2019-03-14

Canoe hull investigation with Gene-Hull VE Canoe

1) A first serie of canoe hulls is generated with :

As constant input data and geometry :
Loa : 6,165 m ***20,23 ft*** ; Lwl : 6,065 m ***19,898 ft***
Boa : 0,84 m ***33,07 inch*** at 50% Lwl
Sheer line geometry with as free-boards :

Freeboards (m) >	**Aft**	**Midship**	**Fore**
	0,30	**0,23**	**0,35**
>> inch	***11,81***	***9,06***	***13,78***

A flat bottom line

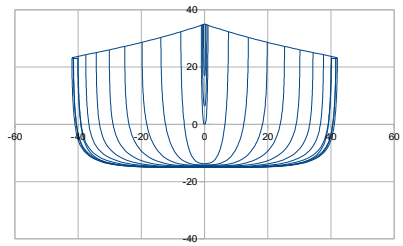
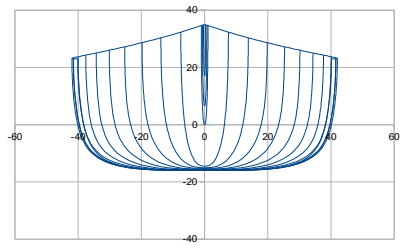
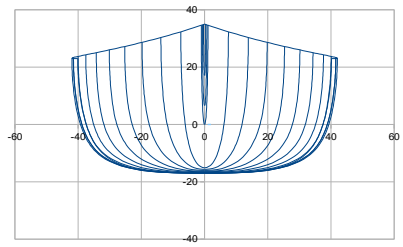
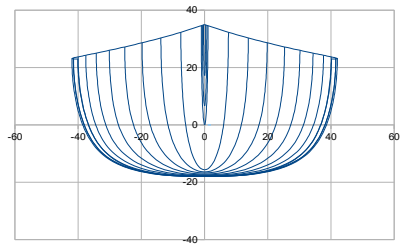
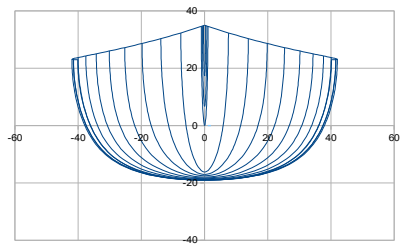
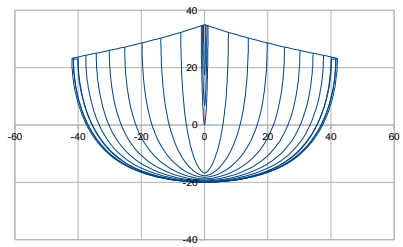
As variable input data :
Hull draft Tc (m) : 0,15 (« C1 » to 0,21 m (« C7 »), step 0,01 m positioned at 50% Lwl

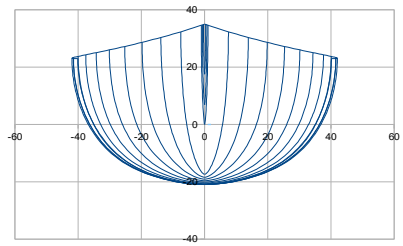
Data on which to converge :
Displacement : 421 kg *928,2 lbs* (with water density 1000 kg/m3)
LCB : at 49% Lwl (from aft perpendicular)
Cp : 61,94

>>> Output data :
Bwl
Half entrance-angle (of the fore waterline, at the inflexion point and at the every end)
Sw hull
GM0,1° ,with assuming this simplified mass spreadsheet (the mass and the Zg of the Canoe bare hull being computed for each case).

Simplified Mass spreadsheet				
	Hull weight unit (kg/m2)	Mass (kg)	Zg (/H0) (m)	Zg (m)
Canoe (kg)	**4,18**	30,90	-0,01	-0,009
Load (kg)		**390,10**	**0,070**	0,070
M tot (kg)		**421,0**		
Zg tot (m)				**0,064**

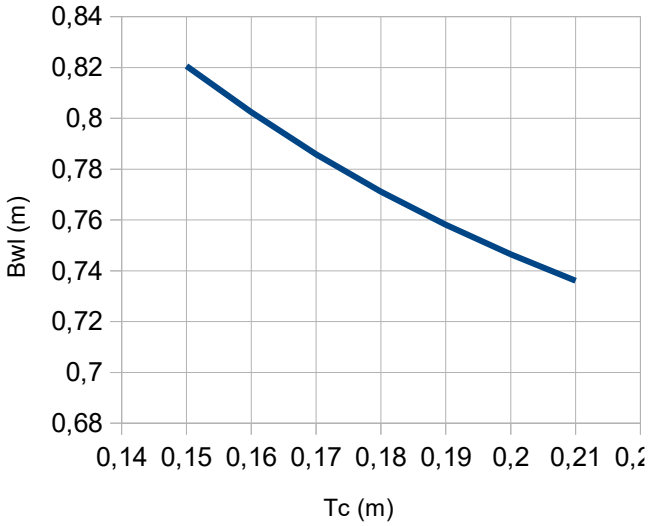
Speed estimation ,with assuming 100 W of net propulsion on calm water and no wind (based Delft series with an estimated reduction factor for the residuary drag due to Lwl/Bwl high value).

Summary table, all with Displacement 421 kg , LCB 49 %Lwl , Cp 61,94	
	**C1 with hull draft Tc = 0,15 m** Bwl : 0,8206 m *32,31 inch* Half entrance-angle : 11,17 ° (at inflexion point) 10,79° (at very end) Sw : 4,22 m2 *45,46 sqft* GM0,1° : 15,4 cm *6,07 inch* Speed (100 W net) : 4,07 Knots
	**C2 with hull draft Tc = 0,16 m** Bwl : 0,8024 m *31,59 inch* Half entrance-angle : 10,95 ° (at inflexion point) 10,58° (at very end) Sw : 4,13 m2 *44,43 sqft* GM0,1° : 13,1 cm *5,17 inch* Speed (100 W net) : 4,11 Knots
	**C3 with hull draft Tc = 0,17 m** Bwl : 0,7858 m *30,94 inch* Half entrance-angle : 10,74 ° (at inflexion point) 10,40° (at very end) Sw : 4,06 m2 *43,74 sqft* GM0,1° : 11,2 cm *4,40 inch* Speed (100 W net) : 4,15 Knots
	**C4 with hull draft Tc = 0,18 m** Bwl : 0,7711 m *30,36 inch* Half entrance-angle : 10,56 ° (at inflexion point) 10,24° (at very end) Sw : 4,02 m2 *43,29 sqft* GM0,1° : 9,5 cm *3,73 inch* Speed (100 W net) : 4,18 Knots
	**C5 with hull draft Tc = 0,19 m** Bwl : 0,7581 m *29,85 inch* Half entrance-angle : 10,39 ° (at inflexion point) 10,08° (at very end) Sw : 4,00 m2 *43,01 sqft* GM0,1° : 8,0 cm *3,16 inch* Speed (100 W net) : 4,21 Knots
	**C6 with hull draft Tc = 0,20 m** Bwl : 0,7465 m *29,39 inch* Half entrance-angle : 10,23 ° (at inflexion point) 9,94° (at very end) Sw : 3,98 m2 *42,89 sqft* GM0,1° : 6,8 cm *2,66 inch* Speed (100 W net) : 4,23 Knots
	C7 with hull draft Tc = 0,21 m

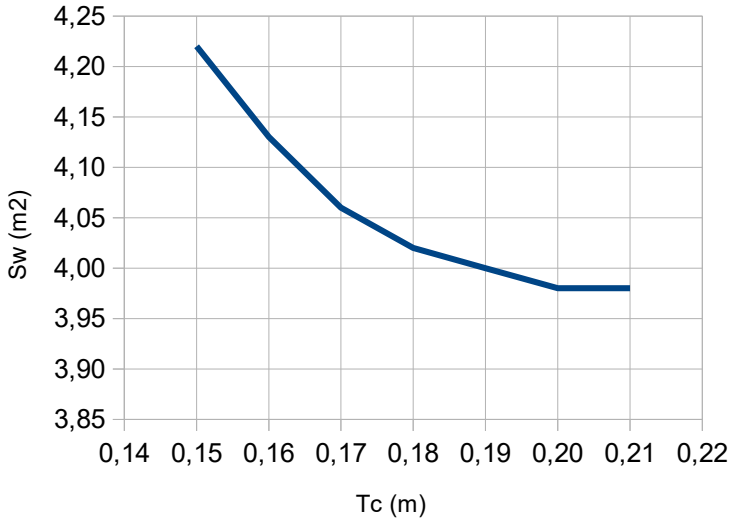


Bwl : 0,7361 m *28,98 inch*
Half entrance-angle : 10,09 ° (at inflexion point)
9,82° (at very end)
Sw : 3,98 m2 *42,89 sqft*
GM0,1° : 5,6 cm *2,21 inch*
Speed (100 W net) : 4,24 Knots

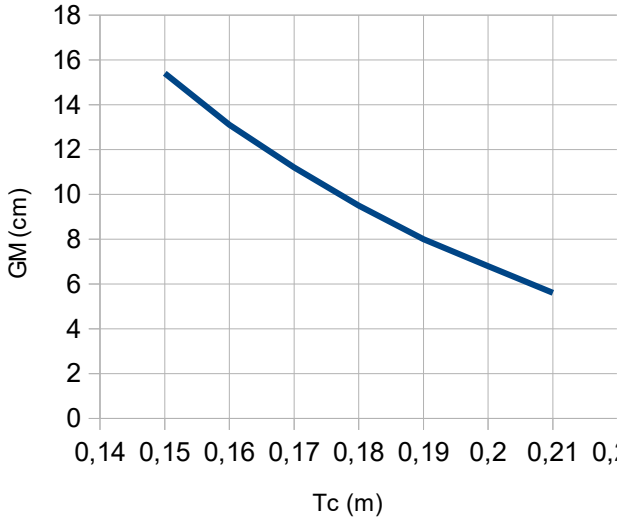
Bwl versus Tc



Sw versus Tc

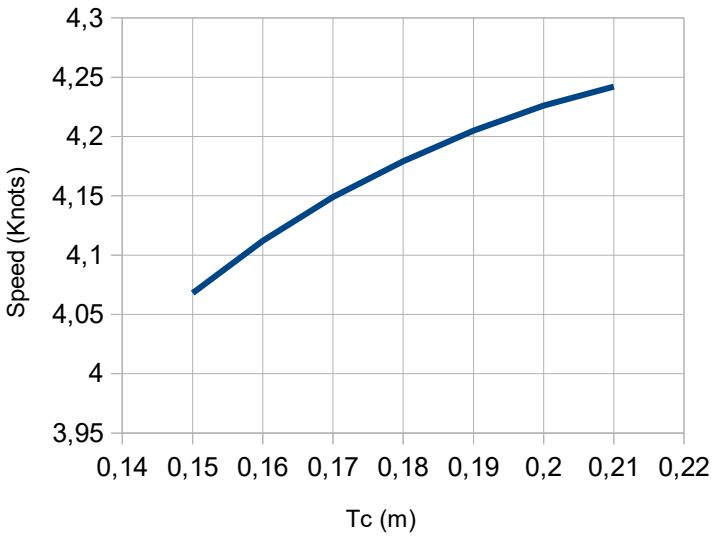


GM versus Tc



Speed estimation versus Tc

with 100W net propulsion



2) <u>A second serie of canoe hulls is generated, crossing the previous one at case C3, by fixing Bwl (0,7858 m) and by varying the hull draft still at same Displacement 421 kg , LCB 49 %Lwl and Cp 61,94.</u>

As constant input data and geometry :
Loa : 6,165 m ***20,23 ft*** ; Lwl : 6,065 m ***19,898 ft***
Boa : 0,84 m ***33,07 inch*** at 50% Lwl
Bwl : 0,7858 m *30,94 inch*
Sheer line geometry with as free-boards :

Freeboards (m) >	**Aft**	**Midship**	**Fore**
	0,30	**0,23**	**0,35**
>> inch	***11,81***	***9,06***	***13,78***

A flat bottom line

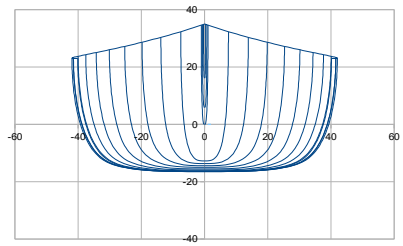
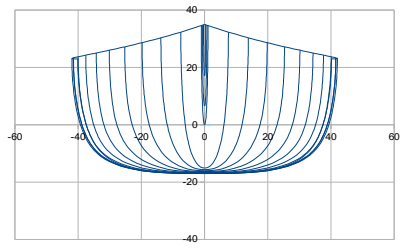
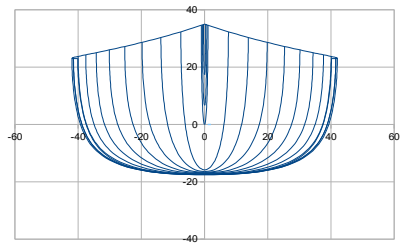
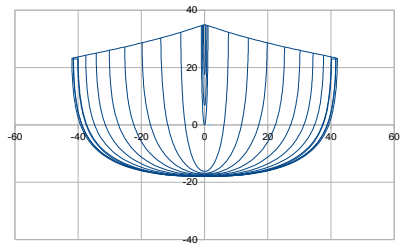
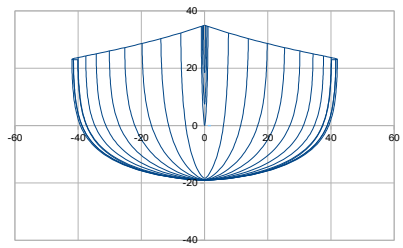
As variable input data :
Hull draft Tc (m) : 0,165, 0,170 (C3 case), 0,175, 0,180 , 0,190 positioned at 50% Lwl

Data on which to converge :
Displacement : 421 kg *928,2 lbs* (with water density 1000 kg/m3)
LCB : at 49% Lwl (from aft perpendicular)
Cp : 61,94

>>> Output data :
Half entrance-angle (of the fore waterline, at the inflexion point and at the every end)
Sw hull
GM0,1° ,with assuming this simplified mass spreadsheet (the mass and the Zg of the Canoe bare hull being computed for each case).

