0340 Preliminary Stability Calculation Booklet

According ISO 12217-1:2002+A1:2009

41 AC

6836 / Jetten Yachting

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Preface

The information presented in this report is based on a calculated Light Ship Weight, corresponding to Revision P0 of the Preliminary Weight Calculation. It contains the calculations made to show compliance with the stability criteria as known for design category B, as well as the hydrostatic properties and stability calculations.

Sneek, 12/08/2011

Identification And Approval

General information of the ship				
1	Ship's Name	-		
2	Type of ship	41 AC		
3	Name of builders	Jetten Yachting		
4	HIN code	-		
5	CE design Category	B		
6	Test option	1		
7	Maximum load	1500 kg (including persons, excl. tanks)		
8	Crew Limit	10 persons		
9	Principal dimensions			
		Length hull	12.420	m
		Breadth hull	4.240	m

In order to obtain the light ship weight an inclining test will be held. The test has not been conducted yet, therefore the weights and their centres of mass have been estimated by means of a weight calculation.

Light Ship Particulars				
Item	Weight	LCG	TCG	VCG
	[kg]	[m]	[m]	[m]
Light ship	16618	4.955	0.000	1.656
Trimballast	0	0.000	0.000	0.000
Crew Limit (10 persons)	750	5.000	2.100	2.500
Maximum Total Load (pers. & tanks excl.)	750	5.000	0.000	2.000
Maximum Fuel Capacity	706	4.770	0.000	0.549
Maximum Fresh water Capacity	909	6.805	0.000	0.592

Note : All centres are measured from ship's origin

Based on the above mentioned data, the following information has become available :

Item		Weight	LCG	TCG	VCG
		[kg]	[m]	[m]	[m]
Minimum Operating mass	M_{MOC}	16807	5.256	0.000	1.736
Loaded displacement mass	M_{LDC}	19707	5.310	0.000	1.851

Note : All centres are measured from ship's origin
A detailed list of the loading conditions can be found in Appendix 1 – Loading Conditions.

Any opening that may admit water into the interior or bilge of a boat is defined as a down flooding point. Such openings are limiting the stability curves. The following down flooding points have been defined (Details can be found in Appendix 7):

Down flooding points			
Item	Longitudinal position [m]	Transverse position [m]	Vertical position [m]
ER VENTILATION PS	3.900	1.950	2.200
ER VENTILATION PS	3.900	-1.950	2.200

Note : All centres are measured from ship's origin

Stability Criteria

Down flooding height

According to ISO 12217-1 Chapter 6.1.2 sufficient freeboard margin has to be demonstrated before water is shipped on board. This test has to be conducted for the boat in the loaded displacement condition.

Criteria :

For category B, using test option 1: HD > HD(R)
where HD(R) = LH / 17 = 0.731 Or 0.4m Whichever is Greater
HD(R) = 0.731
LH = 12.42 m

Attained :
HD = 1.054 m

Conclusion :
HD > HD(R). The down flooding heights comply with category B.

Offset-load test

The offset load angle ($Ø_0$) is the angle of heel as a result of an offset load by all persons on board. In requirement 6.2 of the ISO 12217-1 assessment sufficient stability is to be demonstrated for the ship in loaded displacement condition, exept when any tank has a maximum transverse dimension greater than 0.35BH, than the half loaded condition shall be applied.

Criteria :

For all categories :

$Ø_0 < Ø_{0(R)}$, where $Ø_{0(R)} = 11.5 + \frac{(24 - L_H)^3}{520}$ = 14.48°

LH = 12.42 m

Required minimum heeled freeboard margin during offset-load test:

Freeboard > 0.145 x BH (= 0.615m)

BH = 4.24 m

The maximum righting moment occuring up to the downflooding angle is greater than the heeling moment (=1.881 tonm) at the resulting heel angle.

Attained *(Using the simplified method)* :

LC1 (Crew in aft position)
Ø0 = 4.78°
Freeboard = 0.874 m
Downflooding angle = 0.33 degrees
Maximum Righting moment to downflooding = 6.278 tonm

LC2 (Crew in fwd position)
Ø0 = 4.82°
Freeboard = 0.92 m
Downflooding angle = 0.369 degrees
Maximum Righting moment to downflooding = 7.02 tonm

Conclusion :

The offset load angle Ø0 < Ø0(R), the minimum freeboard requirements and the downflooding righting moment requirements are met. The offset load test complies with category B.

Note :

Maximum transverse dimension of tanks = 1.85 m, which is more than 0.35BH, therefore the half filled tanks have been applied.

Resistance To Waves And Wind (Cat. B)

In assessment 6.3 of the ISO 12217-1 requirement, the stability in wind and waves is being tested. Sufficient stability has to be demonstrated.

The boat shall be assessed in the minimum operating as well as the loaded displacement condition.

The heeling moment due to wind, M_W, expressed in Newton metres, is assumed to be constant at all angles of heel and shall be calculated as follows :

$$M_W = 0.3A_{LV}\left(\left(\frac{A_{LV}}{L_{WL}}\right)+T_m\right)v_w{}^2$$ where A_{LV} shall be taken minimal 0.55 LHBH

The assumed roll angle ØR for category B shall be calculated as follows :

$$ØR = 20 + \frac{20}{v_D}$$

Minimum operating condition :		
A_{LV} :	28.96	m^2
L_{WL} :	11.44	m
T_M :	1.082	m
V_W :	21	$^m/_s$
MOM_W	13847	Nm
V_D :	16807	m^3
ØR :	21.16	o

Loaded displacement condition :		
A_{LV}	28.96	m^2
L_{WL}	11.52	m
T_M	1.151	m
V_W	21	$^m/_s$
MOM_W	14044	Nm
V_D	19707	m^3
ØR :	20.99	o

Recesses

Recesses of boats using stability test option 1, shall comply with the plan area limitation:

Maximum plan area (0 m2) < 15.79824 m^2

Maximum area in fwd half of the boat (0 m2) < 7.89912 m^2

Criteria :

The righting moment curve and the wind heeling moment shall be plotted on the graph. The area representing the righting moment (A2) shall be greater than the area representing the wind heeling moment (A1).
Note: Area ratio's and area curves are shown in appendix 5

Attained :

A2 is greater then A1 in both conditions.

Conclusion :

The Resistance To Waves And Wind (Cat. B) complies with category B.

Conclusions

Based on the information presented in this report and other available data the ship is tested on all criteria, resulting in compliance of the ship with the criteria of design category B.

This means that the ship stability wise is a category B ship.

A boat given design category B is considered to be designed for waves of up to 4 m significant height and a wind of Beaufort force 8 or less. Such conditions may be encountered on offshore voyages of sufficient length or on coasts where shelter may not always be immediately available. These conditions may also be experienced on inland seas of sufficient size for the wave height to be generated. Winds are assumed to gust to 21 m/s.

Appendices

Appendix 1 – Loading Conditions

INTACT STABILITY AT CONDITION 1
OPERATIONAL CONDITION : LIGHT CRAFT CONDITION

SUMMARY OF LOADING

0.0 Cu.M. (0%) DIESEL OIL 0.0 Cu.M. (0%) FRESH WATER
0.0 Cu.M. (0%) SEWAGE

WEIGHT STATUS

Trim: Fwd 0.006/11.100, Heel: Port 0.01 deg.

Part	Weight(MT)	LCG	TCG	VCG	FSM
WEIGHT	16.62	4.955f	0.000	1.656	

	Load	SpGr	Weight(MT)	LCG	TCG	VCG	
FO1.C	0.000	0.840	0.00				0.00
FW1.C	0.000	1.000	0.00				0.00
HO1.C	0.000	1.025	0.00				0.00
Total Tanks			**0.00**				**0.00**

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.006/11.100, Heel: Port 0.01 deg., VCG = 1.656

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.075	16.62	4.955f	0.779	0.36	4.478f	0.25	16.64	1.358

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 11.10m.

Draft is from Baseline.

CRITICAL POINT STATUS

Baseline draft: 1.078 @ 11.10f, 1.072 @ 0.00
Trim: Fwd 0.006/11.100, Heel: Port 0.01 deg.

	Critical Points	LCP	TCP	VCP	Height
(1)	AFT DRAFT MARK FRAME 0	0.000	0.000	0.000	-1.072
(2)	FWD DRAFT MARK FRAME 28	11.100f	0.000	0.000	-1.078

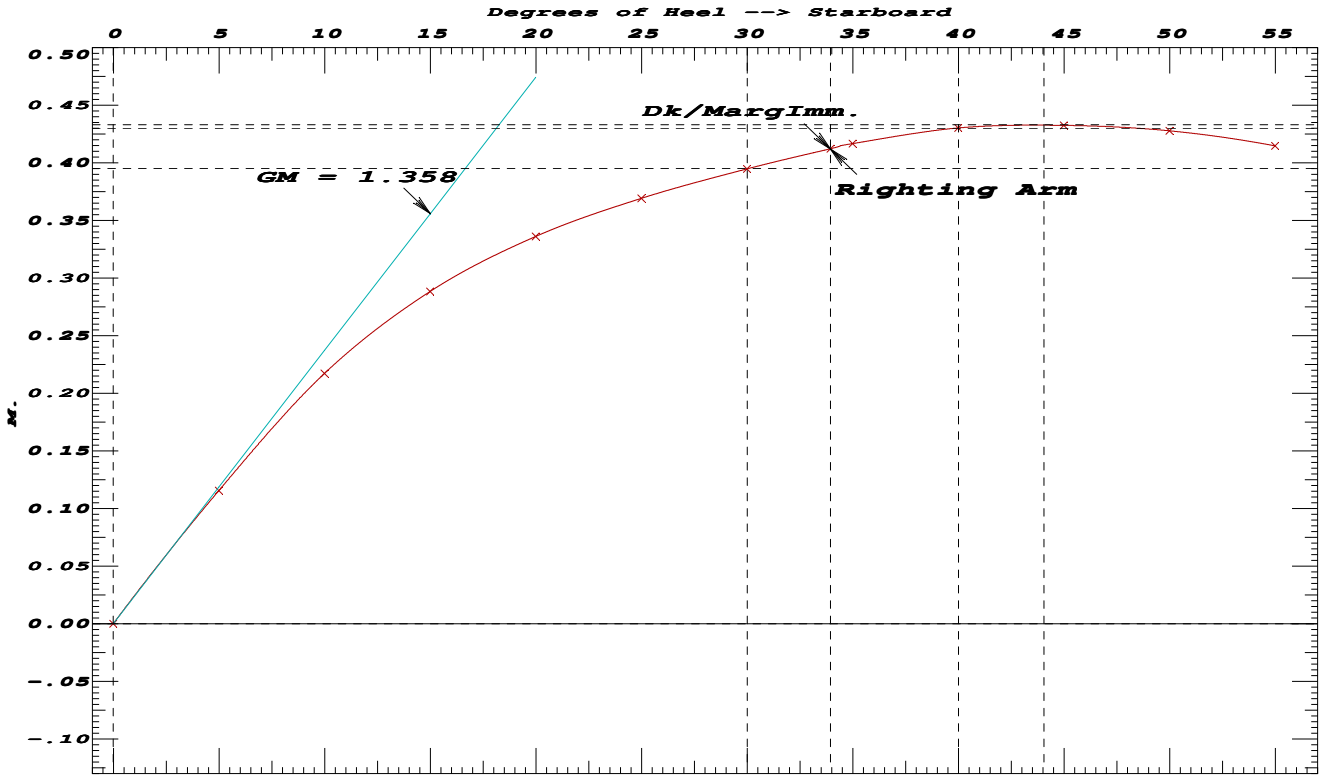
Distances in METERS.

