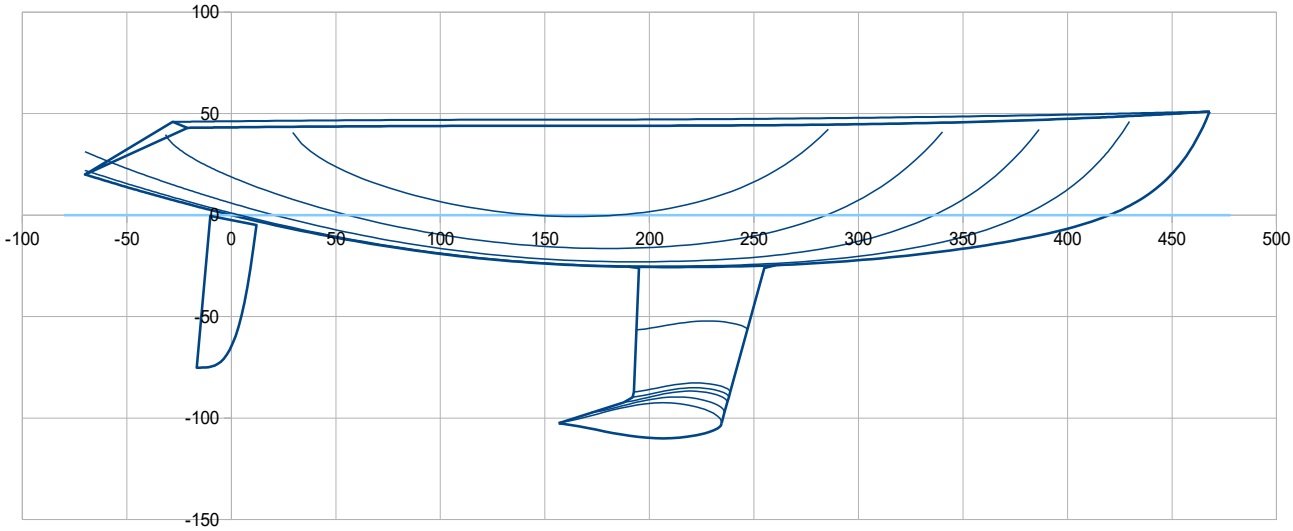
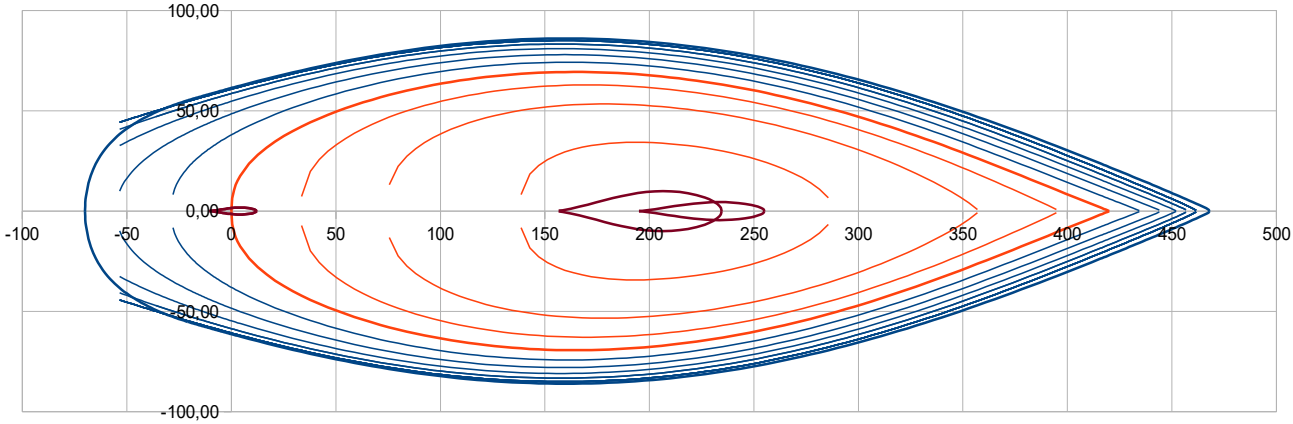
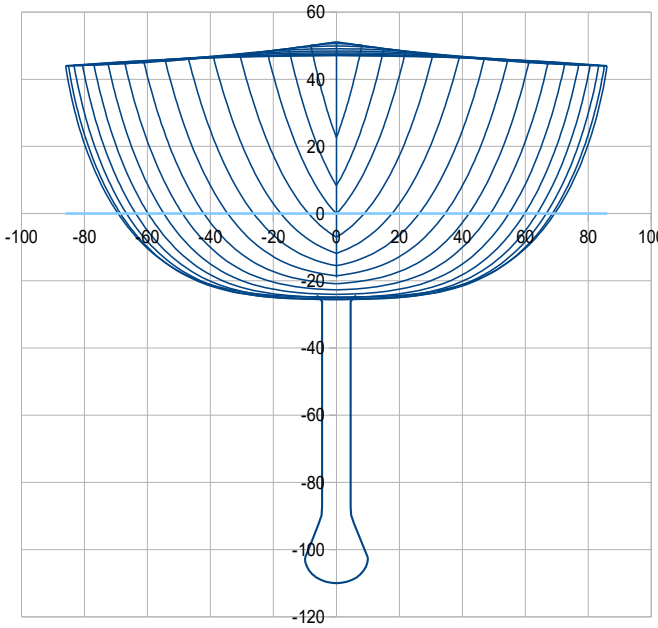