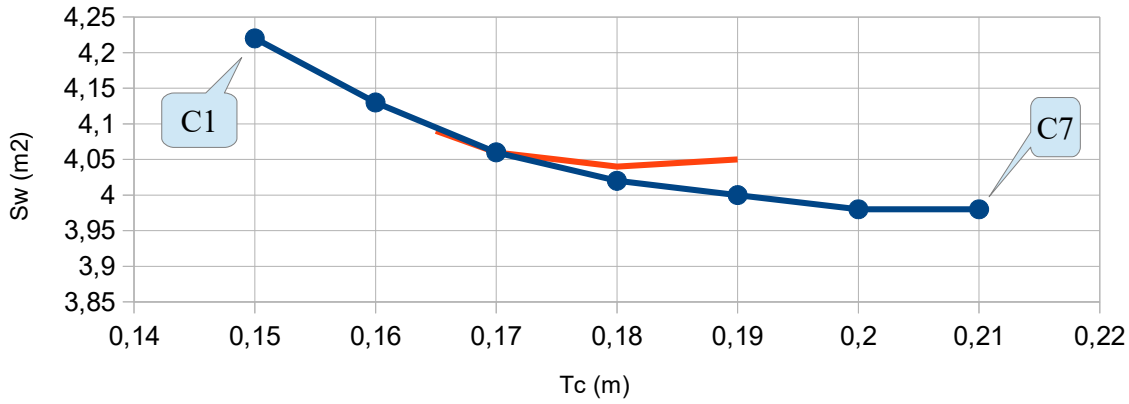
Simplified Mass spreadsheet				
	Hull weight unit (kg/m2)	Mass (kg)	Zg (/H0) (m)	Zg (m)
Canoe (kg)	**4,18**	30,90	-0,01	-0,009
Load (kg)		**390,10**	**0,070**	0,070
M tot (kg)		**421,0**		
Zg tot (m)				**0,064**

Speed estimation ,with assuming 100 W of net propulsion on calm water and no wind (based Delft series with an estimated reduction factor for the residuary drag due to Lwl/Bwl high value).

Summary table, all with Displacement 421 kg , LCB 49 %Lwl , Cp 61,94	
	**Bwl = 0,7858 m and Tc = 0,165 m** Half entrance-angle : 10,92 ° (at inflexion point) 10,85° (at very end) Sw : 4,09 m2 *44,00 sqft* GM0,1° : 11,4 cm *6,07 inch* Speed (100 W net) : 4,141 Knots
	**Bwl = 0,7858 m and Tc = 0,170 m (previous case C3)** Half entrance-angle : 10,74 ° (at inflexion point) 10,40° (at very end) Sw : 4,06 m2 *43,74 sqft* GM0,1° : 11,2 cm *4,40 inch* Speed (100 W net) : 4,149 Knots
	**Bwl = 0,7858 m and Tc = 0,175 m** Half entrance-angle : 10,51 ° (at inflexion point) 10,33° (at very end) Sw : 4,05 m2 *43,60 sqft* GM0,1° : 10,9 cm *4,29 inch* Speed (100 W net) : 4,154 Knots
	**Bwl = 0,7858 m and Tc = 0,180 m** Half entrance-angle : 10,33 ° (at inflexion point) 10,29° (at very end) Sw : 4,04 m2 *43,45 sqft* GM0,1° : 10,6 cm *4,18 inch* Speed (100 W net) : 4,160 Knots
	**Bwl = 0,7858 m and Tc = 0,190 m** Half entrance-angle : 10,17 ° (at inflexion point) 10,07° (at very end) Sw : 4,05 m2 *43,55 sqft* GM0,1° : 10,2 cm *4,02 inch* Speed (100 W net) : 4,163 Knots

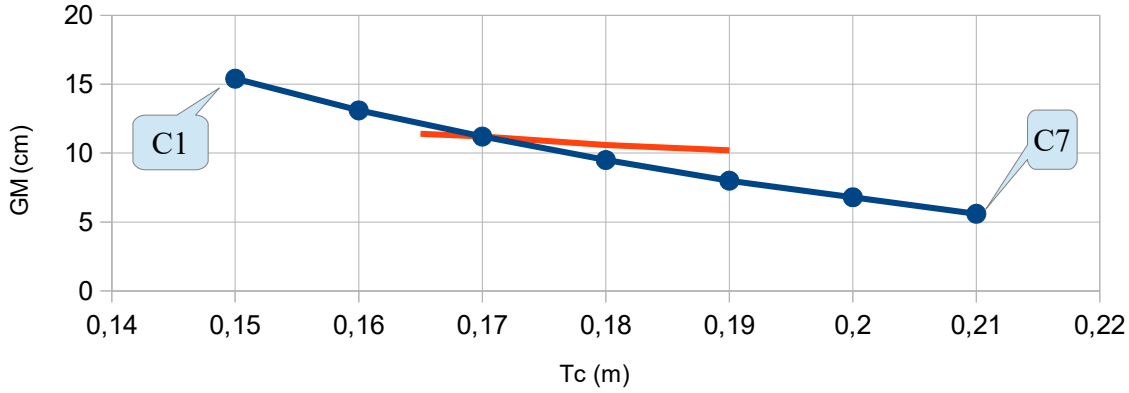
Sw versus Tc

Blue : 1st serie ; Red : 2nd serie with Bwl fixed at 0,7858 m



GM versus Tc

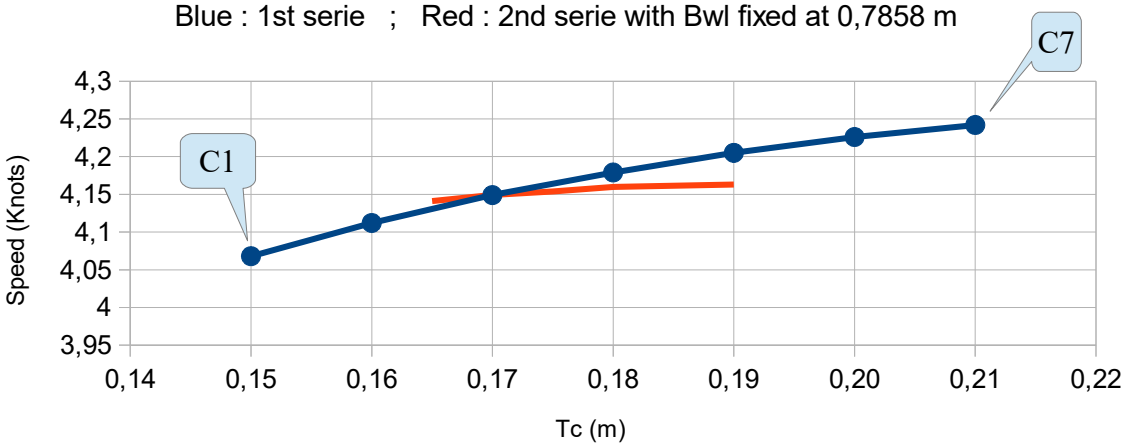
Blue : 1st serie ; Red : 2nd serie with Bwl fixed at 0,7858 m

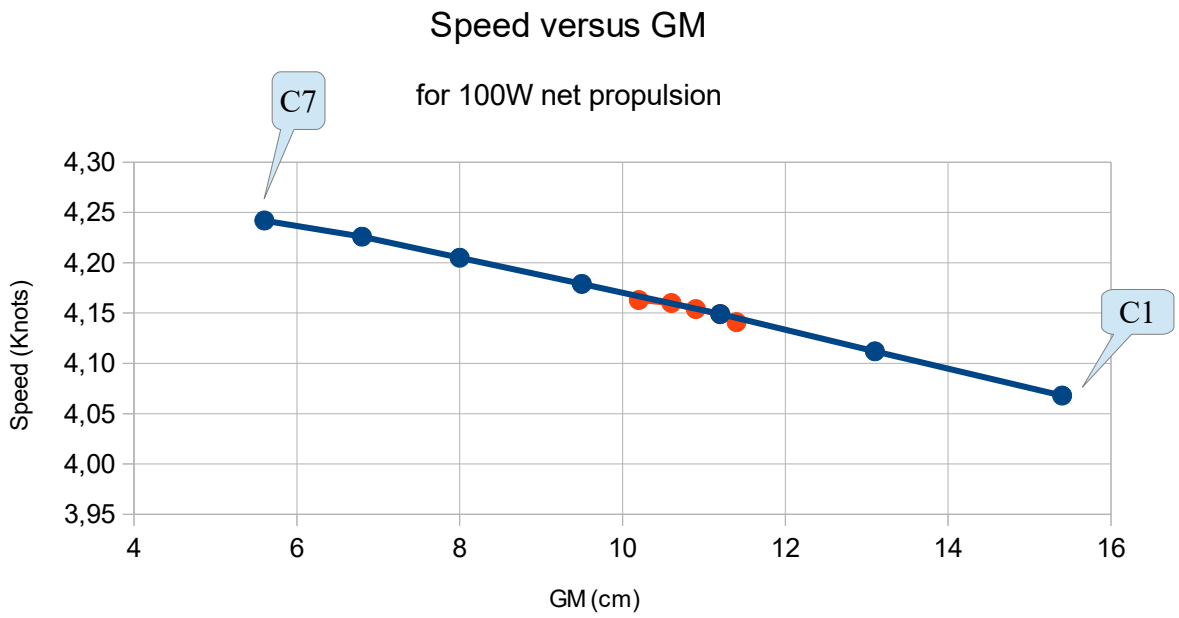


Speed estimation versus Tc

with 100W net propulsion

Blue : 1st serie ; Red : 2nd serie with Bwl fixed at 0,7858 m





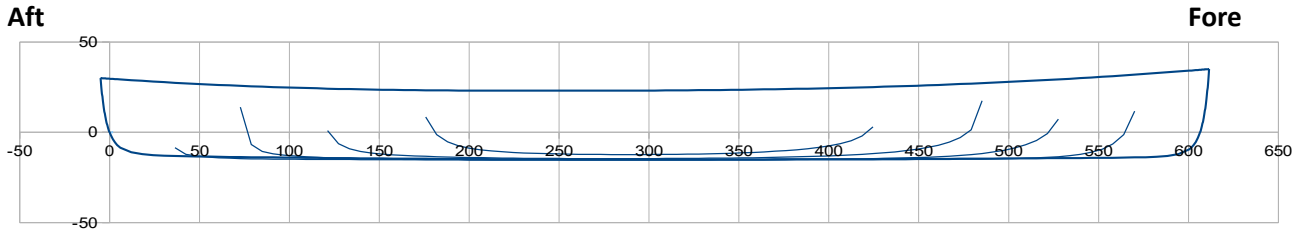
Comment : this last figure shows that there is a strong relation between stability GM and speed potential, all the points from the 2 series are on a same curve. Meaning in particular that the search for an optimum by varying such or such parameter does not lead necessarly to a better solution when the increase of the speed is at the cost of a decrease of the GM. At the end, one cannot avoid the trade off GM / speed.