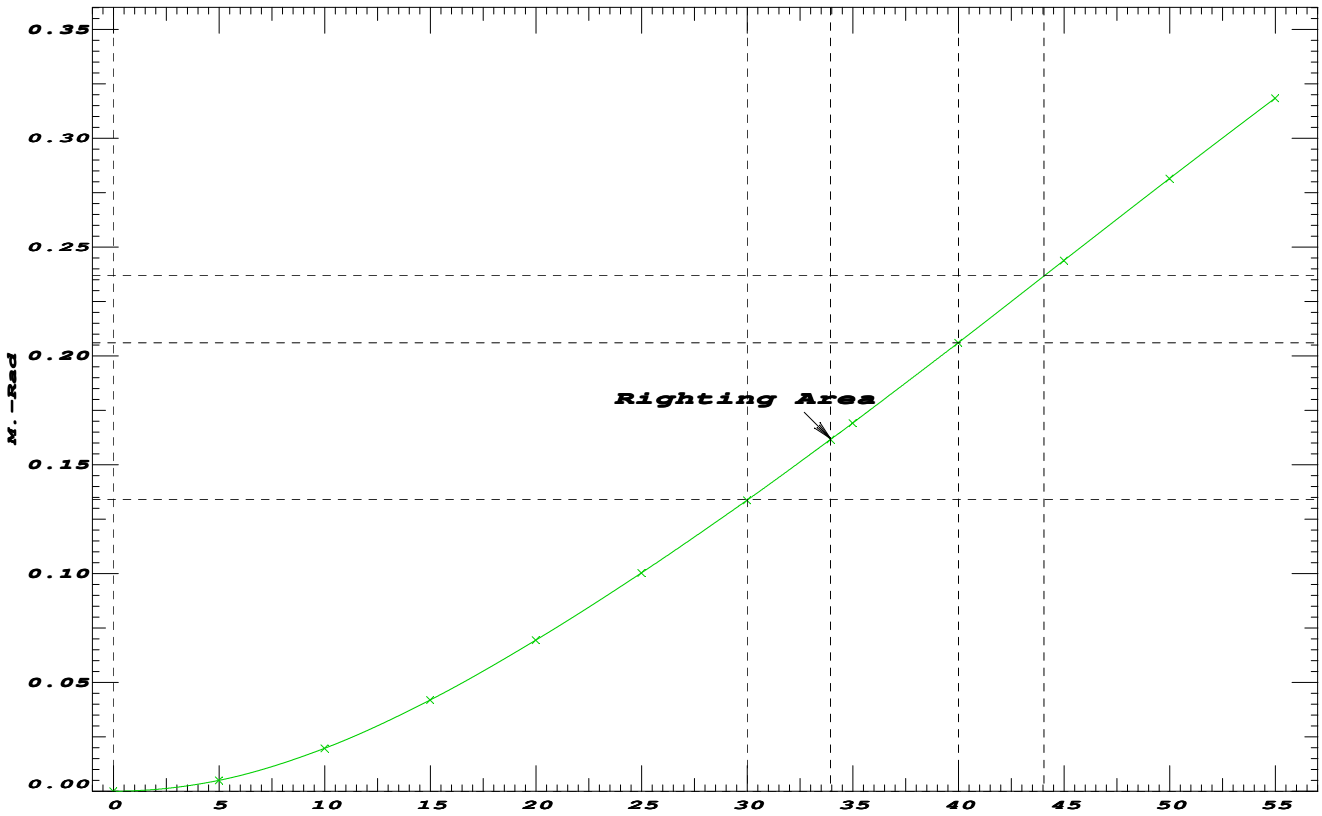
RIGHTING ARMS vs HEEL ANGLE

LCG = 4.955f TCG = 0.000 VCG = 1.656

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Righting Arms in Trim	Righting Arms in Heel	Area	Freebd (Extra)
1.072	0.03f	0.01p	16.618	0.000	0.000	0.0000	
1.063	0.06f	4.99s	16.618	0.000	0.116	0.0050	0.945
1.032	0.16f	9.99s	16.617	0.000	0.217	0.0197	0.767
0.976	0.32f	14.99s	16.616	0.000	0.288	0.0419	0.595
0.901	0.48f	19.99s	16.615	0.000	0.336	0.0694	0.429
0.809	0.64f	24.99s	16.615	0.000	0.369	0.1002	0.269
0.702	0.79f	29.99s	16.615	0.000	0.395	0.1336	0.116
0.607	0.90f	33.95s	16.618	0.000	0.412	0.1615	*-0.001*
0.580	0.93f	34.99s	16.618	0.000	0.417	0.1690	*-0.030*
0.446	1.08f	39.99s	16.616	0.000	0.430	0.2061	*-0.170*
0.340	1.21f	43.71s	16.618	0.000	**0.433**	0.2342	*-0.272*
0.302	1.26f	44.99s	16.618	0.000	0.433	0.2438	*-0.306*
0.147	1.49f	49.99s	16.618	0.000	0.428	0.2814	*-0.438*
-0.015	1.76f	54.99s	16.618	0.000	0.415	0.3182	*-0.567*

Distances in METERS. Specific Gravity = 1.025. Area in m.-Rad.





INTACT STABILITY AT CONDITION 2
OPERATIONAL CONDITION : MINIMUM OPERATING CONDITION

SUMMARY OF LOADING

0.0 Cu.M. (2%) DIESEL OIL 0.0 Cu.M. (2%) FRESH WATER
0.0 Cu.M. (2%) SEWAGE
0.25 MT of Misc. Weights

WEIGHT STATUS

Trim: 0.000/11.100, Heel: Port 0.01 deg.

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	16.62	4.955f	0.000	1.656
CREW	0.15	2.800f	0.000	3.800
NON CONSUMABLES	0.10	5.000f	0.000	2.000
Total Fixed	**16.87**	**4.936f**	**0.000**	**1.677**

	Load	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1.C	0.020	0.840	0.01	5.250f	0.004p	0.332	0.16
FW1.C	0.020	1.000	0.01	6.424f	0.000	0.329	0.01
HO1.C	0.020	1.025	0.01	4.670f	0.045p	1.644	0.87
Total Tanks			**0.03**	**5.576f**	**0.010p**	**0.590**	**1.03**
Total Weight			**16.90**	**4.937f**	**0.000**	**1.675**	
Free Surface Adjustment						**0.061**	
Adjusted CG				**4.937f**	**0.000**	**1.736**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: 0.000/11.100, Heel: Port 0.01 deg., VCG = 1.675

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.082	16.90	4.937f	0.784	0.36	4.470f	0.25	16.48	1.262

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 11.10m.
Draft is from Baseline. True Free Surface included.

CRITICAL POINT STATUS

Baseline draft: 1.082 @ 11.10f, 1.083 @ 0.00
Trim: 0.000/11.100, Heel: Port 0.01 deg.

	Critical Points	LCP	TCP	VCP	Height
(1)	AFT DRAFT MARK FRAME 0	0.000	0.000	0.000	-1.083
(2)	FWD DRAFT MARK FRAME 28	11.100f	0.000	0.000	-1.082

Distances in METERS.