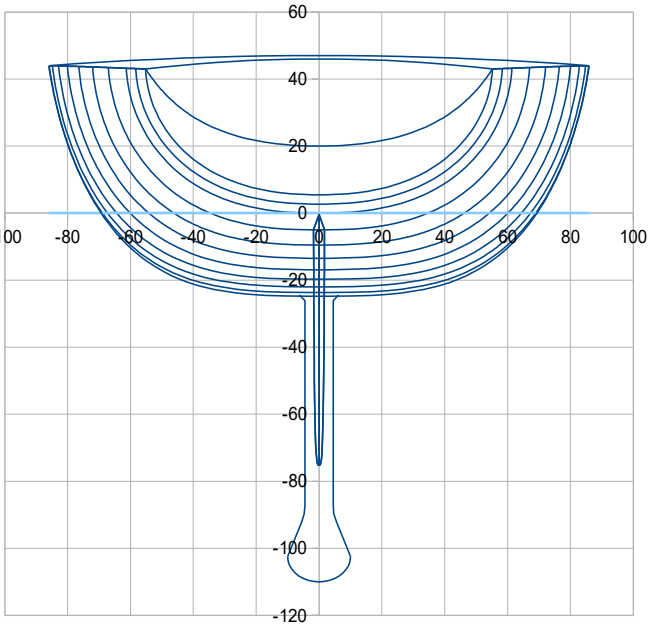
Mini keel boat for 2 crew – early stage approach with Gene-Hull UE 2.3

