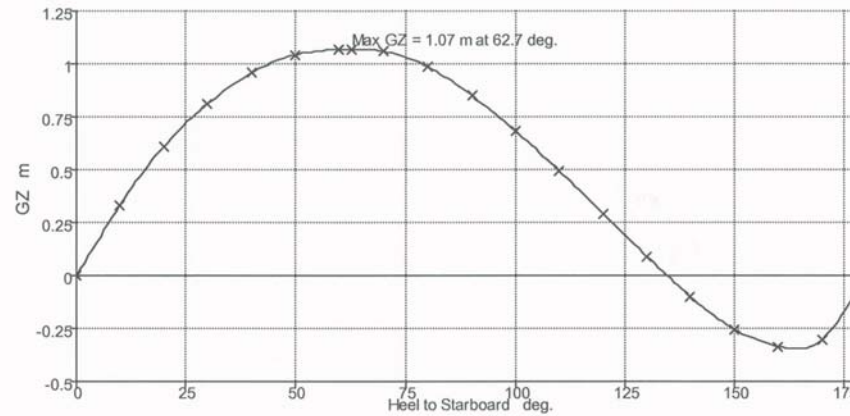


Large Angle Stability

The results of the large angle stability analysis by Hydromax are detailed in appendix 13 and summarized by the GZ(Heel Angle) curve on figure 7. Only the deck and the hull were considered for this analysis, since the mast would break if it was immersed. The righting moment is maximum at 62.7 degrees, and vanishes at approximately 132 degrees, which is reasonable from a safety point of view.



- Figure 7: Righting Arm vs Heel Angle (hull and deck only)-

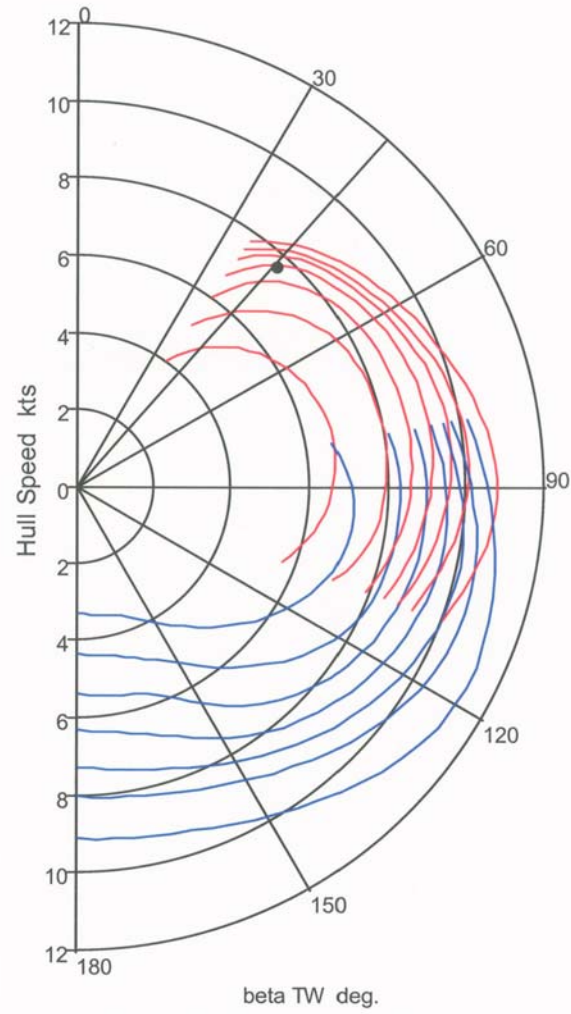
Design performance

The performance is finally evaluated by running the VPP Span. The complete results are presented in appendix 14. Figure 8 shows the predicted hull speed for different wind speeds (6,8,10,12,14,16 and 20knots) and wind angles (polar curves).

We can conclude from these predictions that the design objectives are met: the design performs very well upwind in moderate winds, with a VMG of 5.74kts in a wind of 12kts, and a top speed of 11.2kts downwind in a 20kts wind. The light air performance downwind would certainly be improved by using the 180m² masthead spinnaker. Finally, the light wind performance upwind seems reasonable, with a VMG of 4.6kts in an 8kts wind. Table 13 summarizes the best VMG upwind and downwind for different wind speeds.

TWS (kts)	VMG upwind (kts) @TWA	VMG downwind (kts) (@TWA)
6	3.64 @45deg	-3.62 @140deg
8	4.57 @45deg	-4.63 @140deg
10	5.32 @42deg	-5.61 @140deg
12	5.74 @40deg	-6.45 @150deg
14	6.02 @39deg	-7.29 @165deg
16	6.18 @39deg	-7.99 @175deg
20	6.35 @39deg	-9.06 @175deg