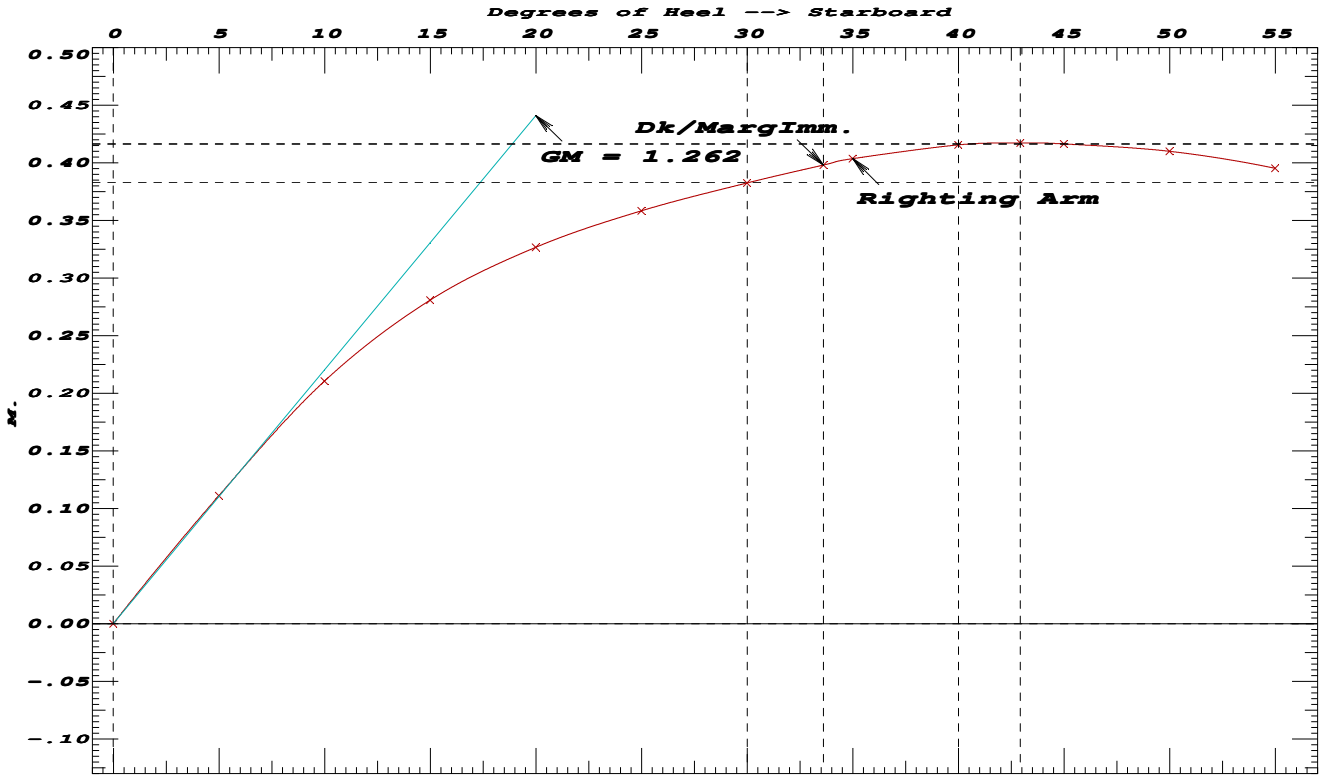
RIGHTING ARMS vs HEEL ANGLE

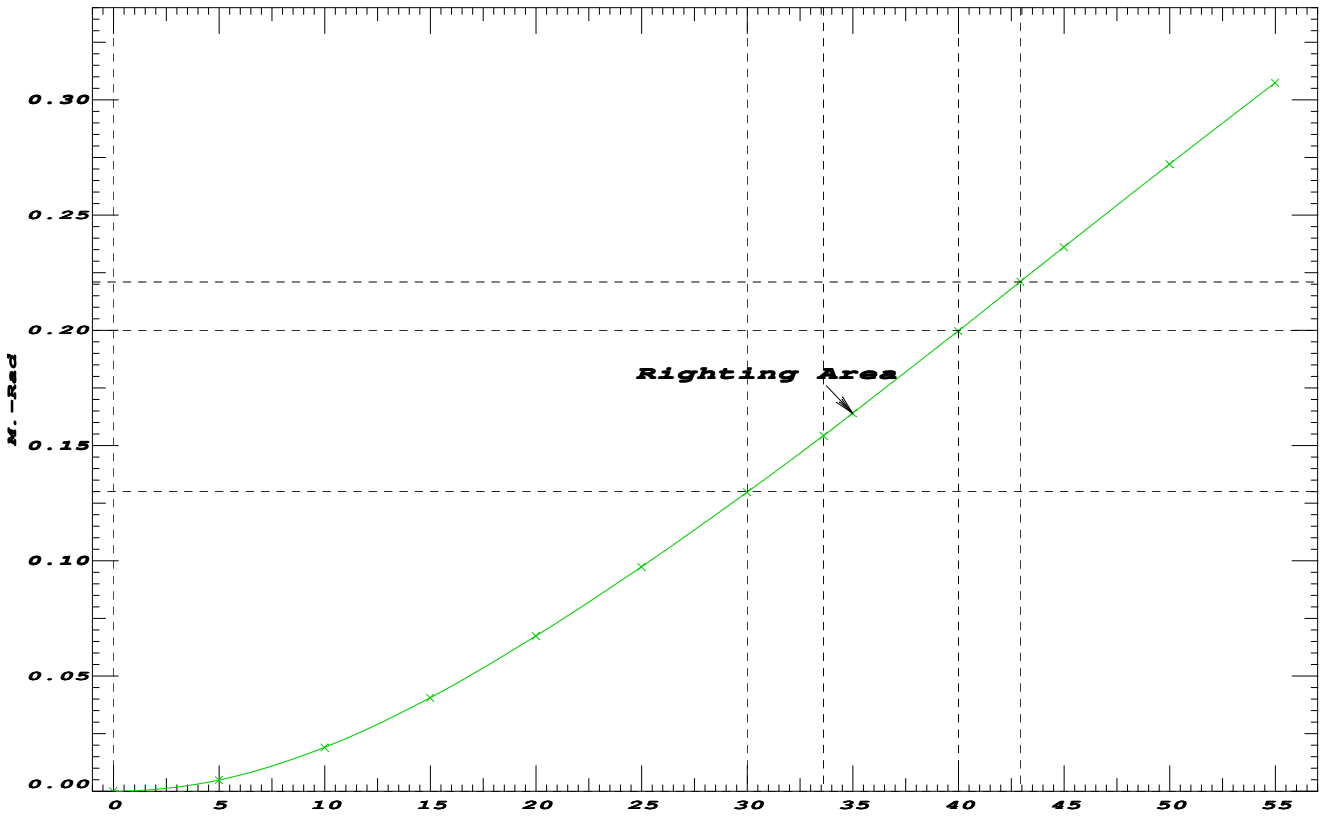
Fixed CG: LCG = 4.936f TCG = 0.000 VCG = 1.677

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Righting Arms in Trim	Righting Arms in Heel	Area	Freebd (Extra)
1.082	0.00	0.01p	16.895	0.000	0.000	0.0000	
1.074	0.02f	4.99s	16.900	0.000	0.111	0.0049	0.937
1.044	0.11f	9.99s	16.899	0.000	0.211	0.0190	0.758
0.989	0.26f	14.99s	16.897	0.000	0.281	0.0406	0.585
0.916	0.41f	19.99s	16.897	0.000	0.327	0.0673	0.419
0.826	0.56f	24.99s	16.897	0.000	0.358	0.0973	0.259
0.720	0.70f	29.99s	16.897	0.000	0.382	0.1297	0.105
0.633	0.80f	33.61s	16.899	0.000	0.398	0.1543	*-0.001*
0.598	0.84f	34.99s	16.899	0.000	0.404	0.1640	*-0.040*
0.465	0.98f	39.99s	16.898	0.000	0.415	0.1998	*-0.180*
0.382	1.08f	42.93s	16.899	0.000	**0.417**	0.2212	*-0.261*
0.321	1.16f	44.99s	16.899	0.000	0.416	0.2361	*-0.316*
0.166	1.39f	49.99s	16.899	0.000	0.410	0.2722	*-0.448*
0.005	1.65f	54.99s	16.899	0.000	0.395	0.3075	*-0.577*

Distances in METERS. Specific Gravity = 1.025. Area in m.-Rad.

Note: The Center of Gravity shown above is for the Fixed Weight of 16.87 MT. As the tank load centers shift with heel and trim, the total Center of Gravity varies. The righting arms shown above include the effect of the C.G. variation.





INTACT STABILITY AT CONDITION 3
OPERATIONAL CONDITION : HALFLOAD
TANKLOAD OPTIMISED FOR MINIUMUM TRIM

Note: Weight item "CREW" replaced.

SUMMARY OF LOADING

0.4 Cu.M. (50%) DIESEL OIL 0.3 Cu.M. (50%) FRESH WATER
0.0 Cu.M. (2%) SEWAGE
0.30 MT of CREW 0.20 MT of STORES

WEIGHT STATUS

Trim: Fwd 0.016/11.100, Heel: Port 0.02 deg.

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	16.62	4.955f	0.000	1.656
CREW	0.30	2.800f	0.000	3.800
STORES	0.20	4.500f	0.000	2.000
Total Fixed	**17.12**	**4.912f**	**0.000**	**1.698**

	Load	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1.C	0.500	0.840	0.35	4.819f	0.002p	0.479	2.19
FW1.C	0.500	1.000	0.31	6.485f	0.000	0.497	0.44
HO1.C	0.020	1.025	0.01	4.672f	0.050p	1.644	0.87
Total Tanks			**0.67**	**5.589f**	**0.002p**	**0.498**	**3.50**
Total Weight			**17.79**	**4.937f**	**0.000**	**1.652**	
Free Surface Adjustment						**0.197**	
Adjusted CG				**4.937f**	**0.000**	**1.849**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.016/11.100, Heel: Port 0.02 deg., VCG = 1.652

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.107	17.79	4.939f	0.800	0.37	4.490f	0.25	15.86	1.077

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 11.10m.
Draft is from Baseline. True Free Surface included.

CRITICAL POINT STATUS

Baseline draft: 1.116 @ 11.10f, 1.100 @ 0.00
Trim: Fwd 0.016/11.100, Heel: Port 0.02 deg.

	Critical Points	LCP	TCP	VCP	Height
(1)	AFT DRAFT MARK FRAME 0	0.000	0.000	0.000	-1.100
(2)	FWD DRAFT MARK FRAME 28	11.100f	0.000	0.000	-1.116

Distances in METERS.