Loa 5,38 m ; Lwl 4,20 m ; B 1,72 m ; Draft 1,10 m ; **Light weight : 515 kg** ; Keel-bulb 232 kg
Displacement in charge, with 2 crew 160 kg (at X 1,45 m) : 675 kg
>>> Here below drawings and hydrostatics data are with this displacement in charge 675 kg









2. Data sum-up and results of hydrostatic and surfaces calculations

2.1 Hull

Loa (m)	**5,38**	**Lwl (m)**	**4,20**						
>> ft	*17,65*		*13,78*						
B (m)	**1,72**	**at X (% Lwl)**	**38,0**						
>> ft	*5,65*								
Bwl (m)	**1,39**	**at X (% Lwl)**	**39,0**	> Bwl/B	0,806				
>> ft	*4,55*					**Freeboards (m) >**	**Aft**	**Midship**	**Fore**
Tc (m)	**0,256**	**at X (%Lwl)**	**50,0**				**0,43**	**0,44**	**0,51**
>> ft	*0,84*					*>> ft*	*1,41*	*1,44*	*1,67*
Displacement at H0 (m3)		**0,62365**	**at Xc (m)**	**1,946**	**Xc (%Lwl)**		**46,34**	**Zc (m)**	**-0,095**
	>> lbs	*1409*	*w. seawater*	*1025*	*kg/m3*			*>> ft*	*-0,31*
Disp at H(cm)	-3,00	0,50675	at Xc (m)	1,964	Xc (%Lwl)		46,75	Zc (m)	-0,084
Disp at H(cm)	3,00	0,74932	at Xc (m)	1,929	Xc (%Lwl)		45,92	Zc (m)	-0,107
Cp (%)	**54,63**								
Sf (m2)	**4,06**	**at Xf (m)**	**1,853**	**Xf (%Lwl)**	**44,12**		>>> Xc – Xf (%Lwl)		2,21
>> ft2	*43,65*	*>> ft*	*6,08*						
Angle immersed sheer li (°)		**27,1**	at section C4 (40% Lwl)						
Sw (m2)	**4,48**	>Sm/D^(2/3)	6,13						
>> ft2	*48,18*								
Shull (m2)	**9,70**	**at X (m)**	**1,890**	**Z (m)**	**0,034**				
>> ft2	*104,37*	*>> ft*	*6,20*	*>> ft*	*0,11*				
Sdeck (m2)	**6,12**	**at X (m)**	**1,848**						
>> ft2	*65,91*	*>> ft*	*6,06*						

2.2 Keel

Vol. keel (m3)	**0,01884**	**at X (m)**	**2,249**	**X (%Lwl)**	**53,54**	**Z (m)**	**-0,546**
Mass keel(kg)	**137,52**	*>> ft*	*7,38*			*>> ft*	*-1,79*
>> lbs	*303*						
Vol. Bulb(m3)	**0,01288**	**at X (m)**	**2,079**	**X (%Lwl)**	**49,49**	**Z (m)**	**-1,001**
Mass bulb(kg)	**94,00**	*>> ft*	*6,82*			*>> ft*	*-3,28*
>> lbs	*207*						
Draft oa (m)	**1,10**		**Sw (m2)**	**1,19**		**Sxz (m2)**	**0,43**
>> ft	*3,61*		*>> ft2*	*12,84*		*>> ft2*	*4,66*
CLR (m)	**2,35**	**CLR (%Lwl)**	**55,97**	*CLR = Center of Lateral Resistance*			
>> ft2	*25,30*	method : keel profile extended to the waterline, LCR at 25% chord and 45% draft oa					

2.3 Rudder(s)

Number	**1**							
Volume (m3)	**0,00259**	**at X (m)**	**-0,012**	**X (%Lwl)**	**-0,28**	**Z (m)**	**-0,335**	
Sw (m2)	**0,29**	*>> ft*	*-0,04*			**Sxz (m2)**	**0,14**	per rudder
>> ft2	*3,11*					*>> ft2*	*1,50*	

2.4 Hull + Keel + Rudder(s)

Displacement at H0 (m3)		**0,65796**	**at Xc (m)**	**1,950**	**Xc (%Lwl)**	**46,42**	**Zc (m)**	**-0,127**
	(kg)	**674**	*>> ft*	*6,40*			*>> ft*	*-0,42*
	>> lbs	*1487*						
	Ballast (kg)	**232**	**at Xg (m)**	**2,180**	**Xg (%Lwl)**	**51,90**	**Zg (m)**	**-0,731**
	>> lbs	*510*	*>> ft*	*7,15*			*>> ft*	*-2,40*
	>> % Ballast	34,3						
	Sw (m2)	**5,96**	>Sw/D^(2/3)	7,88	Lwl/D^(1/3)	4,83		
	>> ft2	*64,13*			*DLR*	*254*	*M(lbs/2240)/(Lwl(ft)/100)^3*	