- Table 13: Best VMG for different wind speeds -

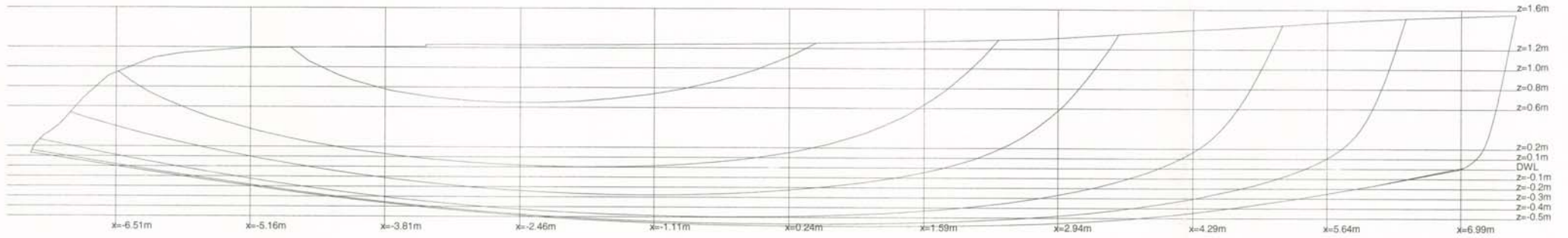


Upw ind 12 kts = 7.642 kts beta TW = 41.371 deg. Vmg = 5.735

- Figure 8: Predicted Hull Speed polar curves -

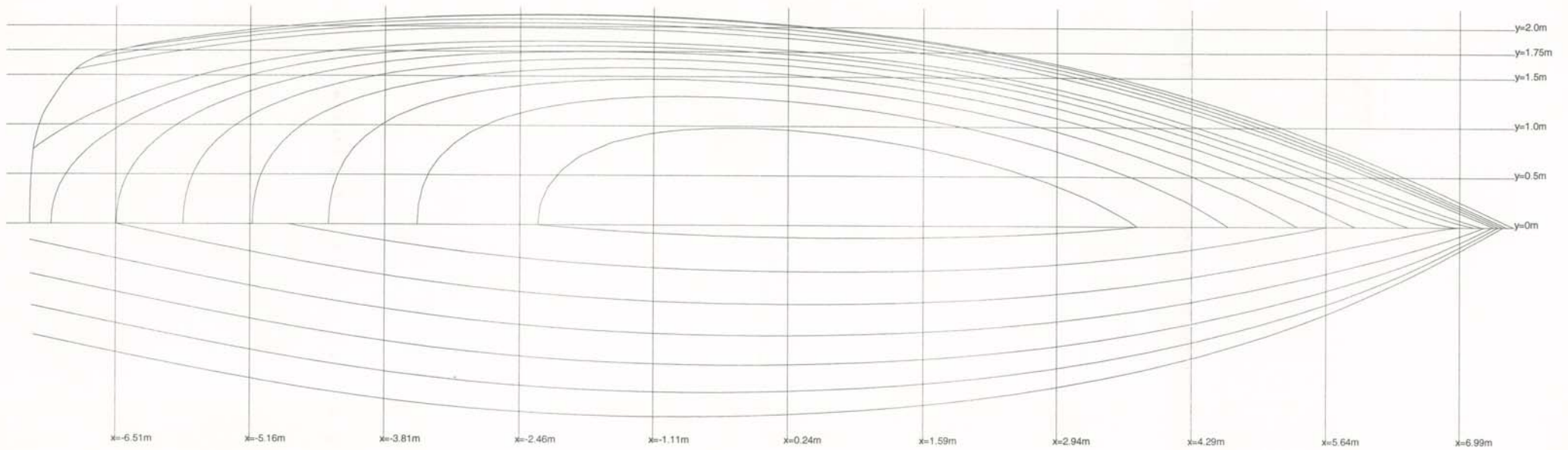
Appendix

1. Profile View, scale 1:40
2. Plan View, scale 1:40
3. Body Plan, scale 1:20
4. Hull, Deck and Appendages profile view, scale 1:40
5. Hull, Deck and Appendages plan view, scale 1:40
6. Hull, Deck and Appendages body plan, scale 1:20
7. 3 views of Deck layout, Rig and sailplan design
8. 2 views of Interior layout
9. 3 views of Stiffeners and Bulkheads arrangement
10. Panels dimensions
11. Weight balance worksheet
12. Structural calculations (according to ABS Rules)
13. Large Angle Stability Analysis (Hydromax)
14. Performance Prediction (Span)
15. Navtec Rod specifications



