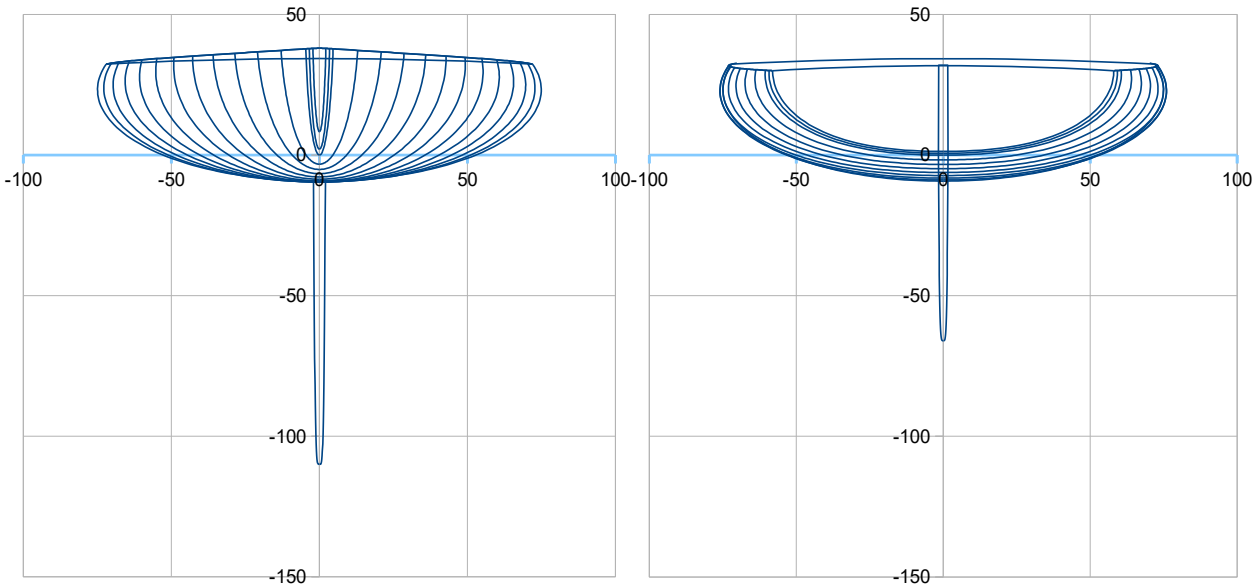
A2 – Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	
A3 – Rudder		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

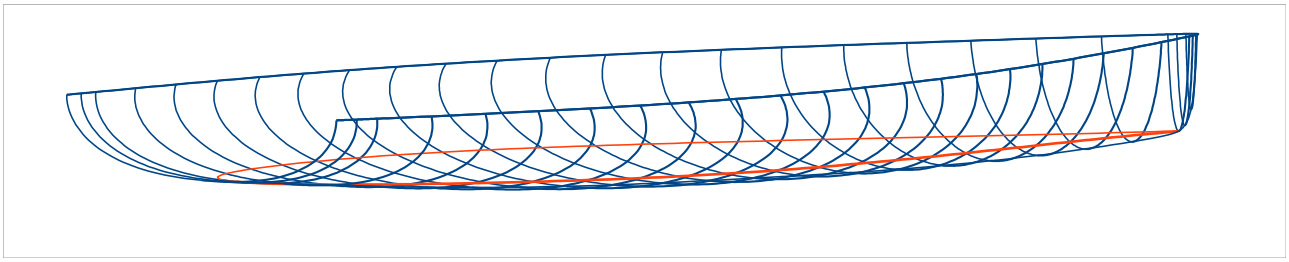
Dinghy D3

Loa 4,27 m (14') ; Lwl 4,04 m ; B 1,52 m ; **Bwl 1,07 m** ; Draft 1,10 m ; Displacement of design : 160 kg (Dinghy 60 kg + average load 100 kg) ; LCB hull 45,76 %Lwl ; Cp hull : 0,539 ; Sw : 3,55 m2









B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**4,04**	> Hull speed (Knots)	4,9	at Froude 0,4			
>> ft	*14,01*		*13,25*						
Boa (m)	**1,52**	**at X (% Lwl)**	**32,0**	Bsheer (m)	1,46	at X (% Lwl)	32,0		
>> ft	*4,99*								
Bwl (m)	**1,07**	**at X (% Lwl)**	**36,0**	> Bwl / Boa	0,702				
>> ft	*3,50*				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,096**	**at X (%Lwl)**	**57**			**0,30**	**0,32**	**0,38**	
>> ft	*0,31*				*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,14734**	**at LCB (m)**	**1,849**	**LCB (%Lwl)**	**45,76**	**ZCB (m)**	**-0,034**		
>> lbs	*333*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,11*		
Cp	**0,539**								
Sf (m2)	**2,77**	**at LCF (m)**	**1,703**	**LCF (%Lwl)**	**42,17**	>>> LCB – LCF (%Lwl)	3,60		
>> ft2	*29,78*	*>> ft*	*5,59*						
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)							
Sw (m2)	**2,83**	>Sw/D^(2/3)	10,16						
>> ft2	*30,51*								
Shull (m2)	**6,55**	**at X (m)**	**1,809**	**Z (m)**	**0,057**				
>> ft2	*70,53*	*>> ft*	*5,94*	*>> ft*	*0,19*				
Sdeck (m2)	**4,63**	**at X (m)**	**1,604**	**Z (m)**	**0,34**				
>> ft2	*49,83*	*>> ft*	*5,26*	*>> ft*	*1,11*				

B1.2 Daggerboard

Vol. keel(m3)	**0,00497**	**at X (m)**	**2,161**	**X (%Lwl)**	**53,49**	**Z (m)**	**-0,491**	
		>> ft	*7,09*			*>> ft*	*-1,61*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,12*		*>> ft2*	*2,46*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**54,35**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,46**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,15561**	**at LCB (m)**	**1,814**	**LCB (%Lwl)**	**44,90**	**at ZCB (m)**	**-0,050**	
(kg)	**160**	*>> ft*	*5,95*			*>> ft*	*-0,16*	
>> lbs	*352*							
Sw (m2)	**3,55**	>Sw/D^(2/3)	12,27	Lwl/D^(1/3)	7,51			
>> ft2	*38,22*			***DLR***	***67***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**160**	**at Xg (m)**	**1,633**	**Xg (%Lwl)**	**40,41**	**at Zg (m)**	**0,582**
Light boat	59,9		1,754				0,469

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,55		**4,00**	26,21	1,809	47,426	0,057	1,488
Transom assuming at unit mass kg/m2		0,27		**4,00**	1,08	-0,150	-0,162	0,175	0,190
Deck - benches									
assuming at average unit mass kg/m2		4,63		**3,00**	13,89	1,604	22,279	0,338	4,687
Daggerboard :									
Daggerboard, assuming at kg/m3		0,004973		**500,00**	2,49	2,161	5,373	-0,491	-1,221
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,148	0,370
Rudder :									
Rudder, assuming kg/m3		0,003298		**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	2,020	5,050	0,320	0,800
Light weight >>>					**59,9**	**1,75**	105,121	**0,47**	28,101

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,62 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*59,94*	*1,754*	*0,469*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,62**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**179,94**	**1,665**	**0,590**	**0,000**	**Crew at center**
Disp. (m3)	**0,17555**		**0,423**	**0,667**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

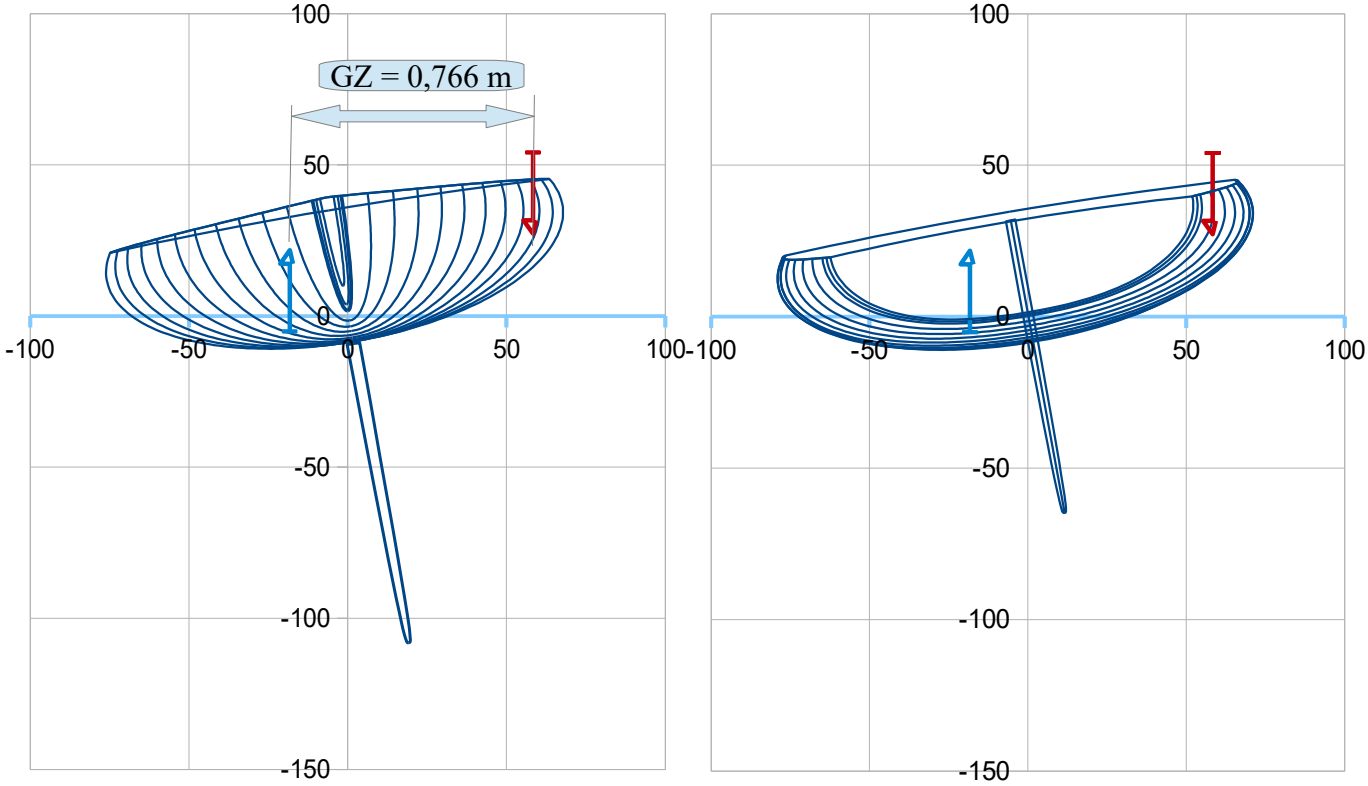
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17555**	**/ Disp. (m3)**	**0,17555**	**Relevant only when heel = 0°**		DLR	73
Height (cm)	**-0,5080**	**Xc heel (m)**	**1,664**	**/ Xg (m)**	**1,665**	Lwl (m)	4,09	Z fore (cm)	1,6
Trim (°)	**0,532**	Yc heel (m)	-0,020	Yg heel (m)	0,659	Bwl (m)	1,11	Z aft (cm)	-2,2
		Zc heel (m)	-0,050	**> GZ (m)**	**0,679**	Tc (m)	0,10	Trim (°)	0,53
		Sw heel(m2)	**3,80**	**RM (kN.m)**	**1,198**	Cp Hull	0,543	LCB Hull (%)	44,89
		Bwl heel (m)	**1,11**	**FB mini (cm)**	**26,8**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**2,06**	**Obliquity (°)**	**0,4**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,009		
						> GM1° (m)	**0,53**		

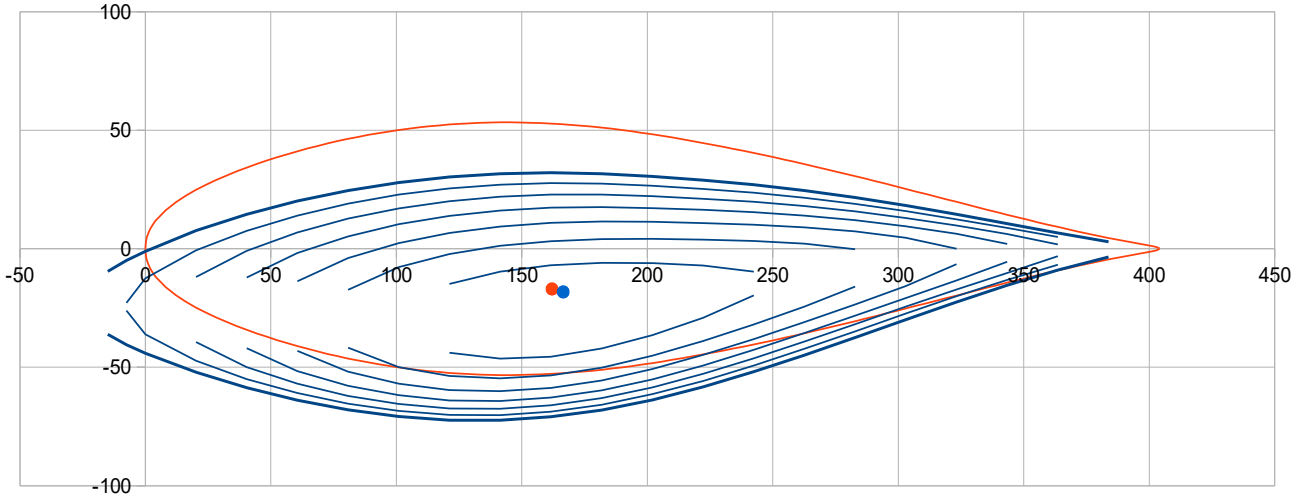
>>> GM1°/ X40% Z65 = 0,53 m

At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		**Results**			
Heel (°)	**10**	**Disp. (m3)**	**0,17555**	**/ Disp. (m3)**	**0,17555**
Height (cm)	**0,9000**	**Xc heel (m)**	**1,665**	**/ Xg (m)**	**1,665**
Trim (°)	**0,225**	Yc heel (m)	-0,182	Yg heel (m)	0,583
		Zc heel (m)	-0,051	**> GZ (m)**	**0,766**
		Sw heel(m2)	**3,62**	**RM (kN.m)**	**1,352**
		Bwl heel (m)	**1,04**	**FB mini (cm)**	**18,8**
		LCB – LCF (%Lwl)	**1,11**	**Obliquity (°)**	**3,7**