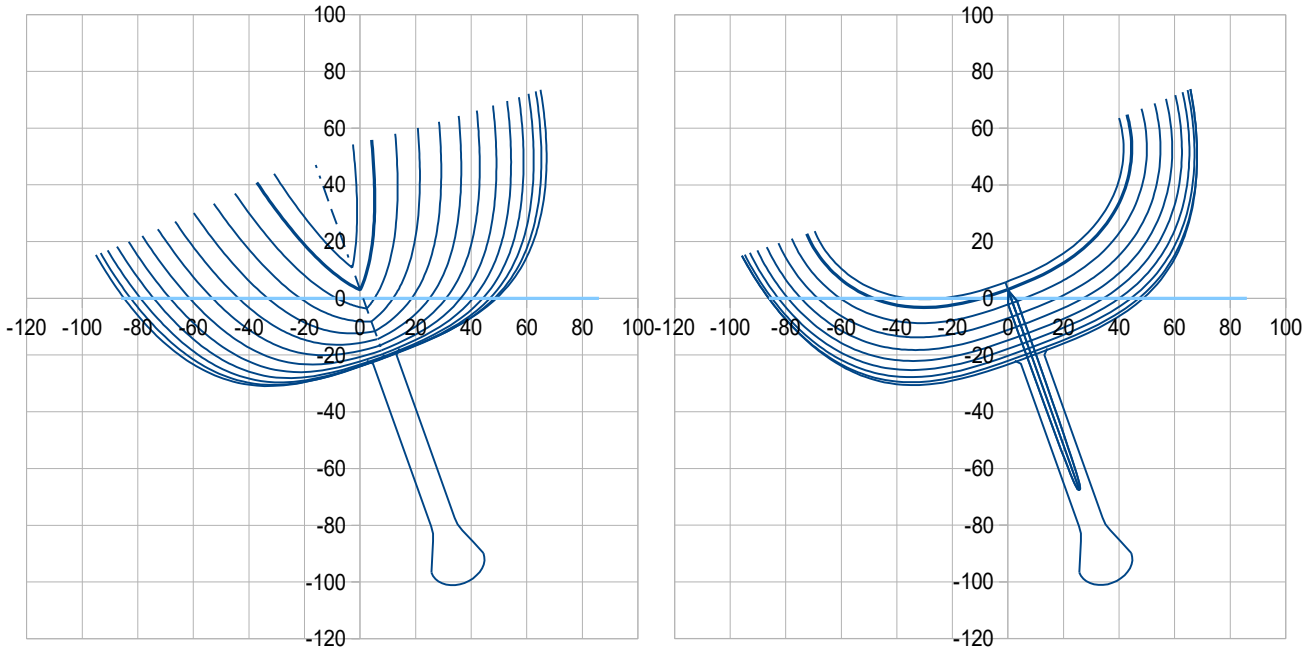
2.5 Data from the mass spreadsheet

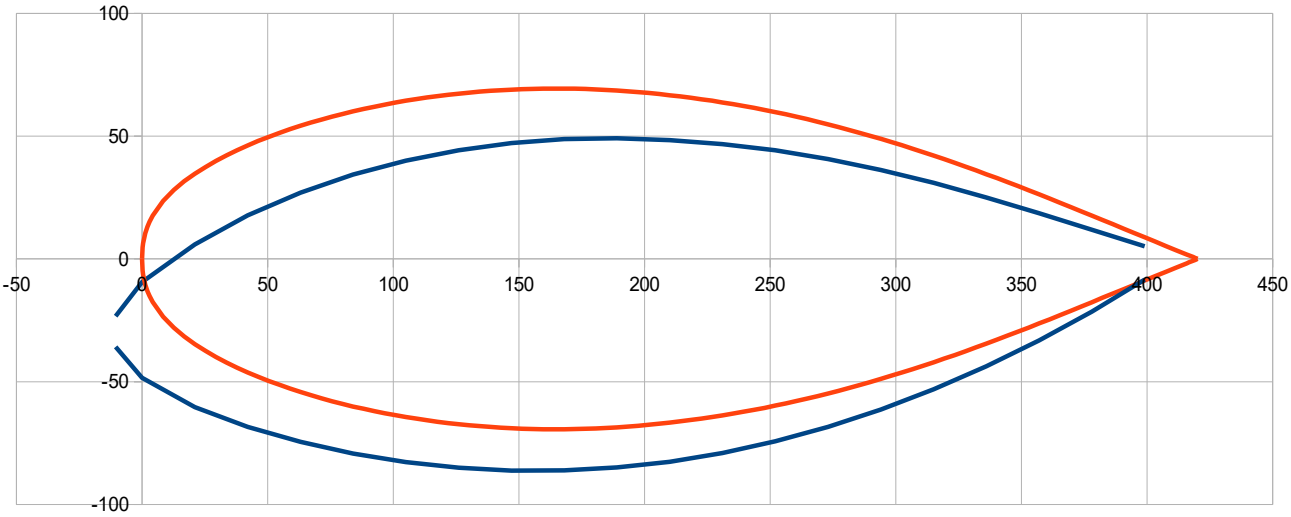
ht boat+ 2crew	**M (kg)**	**675**	**at Xg (m)**	**1,896**	**at Zg (m)**	**0,126**