① Profile view of the canoe Body
Scale: 1:40

Profile View



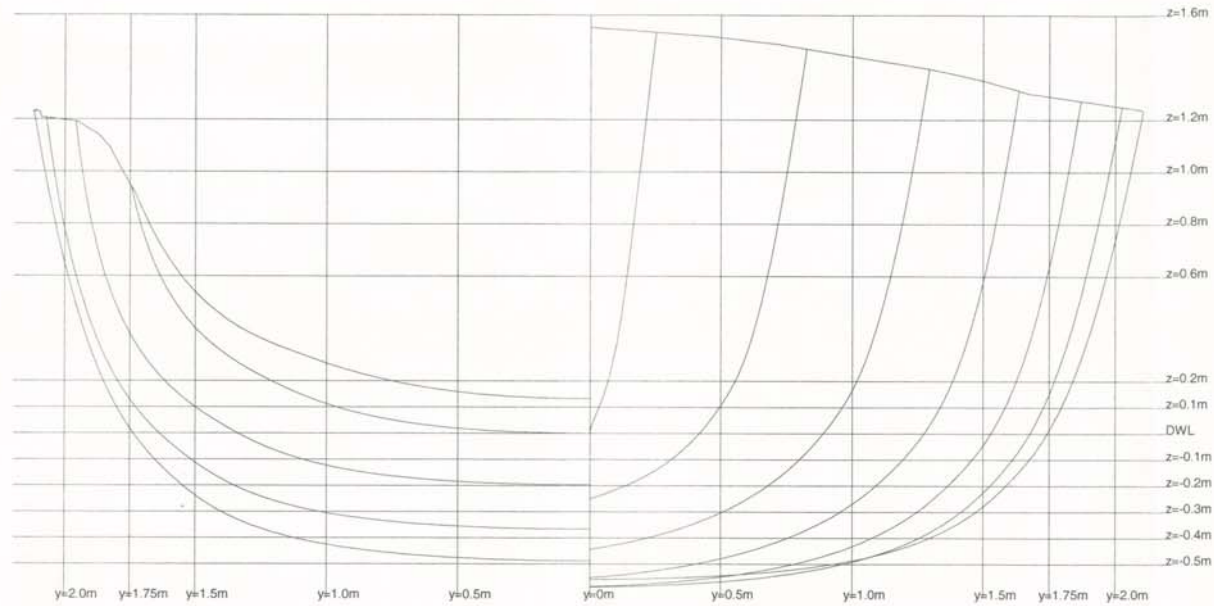
② Plan view of the Conoa Body

Scale: 1:40

Diagonals: 45 degrees

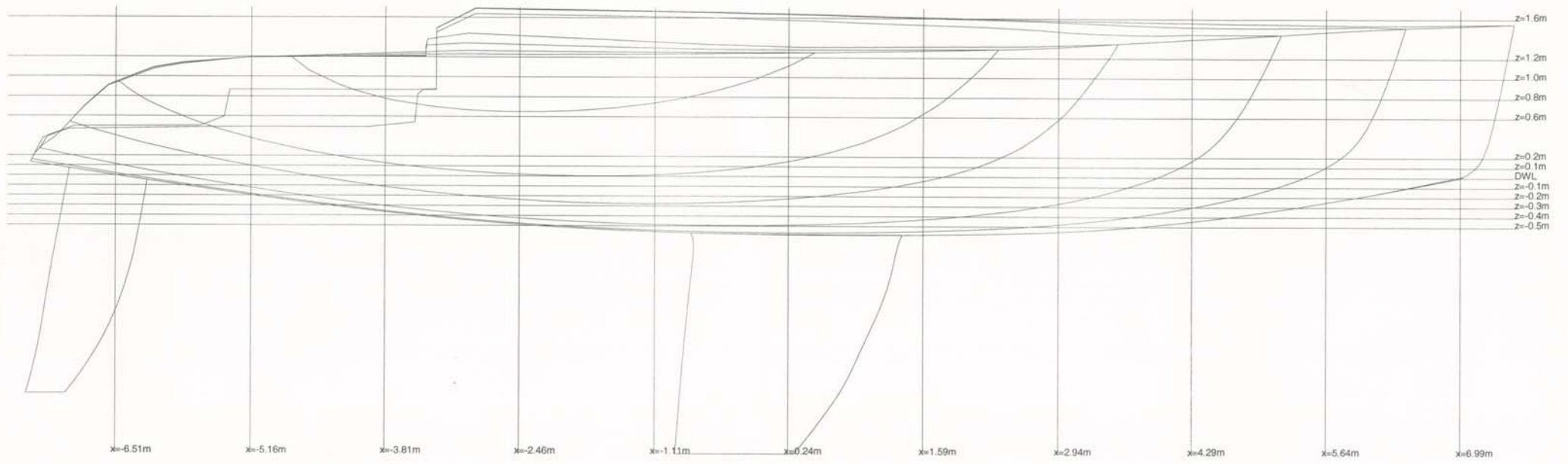
• 2 @ $C_L = -0.5, -0.25, 0, 0.25, 0.5,$
 $0.75, 1m$

Plan View



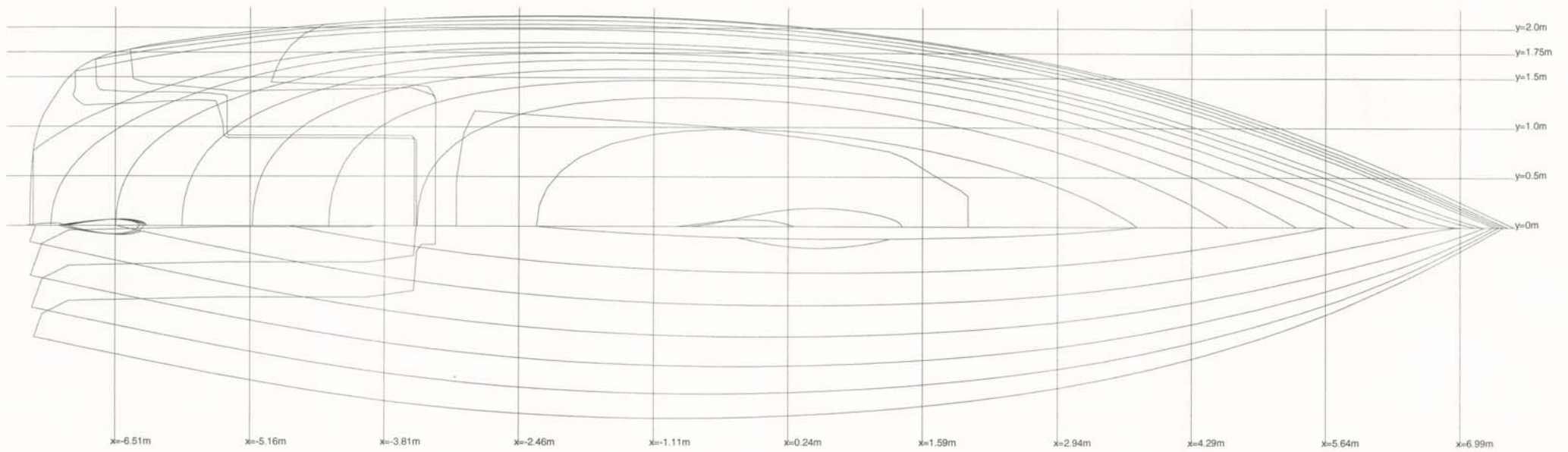
③ Body plan view of the canoe body
Scale: 1:20