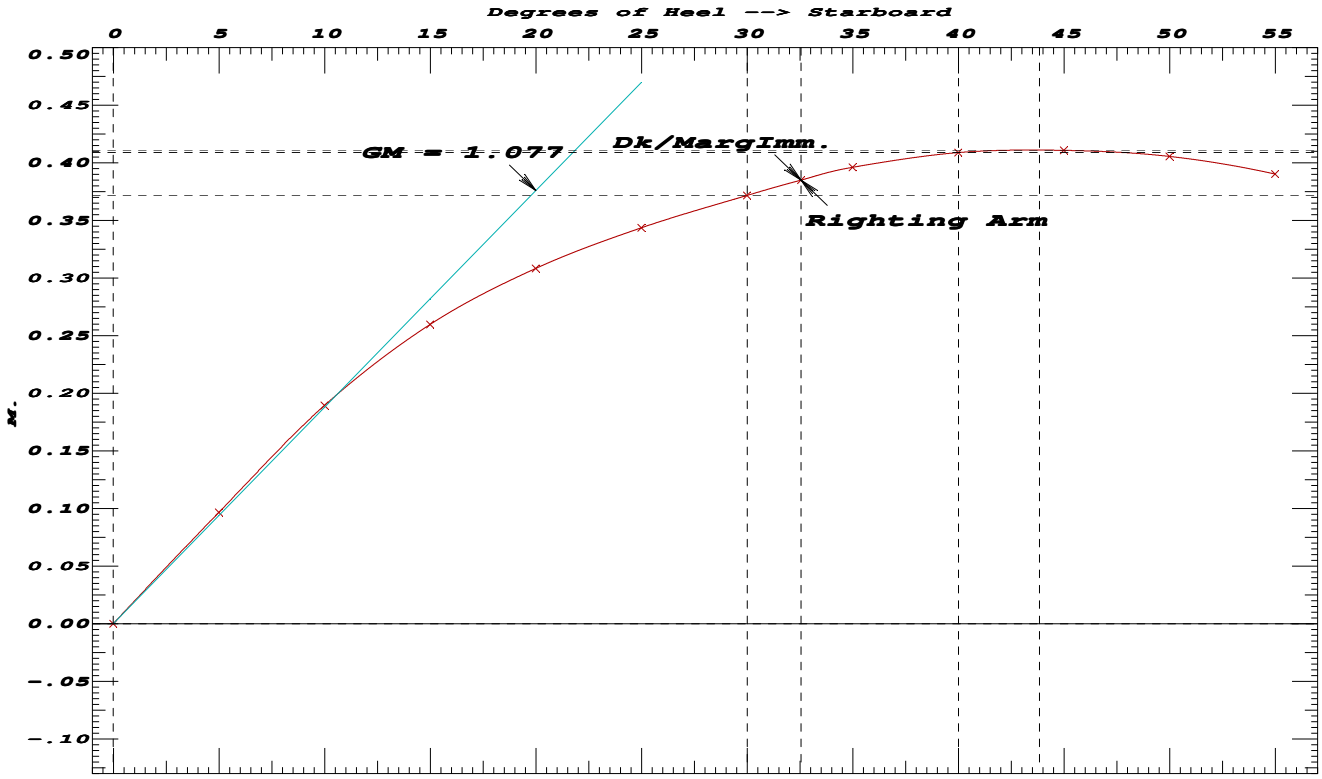
RIGHTING ARMS vs HEEL ANGLE

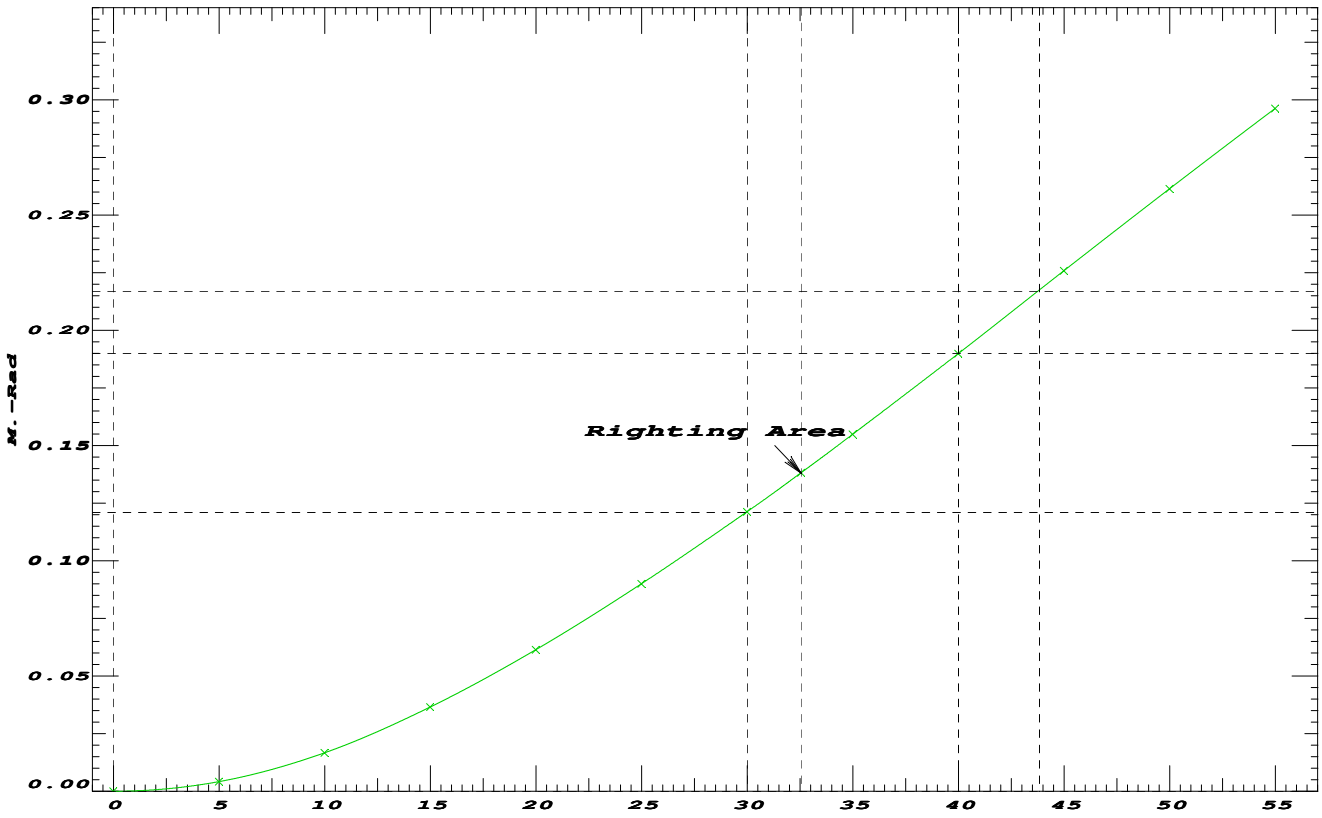
Fixed CG: LCG = 4.912f TCG = 0.000 VCG = 1.698

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Righting Arms in Trim	Righting Arms in Heel	Area	Freebd (Extra)
1.100	0.08f	0.02p	17.786	0.000	0.000	0.0000	
1.093	0.09f	4.98s	17.787	0.000	0.097	0.0042	0.913
1.065	0.17f	9.98s	17.787	0.000	0.189	0.0167	0.733
1.014	0.29f	14.98s	17.786	0.000	0.260	0.0365	0.558
0.944	0.42f	19.98s	17.785	0.000	0.308	0.0614	0.390
0.856	0.54f	24.98s	17.785	0.000	0.344	0.0900	0.230
0.752	0.67f	29.98s	17.785	0.000	0.372	0.1212	0.076
0.692	0.73f	32.55s	17.787	0.000	0.385	0.1382	*-0.000*
0.632	0.79f	34.98s	17.787	0.000	0.396	0.1548	*-0.070*
0.501	0.92f	39.98s	17.786	0.000	0.409	0.1900	*-0.211*
0.398	1.05f	43.63s	17.787	0.000	**0.411**	0.2161	*-0.311*
0.358	1.10f	44.98s	17.787	0.000	0.411	0.2258	*-0.348*
0.203	1.34f	49.98s	17.785	0.000	0.406	0.2615	*-0.480*
0.045	1.59f	54.98s	17.787	0.000	0.390	0.2963	*-0.610*

Distances in METERS. Specific Gravity = 1.025. Area in m.-Rad.

Note: The Center of Gravity shown above is for the Fixed Weight of 17.12 MT. As the tank load centers shift with heel and trim, the total Center of Gravity varies. The righting arms shown above include the effect of the C.G. variation.





INTACT STABILITY AT CONDITION 4

OPERATIONAL CONDITION : MAXIMUM TOTAL LOAD

SUMMARY OF LOADING

0.8 Cu.M. (98%) DIESEL OIL 0.6 Cu.M. (98%) FRESH WATER
0.0 Cu.M. (2%) SEWAGE
0.75 MT of CREWLIMIT 0.75 MT of MAXIMUM TOTAL LOAD

WEIGHT STATUS

Trim: Fwd 0.032/11.100, Heel: Port 0.02 deg.

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	16.62	4.955f	0.000	1.656
CREWLIMIT	0.75	4.000f	0.000	2.500
MAXIMUM TOTAL LOAD	0.75	4.000f	0.000	2.000
Total Fixed	**18.12**	**4.876f**	**0.000**	**1.705**

	Load	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1.C	0.980	0.840	0.69	4.777f	0.001p	0.547	2.77
FW1.C	0.980	1.000	0.61	6.493f	0.000	0.588	0.66
HO1.C	0.020	1.025	0.01	4.673f	0.053p	1.644	0.88
Total Tanks			**1.31**	**5.574f**	**0.001p**	**0.572**	**4.30**
Total Weight			**19.42**	**4.923f**	**0.000**	**1.629**	
Free Surface Adjustment						**0.222**	
Adjusted CG				**4.922f**	**0.000**	**1.851**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.032/11.100, Heel: Port 0.02 deg., VCG = 1.629

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.151	19.42	4.925f	0.827	0.37	4.525f	0.26	14.85	0.955

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 11.10m.
Draft is from Baseline. True Free Surface included.

CRITICAL POINT STATUS

Baseline draft: 1.170 @ 11.10f, 1.138 @ 0.00
Trim: Fwd 0.032/11.100, Heel: Port 0.02 deg.

	Critical Points	LCP	TCP	VCP	Height
(1)	AFT DRAFT MARK FRAME 0	0.000	0.000	0.000	-1.138
(2)	FWD DRAFT MARK FRAME 28	11.100f	0.000	0.000	-1.170

Distances in METERS.