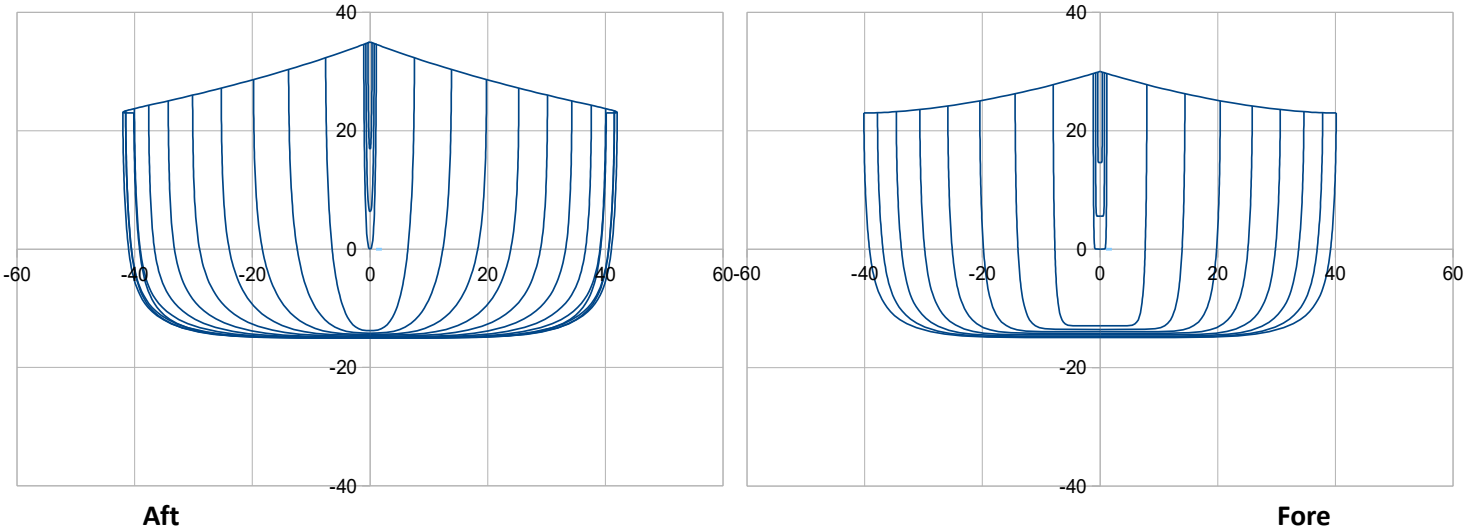
Annexes : output data and linesplan of the cases

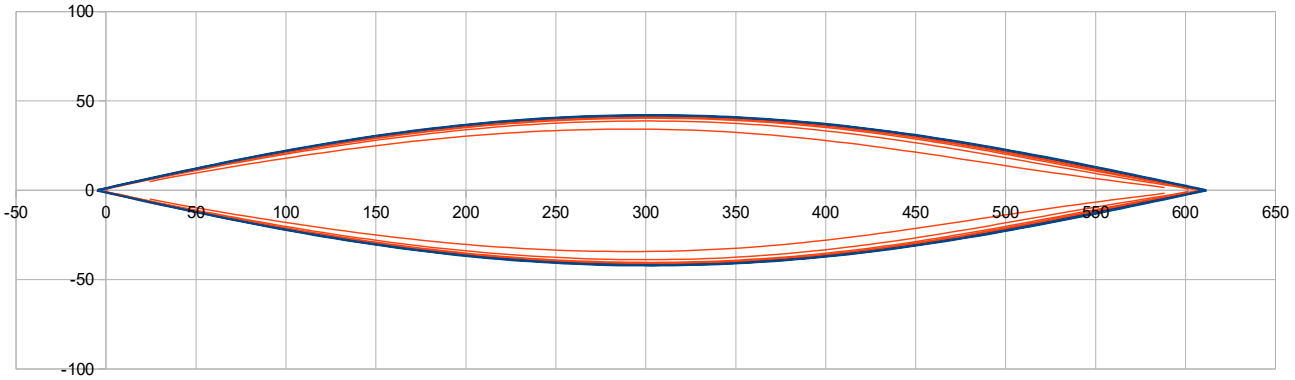
C1 , with Tc = 0,15 m :

Hull

Loa (m)	6,165	Lwl (m)	6,065	> Lwl/D^(1/3)	8,09				
>> ft	*20,23*	*>> ft*	*19,898*	*DLR*	*53*				
B (m)	0,840	at X (% Lwl)	50,0						
>> inch	*33,07*								
Bwl (m)	0,8206	at X (% Lwl)	50,0	> Bwl / B	0,977	Bwl/Loa	0,13311		
>> inch	*32,31*					Freeboards (m) >	Aft	Midship	Fore
Tc (m)	0,15	at X (%Lwl)	50				0,30	0,23	0,35
>> feet	*0,492*					*>> inch*	*11,81*	*9,06*	*13,78*
Displacement	at H0 (m3)	0,42100	at Xc (m)	2,972	Xc (%Lwl)	49,00	Zc (m)	-0,069	
	(kg)	421,00	*>> ft*	*9,75*			*>> inch*	*-2,70*	
	>> lbs	*928,2*	*with water mass / vol. of*		*1000*	*kg/m3*			
Cp (%)	61,94								
Sf (m2)	3,21	at Xf (m)	3,003	Xf (%Lwl)	49,51	>>> Xc – Xf (%Lwl)	-0,51		
>> ft2	*34,54*	*>> ft*	*9,85*						
Angle immersed sheer li (°)		29,8	at section C4 (40% Lwl)		Half entrance-angle (°)		11,17	at inflexion point	
Sw (m2)	4,22	>Sw/D^(2/3)	7,52				10,79	at very end	
>> ft2	*45,46*								
Shull (m2)	7,39	at X (m)	304,33	Z (m)	-0,01				
>> ft2	*79,57*	*>> ft*	*998,47*	*>> ft*	*-0,03*				





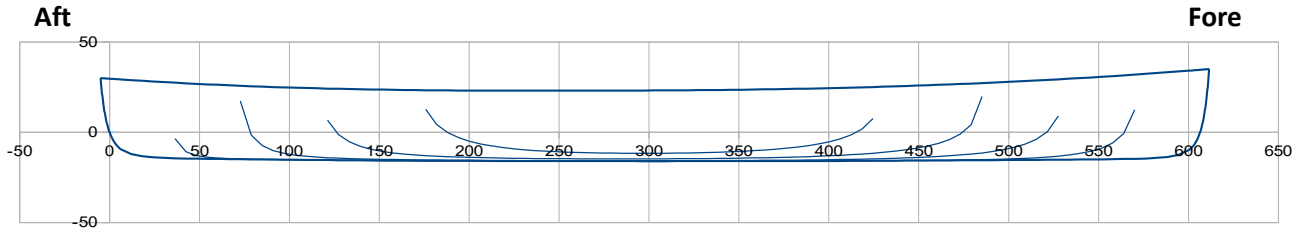


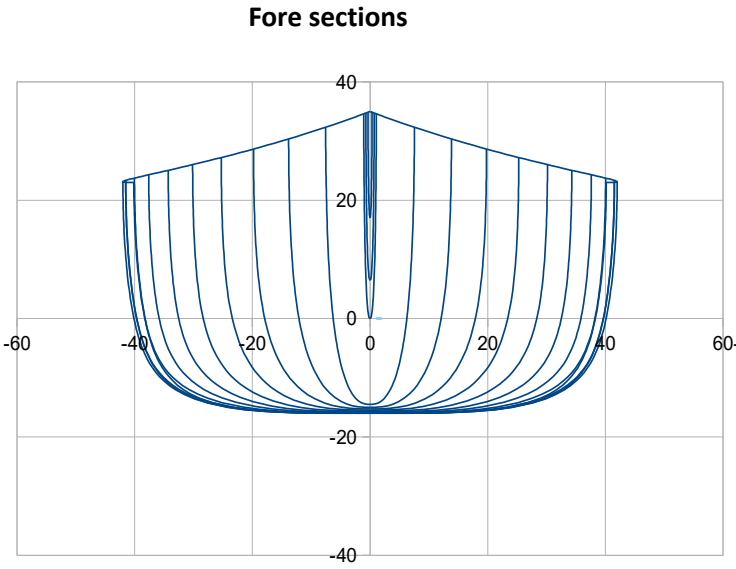
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42100**	**Disp tot(m3)**	**0,42100**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42101**	>> Lwl (m)	6,064	>> Bwl (m)	0,819
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,150
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,07	/ Zc Heel 0°	-0,07	>> GZ (m)	0,0003
		>> Sw (m2)	4,22	/ Sw Heel 0°	4,22	**GM (cm)**	**15,4**
						(inch)	*6,07*

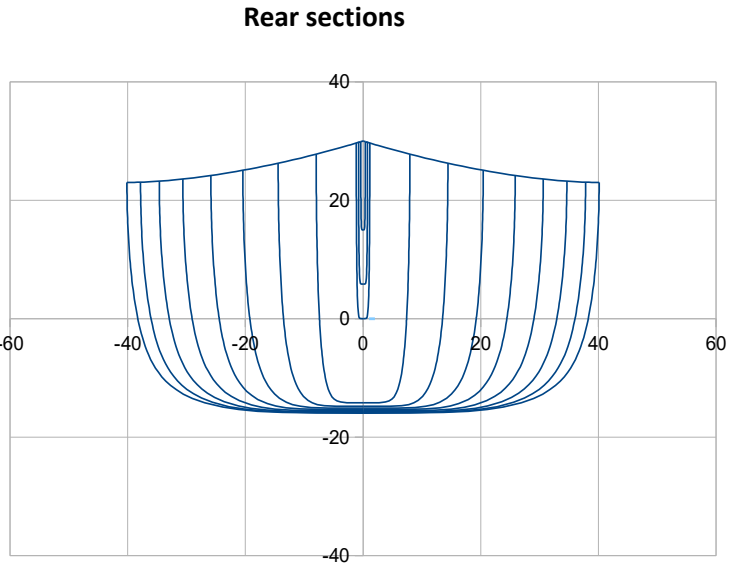
C2 , with Tc = 0,16 m :

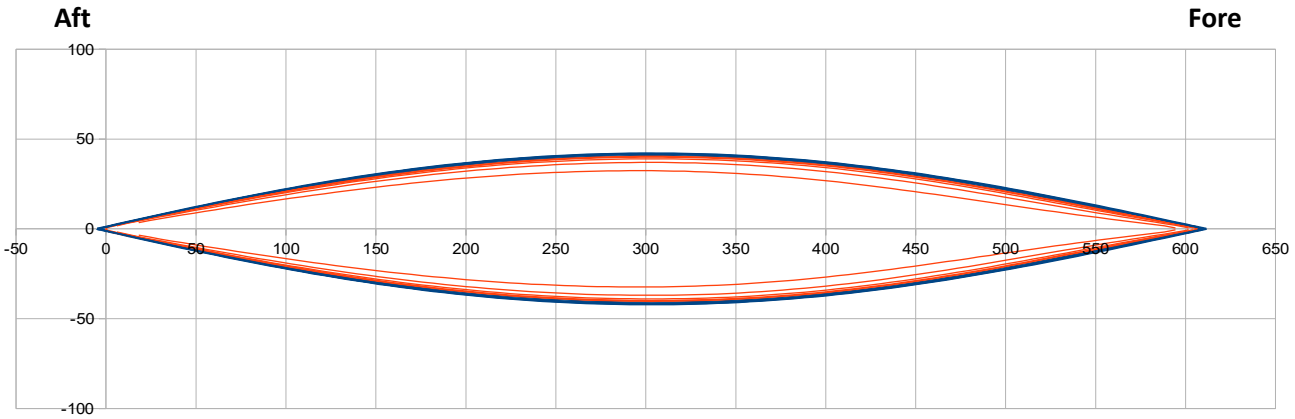
Hull

Loa (m)	**6,165**	**Lwl (m)**	**6,065**	> Lwl/D^(1/3)	8,09				
>> ft	***20,23***	***>> ft***	***19,898***	*DLR*	*53*				
B (m)	**0,840**	**at X (% Lwl)**	**50,0**						
>> inch	***33,07***								
Bwl (m)	**0,8024**	**at X (% Lwl)**	**50,0**	> Bwl / B	0,955	Bwl/Loa	0,13016		
>> inch	***31,59***				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,16**	**at X (%Lwl)**	**50**			**0,30**	**0,23**	**0,35**	
>> feet	***0,525***				***>> inch***	***11,81***	***9,06***	***13,78***	
Displacement	**at H0 (m3)**	**0,42100**	**at Xc (m)**	**2,972**	**Xc (%Lwl)**	**49,00**	**Zc (m)**	**-0,072**	
	(kg)	**421,00**	*>> ft*	*9,75*			*>> inch*	*-2,82*	
	>> lbs	***928,2***	*with water mass / vol. of*		*1000*	*kg/m3*			
Cp (%)	**61,94**								
Sf (m2)	**3,13**	**at Xf (m)**	**3,006**	**Xf (%Lwl)**	**49,56**	>>> Xc – Xf (%Lwl)		-0,56	
>> ft2	*33,72*	*>> ft*	*9,86*						
Angle immersed sheer li (°)		**29,8**	at section C4 (40% Lwl)		**Half entrance-angle (°)**		**10,95**	at inflexion point	
Sw (m2)	**4,13**	>Sw/D^(2/3)	7,35				**10,58**	at very end	
>> ft2	*44,43*								
Shull (m2)	**7,30**	**at X (m)**	**304,90**	**Z (m)**	**-0,01**				
>> ft2	*78,60*	*>> ft*	*1000,32*	*>> ft*	*-0,03*				