Body Plan View



④ Hull, Deck & Appendages
(Profile view)
Scale: 1:10

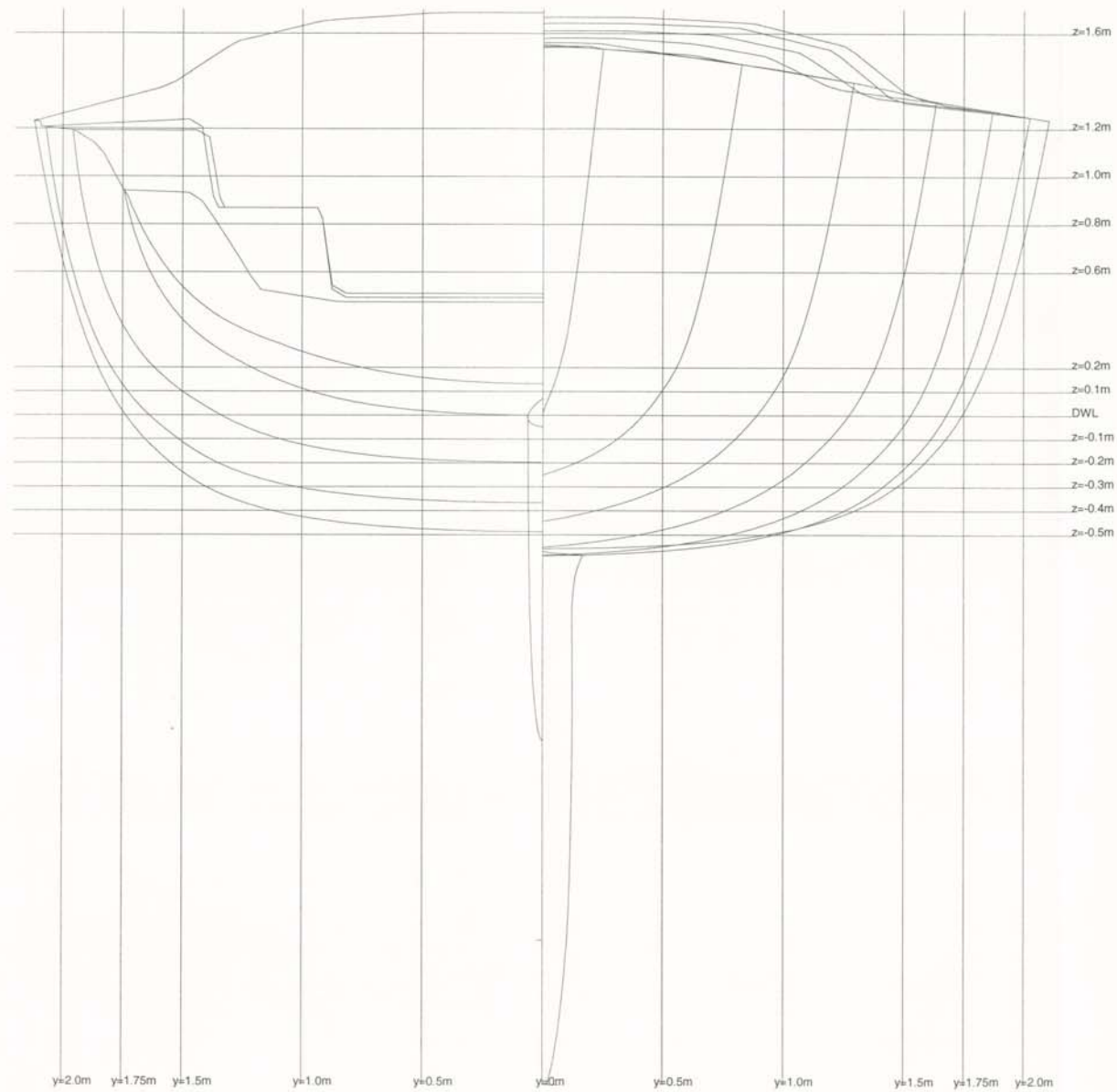
Profile View



⑤ Hull, Deck and Appendages
(plan view)
Scale: 1:40

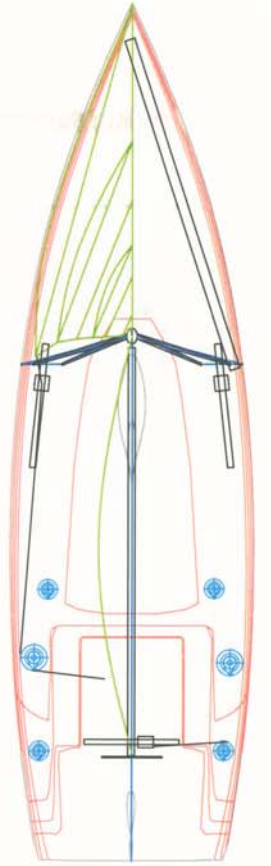
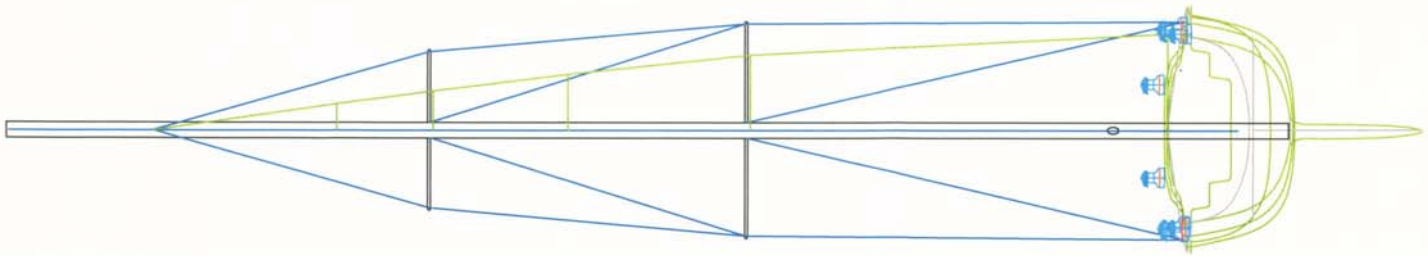
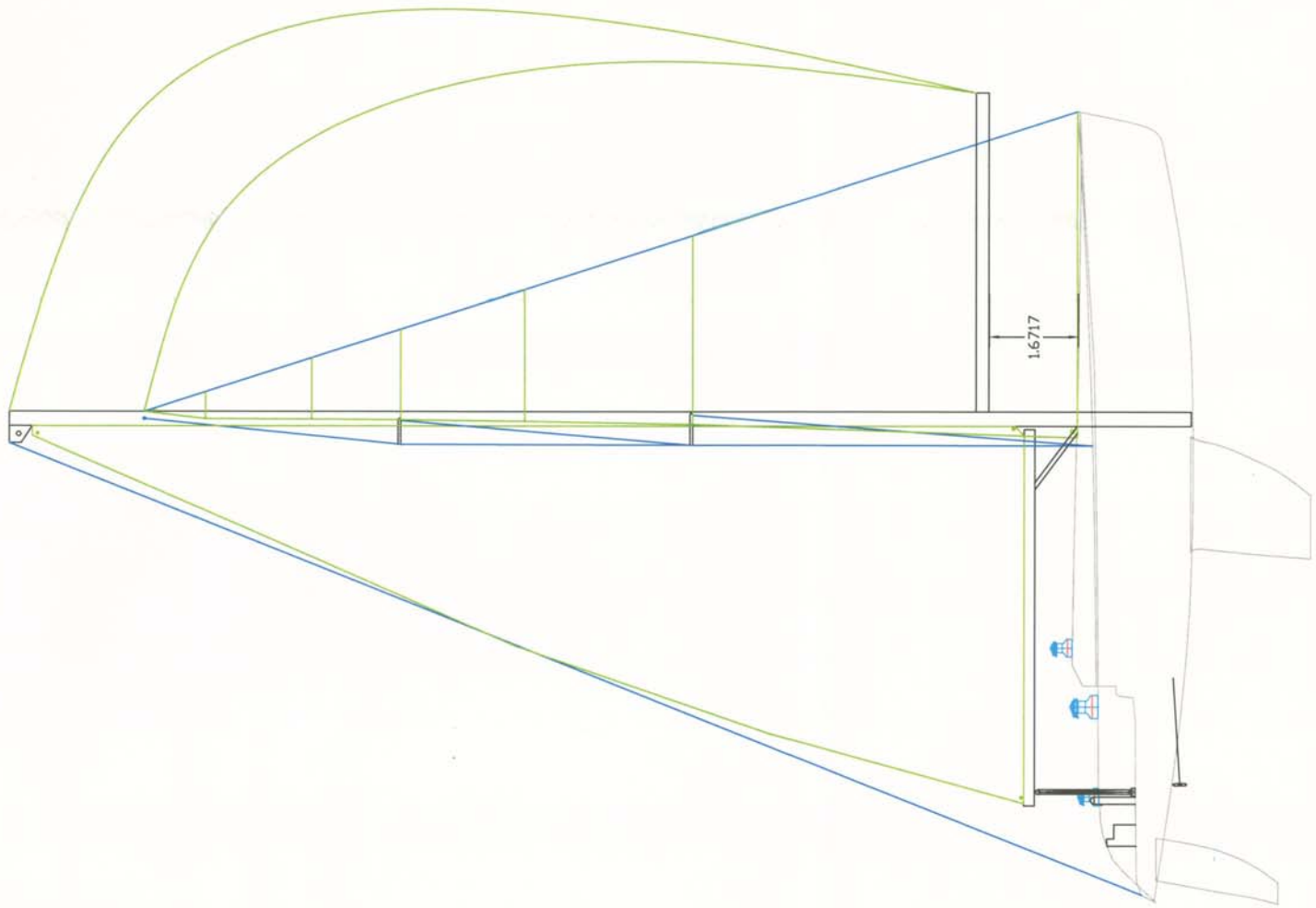
Diagonals: -45°
 $-2 @ C_L = -0,5 ; -0,25 ; 0$
 $0,25 ; 0,5 ; 0,75 ; 1,0$