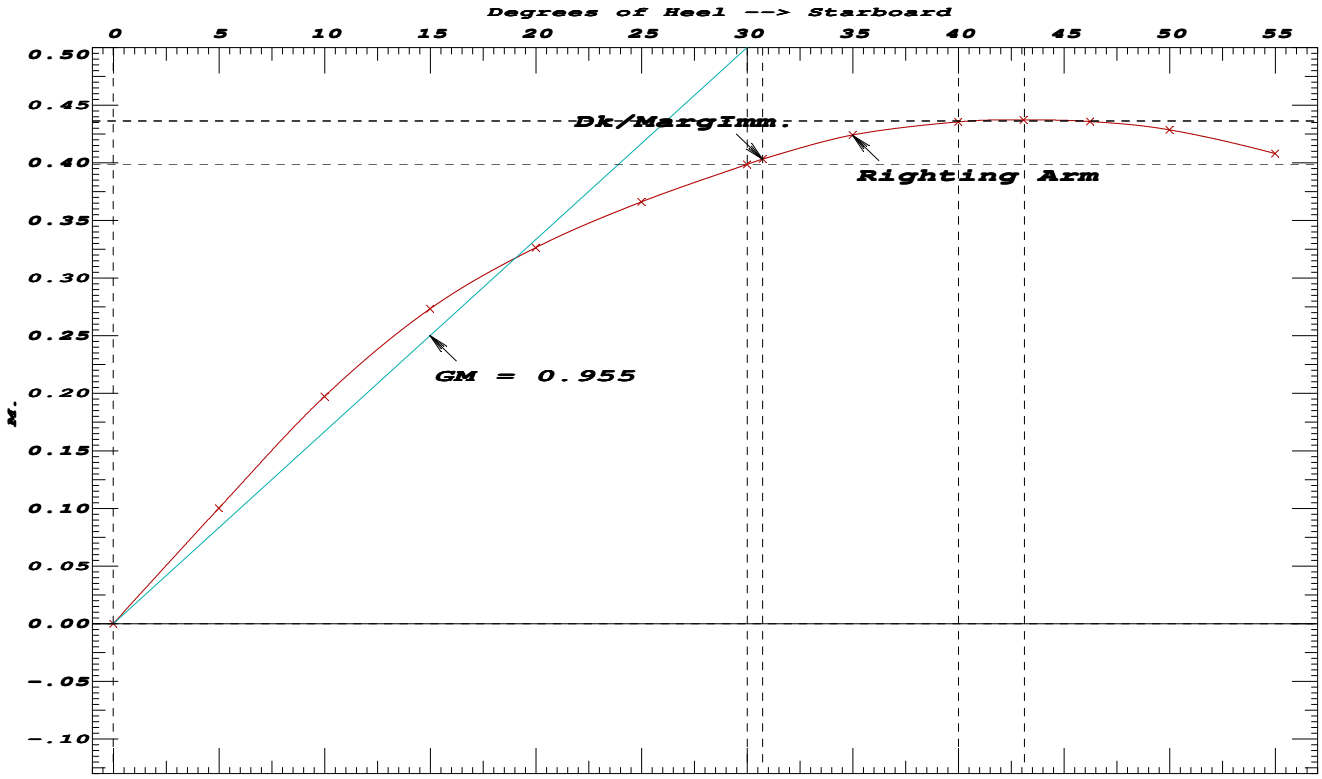
RIGHTING ARMS vs HEEL ANGLE

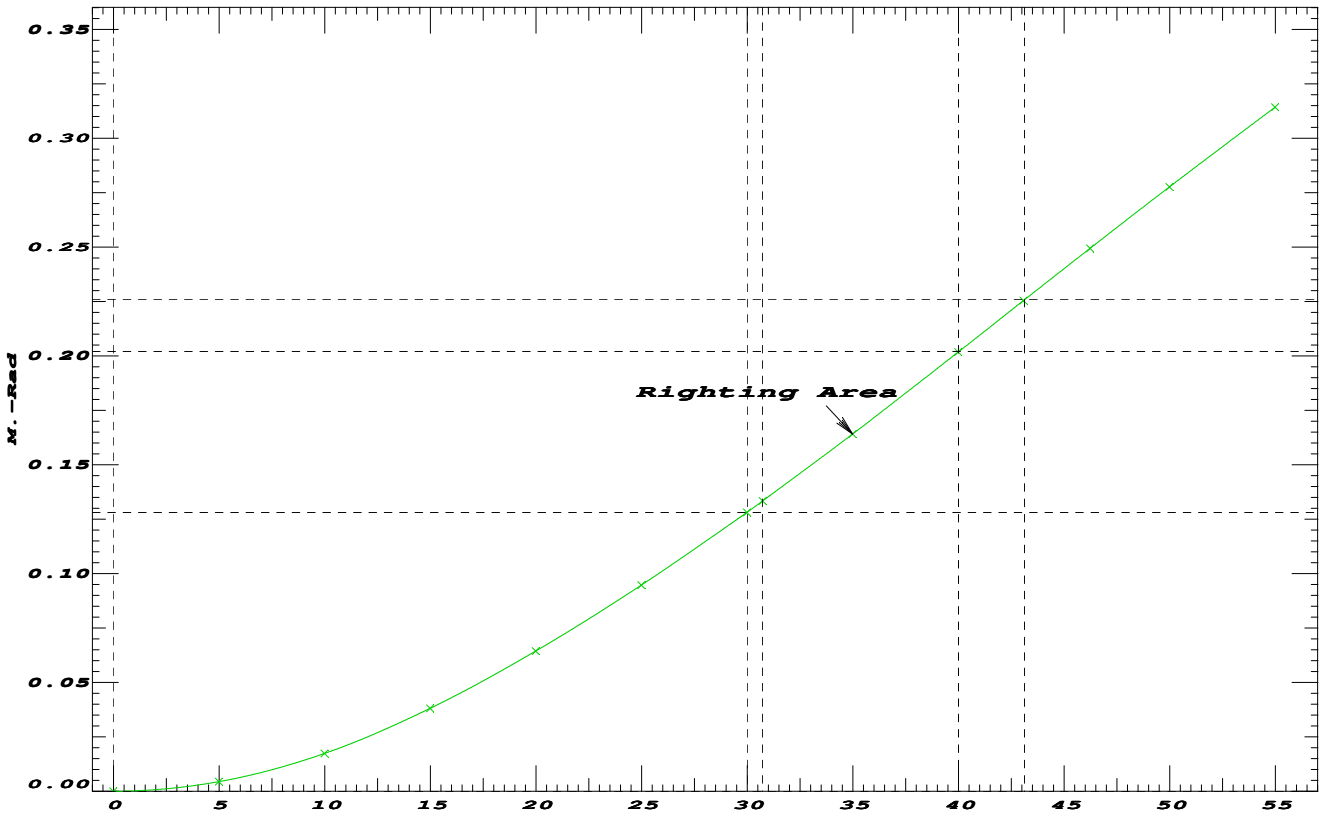
Fixed CG: LCG = 4.876f TCG = 0.000 VCG = 1.705

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Righting Arms in Trim	Righting Arms in Heel	Area	Freebd (Extra)
1.138	0.16f	0.02p	19.423	0.000	0.000	0.0000	
1.132	0.16f	4.98s	19.425	0.000	0.100	0.0044	0.870
1.109	0.21f	9.98s	19.423	0.000	0.197	0.0174	0.687
1.064	0.29f	14.98s	19.423	0.000	0.273	0.0380	0.509
1.000	0.36f	19.98s	19.423	0.000	0.326	0.0644	0.338
0.917	0.45f	24.98s	19.423	0.000	0.366	0.0947	0.176
0.815	0.55f	29.98s	19.422	0.000	0.399	0.1281	0.022
0.799	0.56f	30.72s	19.423	0.000	0.403	0.1333	*-0.000*
0.700	0.64f	34.98s	19.423	0.000	0.424	0.1641	*-0.125*
0.572	0.76f	39.98s	19.424	0.000	0.436	0.2017	*-0.268*
0.485	0.87f	43.08s	19.424	0.000	**0.437**	0.2253	*-0.353*
0.430	0.95f	44.98s	19.423	0.000	0.437	0.2398	*-0.405*
0.392	1.00f	46.23s	19.424	0.000	0.436	0.2493	*-0.438*
0.277	1.18f	49.98s	19.424	0.000	0.428	0.2776	*-0.538*
0.123	1.40f	54.98s	19.423	0.000	0.408	0.3142	*-0.669*

Distances in METERS. Specific Gravity = 1.025. Area in m.-Rad.

Note: The Center of Gravity shown above is for the Fixed Weight of 18.12 MT. As the tank load centers shift with heel and trim, the total Center of Gravity varies. The righting arms shown above include the effect of the C.G. variation.





Appendix 2 – Hydrostatic Properties

TRIM -1.00 DEGREE

A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

HYDROSTATIC PROPERTIES

Trim: Fwd 0.194/11.100, No Heel, VCG = 0.000

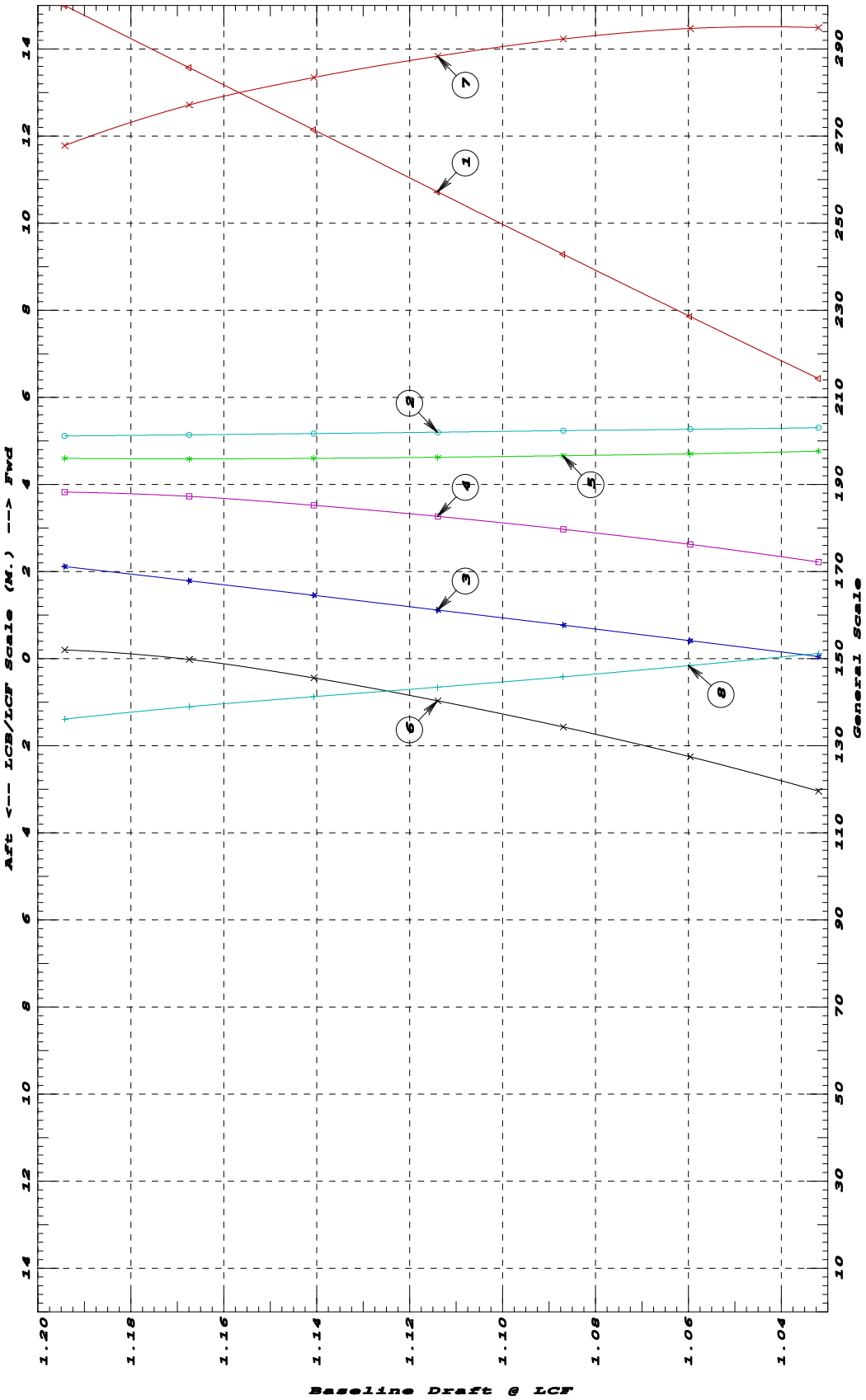
LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.032	15.00	5.304f	0.752	0.34	4.765f	0.24	17.70	3.024
1.060	16.00	5.269f	0.771	0.35	4.706f	0.25	17.68	2.969
1.087	17.00	5.234f	0.789	0.36	4.660f	0.27	17.54	2.917
1.114	18.00	5.201f	0.806	0.37	4.626f	0.28	17.30	2.869
1.141	19.00	5.170f	0.823	0.37	4.600f	0.29	17.01	2.825
1.167	20.00	5.141f	0.839	0.37	4.587f	0.30	16.63	2.780
1.194	21.00	5.115f	0.856	0.38	4.598f	0.30	16.07	2.722

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.