>>> Trim 0,23° ; GZ 0,766 m ; RM 1,352 KN.m ; Sw 3,62 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D3 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	4,04	13,25
Maximum draft of the hull body :		
Tc (m)	0,0960	0,31
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	13,52
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	60,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,3	
Rear end of the transom :		
Xtr aft (m)	-0,15	-0,49
Ztr aft (m)	0,0130	0,04
Sheer line, in horizontal projection xy :		
Bg (m)	0,878	
X Bg (% Lwl)	45,0	
Alfa (°)	6,47	
Po sh y	2,00	
Cor Po sh	0,050	
Po Cor Po	1,75	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,57
Type	0	Bratio aft	0,73
Zhc fore (m)	0,15	Pch1 Fore	1,00
Zhc mid (m)	0,09	Pch2 Fore	0,88
Zhc aft (m)	0,12	Pch1 Aft	0,70
Po hc z	3	Pch2 Aft	0,88

Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

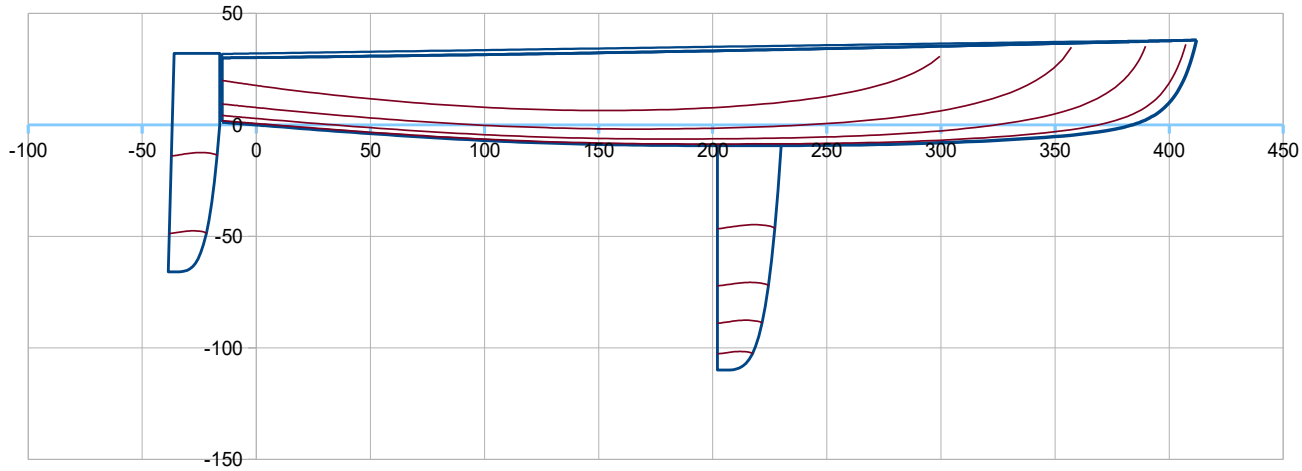
	PE1	C PE1	PE2
Fore	2,000	1,500	2,000
Mid	2,000	0,750	2,000
Aft	2,000	1,000	2,500

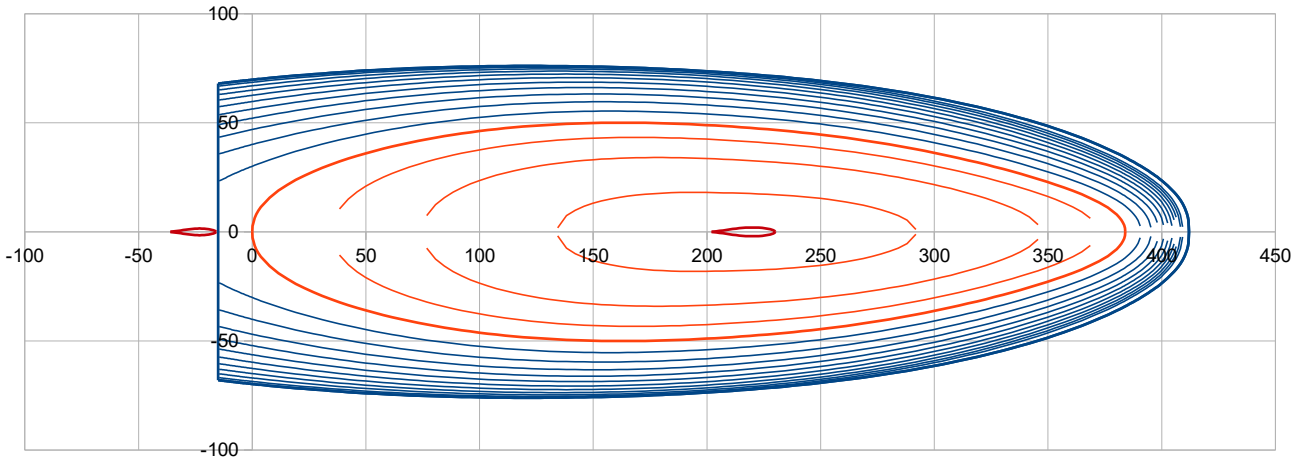
A2 – Daggerboard		
Xq aft (m)	2,02	6,63
C root (m)	0,28	0,92
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	3,61
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

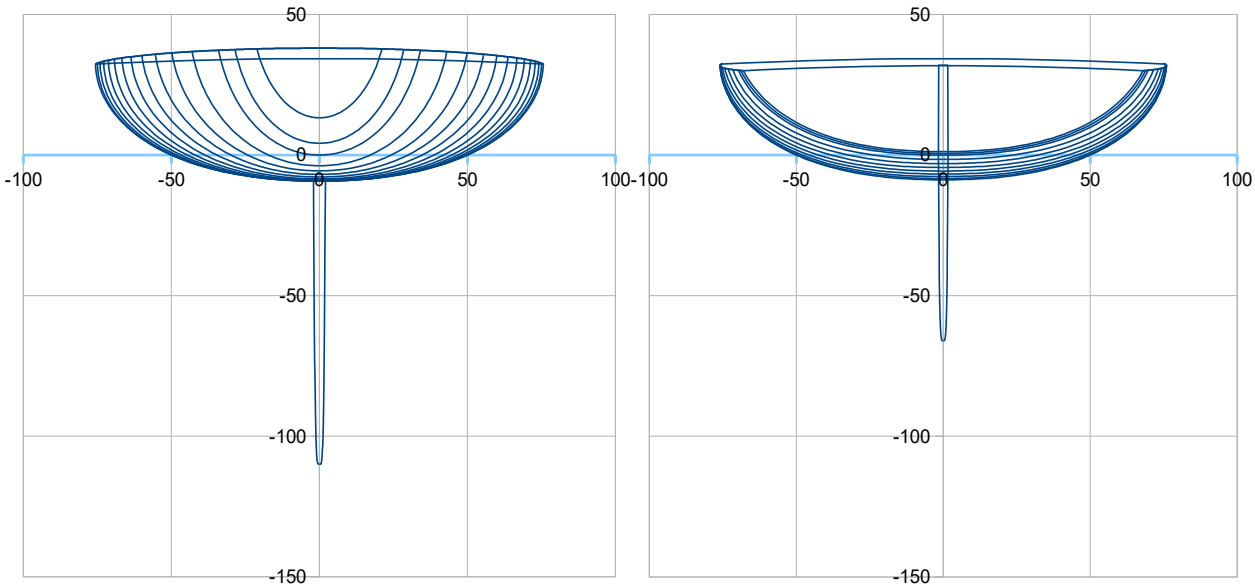
A3 – Rudder		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

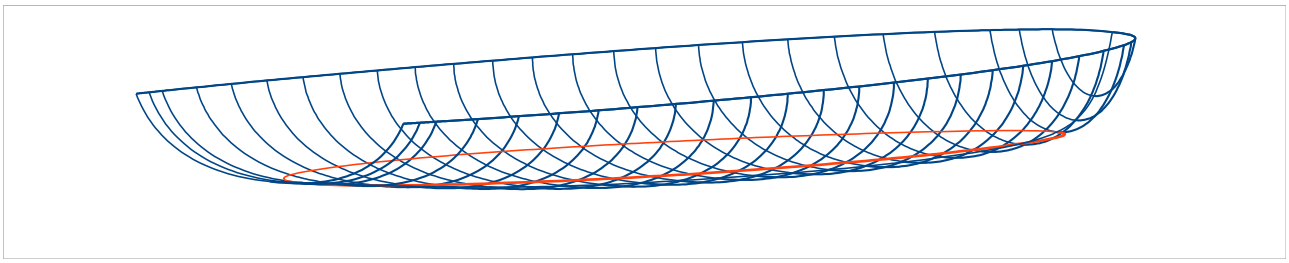
Dinghy D4

Loa 4,27 m (14') ; Lwl 3,84 m ; B 1,52 m ; **Bwl 1,00 m** ; Draft 1,10 m ; Displacement of design : 164 kg (Dinghy 64 kg + average load 100 kg) ; LCB hull 50,84 %Lwl ; Cp hull : 0,616 ; Sw : 3,69 m2









B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**3,84**	> Hull speed (Knots)	4,8	at Froude 0,4		
>> ft	*14,01*		*12,60*					
Boa (m)	**1,52**	**at X (% Lwl)**	**32,0**	Bsheer (m)	1,52	at X (% Lwl)	32,0	
>> ft	*4,99*							
Bwl (m)	**1,00**	**at X (% Lwl)**	**42,0**	> Bwl / Boa	0,658			
>> ft	*3,28*			**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,093**	**at X (%Lwl)**	**57**		**0,30**	**0,32**	**0,38**	
>> ft	*0,30*			*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,15205**	**at LCB (m)**	**1,952**	**LCB (%Lwl)**	**50,84**	**ZCB (m)**	**-0,033**	
>> lbs	*344*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,11*	
Cp	**0,616**							
Sf (m2)	**2,93**	**at LCF (m)**	**1,838**	**LCF (%Lwl)**	**47,87**	>>> LCB – LCF (%Lwl)	2,97	
>> ft2	*31,57*	*>> ft*	*6,03*					
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)						
Sw (m2)	**2,97**	>Sw/D^(2/3)	10,42					
>> ft2	*31,95*							
Shull (m2)	**6,90**	**at X (m)**	**1,869**	**Z (m)**	**0,057**			
>> ft2	*74,24*	*>> ft*	*6,13*	*>> ft*	*0,19*			
Sdeck (m2)	**5,50**	**at X (m)**	**1,754**	**Z (m)**	**0,34**			
>> ft2	*59,20*	*>> ft*	*5,75*	*>> ft*	*1,11*			

B1.2 Daggerboard

Vol. keel(m3)	**0,00499**	**at X (m)**	**2,161**	**X (%Lwl)**	**56,27**	**Z (m)**	**-0,489**	
		>> ft	*7,09*			*>> ft*	*-1,60*	
Draft oa (m)	**1,10**		**Sw (m2)**	**0,48**		**Sxz (m2)**	**0,23**	
>> ft	*3,61*		*>> ft2*	*5,14*		*>> ft2*	*2,47*	
CLR (m)	**2,20**	**CLR (%Lwl)**	**57,18**	*CLR = Center of Lateral Resistance*				
>> ft	*7,20*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,26**	**X (%Lwl)**	**-6,80**	**Z (m)**	**-0,10**	
Sw (m2)	**0,24**	*>> ft*	*-0,86*			**Sxz (m2)**	**0,12**	
>> ft2	*2,59*					*>> ft2*	*1,24*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,16034**	**at LCB (m)**	**1,913**	**LCB (%Lwl)**	**49,82**	**at ZCB (m)**	**-0,049**	
(kg)	**164**	*>> ft*	*6,28*			*>> ft*	*-0,16*	
>> lbs	*362*							
Sw (m2)	**3,69**	>Sw/D^(2/3)	12,49	Lwl/D^(1/3)	7,07			
>> ft2	*39,68*			***DLR***	***81***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**164**	**at Xg (m)**	**1,644**	**Xg (%Lwl)**	**42,81**	**at Zg (m)**	**0,421**
Light boat	64,1		1,806				0,454

Sailplan : as for D1,1

Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,90		**4,00**	27,59	1,869	51,572	0,057	1,559
Transom assuming at unit mass kg/m2		0,30		**4,00**	1,19	-0,150	-0,179	0,178	0,212
Deck - benches									
assuming at average unit mass kg/m2		5,50		**3,00**	16,50	1,754	28,935	0,338	5,569
Daggerboard :									
Daggerboard, assuming at kg/m3		0,004991		**500,00**	2,50	2,161	5,392	-0,489	-1,220
Daggerboard trunk, assuming kg				**2,50**	2,50	2,161	5,402	0,146	0,366
Rudder :									
Rudder, assuming kg/m3		0,003298		**500,00**	1,65	-0,261	-0,431	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,131	-0,196	0,200	0,300
Rig and sails :									
Mast >> at kg/m		6,191		**0,70**	4,55	2,956	13,450	3,100	14,106
Boom >> at kg/m		2,430		**0,60**	1,53	1,748	2,676	0,960	1,470
Mainsail at mass in g/m2		7,79		**0,25**	2,04	2,081	4,253	2,976	6,083
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	1,920	4,800	0,320	0,800
Light weight >>>					**64,1**	**1,81**	115,676	**0,45**	29,072

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,54 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*64,05*	*1,806*	*0,454*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,54**	**0,65**	**0,00**	Crew at center
			0,40	**1,00**	Crew at windward
Total >>> Mass (kg)	**184,05**	**1,633**	**0,582**	**0,000**	**Crew at center**
Disp. (m3)	**0,17956**		**0,419**	**0,652**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,17956**	**/ Disp. (m3)**	**0,17956**	**Relevant only when heel = 0°**		DLR	90
Height (cm)	**-0,2995**	**Xc heel (m)**	**1,633**	**/ Xg (m)**	**1,633**	Lwl (m)	3,85	Z fore (cm)	2,8
Trim (°)	**0,923**	Yc heel (m)	-0,020	Yg heel (m)	0,645	Bwl (m)	1,04	Z aft (cm)	-3,4
		Zc heel (m)	-0,048	**> GZ (m)**	**0,664**	Tc (m)	0,10	Trim (°)	0,92
		Sw heel(m2)	**3,95**	**RM (kN.m)**	**1,199**	Cp Hull	0,620	LCB Hull (%)	46,88
		Bwl heel (m)	**1,04**	**FB mini (cm)**	**25,4**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**-0,03**	**Obliquity (°)**	**0,2**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,009		
						> GM1° (m)	**0,54**		