Plan View

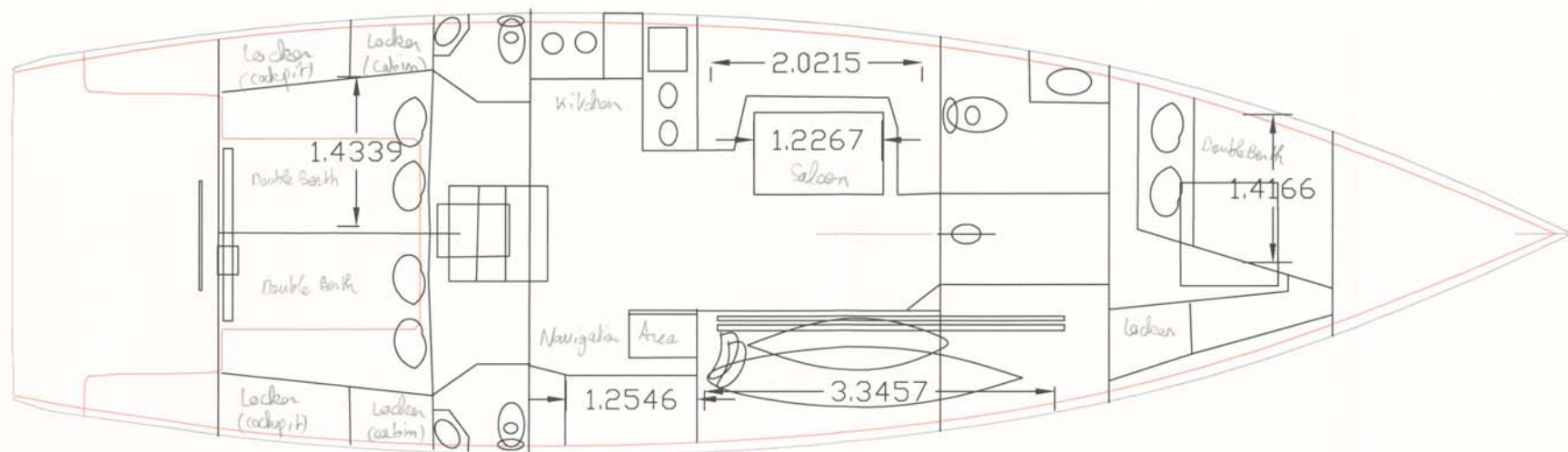
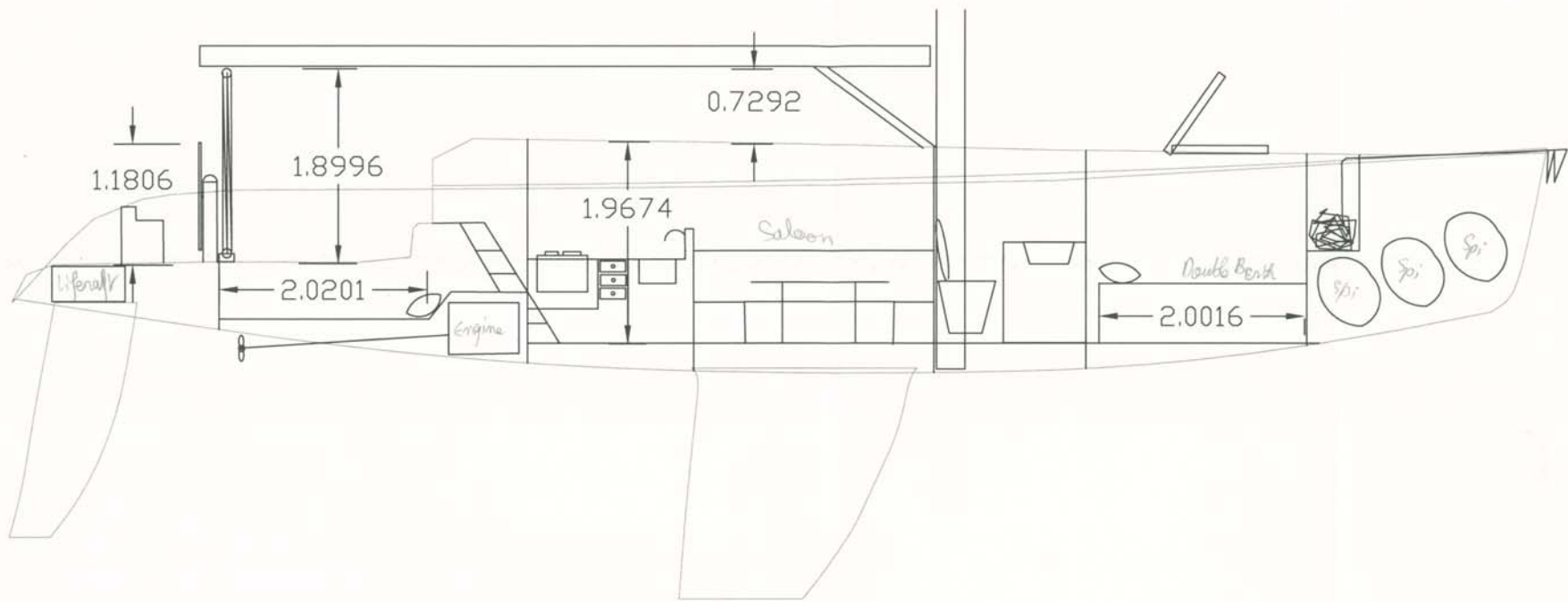