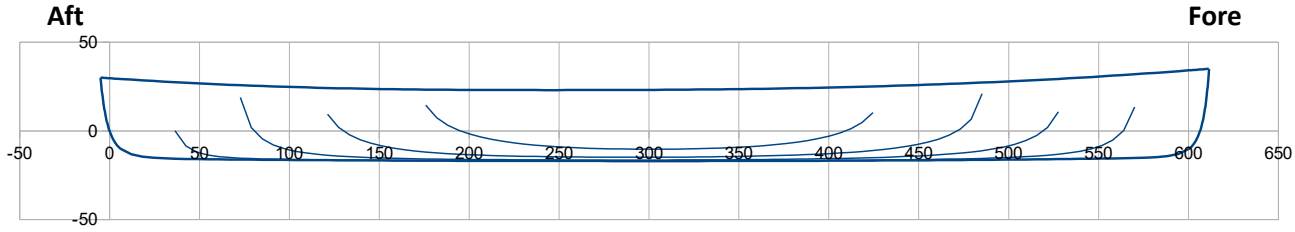


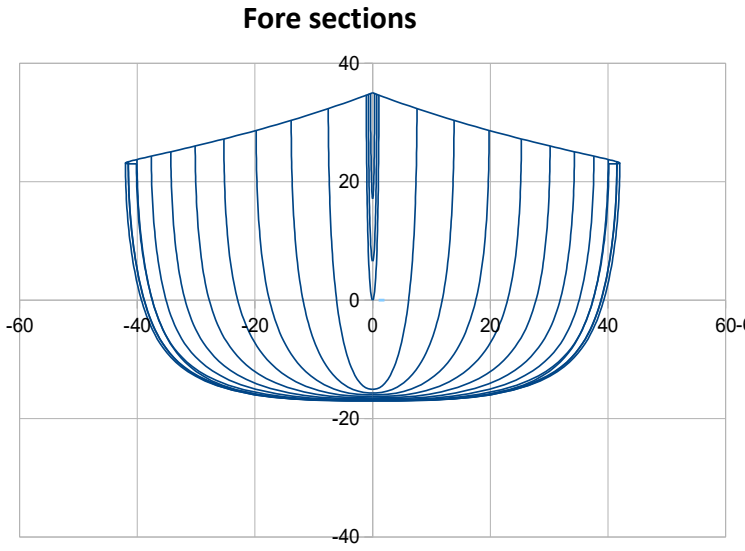
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42100**	**Disp tot(m3)**	**0,42100**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42100**	>> Lwl (m)	6,064	>> Bwl (m)	0,801
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,160
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,07	/ Zc Heel 0°	-0,07	>> GZ (m)	0,0002
		>> Sw (m2)	4,13	/ Sw Heel 0°	4,13	**GM (cm)**	**13,1**
						(inch)	*5,17*

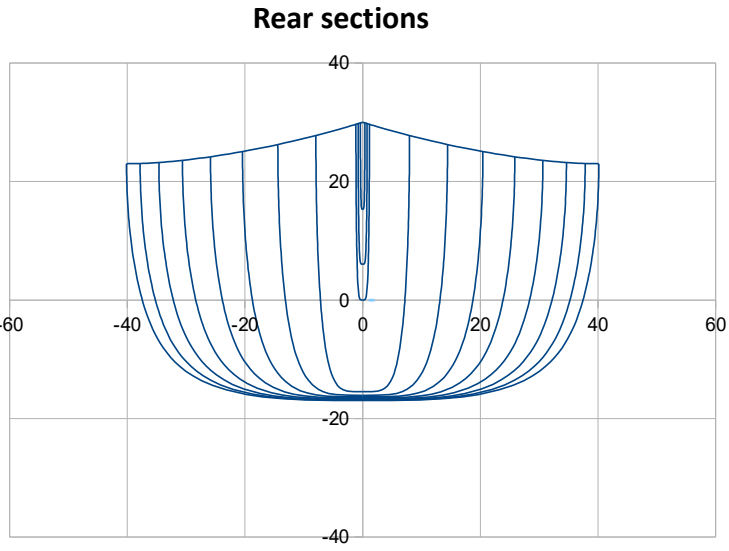
C3 , with Tc = 0,17 m (the case with also Bwl = 0,7858 m)

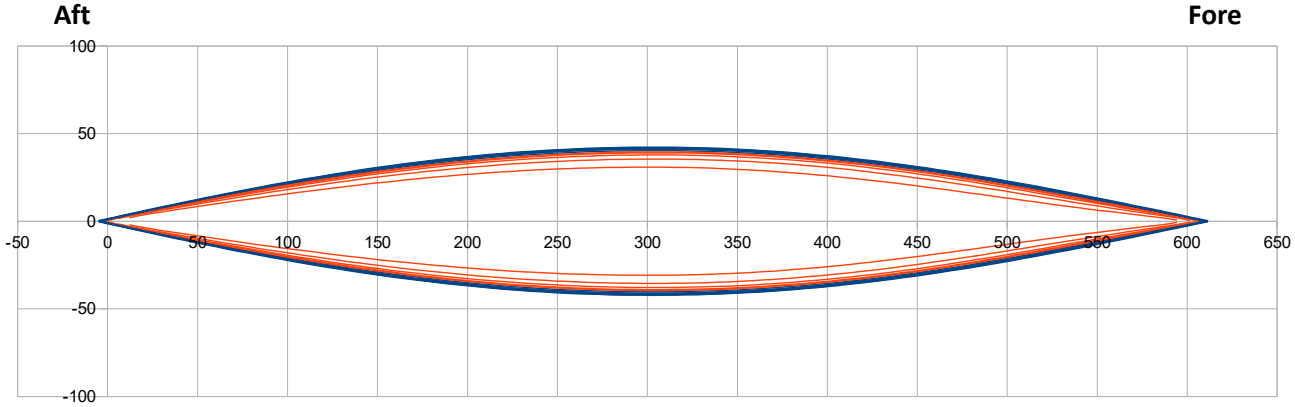
Hull

Loa (m)	**6,165**	**Lwl (m)**	**6,065**	> Lwl/D^(1/3)	8,09				
>> ft	***20,23***	***>> ft***	***19,898***	*DLR*	*53*				
B (m)	**0,840**	**at X (% Lwl)**	**50,0**						
>> inch	***33,07***								
Bwl (m)	**0,7858**	**at X (% Lwl)**	**50,0**	> Bwl / B	0,935	Bwl/Loa	0,12746		
>> inch	***30,94***				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,17**	**at X (%Lwl)**	**50**			**0,30**	**0,23**	**0,35**	
>> feet	***0,558***				***>> inch***	***11,81***	***9,06***	***13,78***	
Displacement	**at H0 (m3)**	**0,42100**	**at Xc (m)**	**2,972**	**Xc (%Lwl)**	**49,00**	**Zc (m)**	**-0,075**	
	(kg)	**421,00**	*>> ft*	*9,75*			*>> inch*	*-2,93*	
	>> lbs	***928,1***	*with water mass / vol. of*		*1000*	*kg/m3*			
Cp (%)	**61,94**								
Sf (m2)	**3,06**	**at Xf (m)**	**3,008**	**Xf (%Lwl)**	**49,60**	>>> Xc – Xf (%Lwl)		-0,60	
>> ft2	*32,99*	*>> ft*	*9,87*						
Angle immersed sheer li (°)		**29,8**	at section C4 (40% Lwl)		**Half entrance-angle (°)**		**10,74**	at inflexion point	
Sw (m2)	**4,06**	>Sw/D^(2/3)	7,23				**10,40**	at very end	
>> ft2	*43,74*								
Shull (m2)	**7,25**	**at X (m)**	**305,17**	**Z (m)**	**-0,01**				
>> ft2	*77,99*	*>> ft*	*1001,20*	*>> ft*	*-0,03*				





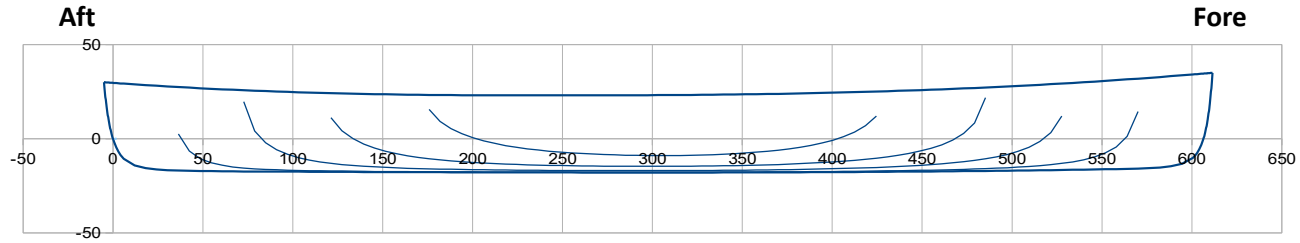


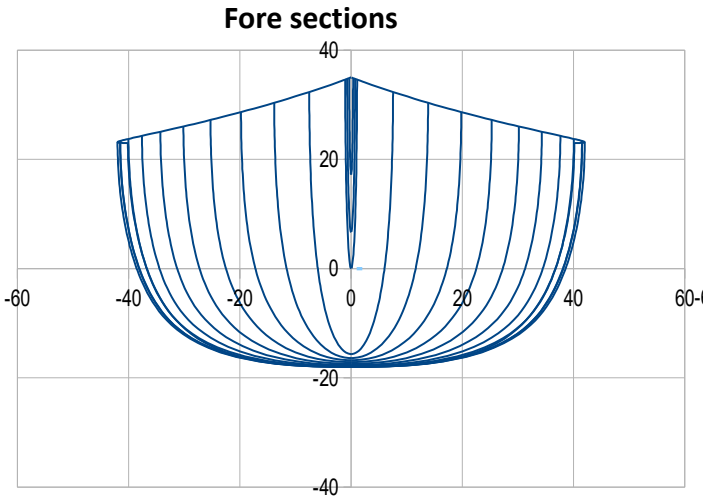


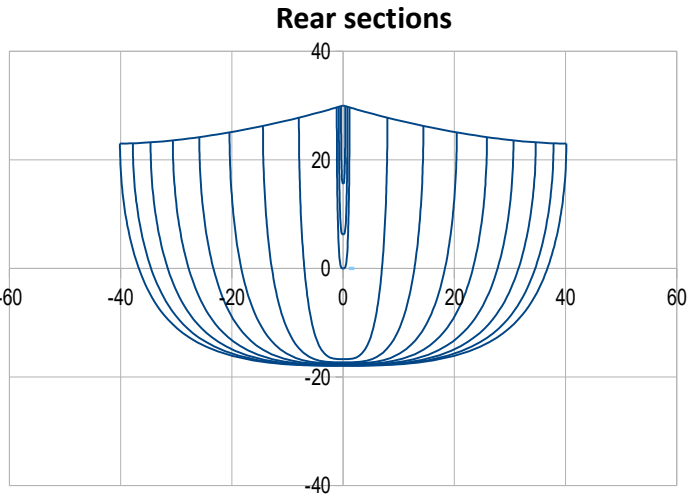
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42100**	**Disp tot(m3)**	**0,42100**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42100**	>> Lwl (m)	6,064	>> Bwl (m)	0,784
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,170
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,07	/ Zc Heel 0°	-0,07	>> GZ (m)	0,0002
		>> Sw (m2)	4,06	/ Sw Heel 0°	4,06	**GM (cm)**	**11,2**
						(inch)	*4,40*

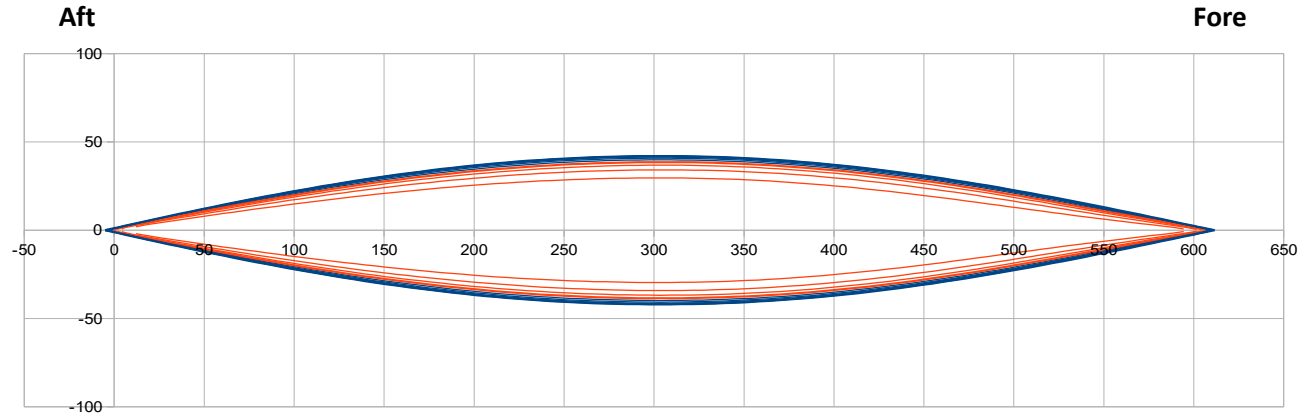
C4 , with Tc = 0,18 m :