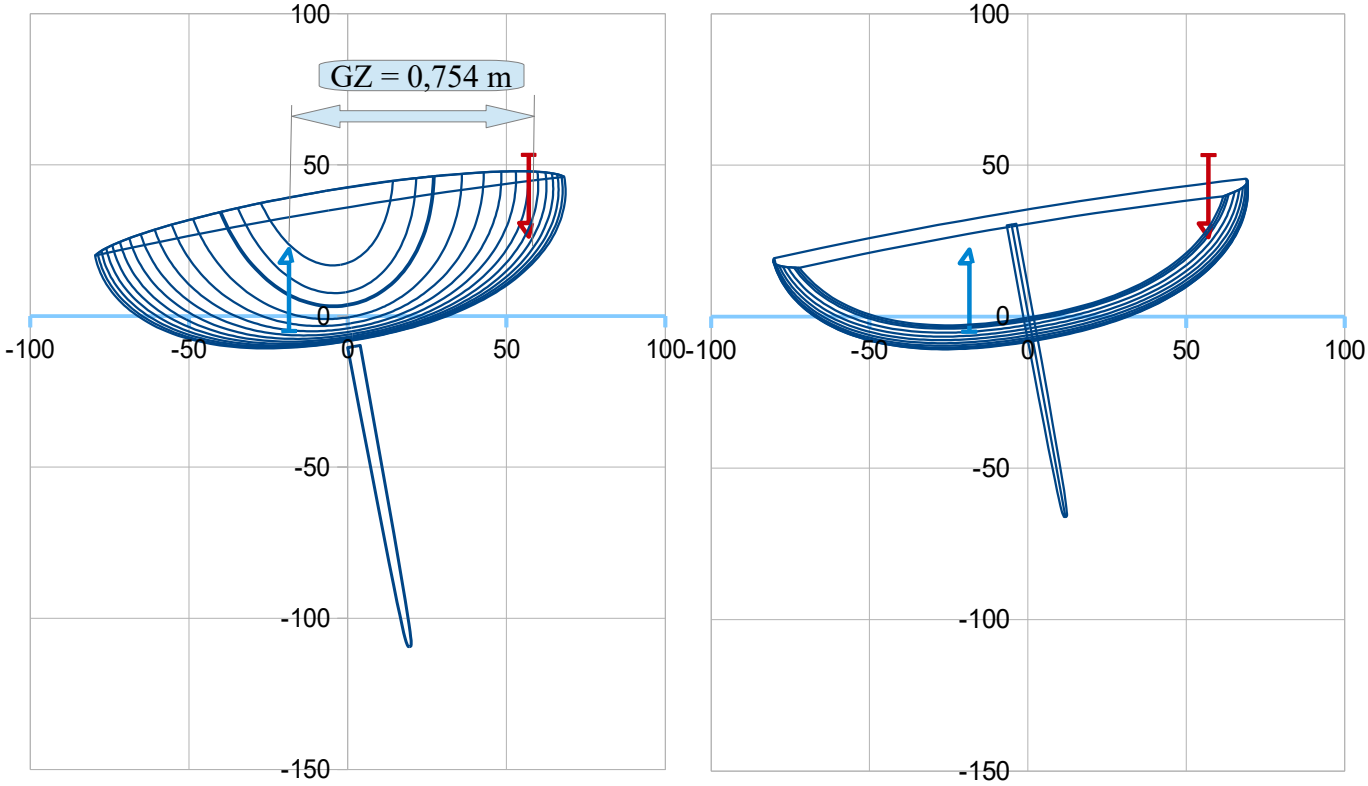
>>> GM1°/ X40% Z65 = 0,54 m

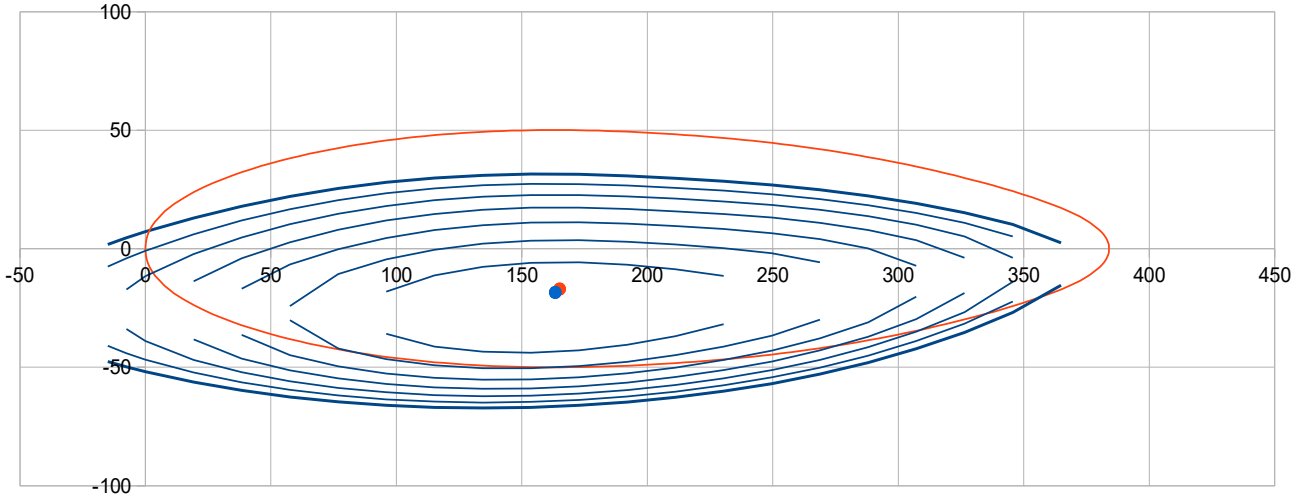
At heel angle 10° and with a crew of 120 kg at windward, at Y 1,00 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei

Data to enter : yellow cells		Results			
Heel (°)	10	Disp. (m3)	0,17956	/ Disp. (m3)	0,17956
Height (cm)	1,1130	Xc heel (m)	1,633	/ Xg (m)	1,633
Trim (°)	0,747	Yc heel (m)	-0,185	Yg heel (m)	0,569
		Zc heel (m)	-0,050	> GZ (m)	0,754
		Sw heel(m2)	3,78	RM (kN.m)	1,361
		Bwl heel (m)	0,98	FB mini (cm)	16,2
		LCB – LCF (%Lwl)	-0,45	Obliquity (°)	2,4

>>> Trim 0,75° ; GZ 0,754 m ; RM 1,361 KN.m ; Sw 3,78 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D4 :

A1 - Hull data		*feet conversion*
Lenght of waterline :		
Lwl (m)	3,84	*12,60*
Maximum draft of the hull body :		
Tc (m)	0,0925	*0,30*
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	4,12	*13,52*
Zbow (m)	0,38	*1,25*
Shape coefficient of the bow :		
Cet	10,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,0	
Rear end of the transom :		
Xtr aft (m)	-0,15	*-0,49*
Ztr aft (m)	0,0122	*0,04*
Sheer line, in horizontal projection xy :		
Bg (m)	0,944	
X Bg (% Lwl)	45,0	
Alfa (°)	6,20	
Po sh y	2,00	
Cor Po sh	0,050	
Po Cor Po	1,75	
Scow	0,80	
Po Scow	0,35	
Option Hard Chine		
Type	0	
Zhc fore (m)	0,15	
Zhc mid (m)	0,09	
Zhc aft (m)	0,12	
Po hc z	3	
Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	*1,05*
Zsh aft (m)	0,30	*0,98*
Deck / central line rear end		
Zd mid (m)	0,34	*1,12*
Zd aft (m)	0,32	*1,05*
Sections :		

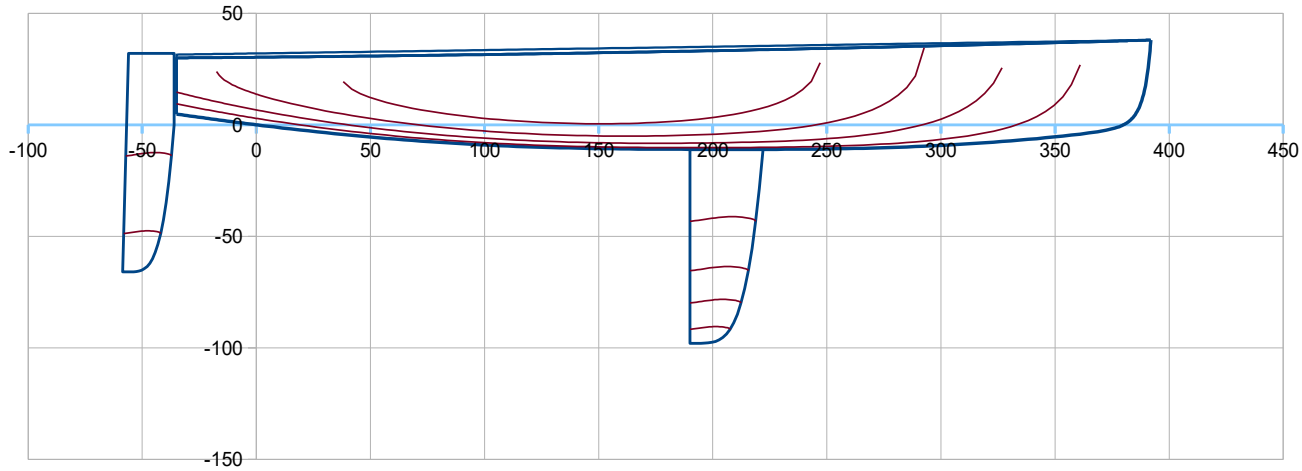
	PE1	C PE1	PE2
Fore	2,000	1,500	2,000
Mid	2,000	1,000	2,390
Aft	2,000	1,500	2,500

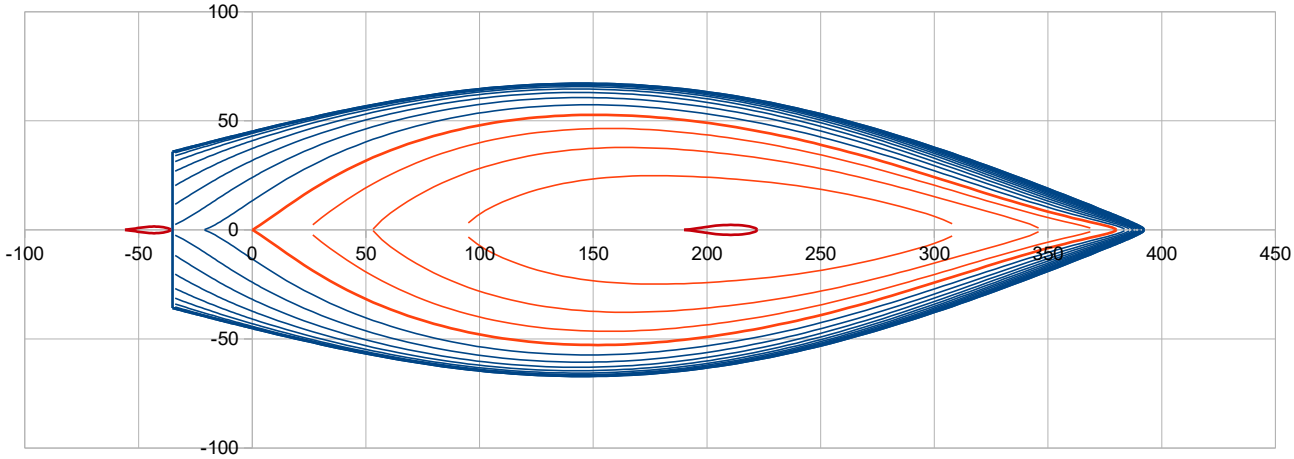
Bratio fore	0,57
Bratio aft	0,73
Pch1 Fore	1,00
Pch2 Fore	0,88
Pch1 Aft	0,70
Pch2 Aft	0,88

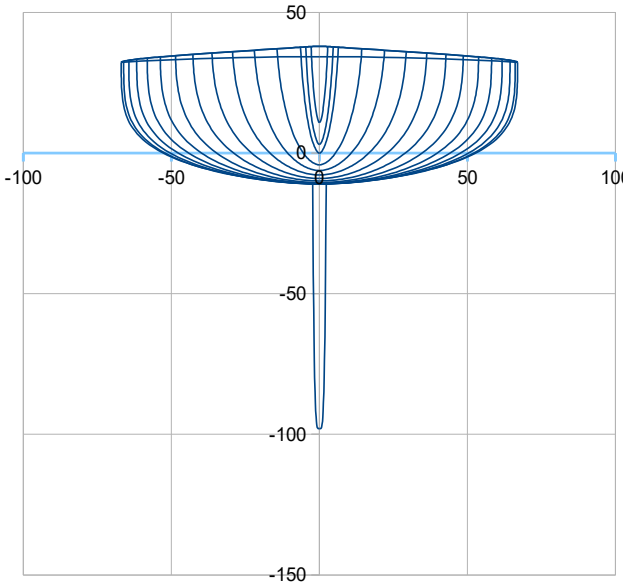
A2 – Daggerboard		
Xq aft (m)	2,02	*6,63*
C root (m)	0,28	*0,92*
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	1,10	*3,61*
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	
A3 – Rudder		
C root (m)	0,20	*0,66*
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	*2,17*
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

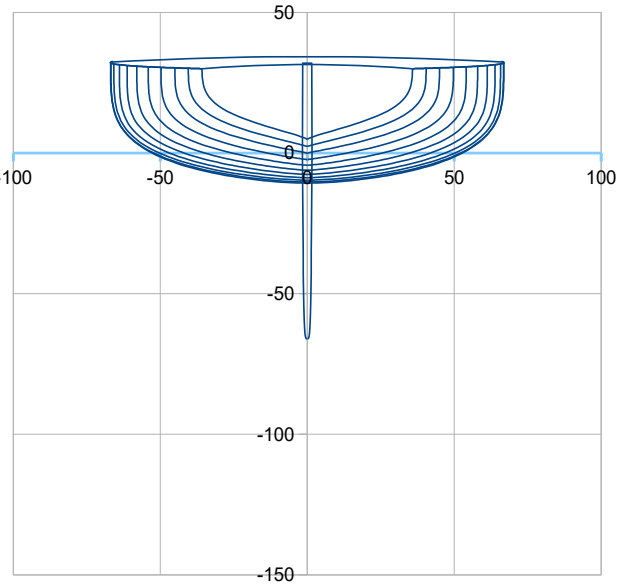
Dinghy D5 rowing & sailing

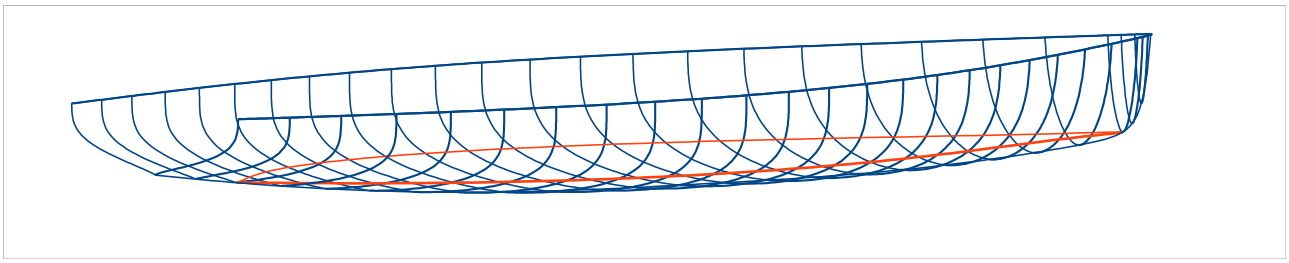
Loa 4,27 m (14') ; Lwl 3,80 m ; **B 1,34 m ; Bwl 1,06 m** ; Draft 0,98 m ; Displacement of design : 175 kg (Dinghy 75 kg + average load 100 kg) ; LCB hull 47,90 %Lwl ; Cp hull : 0,543 ; Sw : 3,37 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**3,80**	> Hull speed (Knots)	4,7	at Froude 0,4			
>> ft	*14,01*		*12,47*						
Boa (m)	**1,34**	**at X (% Lwl)**	**38,0**	Bsheer (m)	1,34	at X (% Lwl)	38,0		
>> ft	*4,40*								
Bwl (m)	**1,06**	**at X (% Lwl)**	**40,0**	> Bwl / Boa	0,788				
>> ft	*3,46*				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,110**	**at X (%Lwl)**	**57**			**0,30**	**0,32**	**0,38**	
>> ft	*0,36*				*>> ft*	*0,98*	*1,05*	*1,25*	
Displacement at H0 (m3)	**0,16152**	**at LCB (m)**	**1,820**	**LCB (%Lwl)**	**47,90**	**ZCB (m)**	**-0,040**		
>> lbs	*365*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,13*		
Cp	**0,543**								
Sf (m2)	**2,56**	**at LCF (m)**	**1,718**	**LCF (%Lwl)**	**45,20**	>>> LCB – LCF (%Lwl)	2,69		
>> ft2	*27,53*	*>> ft*	*5,64*						
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)							
Sw (m2)	**2,66**	>Sw/D^(2/3)	8,97						
>> ft2	*28,63*								
Shull (m2)	**6,01**	**at X (m)**	**1,739**	**Z (m)**	**0,053**				
>> ft2	*64,66*	*>> ft*	*5,71*	*>> ft*	*0,17*				
Sdeck (m2)	**4,13**	**at X (m)**	**1,526**	**Z (m)**	**0,34**				
>> ft2	*44,46*	*>> ft*	*5,01*	*>> ft*	*1,11*				