Study at heel 20° and with 2 crew 160 kg sit winward :

6. Hull-Keel-Rudder with heel

Data to enter		Results for iteration on height and trim		Data to compare with :		Other results for RM and obliquity			
Heel (°)	20,0			Mass (kg)	675,39				
Height (cm)	3,2297	Disp. (m3)	0,65891	/ Disp. (m3)	0,65891	Hull Mom(m4)	0,120	*M tot (kg)*	*675,4*
Trim (°)	-0,030	Xc heel (m)	1,896	/ Xg (m)	1,896	Mom(kN.m)	1,21	*Zg tot (m)*	*0,13*
		Other results		Xc Heel 0°	1,950	Yg heel (m)	0,149	*Yg tot (m)*	*0,20*
		Yc heel (m)	-0,182	Yc Heel 0°	0,000	>> GZ (m)	0,331		
		Zc heel (m)	-0,130	Zc Heel 0°	-0,127	RM (kN.m)	2,19		
		Sw heel (m2)	5,91	Sw Heel 0°	5,96	Obliquity (°)	3,50		



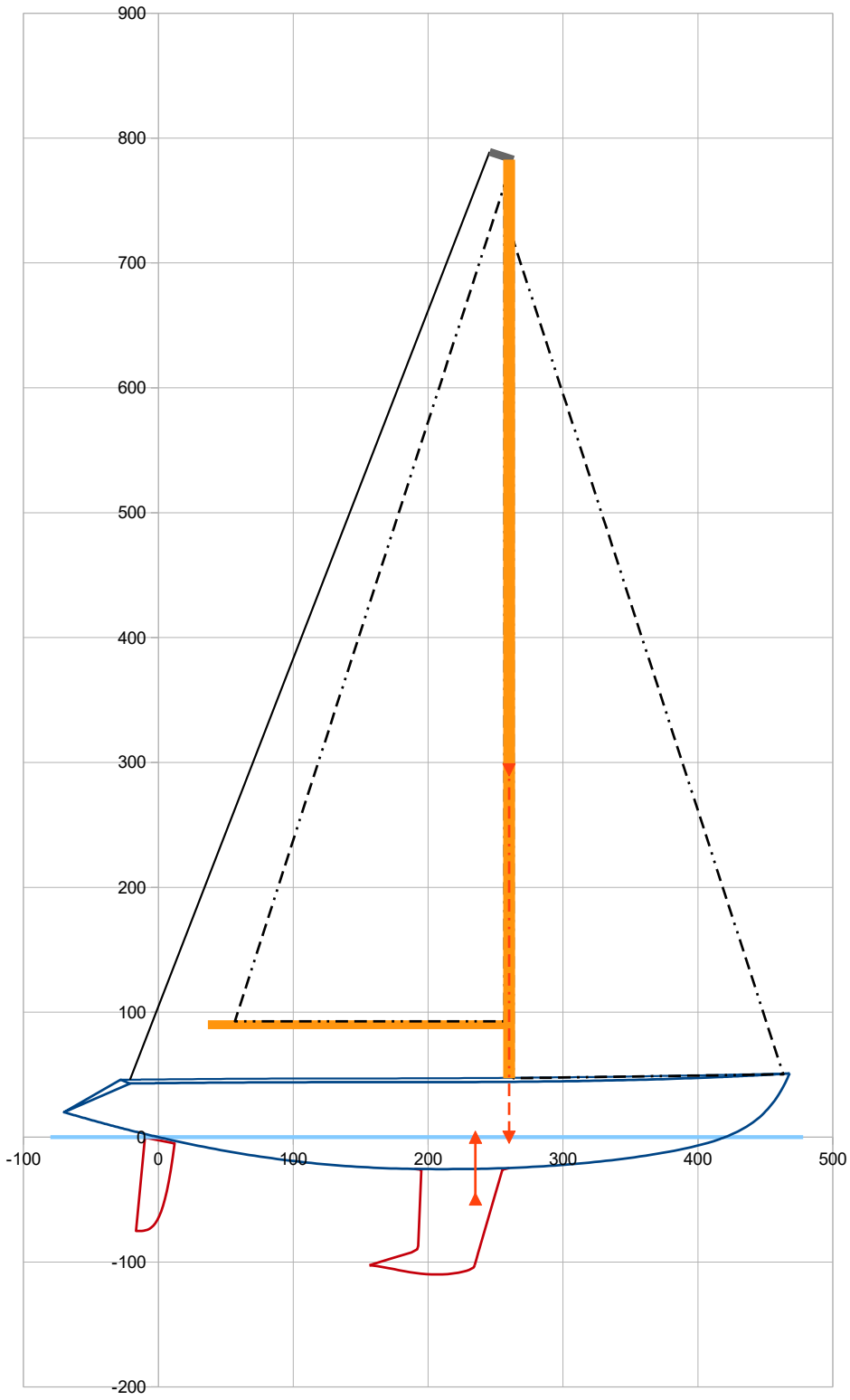


Sailplan – early stage definition

Data to enter		>> in feet
Xmast (m)	2,60	8,53
Zboom(m)	0,90	2,95
I (m)	6,70	21,98
J (m)	2,00	6,56
P (m)	6,70	21,98
E (m)	2,00	6,56

Results for the Sailplan (i.e. Fore + Main triangles)

Geometrical center				
Xv (m)	2,600	Zv (m)	2,942	
Surface triangles St (m2)		**13,40**	*144,24*	*sqft*
>> St / Sw		2,25		
>> St / D^(2/3)		17,71		
>> Skeel / St (%)		3,23		