Hull									
Loa (m)	6,165	Lwl (m)	6,065	> Lwl/D^(1/3)	8,09				
>> ft	20,23	>> ft	19,898	DLR	53				
B (m)	0,840	at X (% Lwl)	50,0						
>> inch	33,07								
Bwl (m)	0,7711	at X (% Lwl)	50,0	> Bwl / B	0,918	Bwl/Loa	0,12508		
>> inch	30,36					Freeboards (m) >	Aft	Midship	Fore
Tc (m)	0,18	at X (%Lwl)	50				0,30	0,23	0,35
>> feet	0,591					>> inch	11,81	9,06	13,78
Displacement	at H0 (m3)	0,42100	at Xc (m)	2,972	Xc (%Lwl)	49,01		Zc (m)	-0,077
	(kg)	421,00	>> ft	9,75				>> inch	-3,04
	>> lbs	928,1	with water mass / vol. of		1000	kg/m3			
Cp (%)	61,94								
Sf (m2)	3,00	at Xf (m)	3,010	Xf (%Lwl)	49,62	>>> Xc – Xf (%Lwl)		-0,62	
>> ft2	32,34	>> ft	9,87						
Angle immersed sheer li (°)		29,8	at section C4 (40% Lwl)			Half entrance-angle (°)		10,56	at inflexion point
Sw (m2)	4,02	>Sw/D^(2/3)	7,16					10,24	at very end
>> ft2	43,29								
Shull (m2)	7,21	at X (m)	305,28	Z (m)	-0,01				
>> ft2	77,62	>> ft	1001,59	>> ft	-0,04				





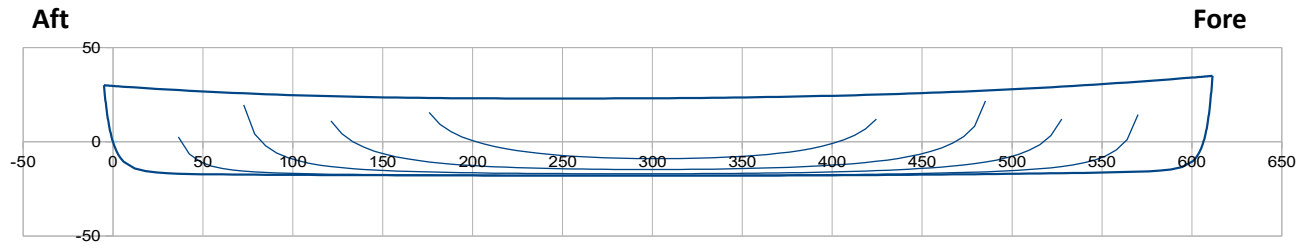


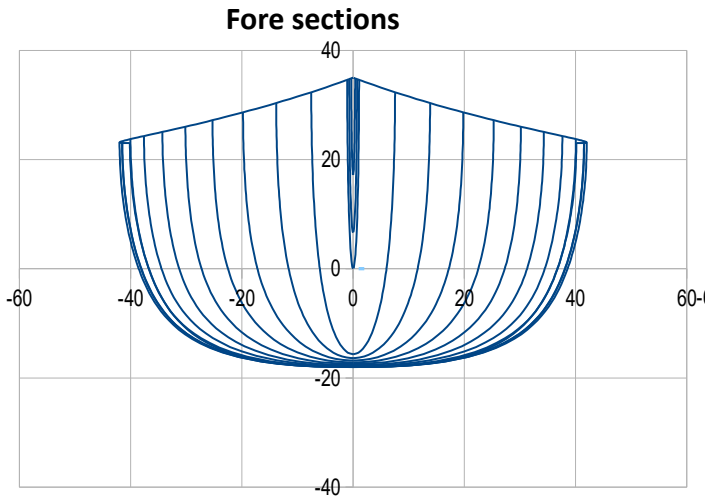


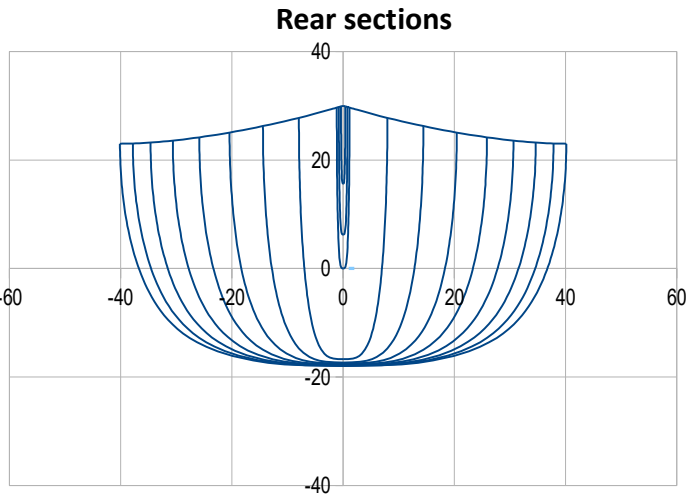
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42100**	**Disp tot(m3)**	**0,42100**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42100**	>> Lwl (m)	6,064	>> Bwl (m)	0,769
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,180
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,08	/ Zc Heel 0°	-0,08	>> GZ (m)	0,0002
		>> Sw (m2)	4,02	/ Sw Heel 0°	4,02	**GM (cm)**	**9,5**
						(inch)	*3,73*

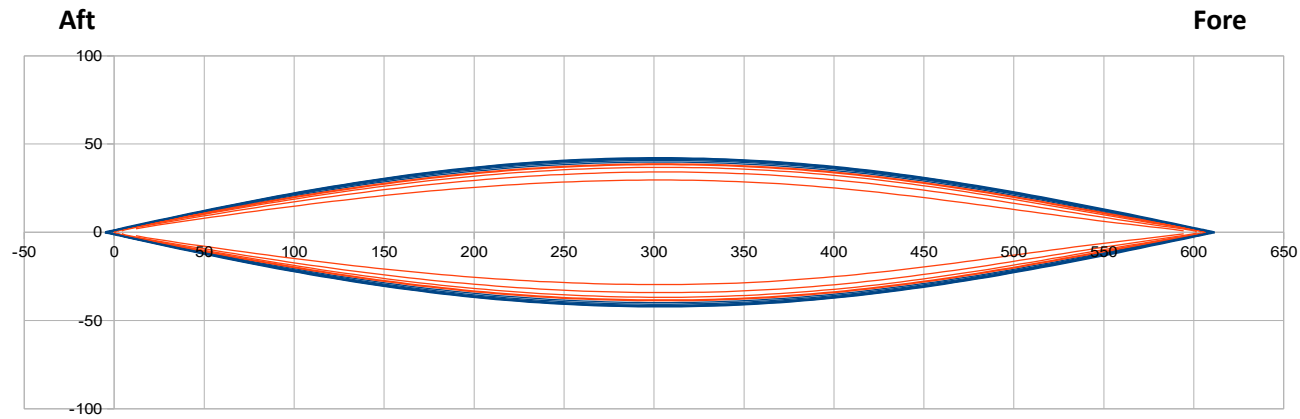
C5 , with Tc = 0,19 m :

Hull									
Loa (m)	6,165	Lwl (m)	6,065	> Lwl/D^(1/3)	8,09				
>> ft	20,23	>> ft	19,898	DLR	53				
B (m)	0,840	at X (% Lwl)	50,0						
>> inch	33,07								
Bwl (m)	0,7581	at X (% Lwl)	50,0	> Bwl / B	0,902	Bwl/Loa	0,12297		
>> inch	29,85				Freeboards (m) >	Aft	Midship	Fore	
Tc (m)	0,19	at X (%Lwl)	50			0,30	0,23	0,35	
>> feet	0,623				>> inch	11,81	9,06	13,78	
Displacement	at H0 (m3)	0,42100	at Xc (m)	2,972	Xc (%Lwl)	49,00	Zc (m)	-0,080	
	(kg)	421,00	>> ft	9,75			>> inch	-3,15	
	>> lbs	928,2	with water mass / vol. of		1000	kg/m3			
Cp (%)	61,94								
Sf (m2)	2,95	at Xf (m)	3,011	Xf (%Lwl)	49,64	>>> Xc – Xf (%Lwl)		-0,64	
>> ft2	31,76	>> ft	9,88						
Angle immersed sheer li (°)		29,8	at section C4 (40% Lwl)		Half entrance-angle (°)		10,39	at inflexion point	
Sw (m2)	4,00	>Sw/D^(2/3)	7,11				10,08	at very end	
>> ft2	43,01								
Shull (m2)	7,19	at X (m)	305,25	Z (m)	-0,01				
>> ft2	77,44	>> ft	1001,48	>> ft	-0,04				





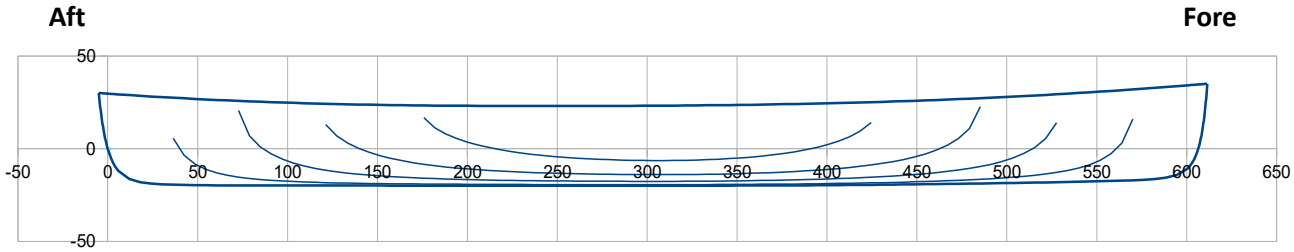


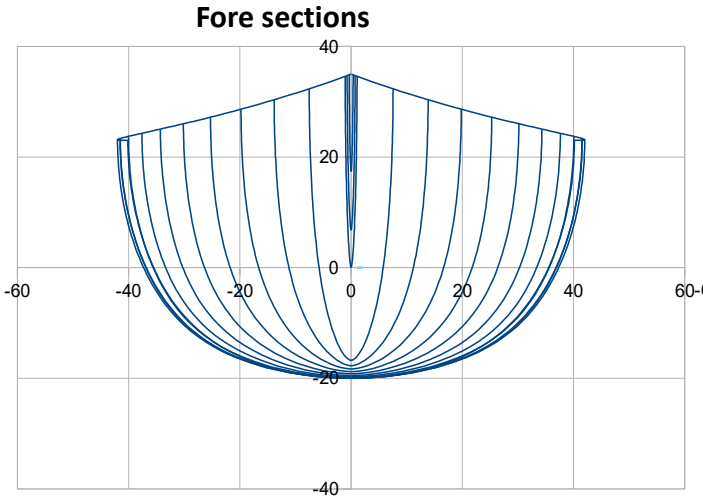


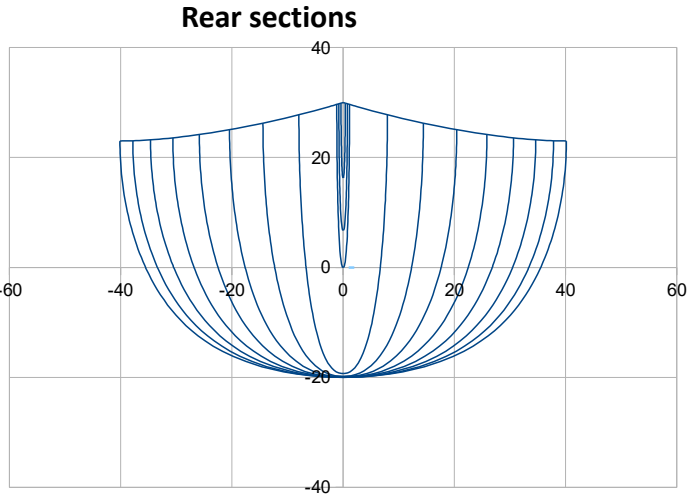
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42100**	**Disp tot(m3)**	**0,42100**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42100**	>> Lwl (m)	6,064	>> Bwl (m)	0,756
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,190
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,08	/ Zc Heel 0°	-0,08	>> GZ (m)	0,0001
		>> Sw (m2)	4,00	/ Sw Heel 0°	4,00	**GM (cm)**	**8,0**
						(inch)	*3,16*

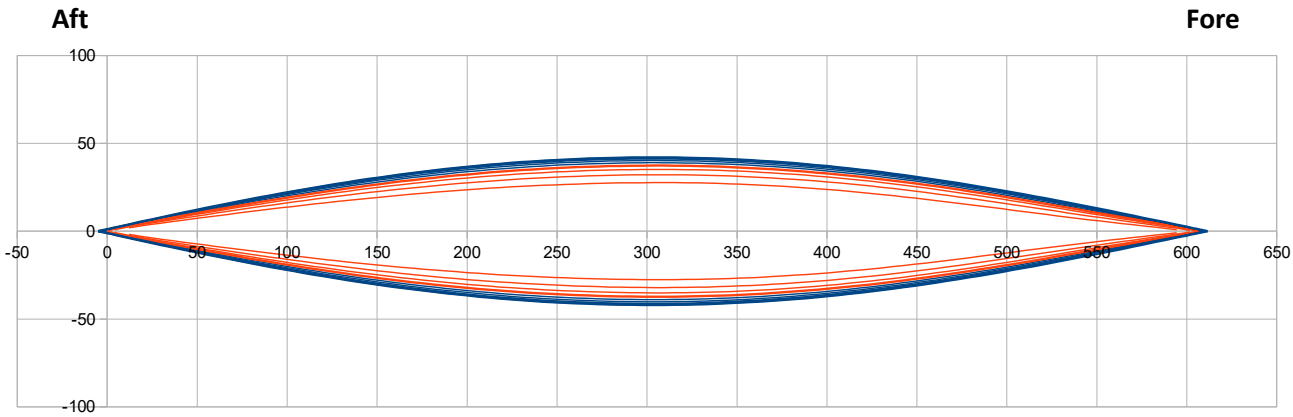
C6 , with Tc = 0,20 m :