Body Plan View

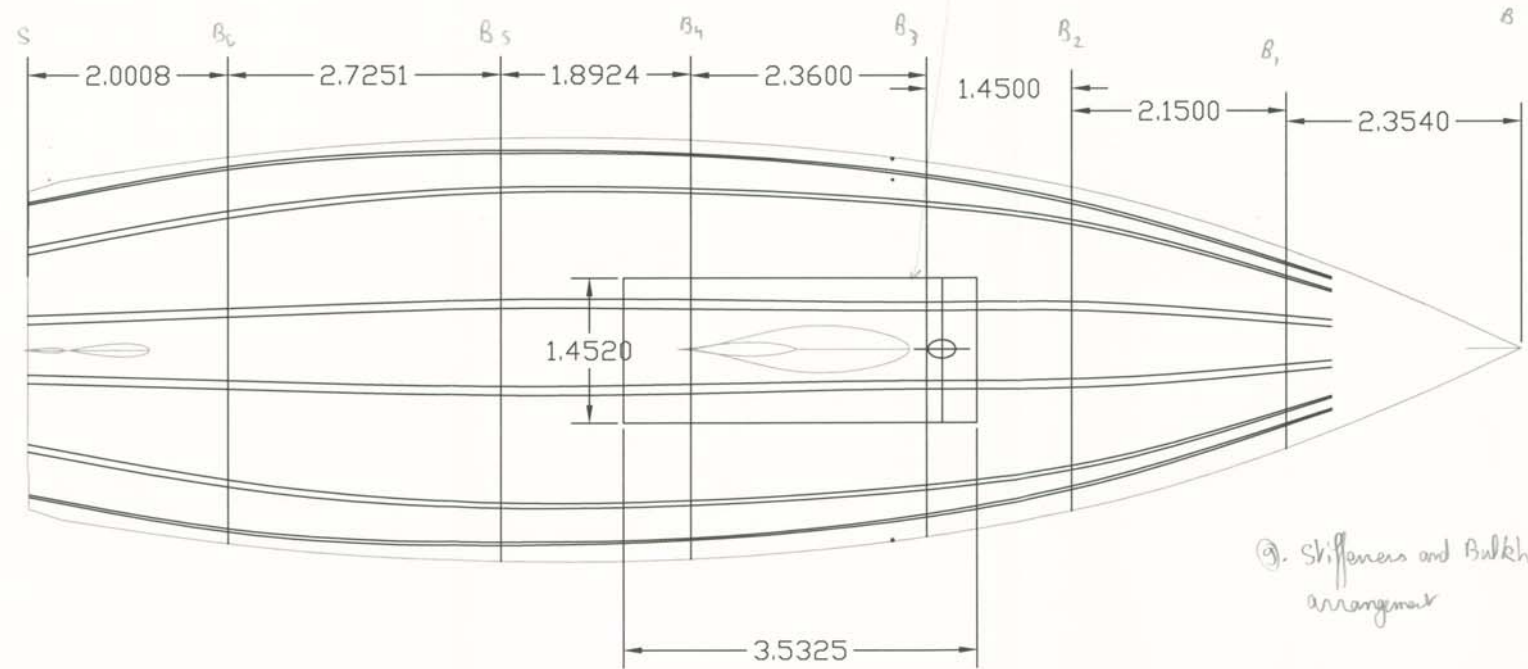
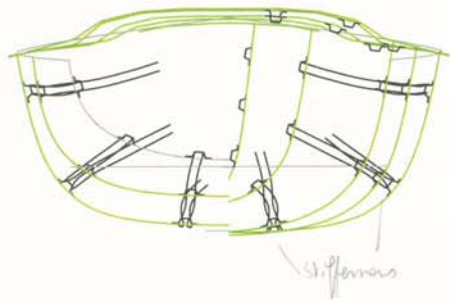
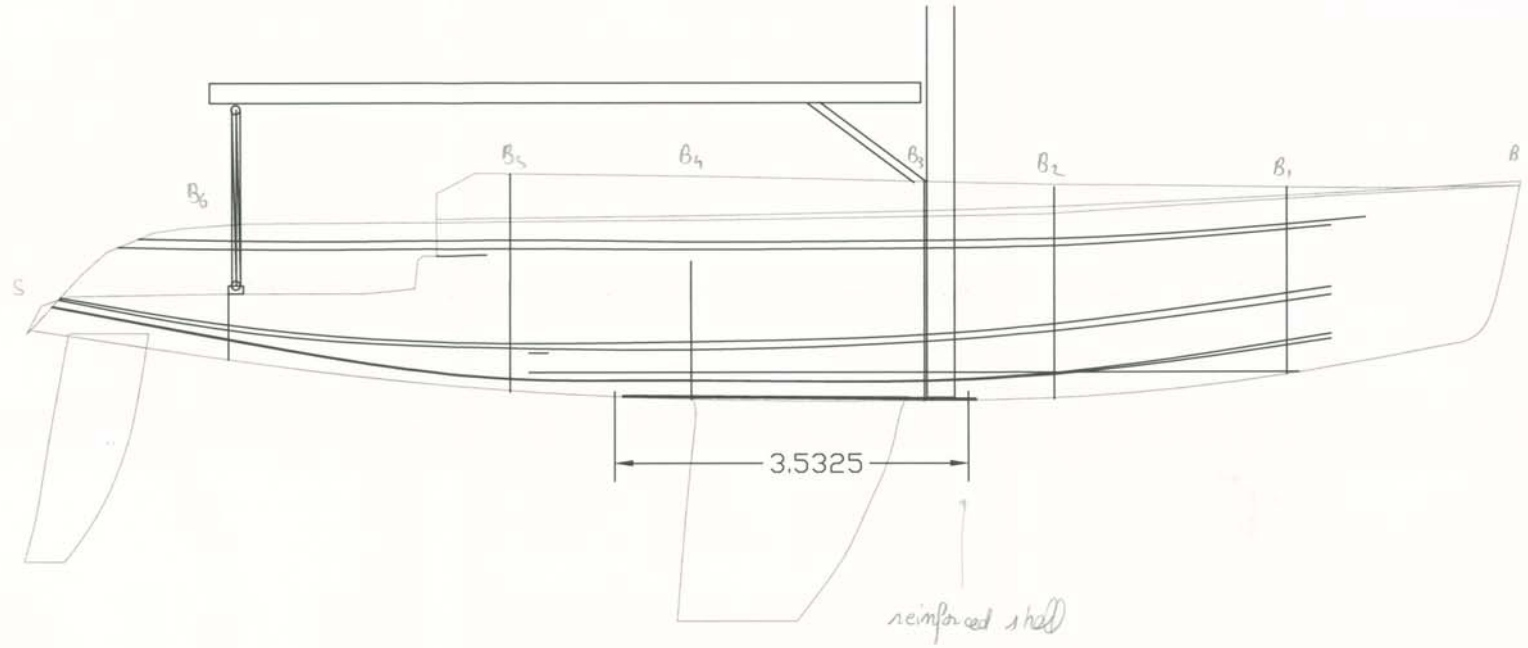
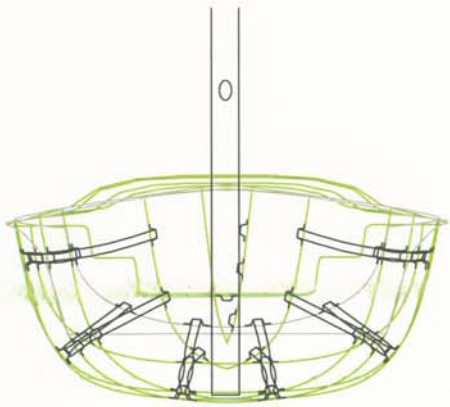
⑥ Hull, Deck and Appendages
(Body Plan)
Scale: 1:20