B1.2 Daggerboard

Vol. keel(m3)	**0,00563**	**at X (m)**	**2,061**	**X (%Lwl)**	**54,24**	**Z (m)**	**-0,452**	
		>> ft	*6,76*			*>> ft*	*-1,48*	
Draft oa (m)	**0,98**		**Sw (m2)**	**0,47**		**Sxz (m2)**	**0,23**	
>> ft	*3,22*		*>> ft2*	*5,07*		*>> ft2*	*2,44*	
CLR (m)	**2,10**	**CLR (%Lwl)**	**55,32**	*CLR = Center of Lateral Resistance*				
>> ft	*6,90*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00330**	**at X (m)**	**-0,46**	**X (%Lwl)**	**-12,14**	**Z (m)**	**-0,10**
Sw (m2)	**0,24**	*>> ft*	*-1,51*			**Sxz (m2)**	**0,12**
>> ft2	*2,59*					*>> ft2*	*1,24*

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,17045**	**at LCB (m)**	**1,784**	**LCB (%Lwl)**	**46,94**	**at ZCB (m)**	**-0,054**
(kg)	**175**	*>> ft*	*5,85*			*>> ft*	*-0,18*
>> lbs	*385*						
Sw (m2)	**3,37**	>Sw/D^(2/3)	10,97	Lwl/D^(1/3)	6,85		
>> ft2	*36,29*			***DLR***	***89***	*M(lbs/2240)/(Lwl(ft)/100)^3*	

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**175**	**at Xg (m)**	**1,578**	**Xg (%Lwl)**	**41,51**	**at Zg (m)**	**0,493**
Light boat	74,8		1,654				0,282

Sailplan :

C - Sailplan – early stage definition

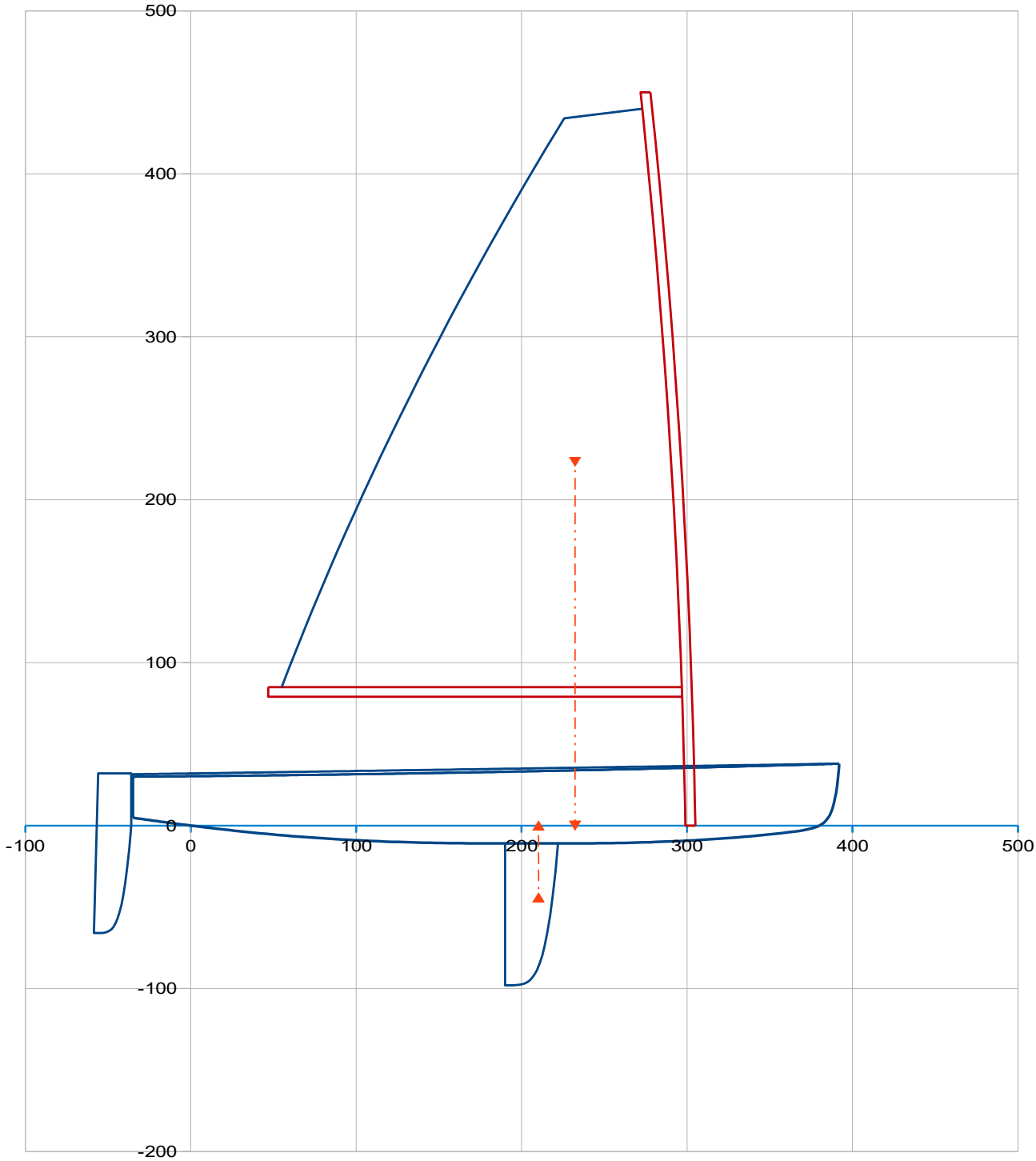
Data to enter		>> in feet
Xmast (m)	3,05	10,01
Zmast (m)	4,50	14,76
Zboom (m)	0,85	2,79
Lboom (m)	2,50	8,20
Z jib (m)	0,00	0,00
Jib overlap	130	%
Mast rake(°)	1,00	

(No jib : put Z jib = 0)

Results for the Sailplan

Main sail (m2)	5,47	Jib (m2)	0,00	>> SA (m2)	5,5
Lead Xv – Xd (%)	5,8				
Sdaggerboard/Sv (%)	4,14			Spi (m2) ~	0,0
Srudder/Sv (%)	2,11				
Sv/Sw	1,62				

For Gene-VPP :	SA (m2)	ZCE (m)	Zdeck (m)	Zmast (m)	Main (m2)	Spi (m2)	ZCE spi (m)
(Main + Fore triangle)	5,47	2,23	0,35	4,40	5,47	0,0	2,23



Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		6,01		**6,00**	36,04	1,739	62,693	0,053	1,916
Transom assuming at unit mass kg/m2		0,13		**6,00**	0,78	-0,350	-0,274	0,203	0,159
Deck - benches									
assuming at average unit mass kg/m2		4,13		**5,00**	20,65	1,526	31,511	0,338	6,970
Daggerboard :									
Daggerboard, assuming at kg/m3			0,005629	**500,00**	2,81	2,061	5,800	-0,452	-1,273
Daggerboard trunk, assuming kg				**2,50**	2,50	2,061	5,152	0,155	0,388
Rudder :									
Rudder, assuming kg/m3			0,003298	**500,00**	1,65	-0,461	-0,760	-0,104	-0,172
Rudder-helm system, assuming kg				**1,50**	1,50	-0,231	-0,346	0,200	0,300
Rig and sails :									
Mast >> at kg/m	4,500			**0,70**	3,31	2,885	9,540	2,250	7,441
Boom >> at kg/m	2,500			**0,60**	1,58	1,718	2,706	0,850	1,339
Mainsail at mass in g/m2		5,47		**0,25**	1,44	2,028	2,913	2,233	3,207
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**2,50**	2,50	1,900	4,750	0,320	0,800
Light weight >>>					**74,8**	**1,65**	123,685	**0,28**	21,073

At heel angle 1° and with a crew of 120 kg centered (Y = 0) at X 1,52 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*74,76*	*1,654*	*0,282*	*0*	*from the mass spreadsheet*
Load (kg)	**120,00**	**1,52**	**0,65**	**0,00**	Crew at center
			0,40	**0,65**	Crew at windward
Total >>> Mass (kg)	**194,76**	**1,572**	**0,509**	**0,000**	**Crew at center**
Disp. (m3)	**0,19001**		**0,355**	**0,400**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,19001**	**/ Disp. (m3)**	**0,19001**	**Relevant only when heel = 0°**		DLR	90
Height (cm)	**-0,4300**	**Xc heel (m)**	**1,572**	**/ Xg (m)**	**1,572**	Lwl (m)	3,93	Z fore (cm)	3,5
Trim (°)	**1,112**	Yc heel (m)	-0,016	Yg heel (m)	0,394	Bwl (m)	1,09	Z aft (cm)	-3,9
		Zc heel (m)	-0,054	**> GZ (m)**	**0,410**	Tc (m)	0,11	Trim (°)	1,11
		Sw heel(m2)	**3,58**	**RM (kN.m)**	**0,784**	Cp Hull	0,528	LCB Hull (%)	47,83
		Bwl heel (m)	**1,09**	**FB mini (cm)**	**25,2**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**0,51**	**Obliquity (°)**	**0,3**	Yg heel (m)	-0,009	with crew at center	
						Gz (m)	0,007		
						> GM1° (m)	**0,42**		

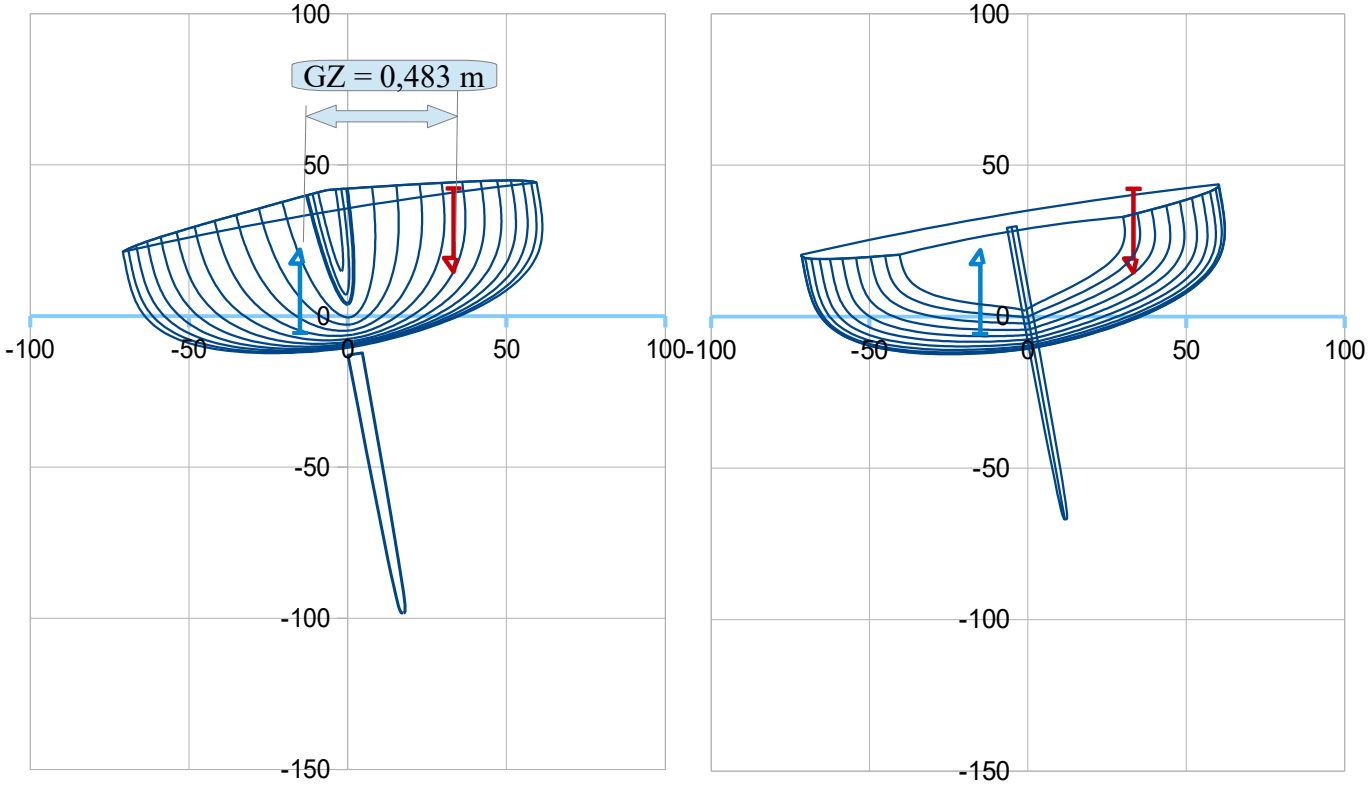
>>> GM1°/ X40% Z65 = 0,42 m

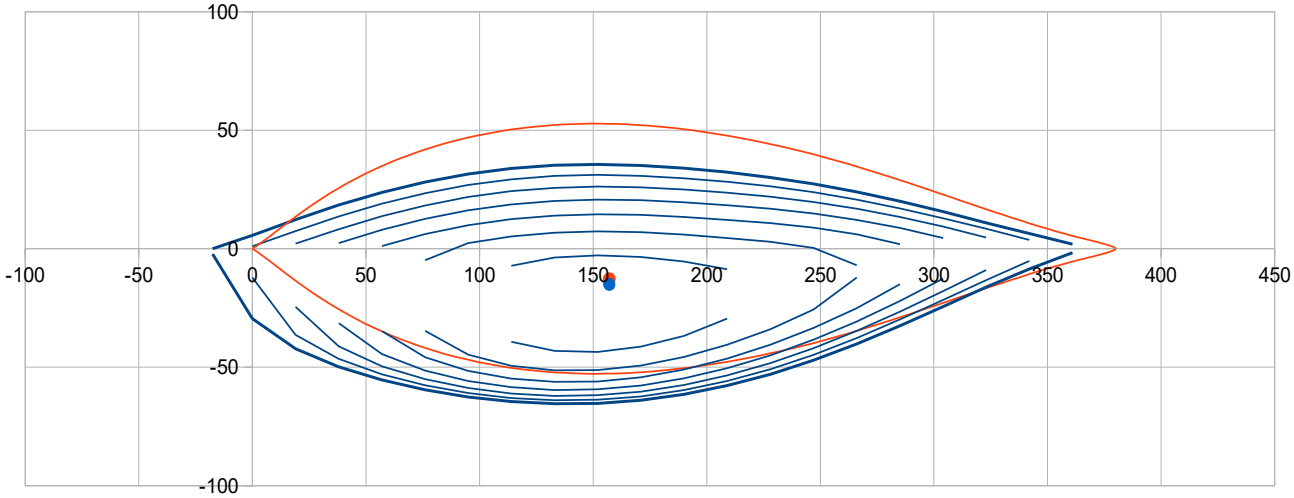
At heel angle 10° and with a crew of 120 kg at windward, at Y 0,65 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei

Data to enter : yellow cells		Results			
Heel (°)	10	Disp. (m3)	0,19001	/ Disp. (m3)	0,19001
Height (cm)	0,6550	Xc heel (m)	1,572	/ Xg (m)	1,572
Trim (°)	0,940	Yc heel (m)	-0,150	Yg heel (m)	0,333
		Zc heel (m)	-0,056	> GZ (m)	0,483
		Sw heel(m2)	3,43	RM (kN.m)	0,923
		Bwl heel (m)	1,01	FB mini (cm)	19,0
		LCB – LCF (%Lwl)	0,02	Obliquity (°)	2,7

>>> Trim 0,94° ; GZ 0,483 m ; RM 0,923 KN.m ; Sw 3,43 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

The input data for D5 :

A1 - Hull data		feet conversion
Lenght of waterline :		
Lwl (m)	3,80	12,47
Maximum draft of the hull body :		
Tc (m)	0,1100	0,36
X Tc (%Lwl)	57,00	
Hull bow :		
Xbow (m)	3,92	12,86
Zbow (m)	0,38	1,25
Shape coefficient of the bow :		
Cet	30,0	
Polynomials of the keel line, front part and rear part :		
Po kl fore	2,5	
Po kl aft	3,3	
Rear end of the transom :		
Xtr aft (m)	-0,35	-1,15
Ztr aft (m)	0,0480	0,16
Sheer line, in horizontal projection xy :		
Bg (m)	1,011	
X Bg (% Lwl)	45,0	
Alfa (°)	4,00	
Po sh y	2,00	
Cor Po sh	0,050	
Po Cor Po	1,75	
Scow	0,05	
Po Scow	0,25	

Option Hard Chine		Bratio fore	0,57
Type	0	Bratio aft	0,73
Zhc fore (m)	0,15	Pch1 Fore	1,00
Zhc mid (m)	0,09	Pch2 Fore	0,88
Zhc aft (m)	0,12	Pch1 Aft	0,70
Po hc z	3	Pch2 Aft	0,88

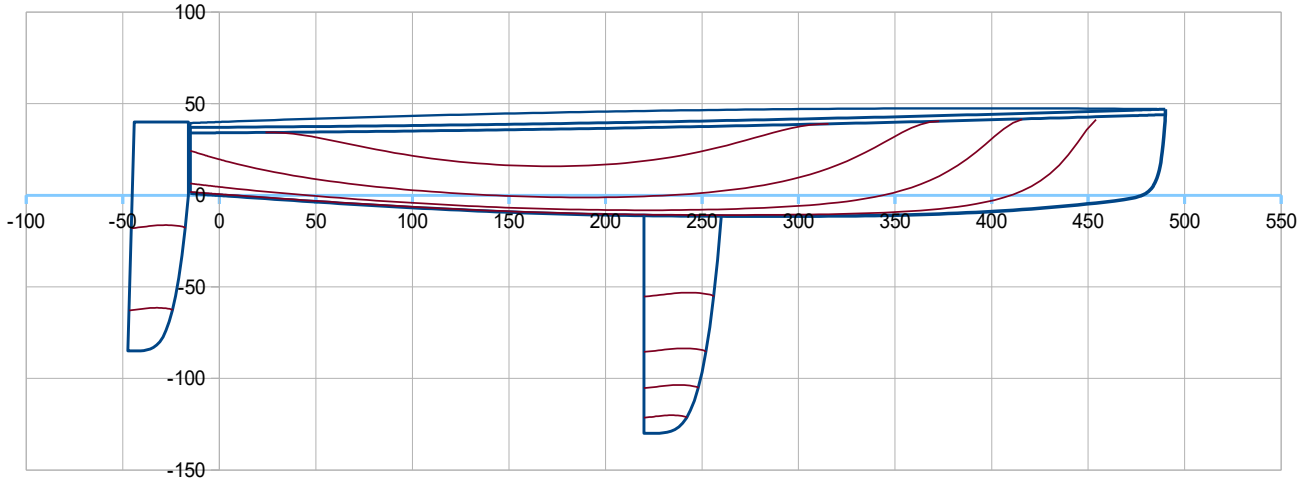
Sheer line, in vertical projection xz :		
Zsh mid (m)	0,32	1,05
Zsh aft (m)	0,30	0,98
Deck / central line rear end		
Zd mid (m)	0,34	1,12
Zd aft (m)	0,32	1,05
Sections :		

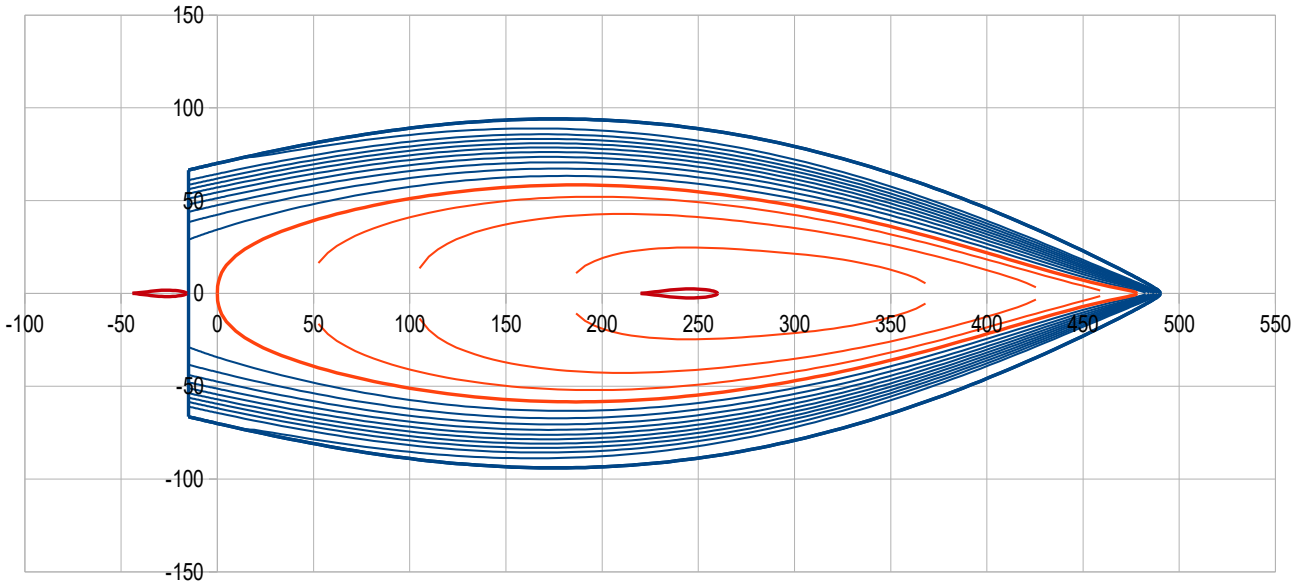
	PE1	C PE1	PE2
Fore	2,000	1,500	1,750
Mid	3,850	1,000	1,780
Aft	3,800	1,000	0,700

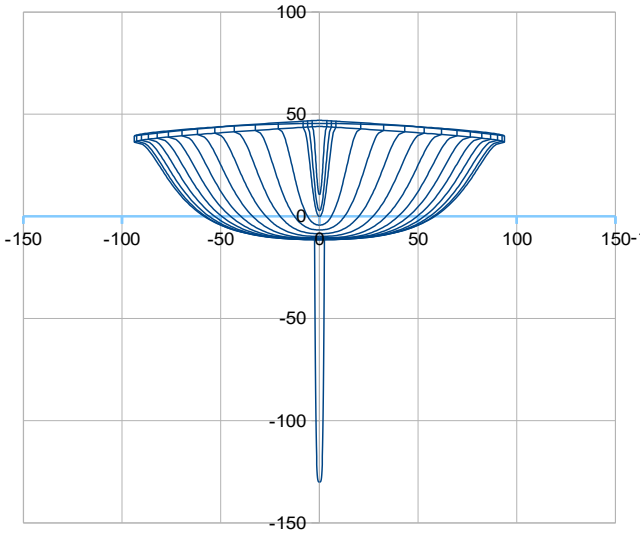
A2 – Daggerboard		
Xq aft (m)	1,90	6,23
C root (m)	0,32	1,05
C roundness	4,40	
t/c (%)	14,00	
Fore angle (°)	90,00	
Draft oa (m)	0,98	3,22
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	
A3 – Rudder		
C root (m)	0,20	0,66
t/c (%)	15,00	
Rear angle (°)	88,50	
Z aft (m)	0,66	2,17
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

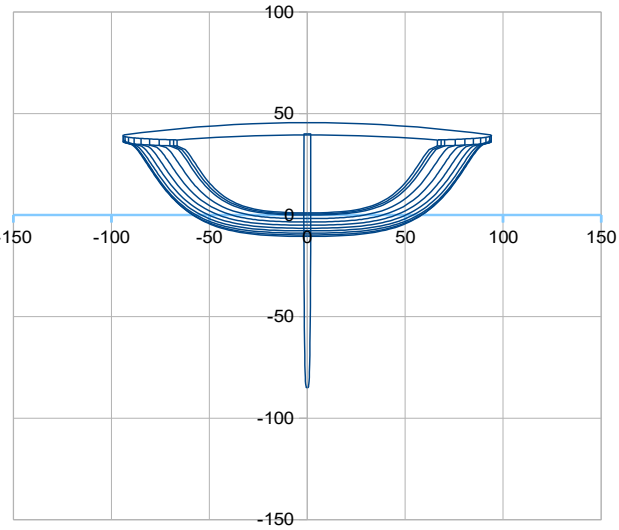
Dinghy D505 , inspired by the 505

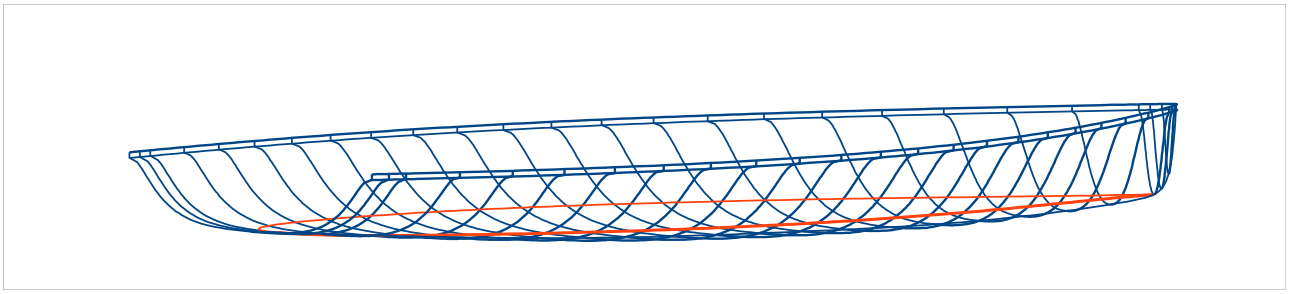
Loa 5,05 m (16,6') ; Lwl 4,78 m ; **B 1,88 m ; Bwl 1,17 m** ; Draft 1,30 m ; Displacement of design : 280 kg (Dinghy 130 kg + average load 150 kg) ; LCB hull 48,32 %Lwl ; Cp hull : 0,559 ; Sw : 5,17 m2











B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**5,05**	**Lwl (m)**	**4,78**	> Hull speed (Knots)	5,3	at Froude 0,4			
>> ft	*16,57*		*15,68*						
Boa (m)	**1,88**	**at X (% Lwl)**	**37,0**	Bsheer (m)	1,88	at X (% Lwl)	37,0		
>> ft	*6,17*								
Bwl (m)	**1,17**	**at X (% Lwl)**	**39,0**	> Bwl / Boa	0,622				
>> ft	*3,84*				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,114**	**at X (%Lwl)**	**62**			**0,37**	**0,39**	**0,47**	
>> ft	*0,37*				*>> ft*	*1,21*	*1,28*	*1,54*	
Displacement at H0 (m3)	**0,25674**	**at LCB (m)**	**2,310**	**LCB (%Lwl)**	**48,32**	**ZCB (m)**	**-0,042**		
>> lbs	*580*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,14*		
Cp	**0,559**								
Sf (m2)	**3,82**	**at LCF (m)**	**2,083**	**LCF (%Lwl)**	**43,59**	>>> LCB – LCF (%Lwl)	4,73		
>> ft2	*41,10*	*>> ft*	*6,84*						
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)							
Sw (m2)	**3,94**	>Sw/D^(2/3)	9,75						
>> ft2	*42,38*								
Shull (m2)	**9,41**	**at X (m)**	**2,212**	**Z (m)**	**0,086**				
>> ft2	*101,27*	*>> ft*	*7,26*	*>> ft*	*0,28*				
Sdeck (m2)	**7,16**	**at X (m)**	**2,004**	**Z (m)**	**0,42**				
>> ft2	*77,11*	*>> ft*	*6,58*	*>> ft*	*1,39*				