Trim is per 11.10m.

Draft is from Baseline.

HYDROSTATIC PROPERTIES at 0.19 M. FWD TRIM



(1) Displacement 1=.07 MT
(2) LCB (use top scale)
(3) VCB (KB) 1=.005 M.
(4) (4) Immersion 1=.002 MT/cm
(4) WPA 1=.195 Sq.M.
(5) LCF (use top scale)
(6) Moment/Trim 1=.002 M.-MT/cm
(7) KML 1=.06 M.
(8) KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base plane

TRIM -0.75 DEGREE
A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

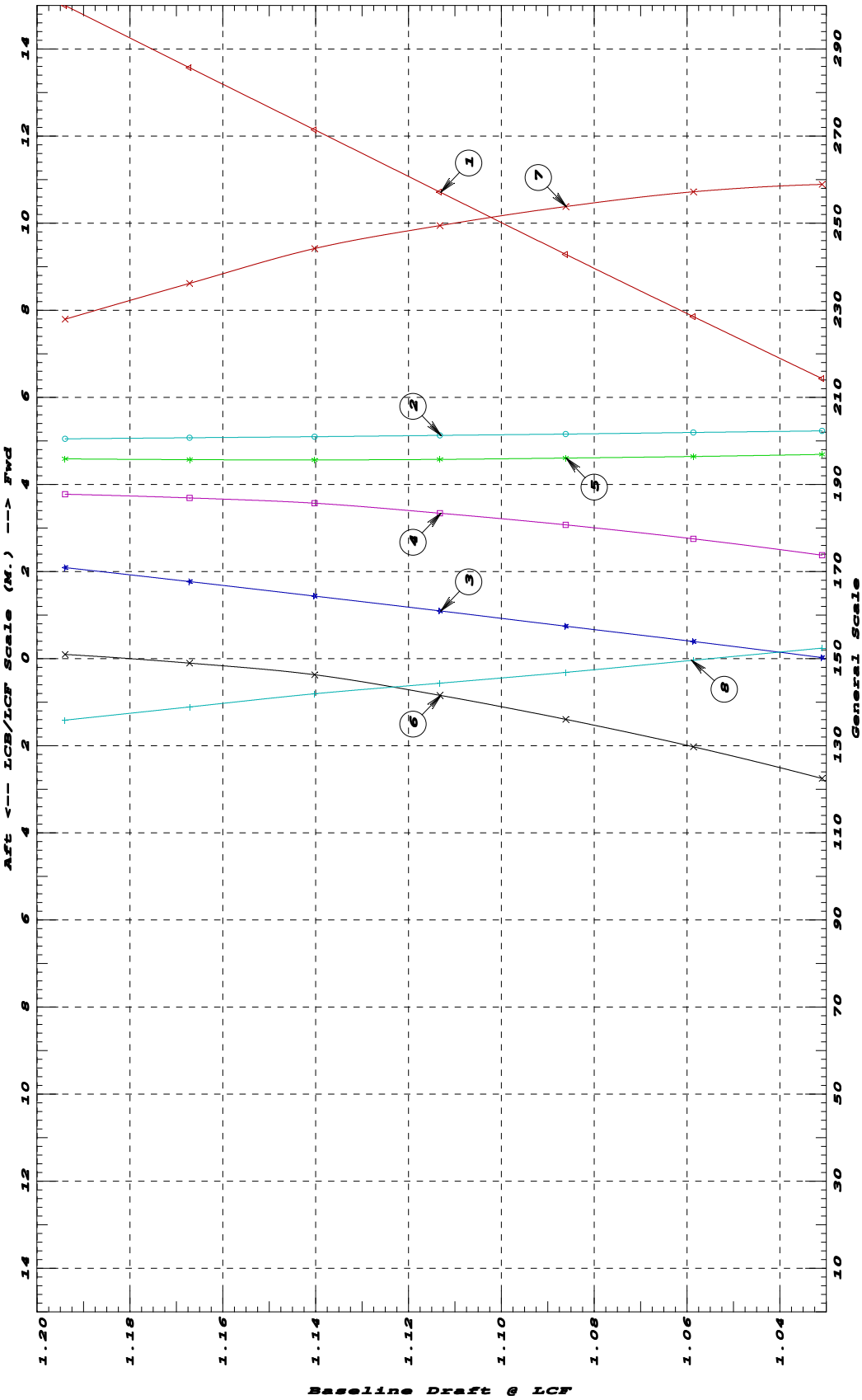
HYDROSTATIC PROPERTIES

Trim: Fwd 0.145/11.100, No Heel, VCG = 0.000

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.031	15.00	5.229f	0.751	0.35	4.692f	0.24	18.12	3.049
1.059	16.00	5.194f	0.770	0.36	4.642f	0.26	18.01	2.992
1.086	17.00	5.160f	0.787	0.36	4.605f	0.27	17.77	2.937
1.113	18.00	5.129f	0.805	0.37	4.579f	0.28	17.46	2.887
1.140	19.00	5.099f	0.822	0.37	4.562f	0.29	17.09	2.839
1.167	20.00	5.073f	0.838	0.37	4.570f	0.30	16.53	2.778
1.194	21.00	5.049f	0.855	0.38	4.585f	0.30	15.96	2.718

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 11.10m.
Draft is from Baseline.

HYDROSTATIC PROPERTIES at 0.15 M. FWD TRIM



(1) Displacement 1=.07 MT
(2) LCB (use top scale)
(3) VCB (KB) 1=.005 M.
(4) Immersion 1=.002 MT/cm
(4) WPA 1=.195 Sq.M.
(5) LCF (use top scale)
(6) Moment/Trim 1=.002 M.-MT/cm
(7) KML 1=.07 M.
(8) KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base plane

TRIM -0.50 DEGREE
A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

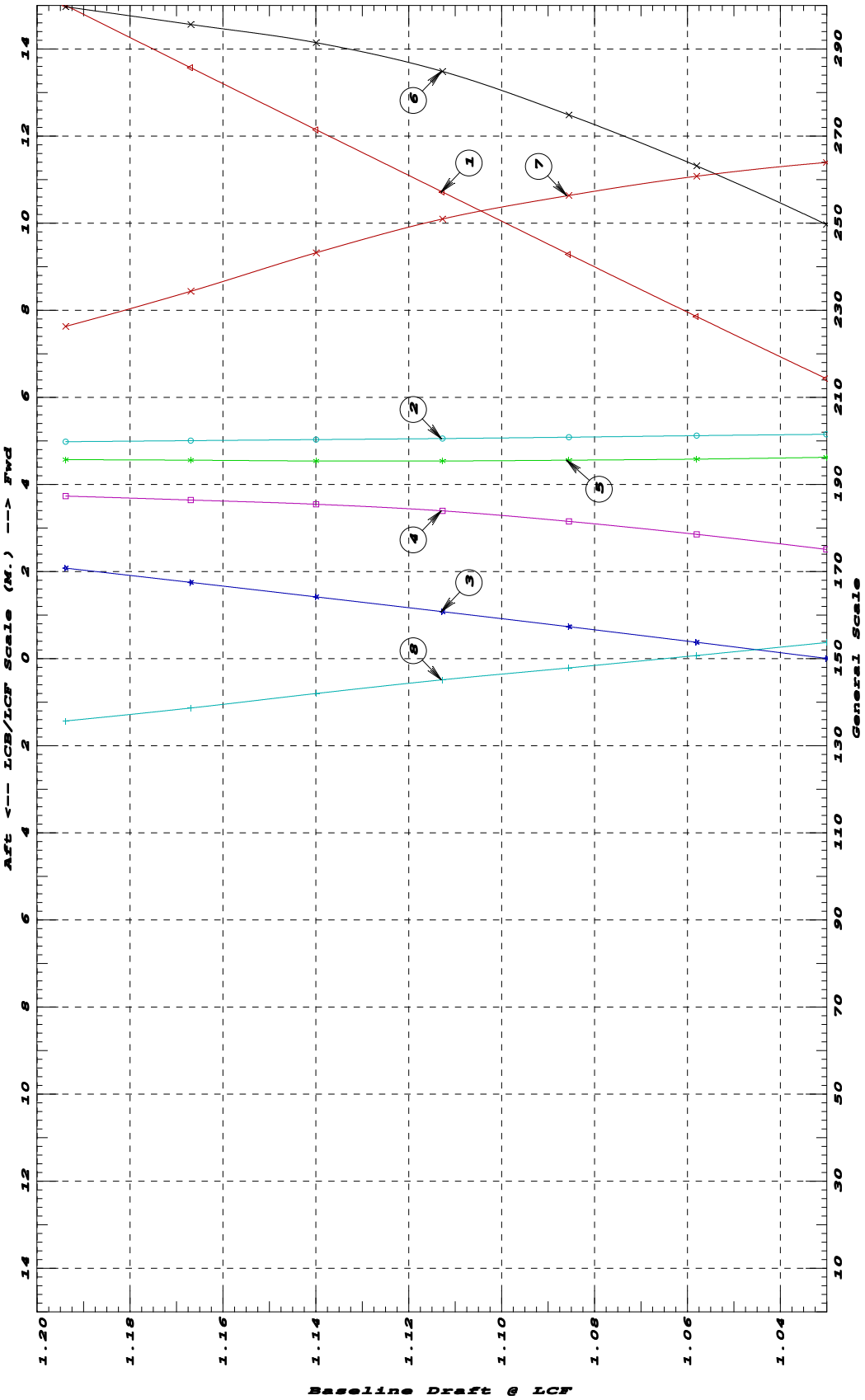
HYDROSTATIC PROPERTIES

Trim: Fwd 0.097/11.100, No Heel, VCG = 0.000

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.030	15.00	5.153f	0.750	0.35	4.623f	0.25	18.48	3.074
1.058	16.00	5.118f	0.769	0.36	4.584f	0.26	18.26	3.014
1.086	17.00	5.086f	0.787	0.36	4.555f	0.27	17.95	2.957
1.113	18.00	5.056f	0.804	0.37	4.537f	0.28	17.57	2.903
1.140	19.00	5.028f	0.821	0.37	4.539f	0.29	17.03	2.841
1.167	20.00	5.004f	0.838	0.37	4.555f	0.30	16.41	2.773
1.194	21.00	4.983f	0.854	0.37	4.571f	0.30	15.84	2.713

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 11.10m.
Draft is from Baseline.