③ Deck layout, Rig and Sail plan



© Interior layout



9. Stiffeners and Bulkheads arrangement

10. Panel Dimensions

Panel Sizes				
Longitudinal Position	Between...	and...	s(mm)	A (mm)
Bow	Centerline	Stiffener 1	306	0
Bow	Stiffener 1	Stiffener 2	513	0
Bow	Stiffener 2	Stiffener 3	534	0
Bow	Stiffener 3	Freeboard	212	0
Bulkhead 1	Centerline	Stiffener 1	676	188
Bulkhead 1	Stiffener 1	Stiffener 2	663	73
Bulkhead 1	Stiffener 2	Stiffener 3	635	0
Bulkhead 1	Stiffener 3	Freeboard	336	0
Bulkhead 2	Centerline	Stiffener 1	1011.2	91
Bulkhead 2	Stiffener 1	Stiffener 2	1040	128
Bulkhead 2	Stiffener 2	Stiffener 3	841	36
Bulkhead 2	Stiffener 3	Freeboard	404	0
Bulkhead 3	Centerline	Stiffener 1	1003	17
Bulkhead 3	Stiffener 1	Stiffener 2	1184	144
Bulkhead 3	Stiffener 2	Stiffener 3	940	50
Bulkhead 3	Stiffener 3	Freeboard	396	0
Bulkhead 4	Centerline	Stiffener 1	1056	17
Bulkhead 4	Stiffener 1	Stiffener 2	1251	185
Bulkhead 4	Stiffener 2	Stiffener 3	1033	63
Bulkhead 4	Stiffener 3	Freeboard	361	0
Bulkhead 5	Centerline	Stiffener 1	1016	19
Bulkhead 5	Stiffener 1	Stiffener 2	1242	142
Bulkhead 5	Stiffener 2	Stiffener 3	1043	70
Bulkhead 5	Stiffener 3	Freeboard	331	0
Bulkhead 6	Centerline	Stiffener 1	900	16
Bulkhead 6	Stiffener 1	Stiffener 2	1061	97
Bulkhead 6	Stiffener 2	Stiffener 3	933	111
Bulkhead 6	Stiffener 3	Freeboard	289	0
Stern	Centerline	Stiffener 1	744	33
Stern	Stiffener 1	Stiffener 2	723	47
Stern	Stiffener 2	Stiffener 3	751	97
Stern	Stiffener 3	Freeboard	207	0