Hull									
Loa (m)	6,165	Lwl (m)	6,065	> Lwl/D^(1/3)	8,09				
>> ft	20,23	>> ft	19,898	DLR	53				
B (m)	0,840	at X (% Lwl)	50,0						
>> inch	33,07								
Bwl (m)	0,7465	at X (% Lwl)	50,0	> Bwl / B	0,889	Bwl/Loa	0,12108		
>> inch	29,39				Freeboards (m) >	Aft	Midship	Fore	
Tc (m)	0,2	at X (%Lwl)	50			0,30	0,23	0,35	
>> feet	0,656				>> inch	11,81	9,06	13,78	
Displacement	at H0 (m3)	0,42100	at Xc (m)	2,972	Xc (%Lwl)	49,00	Zc (m)	-0,082	
	(kg)	421,00	>> ft	9,75			>> inch	-3,24	
	>> lbs	928,1	with water mass / vol. of		1000	kg/m3			
Cp (%)	61,94								
Sf (m2)	2,90	at Xf (m)	3,011	Xf (%Lwl)	49,65	>>> Xc – Xf (%Lwl)		-0,65	
>> ft2	31,25	>> ft	9,88						
Angle immersed sheer li (°)		29,8	at section C4 (40% Lwl)		Half entrance-angle (°)		10,23	at inflexion point	
Sw (m2)	3,98	>Sw/D^(2/3)	7,09				9,94	at very end	
>> ft2	42,89								
Shull (m2)	7,19	at X (m)	305,15	Z (m)	-0,01				
>> ft2	77,42	>> ft	1001,14	>> ft	-0,04				







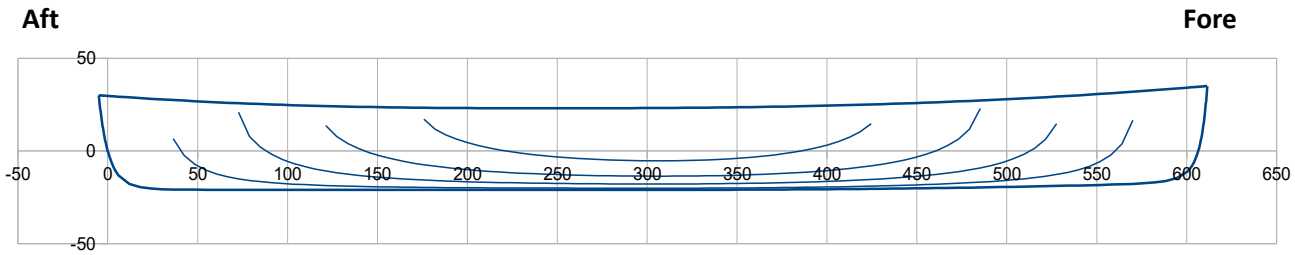


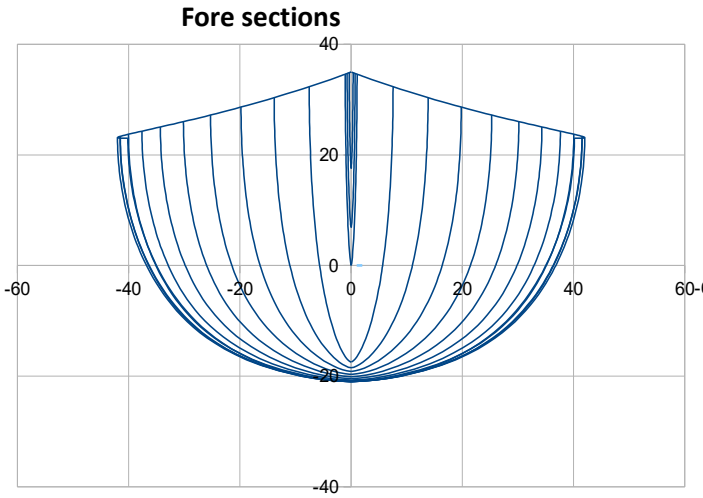
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42100**	**Disp tot(m3)**	**0,42100**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42100**	>> Lwl (m)	6,064	>> Bwl (m)	0,745
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,200
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,08	/ Zc Heel 0°	-0,08	>> GZ (m)	0,0001
		>> Sw (m2)	3,98	/ Sw Heel 0°	3,98	**GM (cm)**	**6,8**
						(inch)	*2,66*

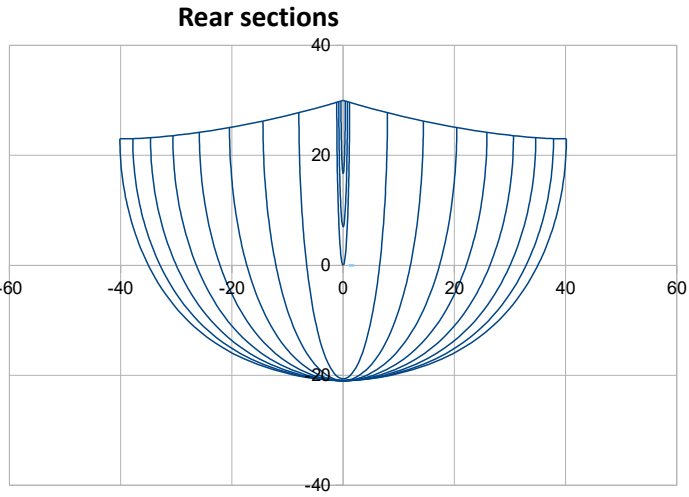
C7 , with Tc = 0,21 m :

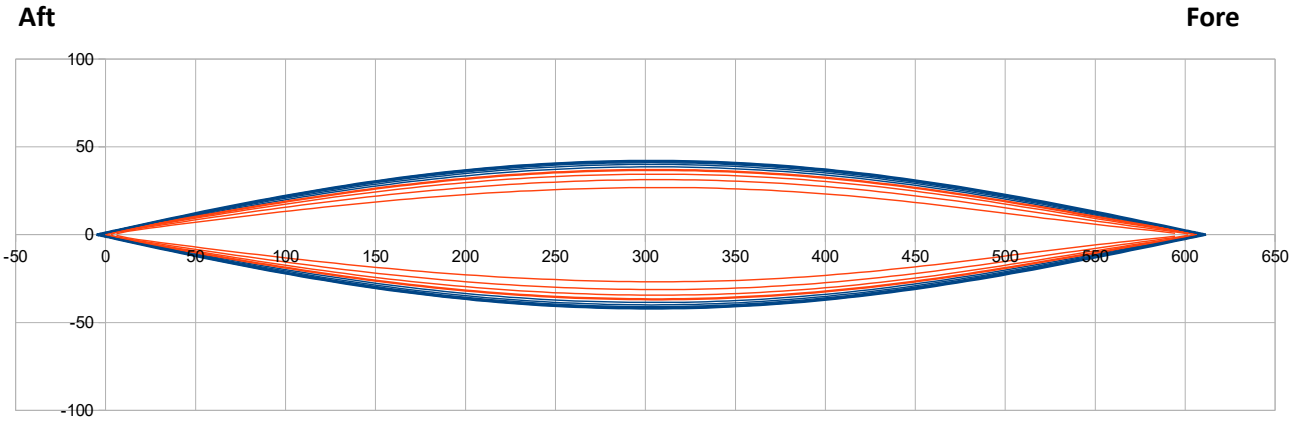
Hull

Loa (m)	**6,165**	**Lwl (m)**	**6,065**	> Lwl/D^(1/3)	8,09				
>> ft	***20,23***	***>> ft***	***19,898***	*DLR*	*53*				
B (m)	**0,840**	**at X (% Lwl)**	**50,0**						
>> inch	***33,07***								
Bwl (m)	**0,7361**	**at X (% Lwl)**	**50,0**	> Bwl / B	0,876	Bwl/Loa	0,11939		
>> inch	***28,98***				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,21**	**at X (%Lwl)**	**50**			**0,30**	**0,23**	**0,35**	
>> feet	***0,689***				***>> inch***	***11,81***	***9,06***	***13,78***	
Displacement	**at H0 (m3)**	**0,42100**	**at Xc (m)**	**2,973**	**Xc (%Lwl)**	**49,03**	**Zc (m)**	**-0,085**	
	(kg)	**421,00**	*>> ft*	*9,76*			*>> inch*	*-3,34*	
	>> lbs	***928,2***	*with water mass / vol. of*		*1000*	*kg/m3*			
Cp (%)	**61,94**								
Sf (m2)	**2,86**	**at Xf (m)**	**3,012**	**Xf (%Lwl)**	**49,66**	>>> Xc – Xf (%Lwl)		-0,64	
>> ft2	*30,79*	*>> ft*	*9,88*						
Angle immersed sheer li (°)		**29,8**	at section C4 (40% Lwl)		**Half entrance-angle (°)**		**10,09**	at inflexion point	
Sw (m2)	**3,98**	>Sw/D^(2/3)	7,09				**9,82**	at very end	
>> ft2	*42,89*								
Shull (m2)	**7,20**	**at X (m)**	**305,05**	**Z (m)**	**-0,01**				
>> ft2	*77,52*	*>> ft*	*1000,81*	*>> ft*	*-0,05*				







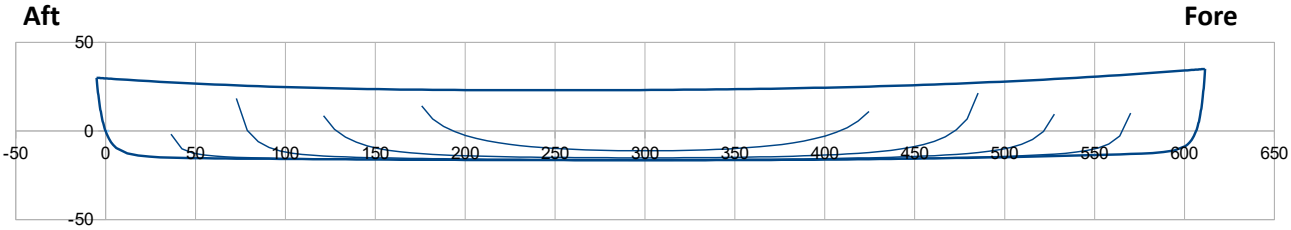


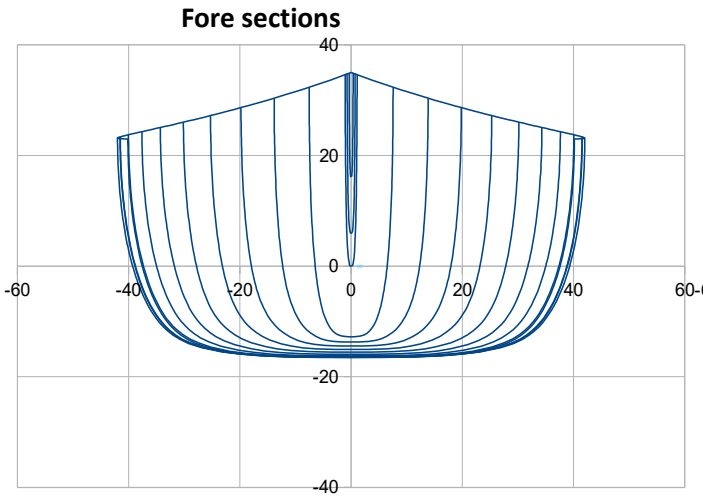
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42100**	**Disp tot(m3)**	**0,42100**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42100**	>> Lwl (m)	6,064	>> Bwl (m)	0,734
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,210
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,08	/ Zc Heel 0°	-0,08	>> GZ (m)	0,0001
		>> Sw (m2)	3,98	/ Sw Heel 0°	3,98	**GM (cm)**	**5,6**
						(inch)	*2,21*