HYDROSTATIC PROPERTIES at 0.1 M. FWD TRIM



(1) Displacement 1=.07 MT
(2) LCB (use top scale)
(3) VCB (KB) 1=.005 M.
(4) (4) Immersion 1=.002 MT/cm
WPA 1=.195 Sq.M.
(5) LCF (use top scale)
(6) Moment/Trim 1=.001 M.-MT/cm
(7) KML 1=.07 M.
(8) KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base plane

TRIM -0.25 DEGREE
A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

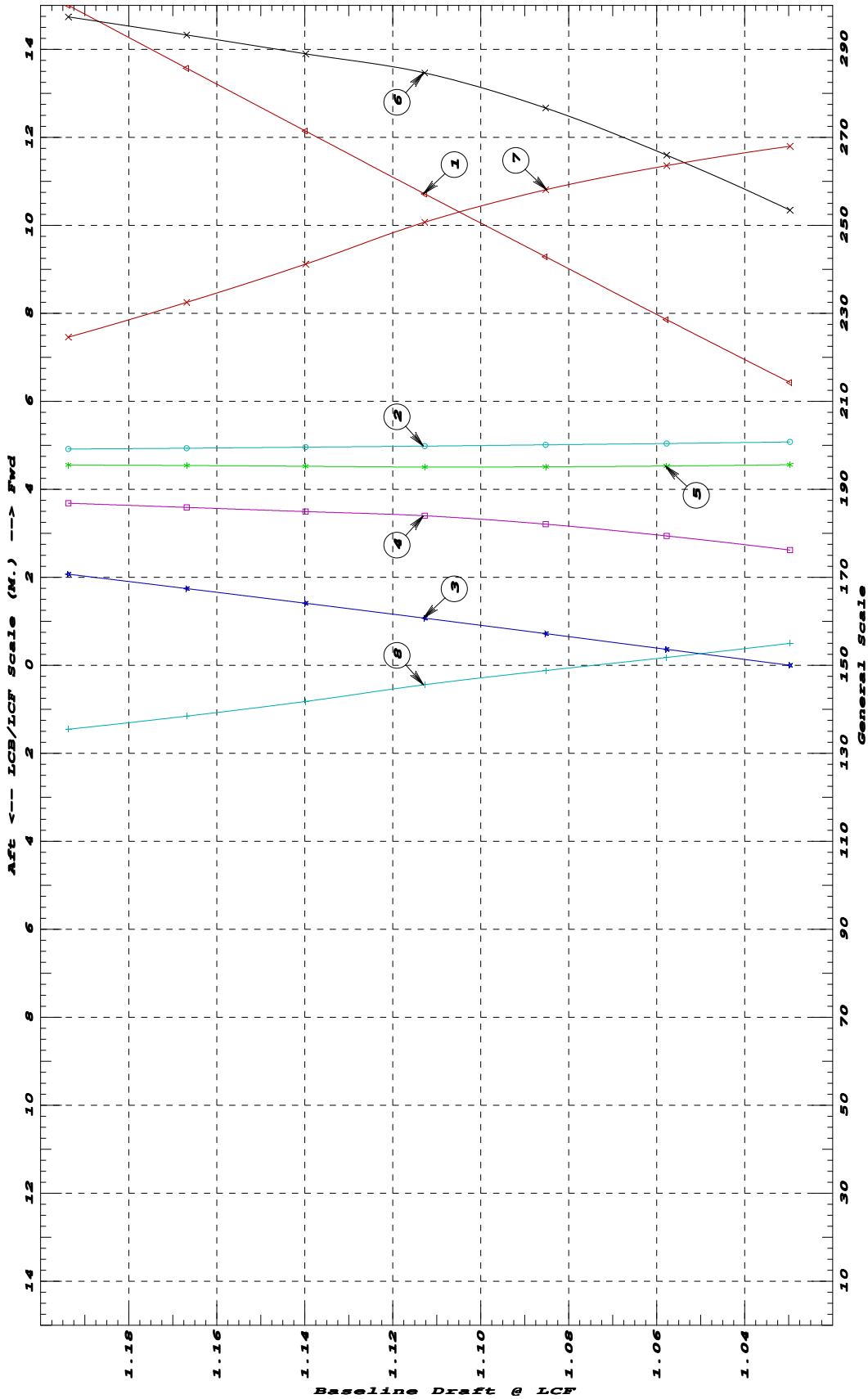
HYDROSTATIC PROPERTIES

Trim: Fwd 0.048/11.100, No Heel, VCG = 0.000

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.030	15.00	5.075f	0.750	0.35	4.561f	0.25	18.76	3.099
1.058	16.00	5.041f	0.768	0.36	4.530f	0.27	18.45	3.036
1.085	17.00	5.011f	0.786	0.36	4.509f	0.28	18.07	2.976
1.113	18.00	4.983f	0.804	0.37	4.506f	0.28	17.55	2.912
1.140	19.00	4.958f	0.820	0.37	4.523f	0.29	16.88	2.836
1.167	20.00	4.937f	0.837	0.37	4.540f	0.29	16.28	2.769
1.194	21.00	4.918f	0.853	0.37	4.557f	0.30	15.72	2.709

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 11.10m.
Draft is from Baseline.

HYDROSTATIC PROPERTIES at 0.05 M. FWD TRIM



(1) Displacement 1=.07 MT
(2) LCB (use top scale)
(3) VCB (KB) 1=.005 M.
(4) Immersion 1=.002 MT/cm
(4) WPA 1=.195 Sq.M.
(5) LCF (use top scale)
(6) Moment/Trim 1=.001 M.-MT/cm
(7) KML 1=.07 M.
(8) KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base Plane

TRIM 0.00 DEGREE

A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

HYDROSTATIC PROPERTIES

No Trim, No Heel, VCG = 0.000

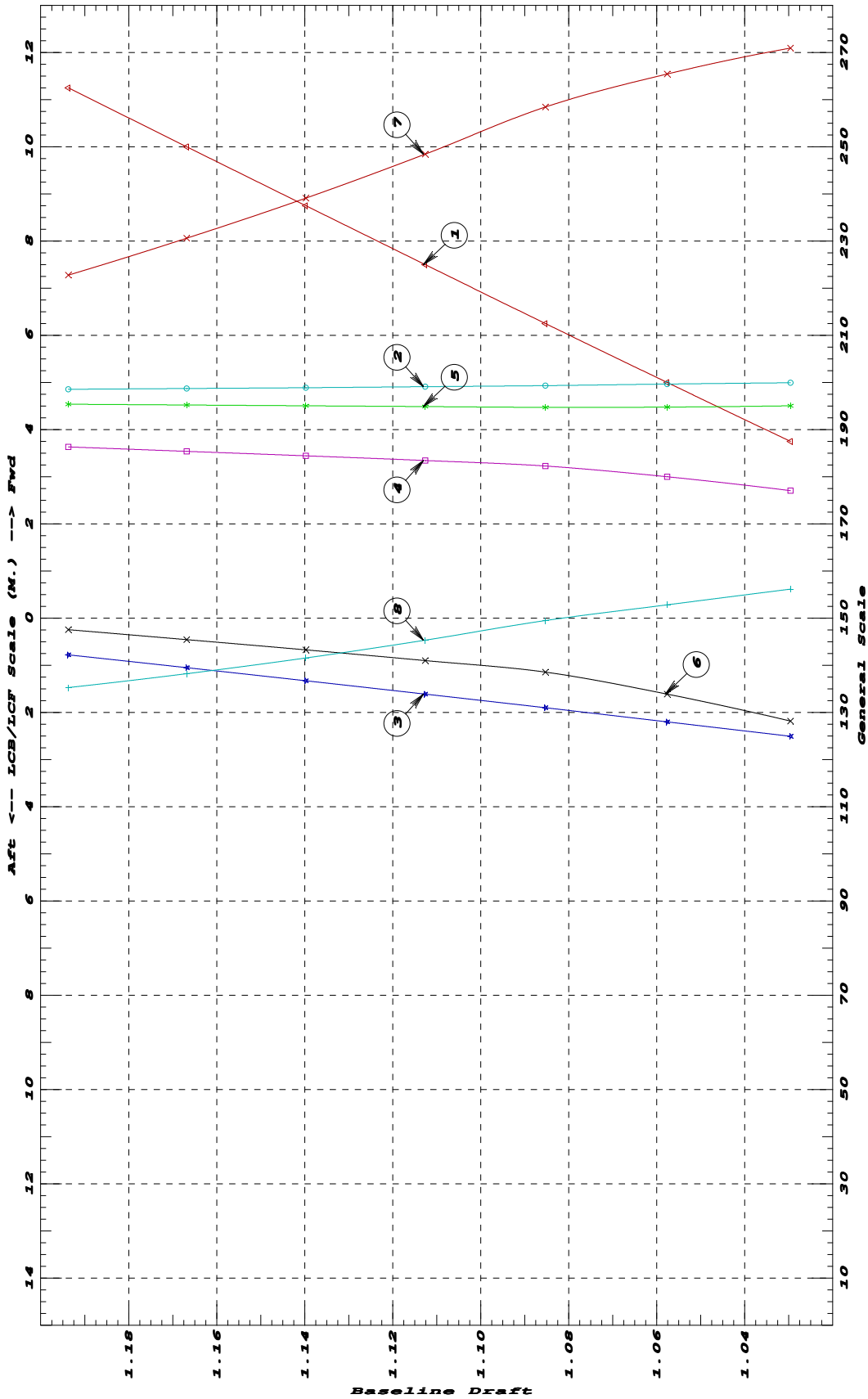
LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.030	15.00	4.996f	0.750	0.35	4.503f	0.26	18.97	3.123
1.058	16.00	4.964f	0.768	0.36	4.481f	0.27	18.58	3.057
1.085	17.00	4.935f	0.786	0.36	4.471f	0.28	18.09	2.989
1.113	18.00	4.910f	0.803	0.37	4.489f	0.28	17.39	2.907
1.140	19.00	4.888f	0.820	0.37	4.507f	0.29	16.74	2.831
1.167	20.00	4.870f	0.837	0.37	4.525f	0.29	16.14	2.765
1.194	21.00	4.854f	0.853	0.37	4.542f	0.30	15.60	2.705

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.

Trim is per 11.10m.

Draft is from Baseline.