Panel Areas, Cg and moment of inertia							
	Area (m2)	VCG	LCG from amid	TCG	I-roll	I-pitch	I-yaw
Deck	56.387	1.228	-1.609	0	75.1	746.0	801.8
Hull Total	80.741	0.173	-0.418	0	158.6	1251.7	1357.8
Panel Bow-Bulkhead2							
Above	12.598	0.853	4.850	0	13.9	37.2	47.5
Below	8.231	-0.201	3.961	0	3.3	23.8	26.3
Panel Bulkhead2-Bulkhead6							
Above	19.300	0.731	-1.239	0	70.3	126.5	192.7
Below	33.436	-0.315	-1.426	0	40.9	188.3	226.2
Panel Bulkhead6 - Stern							
Above	4.340	0.677	-5.093	0	12.0	48.1	58.8
Below	5.486	-0.036	-5.875	0	3.0	22.3	24.9
Bulkheads							
B1	2.808	0.731	4.963	0	1.3	0.7	0.7
B2	5.380	0.594	2.813	0	5.0	1.6	3.4
B3	6.562	0.562	1.363	0	7.8	2.1	5.6
B4	7.538	0.571	-0.997	0	10.7	2.6	8.1
B5	7.491	0.626	-2.887	0	10.8	2.4	8.4
B6	2.907	0.410	-5.617	0	4.1	0.3	3.7

11. Weight balance

	Mass (kg)	VCG (m above DWL)	LCG (m fwd amidships)	TCG (m)	Length, surface, volume (m or m2 or m3)	Length, surface, volume density (kg/m or kg/m2 or kg/m3)
Total	12940	-0.203	-0.261	0.000		
Hull structure	1173					
Shell Panel B-2 Above	128	0.853	4.850	0.000	12.598	10.130
Shell Panel 2-6 Above	196	0.731	-1.239	0.000	19.3	10.130
Shell Panel 6-S Above	44	0.677	-5.093	0.000	4.34	10.130
Shell Panel B-2 Below	83	-0.201	3.961	0.000	8.231	10.130
Shell Panel 2-6 Below	289	-0.315	-1.426	0.000	28.550	10.130
Shell Panel 6-S Below	56	-0.036	-5.875	0.000	5.486	10.130
Reinforced Shell	130	-0.570	0.090	0.000	4.886	26.616
Stiffeners B-2 (6)	59	0.200	0.000	0.000	4.5	2.188
Stiffeners 2-6 (6)	163	0.200	0.000	0.000	8.43	3.224
Stiffeners 6-S (6)	25	0.200	0.000	0.000	2.03	2.070
Bulkheads	134					
B1	12	0.731	4.963	0.000	1.404	8.243
B2	22	0.594	2.813	0.000	2.690	8.243
B3	27	0.562	1.363	0.000	3.281	8.243
B4	31	0.571	-0.997	0.000	3.769	8.243
B5	31	0.626	-2.887	0.000	3.746	8.243
B6	12	0.410	-5.617	0.000	1.454	8.243
Rudder	64	-0.889	-6.959	0.000	40	1.603
Rudder stock	103	-0.400	-6.680	0.000	0.0158	6500
Keel Structure	223	-1.498	0.014	0.000	7.947	28.00
Ballast (lead)	5861	-1.498	0.014	0.000	0.5328	11000
Internal ballast	350	-0.4	0.014	0.000	0.0318	11000
Sails	292					
Hoisted Main	76	9.233	0.283	0.000	75.6	1
Hoisted Jib	39	7.451	3.433	0.000	56.00	0.7
Stored Jibs (2)	78	0.000	-3.000	0.000	112.0	0.7
Stored Spinnakers (3)	99	0.000	5.000	0.000	397	0.25
Rig	398					
Mast	240	10.600	1.500	0.000	22.2	10.8
Top fittings	5	21.700	1.500	0.000		
Other fittings	12	2.500	1.500	0.000		
Boom	57	2.500	-5.600	0.000		
Spinnaker Pole (on deck)	14	1.500	3.000	0.000		
Lower Spreader	2	8.832	1.500	0.000		
Upper Spreader	2	14.332	1.500	0.000		
Shrouds V1	6	5.141	1.013	0.000	7.62	0.764
Shrouds D1	6	5.082	1.013	0.000	7.94	0.764
Shrouds V2	2	11.726	1.013	0.000	5.61	0.435
Shrouds D2	2	11.641	1.013	0.000	5.92	0.316
Shrouds D3	2	16.827	1.013	0.000	4.92	0.435
Headstay	10	10.109	4.400	0.000	18.49	0.562
Backstay	6	10.850	-3.100	0.000	23.57	0.25
Halyards	20	10.600	0.000	0.000		
Chain plates	12	1.600	1.013	0.000		

Deck		765					
Deck+Cockpit Structure	511	1.228	-1.609	0.000		56.39	9.07
Jib/Spinnaker winches	20	1.100	-5.250	0.000			
Halyard winches	15	1.750	-3.300	0.000			
Mainsail winches	15	1.100	-4.300	0.000			
Jib tracks and cars	8	1.600	2.000	0.000			
Main traveler + car	10	0.800	-2.000	0.000			
Vang	12	2.200	1.000	0.000			
Lifelines	20	2.300	0.000	0.000			
Wheel	4	2.000	-2.000	0.000			
Anchor + Chain	100	0.600	5.000	0.000			
Other deck hardware	50	0.800	0.000	0.000			

Machinery		650			
Steering gear	50	0.300	-2.000	0.000	
Engine	300	0.000	-2.000	0.000	
Plumbing	120	0.000	-1.000	0.000	
Electrical	80	0.000	0.000	0.000	
Batteries	100	-0.200	-2.000	0.000	

Interior		1650			
Double Berths Aft	300	0.000	-3.000	0.000	
Double Berth Fwd	150	0.300	4.000	0.000	
Saloon equipment	200	0.500	2.000	0.000	
Nav table + seat	40	0.500	0.000	0.000	
Electronics	25	0.600	0.000	0.000	
WC	20	0.000	0.000	0.000	
Stove	35	0.300	0.000	0.000	
Kitchenware	30	0.500	0.000	0.000	
Water tank	50	0.000	-0.500	0.000	
Water	500	0.200	-0.500	0.000	
Fuel tank	50	0.000	-0.500	0.000	
Fuel	250	0.200	-0.500	0.000	

Payload		990			
Crew of 7	630	1.400	-1.000	0.000	
Crew equipment	60	0.200	0.000	0.000	
Food (10days)	300	-0.100	0.500	0.000	

Movable ballast	287	-0.120	-1.000	0.000	
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longitudinal position adjusted such that LCG=LCB