B1.2 Daggerboard

Vol. keel(m3)	**0,01028**	**at X (m)**	**2,401**	**X (%Lwl)**	**50,23**	**Z (m)**	**-0,580**	
		>> ft	*7,88*			*>> ft*	*-1,90*	
Draft oa (m)	**1,30**		**Sw (m2)**	**0,80**		**Sxz (m2)**	**0,39**	
>> ft	*4,27*		*>> ft2*	*8,65*		*>> ft2*	*4,16*	
CLR (m)	**2,45**	**CLR (%Lwl)**	**51,28**	*CLR = Center of Lateral Resistance*				
>> ft	*8,04*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00652**	**at X (m)**	**-0,30**	**X (%Lwl)**	**-6,29**	**Z (m)**	**-0,14**	
Sw (m2)	**0,43**	*>> ft*	*-0,99*			**Sxz (m2)**	**0,21**	
>> ft2	*4,63*					*>> ft2*	*2,23*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,27354**	**at LCB (m)**	**2,251**	**LCB (%Lwl)**	**47,09**	**at ZCB (m)**	**-0,065**
(kg)	**280**	*>> ft*	*7,38*			*>> ft*	*-0,21*
>> lbs	*618*						
Sw (m2)	**5,17**	>Sw/D^(2/3)	12,27	Lwl/D^(1/3)	7,36		
>> ft2	*55,66*			***DLR***	***72***	*M(lbs/2240)/(Lwl(ft)/100)^3*	

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**280**	**at Xg (m)**	**1,996**	**Xg (%Lwl)**	**41,77**	**at Zg (m)**	**0,445**
Light boat	130,0		2,096				0,496

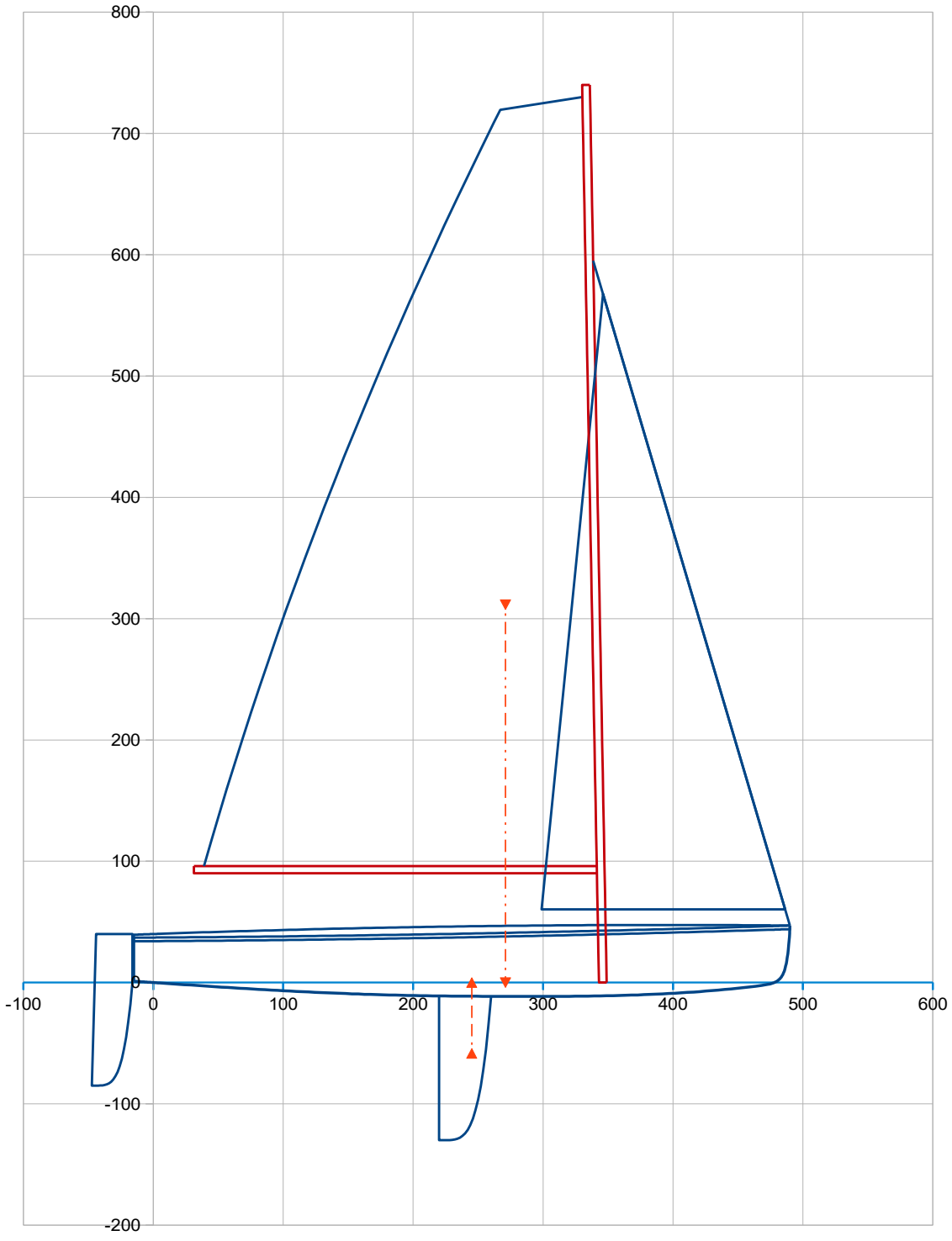
Sailplan :

C - Sailplan – early stage definition

Data to enter		>> in feet	Results for the Sailplan					
Xmast (m)	3,49	11,45	Main sail (m2)	12,32	Jib (m2)	4,97	>> SA (m2)	17,3
Zmast (m)	7,40	24,28	Lead Xv – Xd (%)	6,5				
Zboom (m)	0,96	3,15	Sdaggerboard/Sv (%)	2,23			Spi (m2) ~	29,1
Lboom (m)	3,10	10,17	Srudder/Sv (%)	1,20				
Z jib (m)	5,95	19,52	Sv/Sw	3,34				
Jib overlap	130	%						
Mast rake(°)	1,00							

(No jib : put Z jib = 0)

For Gene-VPP :	SA (m2)	ZCE (m)	Zdeck (m)	Zmast (m)	Main (m2)	Spi (m2)	ZCE spi (m)
(Main + Fore triangle)	16,19	3,17	0,43	7,30	12,32	29,1	3,23



Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		9,41		**6,40**	60,21	2,212	133,167	0,086	5,169
Transom assuming at unit mass kg/m2		0,36		**6,40**	2,31	-0,150	-0,347	0,214	0,495
Deck - benches									
assuming at average unit mass kg/m2		7,16		**5,00**	35,82	2,004	71,789	0,424	15,178
Daggerboard :									
Daggerboard, assuming at kg/m3			0,010280	**500,00**	5,14	2,401	12,342	-0,580	-2,984
Daggerboard trunk, assuming kg				**3,00**	3,00	2,401	7,204	0,157	0,471
Rudder :									
Rudder, assuming kg/m3			0,006524	**500,00**	3,26	-0,301	-0,981	-0,138	-0,452
Rudder-helm system, assuming kg				**2,00**	2,00	-0,150	-0,301	0,247	0,493
Rig and sails :									
Mast >> at kg/m		7,391		**1,00**	7,76	3,395	26,351	3,700	28,715
Boom >> at kg/m		3,100		**0,80**	2,60	1,863	4,852	0,960	2,500
Mainsail at mass in g/m2		12,32		**0,30**	3,88	2,283	8,861	3,446	13,376
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**4,00**	4,00	2,390	9,560	0,390	1,560
Light weight >>>					**130,0**	**2,10**	272,496	**0,50**	64,522

At heel angle 1° and with a crew of 150 kg centered (Y = 0) at X 1,91 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*129,99*	*2,096*	*0,496*	*0*	*from the mass spreadsheet*
Load (kg)	**150,00**	**1,91**	**0,65**	**0,00**	Crew at center
			0,40	**1,500**	Crew at windward
Total >>> Mass (kg)	**279,99**	**1,996**	**0,579**	**0,000**	**Crew at center**
Disp. (m3)	**0,27316**		**0,445**	**0,804**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

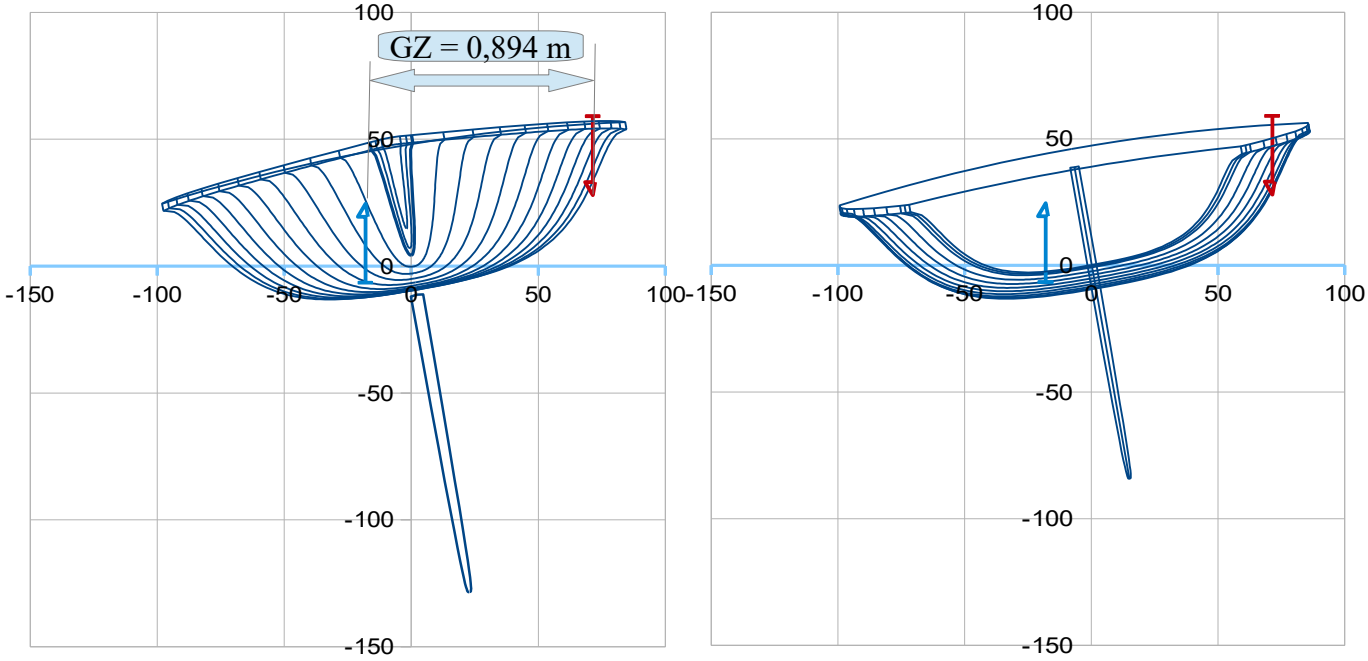
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,27316**	**/ Disp. (m3)**	**0,27316**	**Relevant only when heel = 0°**		DLR	75
Height (cm)	**0,3960**	**Xc heel (m)**	**1,996**	**/ Xg (m)**	**1,996**	Lwl (m)	4,70	Z fore (cm)	4,0
Trim (°)	**0,818**	Yc heel (m)	-0,019	Yg heel (m)	0,796	Bwl (m)	1,18	Z aft (cm)	-2,8
		Zc heel (m)	-0,062	**> GZ (m)**	**0,815**	Tc (m)	0,11	Trim (°)	0,82
		Sw heel(m2)	**5,33**	**RM (kN.m)**	**2,239**	Cp Hull	0,577	LCB Hull (%)	46,50
		Bwl heel (m)	**1,18**	**FB mini (cm)**	**32,9**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**1,63**	**Obliquity (°)**	**0,3**	Yg heel (m)	-0,010	with crew at center	
						Gz (m)	0,009		
						> GM1° (m)	**0,54**		

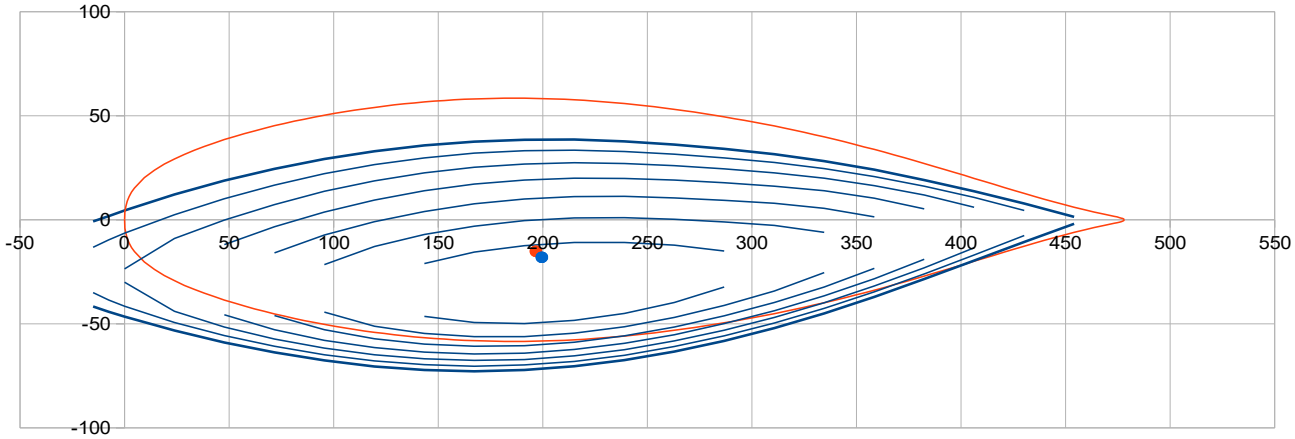
>>> GM1°/ X40% Z65 = 0,54 m

At heel angle 10° and with a crew of 150 kg at windward, at Y 1,50 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		Results			
Heel (°)	10	Disp. (m3)	0,27316	/ Disp. (m3)	0,27316
Height (cm)	1,5790	Xc heel (m)	1,996	/ Xg (m)	1,996
Trim (°)	0,610	Yc heel (m)	-0,180	Yg heel (m)	0,714
		Zc heel (m)	-0,065	> GZ (m)	0,894
		Sw heel(m2)	5,07	RM (kN.m)	2,456
		Bwl heel (m)	1,11	FB mini (cm)	22,3
		LCB – LCF (%Lwl)	0,60	Obliquity (°)	2,8

>>> Trim 0,61° ; GZ 0,894 m ; RM 2,456 KN.m ; Sw 5,07 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.