>> Srudder / St (%)		1,04		
Lead (Xv – CLR) (% Lwl)		**5,9**		



Mass and Xg, Zg position – early stage estimation	**Input data**		**Results**						
Data from Gene-Hull sheet are in blue	**L or S or V**	**mass unit**	**Mass**	**Xg**	M Xg	**Yg**	M Yg	**Zg**	M Zg
Data to enter are in bold black (inc. default value to initiate)	m or m2 or m3	**or % Disp.**	**(kg)**	**(m)**		**(m)**		**(m)**	
Hull (skin, structure, keel interface)	9,70	**16,00**	155,14	1,89	293,23			0,03	5,31
, with S, Xs and Zs from Gene-Hull sheet		(kg/m2)							
Deck – roof – cockpit (skin and structure)	6,12	**11,00**	67,35	1,85	124,50			0,47	31,66
, with S, Xs and Zs from Gene-Hull sheet		(kg/m2)							
Rig, sails and deck fittings		**8,00**	53,95	**2,34**	126,25			**2,50**	134,88
		(% Disp.)							
Crew 2p 160 kg sit windward			**160,00**	**1,45**	232,00	0,86	137,66	**0,53**	84,80
Keel			231,52	2,18	504,67			-0,73	-169,21
Rudder		**1,10**	7,42	-0,01	-0,09			-0,33	-2,49
		(% Disp.)							
Results : Displacement in charge with 2 crew sit winward			**675,39**	**1,90**	1280,56	**0,20**	137,66	**0,13**	84,95