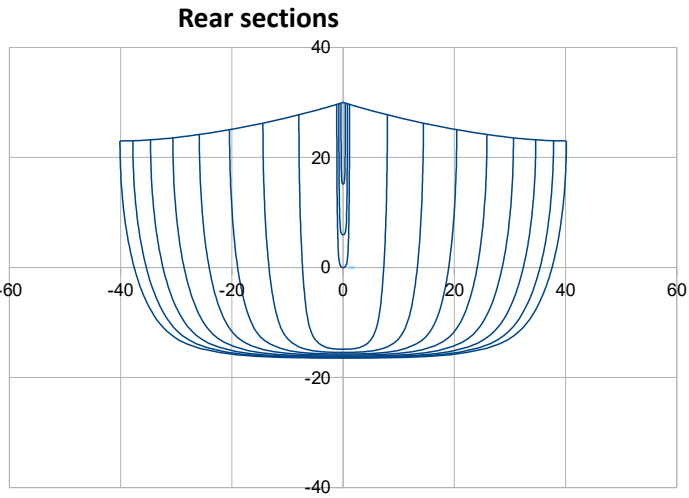
With Bwl = 0,7858 m and Tc = 0,165 m

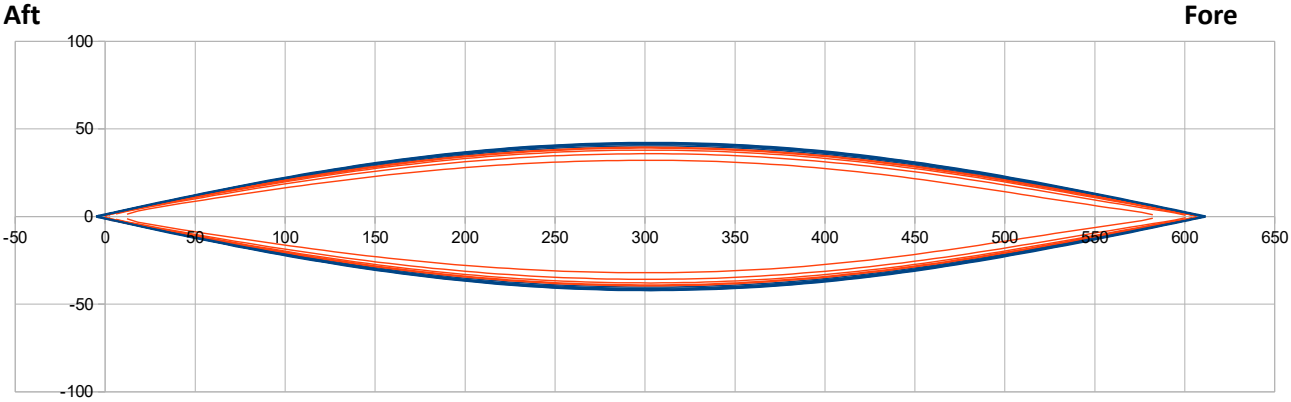
Hull

Loa (m)	**6,165**	**Lwl (m)**	**6,065**	> Lwl/D^(1/3)	8,09				
>> ft	***20,23***	***>> ft***	***19,898***	*DLR*	*53*				
B (m)	**0,840**	**at X (% Lwl)**	**50,0**						
>> inch	***33,07***								
Bwl (m)	**0,7858**	**at X (% Lwl)**	**50,0**	> Bwl / B	0,935	Bwl/Loa	0,12746		
>> inch	***30,94***				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,1650**	**at X (%Lwl)**	**50**			**0,30**	**0,23**	**0,35**	
>> feet	***0,541***				***>> inch***	***11,81***	***9,06***	***13,78***	
Displacement	**at H0 (m3)**	**0,42111**	**at Xc (m)**	**2,972**	**Xc (%Lwl)**	**49,00**	**Zc (m)**	**-0,073**	
	(kg)	**421,11**	*>> ft*	*9,75*			*>> inch*	*-2,88*	
	>> lbs	***928,4***	*with water mass / vol. of*		*1000*	*kg/m3*			
Cp (%)	**61,94**								
Sf (m2)	**3,08**	**at Xf (m)**	**3,009**	**Xf (%Lwl)**	**49,62**	>>> Xc – Xf (%Lwl)		-0,62	
>> ft2	*33,17*	*>> ft*	*9,87*						
Angle immersed sheer li (°)		**29,8**	at section C4 (40% Lwl)		**Half entrance-angle (°)**		**10,92**	at inflexion point	
Sw (m2)	**4,09**	>Sw/D^(2/3)	7,28				**10,85**	at very end	
>> ft2	*44,00*								
Shull (m2)	**7,27**	**at X (m)**	**304,95**	**Z (m)**	**-0,01**				
>> ft2	*78,23*	*>> ft*	*1000,50*	*>> ft*	*-0,03*				





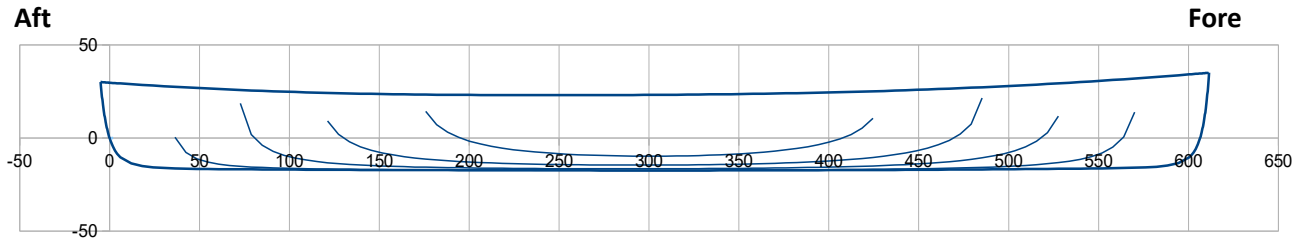


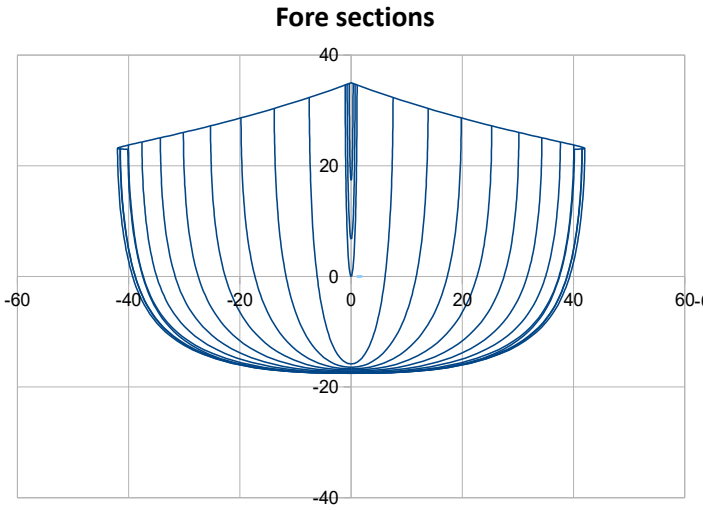


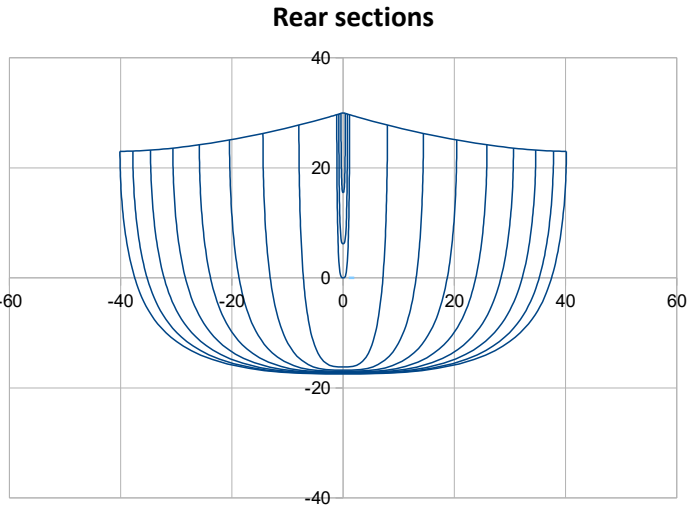
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42111**	**Disp tot(m3)**	**0,42111**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42111**	>> Lwl (m)	6,064	>> Bwl (m)	0,784
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,165
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,07	/ Zc Heel 0°	-0,07	>> GZ (m)	0,0002
		>> Sw (m2)	4,09	/ Sw Heel 0°	4,09	**GM (cm)**	**11,4**
						(inch)	*4,51*

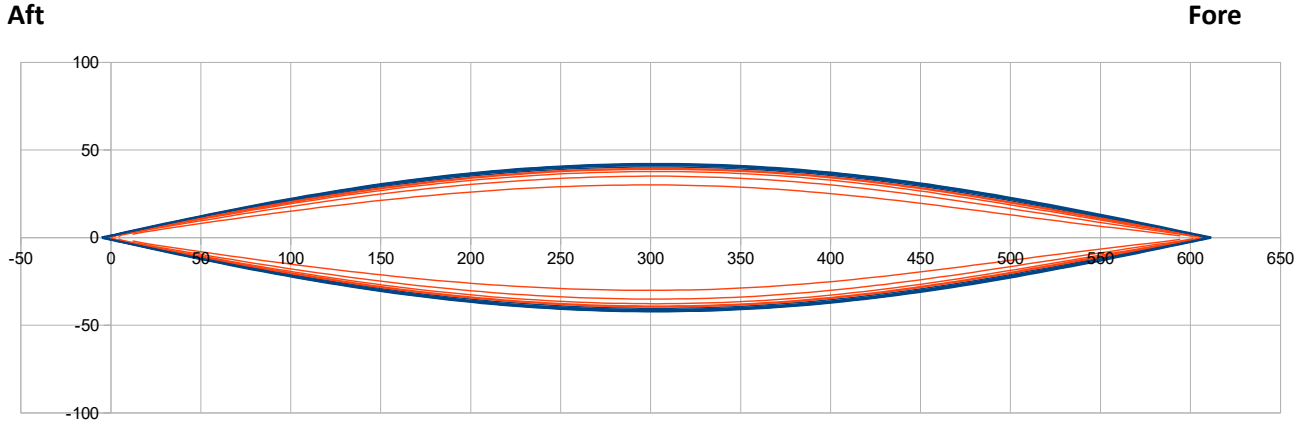
With Bwl = 0,7858 m and Tc = 0,175 m

Hull									
Loa (m)	6,165	Lwl (m)	6,065	> Lwl/D^(1/3)	8,09				
>> ft	20,23	>> ft	19,898	DLR	53				
B (m)	0,840	at X (% Lwl)	50,0						
>> inch	33,07								
Bwl (m)	0,7858	at X (% Lwl)	50,0	> Bwl / B	0,935	Bwl/Loa	0,12746		
>> inch	30,94				Freeboards (m) >	Aft	Midship	Fore	
Tc (m)	0,1750	at X (%Lwl)	50			0,30	0,23	0,35	
>> feet	0,574				>> inch	11,81	9,06	13,78	
Displacement	at H0 (m3)	0,42152	at Xc (m)	2,972	Xc (%Lwl)	49,00	Zc (m)	-0,076	
	(kg)	421,52	>> ft	9,75			>> inch	-2,98	
	>> lbs	929,3	with water mass / vol. of		1000	kg/m3			
Cp (%)	61,94								
Sf (m2)	3,06	at Xf (m)	3,004	Xf (%Lwl)	49,53	>>> Xc – Xf (%Lwl)		-0,53	
>> ft2	32,89	>> ft	9,86						
Angle immersed sheer li (°)		29,8	at section C4 (40% Lwl)		Half entrance-angle (°)		10,51	at inflexion point	
Sw (m2)	4,05	>Sw/D^(2/3)	7,20				10,33	at very end	
>> ft2	43,60								
Shull (m2)	7,23	at X (m)	305,39	Z (m)	-0,01				
>> ft2	77,85	>> ft	1001,94	>> ft	-0,03				





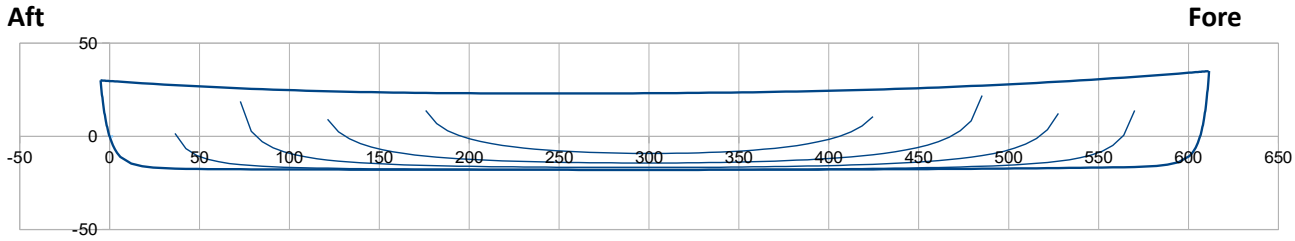


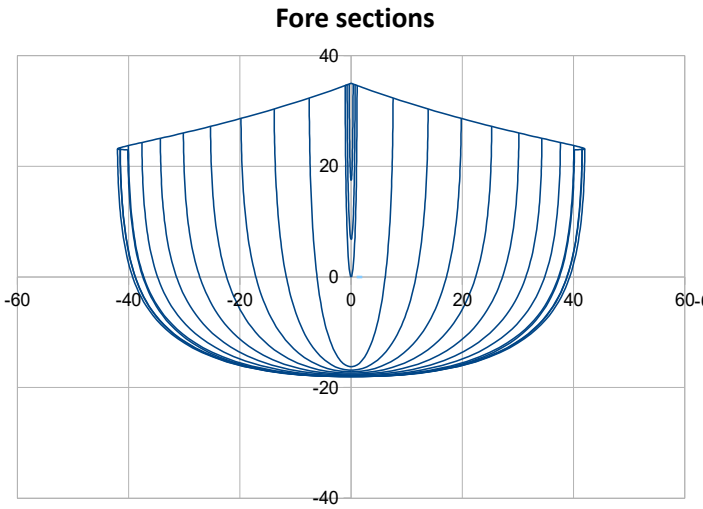


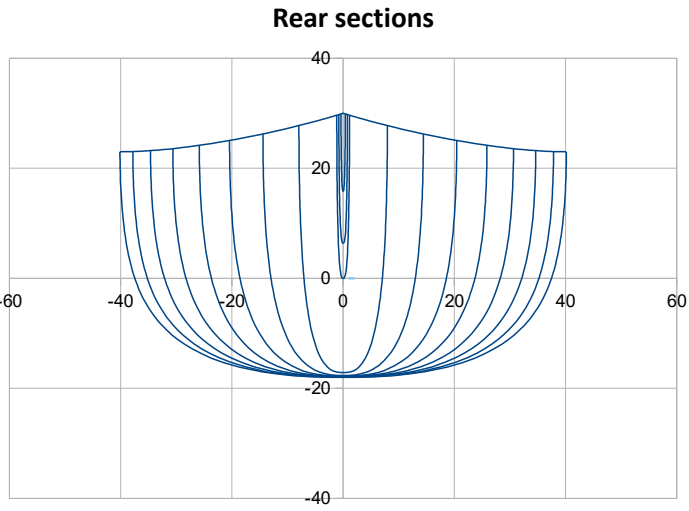
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42152**	**Disp tot(m3)**	**0,42152**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42152**	>> Lwl (m)	6,064	>> Bwl (m)	0,784
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,175
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,08	/ Zc Heel 0°	-0,08	>> GZ (m)	0,0002
		>> Sw (m2)	4,05	/ Sw Heel 0°	4,05	**GM (cm)**	**10,9**
						(inch)	*4,29*