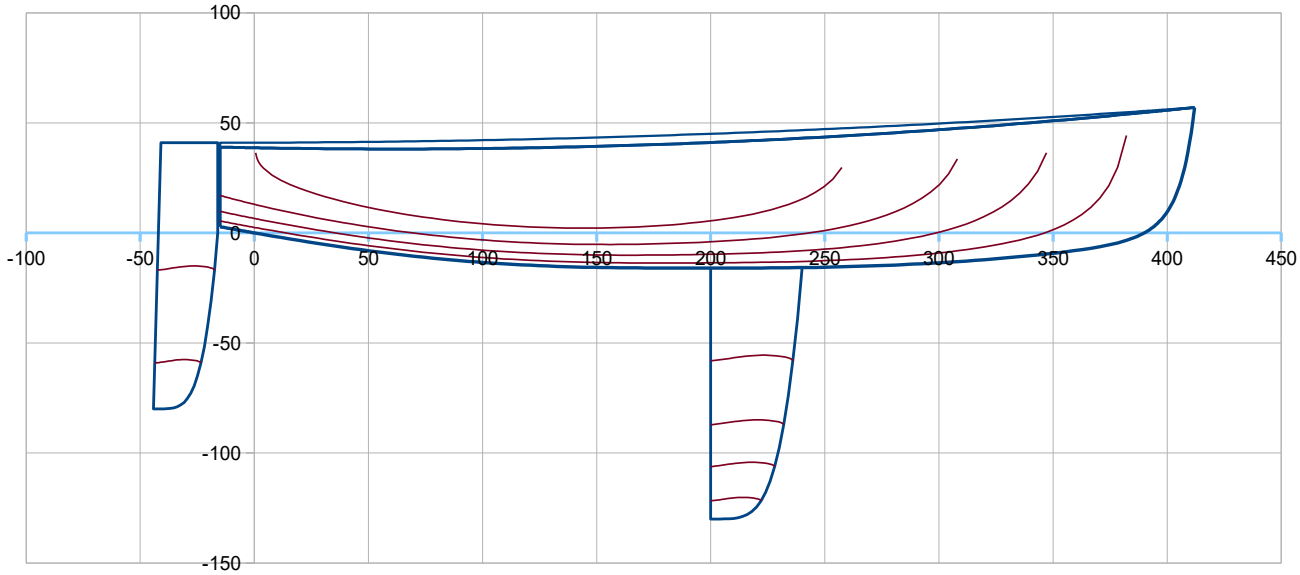
The input data for D505 :

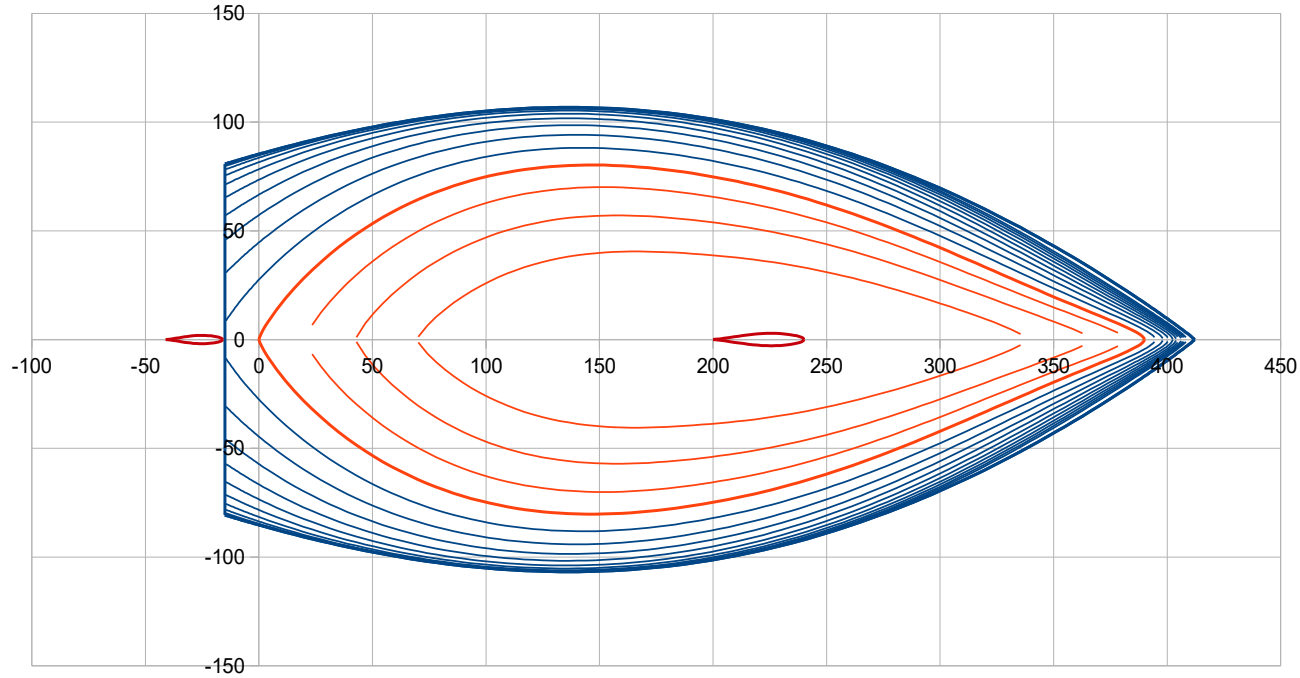
A1 - Hull data		feet conversion	
Lenght of waterline :			
Lwl (m)	4,78	15,68	
Maximum draft of the hull body :			
Tc (m)	0,1140	0,37	
X Tc (%Lwl)	62,00		
Hull bow :			
Xbow (m)	4,90	16,08	
Zbow (m)	0,47	1,54	
Shape coefficient of the bow :			
Cet	40,0		
Polynomials of the keel line, front part and rear part :			
Po kl fore	2,5		
Po kl aft	3,0		
Rear end of the transom :			
Xtr aft (m)	-0,15	-0,49	
Ztr aft (m)	0,0110	0,04	
Sheer line, in horizontal projection xy :			
Bg (m)	1,034	1,08	1,129
X Bg (% Lwl)	52,50	51,25	50,0
Alfa (°)	8,685	8,09	7,50
Po sh y	2,00		
Cor Po sh	0,020		
Po Cor Po	2,00		
Scow	0,05		
Po Scow	0,25		
Option Hard Chine		Bratio fore	1,00
Type	2	Bratio aft	1,00
Zhc fore (m)	0,44	Pch1 Fore	1,00
Zhc mid (m)	0,36	Pch2 Fore	1,00
Zhc aft (m)	0,34	Pch1 Aft	1,00
Po hc z	3	Pch2 Aft	1,00
Sheer line, in vertical projection xz :			
Zsh mid (m)	0,39	1,28	
Zsh aft (m)	0,37	1,21	
Deck / central line rear end			
Zd mid (m)	0,45	1,48	
Zd aft (m)	0,40	1,31	
Sections :			
	PE1	C PE1	PE2
Fore	0,400	1,000	2,000
Mid	0,350	1,000	6,700
Aft	0,350	1,000	7,000

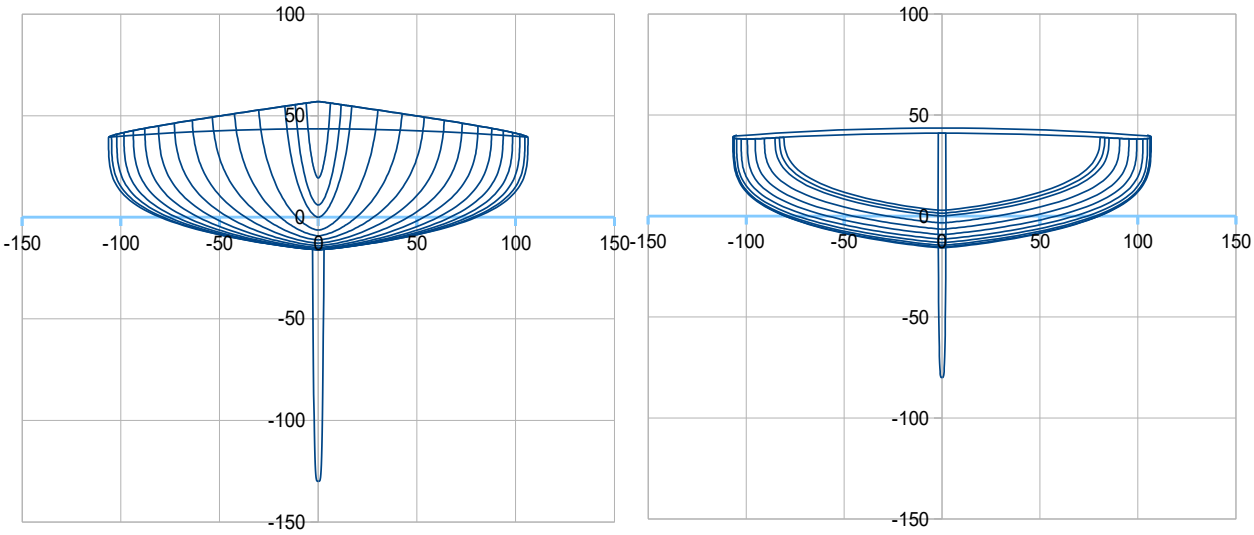
A2 – Daggerboard		
Xq aft (m)	2,20	7,22
C root (m)	0,40	1,31
C roundness	4,40	
t/c (%)	12,00	
Fore angle (°)	90,00	
Draft oa (m)	1,30	4,27
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	
1.3 Rudder data		
C root (m)	0,28	0,92
t/c (%)	12,00	
Rear angle (°)	88,50	
Z aft (m)	0,85	2,79
C roundness	4,40	
naca 00xx	0	
naca 63-0xx	1	
naca 65-0xx	0	

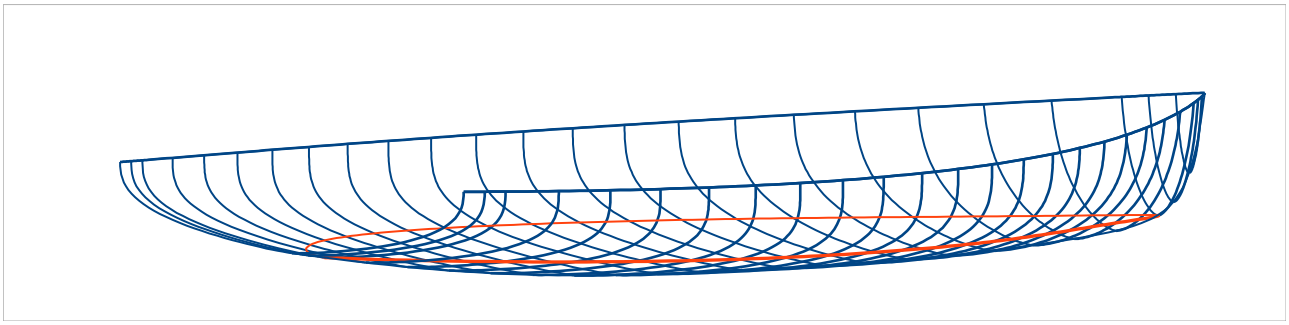
Dinghy D6 , inspired by traditionnal APBY 14' catboat (Arey's Pond Boat Yard)

Loa 4,27 m (14') ; Lwl 3,90 m ; **B 2,14 m ; Bwl 1,61 m** ; Draft 1,30 m ; Displacement of design : 372 kg (Dinghy 272 kg + average load 100 kg) ; LCB hull 47,15 %Lwl ; Cp hull : 0,566 ; Sw : 5,40 m2






100
50
0
-50
-100
-150
-150
-100
-50
0
50
100
150



B1 – Hydrostatics data

B1.1 Hull

Loa (m)	**4,27**	**Lwl (m)**	**3,90**	> Hull speed (Knots)		4,8	at Froude 0,4		
>> ft	*14,01*		*12,80*						
Boa (m)	**2,14**	**at X (% Lwl)**	**35,0**	Bsheer (m)	2,14	at X (% Lwl)	35,0		
>> ft	*7,01*								
Bwl (m)	**1,61**	**at X (% Lwl)**	**38,0**	> Bwl / Boa	0,752				
>> ft	*5,27*				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,160**	**at X (%Lwl)**	**52**			**0,39**	**0,39**	**0,57**	
>> ft	*0,52*				*>> ft*	*1,28*	*1,28*	*1,87*	
Displacement at H0 (m3)	**0,34486**	**at LCB (m)**	**1,839**	**LCB (%Lwl)**	**47,15**	**ZCB (m)**	**-0,054**		
>> lbs	*779*	*w. seawater*	*1025*	*kg/m3*		*>> ft*	*-0,18*		
Cp	**0,566**								
Sf (m2)	**4,15**	**at LCF (m)**	**1,746**	**LCF (%Lwl)**	**44,76**	>>> LCB – LCF (%Lwl)	2,39		
>> ft2	*44,70*	*>> ft*	*5,73*						
Angle Freeboard/Half beam	0,0	(°), at section C4 (40% Lwl)							
Sw (m2)	**4,26**	>Sw/D^(2/3)	8,67						
>> ft2	*45,89*								
Shull (m2)	**9,15**	**at X (m)**	**1,821**	**Z (m)**	**0,057**				
>> ft2	*98,44*	*>> ft*	*5,98*	*>> ft*	*0,19*				
Sdeck (m2)	**6,90**	**at X (m)**	**1,645**	**Z (m)**	**0,45**				
>> ft2	*74,24*	*>> ft*	*5,40*	*>> ft*	*1,47*				

B1.2 Daggerboard

Vol. keel(m3)	**0,01155**	**at X (m)**	**2,201**	**X (%Lwl)**	**56,44**	**Z (m)**	**-0,607**	
		>> ft	*7,22*			*>> ft*	*-1,99*	
Draft oa (m)	**1,30**		**Sw (m2)**	**0,77**		**Sxz (m2)**	**0,37**	
>> ft	*4,27*		*>> ft2*	*8,33*		*>> ft2*	*4,00*	
CLR (m)	**2,25**	**CLR (%Lwl)**	**57,78**	*CLR = Center of Lateral Resistance*				
>> ft	*7,39*	method: keel profile extended to the waterline, CLR at Z 45% draft and					25,00	% chord

B1.3 Rudder

Volume (m3)	**0,00639**	**at X (m)**	**-0,29**	**X (%Lwl)**	**-7,34**	**Z (m)**	**-0,12**	
Sw (m2)	**0,36**	*>> ft*	*-0,94*			**Sxz (m2)**	**0,18**	
>> ft2	*3,92*					*>> ft2*	*1,88*	

B1.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)	**0,36279**	**at LCB (m)**	**1,813**	**LCB (%Lwl)**	**46,49**	**at ZCB (m)**	**-0,072**	
(kg)	**372**	*>> ft*	*5,95*			*>> ft*	*-0,24*	
>> lbs	*820*							
Sw (m2)	**5,40**	>Sw/D^(2/3)	10,62	Lwl/D^(1/3)	5,47			
>> ft2	*58,13*			***DLR***	***175***	*M(lbs/2240)/(Lwl(ft)/100)^3*		

B1.5 Data from the mass spreadsheet

Dinghy with payload M(kg)	**372**	**at Xg (m)**	**1,725**	**Xg (%Lwl)**	**44,24**	**at Zg (m)**	**0,428**
Light boat	272,0		1,779				0,438