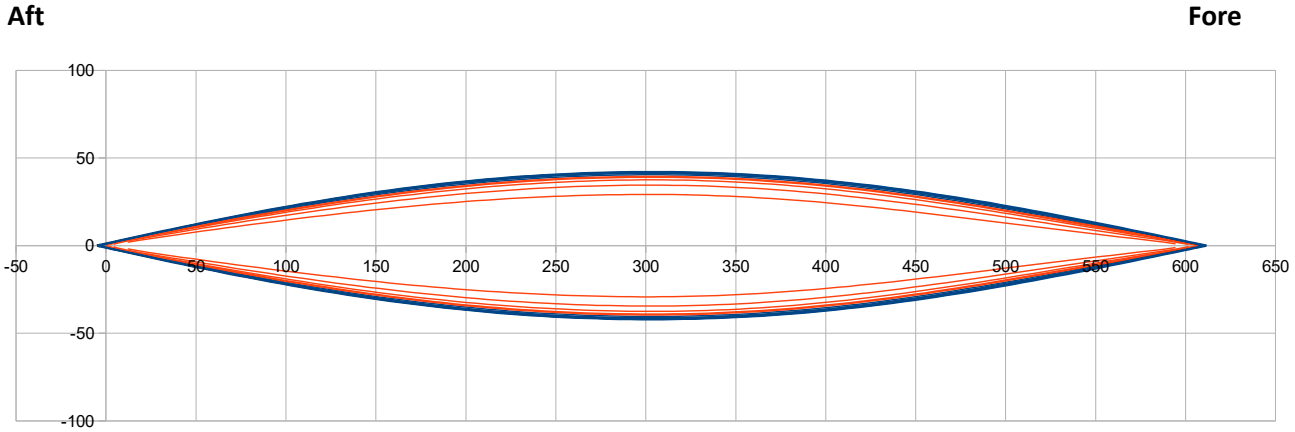
With Bwl = 0,7858 m and Tc = 0,180 m

Hull									
Loa (m)	6,165	Lwl (m)	6,065	> Lwl/D^(1/3)	8,09				
>> ft	20,23	>> ft	19,898	DLR	53				
B (m)	0,840	at X (% Lwl)	50,0						
>> inch	33,07								
Bwl (m)	0,7858	at X (% Lwl)	50,0	> Bwl / B	0,935	Bwl/Loa	0,12746		
>> inch	30,94				Freeboards (m) >	Aft	Midship	Fore	
Tc (m)	0,1800	at X (%Lwl)	50			0,30	0,23	0,35	
>> feet	0,591				>> inch	11,81	9,06	13,78	
Displacement	at H0 (m3)	0,42074	at Xc (m)	2,974	Xc (%Lwl)	49,03	Zc (m)	-0,077	
	(kg)	420,74	>> ft	9,76			>> inch	-3,02	
	>> lbs	927,6	with water mass / vol. of		1000	kg/m3			
Cp (%)	61,93								
Sf (m2)	3,04	at Xf (m)	3,004	Xf (%Lwl)	49,53	>>> Xc – Xf (%Lwl)		-0,49	
>> ft2	32,76	>> ft	9,85						
Angle immersed sheer li (°)		29,8	at section C4 (40% Lwl)		Half entrance-angle (°)		10,33	at inflexion point	
Sw (m2)	4,04	>Sw/D^(2/3)	7,19				10,29	at very end	
>> ft2	43,45								
Shull (m2)	7,22	at X (m)	305,50	Z (m)	-0,01				
>> ft2	77,73	>> ft	1002,31	>> ft	-0,03				







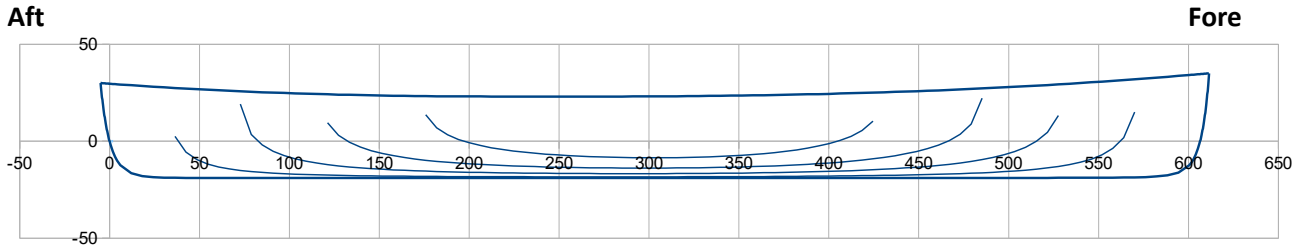


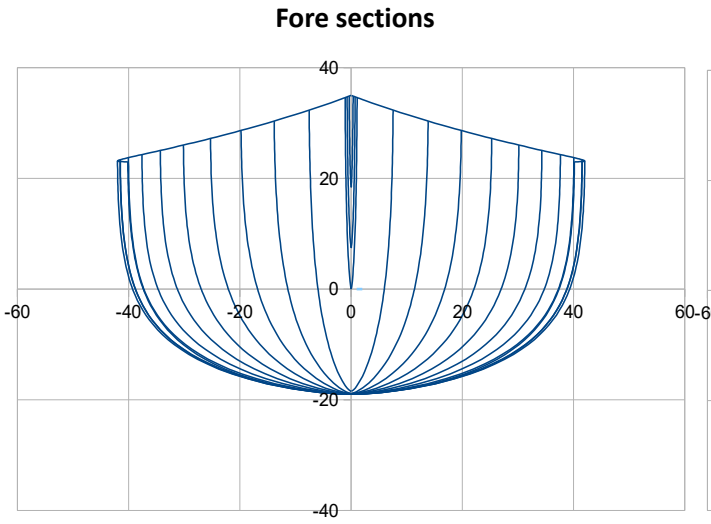
Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42074**	**Disp tot(m3)**	**0,42074**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42074**	>> Lwl (m)	6,064	>> Bwl (m)	0,784
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,180
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,08	/ Zc Heel 0°	-0,08	>> GZ (m)	0,0002
		>> Sw (m2)	4,04	/ Sw Heel 0°	4,04	**GM (cm)**	**10,6**
						(inch)	*4,18*

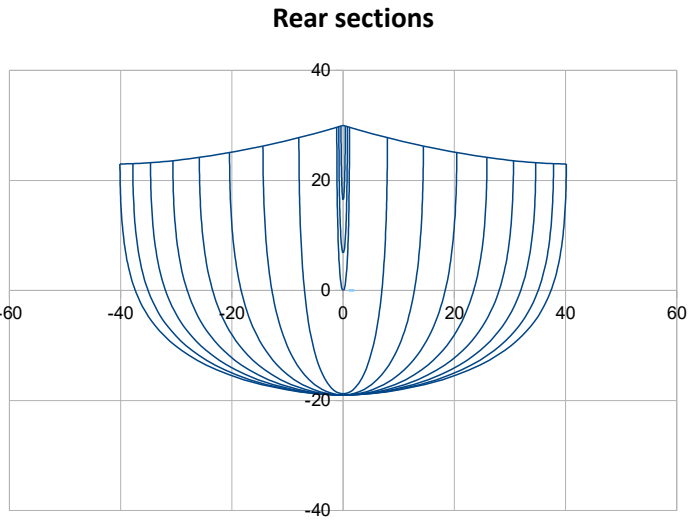
With Bwl = 0,7858 m and Tc = 0,190 m

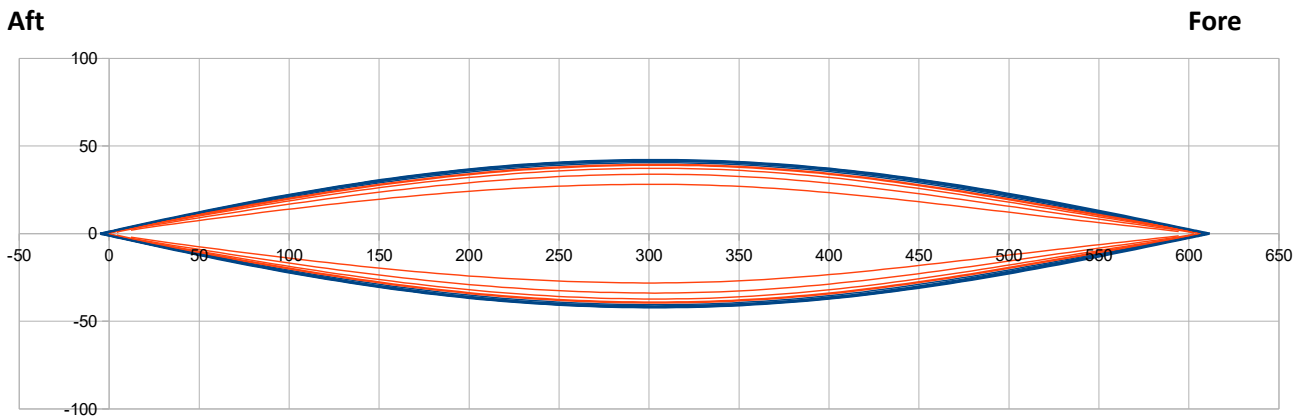
Hull

Loa (m)	**6,165**	**Lwl (m)**	**6,065**	> Lwl/D^(1/3)	8,09				
>> ft	***20,23***	***>> ft***	***19,898***	*DLR*	*53*				
B (m)	**0,840**	**at X (% Lwl)**	**50,0**						
>> inch	***33,07***								
Bwl (m)	**0,7858**	**at X (% Lwl)**	**50,0**	> Bwl / B	0,935	Bwl/Loa	0,12746		
>> inch	***30,94***				**Freeboards (m) >**	**Aft**	**Midship**	**Fore**	
Tc (m)	**0,1900**	**at X (%Lwl)**	**50**			**0,30**	**0,23**	**0,35**	
>> feet	***0,623***				***>> inch***	***11,81***	***9,06***	***13,78***	
Displacement	**at H0 (m3)**	**0,42074**	**at Xc (m)**	**2,972**	**Xc (%Lwl)**	**49,01**	**Zc (m)**	**-0,078**	
	(kg)	**420,74**	*>> ft*	*9,75*			*>> inch*	*-3,09*	
	>> lbs	***927,6***	*with water mass / vol. of*		*1000*	*kg/m3*			
Cp (%)	**61,94**								
Sf (m2)	**3,03**	**at Xf (m)**	**3,002**	**Xf (%Lwl)**	**49,49**	>>> Xc – Xf (%Lwl)		-0,48	
>> ft2	*32,56*	*>> ft*	*9,85*						
Angle immersed sheer li (°)		**29,8**	at section C4 (40% Lwl)		**Half entrance-angle (°)**		**10,17**	at inflexion point	
Sw (m2)	**4,05**	>Sw/D^(2/3)	7,21				**10,07**	at very end	
>> ft2	*43,55*								
Shull (m2)	**7,23**	**at X (m)**	**305,82**	**Z (m)**	**-0,01**				
>> ft2	*77,86*	*>> ft*	*1003,35*	*>> ft*	*-0,04*				









Data to enter		Results					
Heel (°)	**0,1**	Disp. Heel 0°	**0,42074**	**Disp tot(m3)**	**0,42074**		
Height (cm)	**0,0000**	**> Disp. (m3)**	**0,42074**	>> Lwl (m)	6,064	>> Bwl (m)	0,784
		Xc (m)	2,97	/ Xc Heel 0°	2,97	>> Draft (m)	0,190
		Yc (m)	0,00	/ Yc Heel 0°	0,00	Ym (m)	0,00
		Zc (m)	-0,08	/ Zc Heel 0°	-0,08	>> GZ (m)	0,0002
		>> Sw (m2)	4,05	/ Sw Heel 0°	4,05	**GM (cm)**	**10,2**
						(inch)	*4,02*