Sailplan :

C - Sailplan – early stage definition

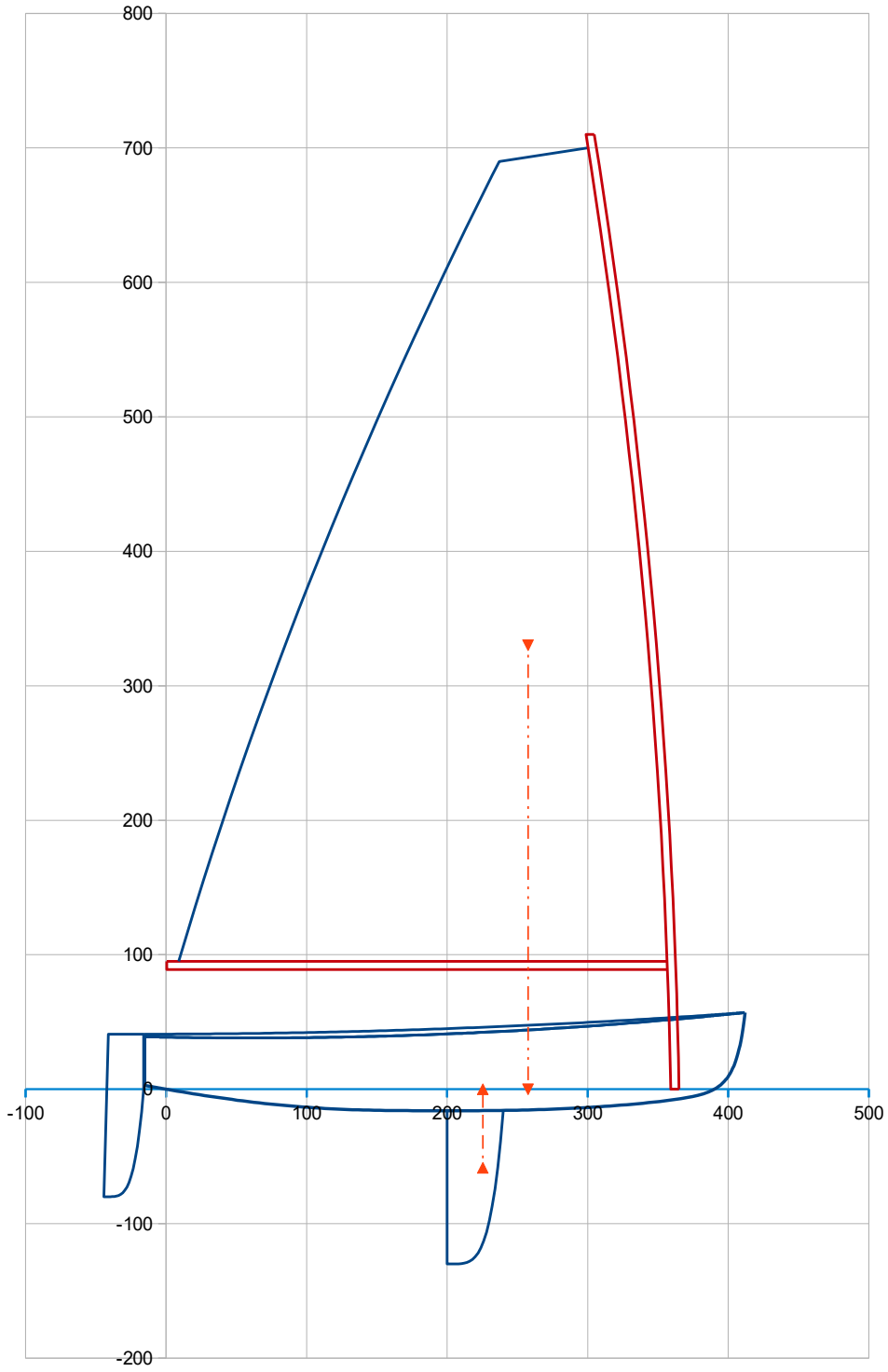
Data to enter		>> in feet
Xmast (m)	3,65	11,98
Zmast (m)	7,10	23,29
Zboom (m)	0,95	3,12
Lboom (m)	3,56	11,68
Z jib (m)	0,00	0,00
Jib overlap	130	%
Mast rake(°)	1,00	

(No jib : put Z jib = 0)

Results for the Sailplan

Main sail (m2)	13,49	Jib (m2)	0,00	>> SA (m2)	13,5	
Lead Xv – Xd (%)	8,3					
Sdaggerboard/Sv (%)	2,76			Spi (m2) ~	0,0	
Srudder/Sv (%)	1,30					
Sv/Sw	2,50					

For Gene-VPP :	SA (m2)	ZCE (m)	Zdeck (m)	Zmast (m)	Main (m2)	Spi (m2)	ZCE spi (m)
(Main + Fore triangle)	13,49	3,30	0,48	7,00	13,49	0,0	3,30



Mass spreasheet - preliminary

D – Mass spreadsheet – Preliminary

Eléments	L m	S m2	V m3	Mass units to enter	Masse (kg)	X (m)	M X	Z (m)	M Z
Hull :									
Hull assuming at unit mass kg/m2		9,15		**14,50**	132,61	1,821	241,528	0,057	7,587
Transom assuming at unit mass kg/m2		0,45		**14,00**	6,28	-0,150	-0,942	0,241	1,516
Deck - benches									
assuming at average unit mass kg/m2		6,90		**11,50**	79,31	1,645	130,451	0,448	35,492
Daggerboard :									
Daggerboard, assuming at kg/m3			0,011547	**500,00**	5,77	2,201	12,709	-0,607	-3,506
Daggerboard trunk, assuming kg				**6,00**	6,00	2,201	13,207	0,180	1,080
Rudder :									
Rudder, assuming kg/m3			0,006386	**500,00**	3,19	-0,286	-0,913	-0,115	-0,368
Rudder-helm system, assuming kg				**4,00**	4,00	-0,143	-0,572	0,260	1,040
Rig and sails :									
Mast >> at kg/m		7,121		**2,00**	14,95	3,319	49,626	3,550	53,086
Boom >> at kg/m		3,560		**1,50**	5,61	1,785	10,008	0,950	5,327
Mainsail at mass in g/m2		13,49		**0,30**	4,25	2,148	9,126	3,302	14,030
Deck & cockpit equipment :									
Various deck equipment, kg of provision				**10,00**	10,00	1,950	19,500	0,390	3,900
Light weight >>>					**272,0**	**1,78**	483,727	**0,44**	119,184

At heel angle 1° and with a crew of 100 kg centered (Y = 0) at X 1,56 m (40% Lwl) and Z 0,65 m, for the computation of GM1°

B4.1 Mass and center of gravity with the input of a load

Data to enter : yellow cells	Mass (kg)	Xg (m)	Zg (m)	Yg (m)	(in the coordinates of the 2D
Boat light weight (kg)	*271,98*	*1,779*	*0,438*	*0*	*from the mass spreadsheet*
Load (kg)	**100,00**	**1,56**	**0,65**	**0,00**	Crew at center
			0,40	**0,75**	Crew at windward
Total >>> Mass (kg)	**371,98**	**1,720**	**0,495**	**0,000**	**Crew at center**
Disp. (m3)	**0,36291**		**0,428**	**0,202**	**Crew at windward**

>>> Computation with heel = 1° and look at the specific pink results :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Height and Trim up to Displacement equality and Xc (LCB

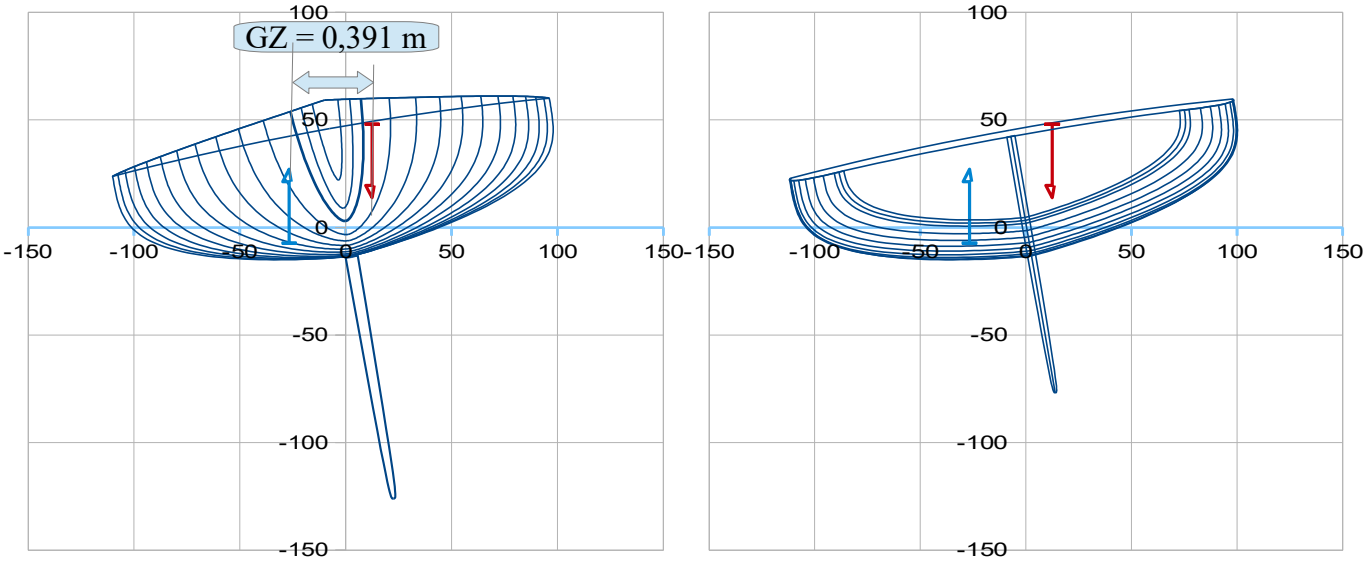
Data to enter : yellow cells		Results				Specific results			
Heel (°)	**1**	**Disp. (m3)**	**0,36291**	**/ Disp. (m3)**	**0,36291**	**Relevant only when heel = 0°**		DLR	172
Height (cm)	**0,1335**	**Xc heel (m)**	**1,720**	**/ Xg (m)**	**1,720**	Lwl (m)	3,92	Z fore (cm)	2,3
Trim (°)	**0,595**	Yc heel (m)	-0,029	Yg heel (m)	0,194	Bwl (m)	1,62	Z aft (cm)	-1,7
		Zc heel (m)	-0,071	**> GZ (m)**	**0,223**	Tc (m)	0,16	Trim (°)	0,60
		Sw heel(m2)	**5,47**	**RM (kN.m)**	**0,814**	Cp Hull	0,554	LCB Hull (%)	46,76
		Bwl heel (m)	**1,62**	**FB mini (cm)**	**35,2**	**Relevant only when heel = 1°**			
		LCB – LCF (%Lwl)	**1,18**	**Obliquity (°)**	**0,6**	Yg heel (m)	-0,009	with crew at center	
						Gz (m)	0,020		
						> GM1° (m)	**1,16**		

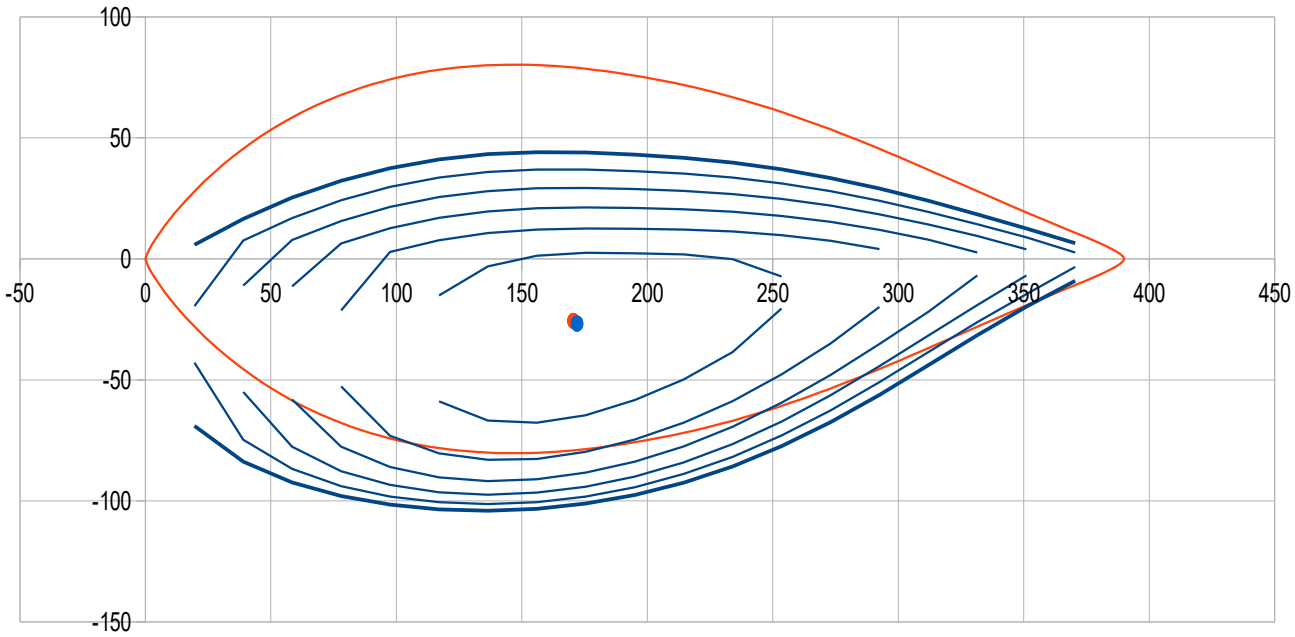
>>> GM1°/ X40% Z65 = 1,16 m

At heel angle 10° and with a crew of 100 kg at windward, at Y 0,75 m and Z 0,40 m , for the computation of the GZ, the righting moment RM and the wetted surface Sw :

B4.2 Computation of the heeled hull : by input of an Heel angle and iteration on Hei					
Data to enter : yellow cells		**Results**			
Heel (°)	**10**	**Disp. (m3)**	**0,36291**	**/ Disp. (m3)**	**0,36291**
Height (cm)	**2,4395**	**Xc heel (m)**	**1,720**	**/ Xg (m)**	**1,720**
Trim (°)	**0,155**	Yc heel (m)	-0,267	Yg heel (m)	0,124
		Zc heel (m)	-0,072	**> GZ (m)**	**0,391**
		Sw heel(m2)	**5,21**	**RM (kN.m)**	**1,429**
		Bwl heel (m)	**1,48**	**FB mini (cm)**	**21,7**
		LCB – LCF (%Lwl)	**0,37**	**Obliquity (°)**	**5,5**

>>> Trim 0,16° ; GZ 0,391 m ; RM 1,429 KN.m ; Sw 5,21 m2





The blue point is the center of buoyancy, the red point is the center of floatation of the heeled hull.