HYDROSTATIC PROPERTIES at LEVEL TRIM



1 Displacement 1=.08 MT
2 LCB (use top scale)
3 VCB (KB) 1=.006 M.
4 Immersion 1=.002 MT/cm
4 WPA 1=.195 Sq.M.
5 LCF (use top scale)
6 Moment/Trim 1=.002 M.-MT/cm
7 KML 1=.07 M.
8 KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base Plane

TRIM 0.25 DEGREE

A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

HYDROSTATIC PROPERTIES

Trim: Aft 0.048/11.100, No Heel, VCG = 0.000

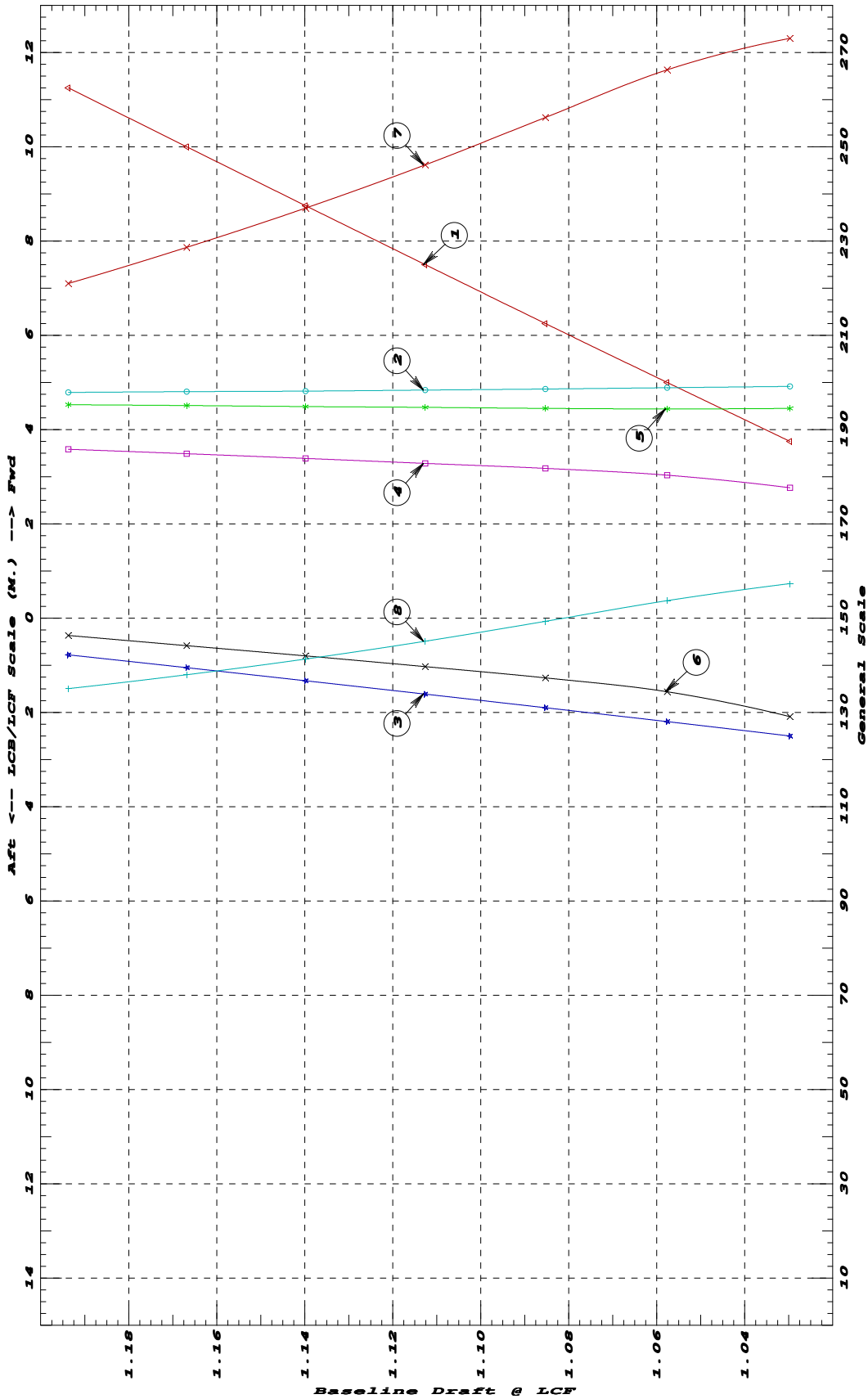
LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.030	15.00	4.916f	0.750	0.36	4.449f	0.26	19.11	3.146
1.058	16.00	4.886f	0.768	0.36	4.437f	0.27	18.64	3.075
1.085	17.00	4.860f	0.786	0.36	4.451f	0.27	17.94	2.987
1.113	18.00	4.838f	0.803	0.37	4.472f	0.28	17.23	2.902
1.140	19.00	4.819f	0.820	0.37	4.491f	0.28	16.59	2.827
1.167	20.00	4.803f	0.837	0.37	4.509f	0.29	16.00	2.761
1.194	21.00	4.790f	0.853	0.37	4.526f	0.29	15.47	2.702

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.

Trim is per 11.10m.

Draft is from Baseline.

HYDROSTATIC PROPERTIES at 0.05 M. AFT TRIM



1 Displacement 1=.08 MT
2 LCB (use top scale)
3 VCB (KB) 1=.006 M.
4 Immersion 1=.002 MT/cm
4 WPA 1=.195 Sq.M.
5 LCF (use top scale)
6 Moment/Trim 1=.002 M.-MT/cm
7 KML 1=.07 M.
8 KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base plane

TRIM 0.50 DEGREE

A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

HYDROSTATIC PROPERTIES

Trim: Aft 0.097/11.100, No Heel, VCG = 0.000

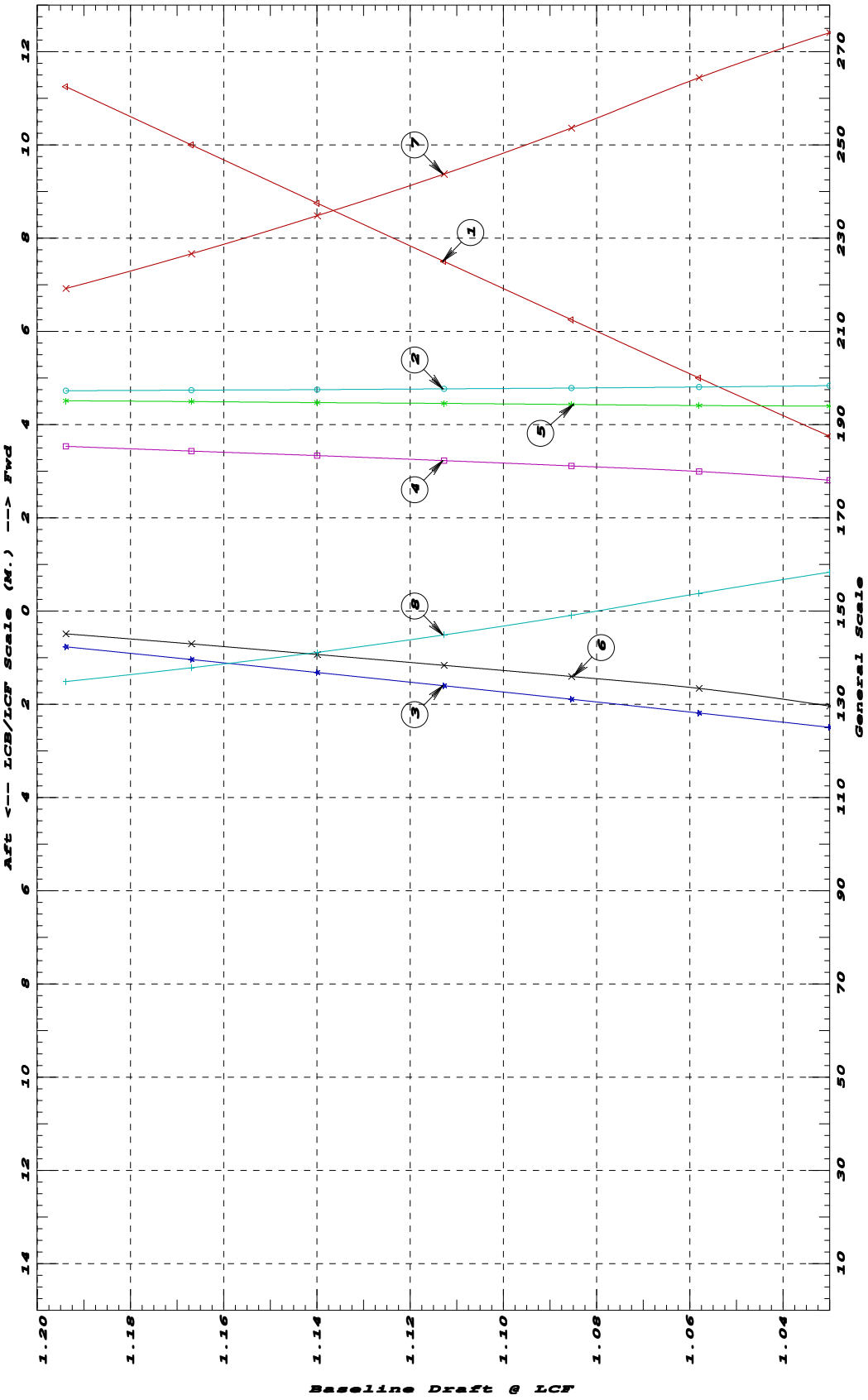
LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.030	15.00	4.835f	0.750	0.36	4.400f	0.26	19.18	3.167
1.058	16.00	4.808f	0.769	0.36	4.409f	0.27	18.51	3.077
1.085	17.00	4.786f	0.787	0.36	4.432f	0.27	17.75	2.981
1.113	18.00	4.767f	0.804	0.36	4.454f	0.28	17.06	2.897
1.140	19.00	4.751f	0.821	0.37	4.474f	0.28	16.44	2.823
1.167	20.00	4.737f	0.838	0.37	4.493f	0.29	15.87	2.757
1.194	21.00	4.726f	0.854	0.37	4.511f	0.29	15.34	2.698

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.

Trim is per 11.10m.

Draft is from Baseline.

HYDROSTATIC PROPERTIES at 0.1 M. AFT TRIM



(1) Displacement 1=.08 MT
(2) LCB (use top scale)
(3) VCB (KB) 1=.006 M.
(4) Immersion 1=.002 MT/cm
(4) WPA 1=.195 Sq.M.
(5) LCF (use top scale)
(6) Moment/Trim 1=.002 M.-MT/cm
(7) KML 1=.07 M.
(8) KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base Plane

TRIM 0.75 DEGREE
A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

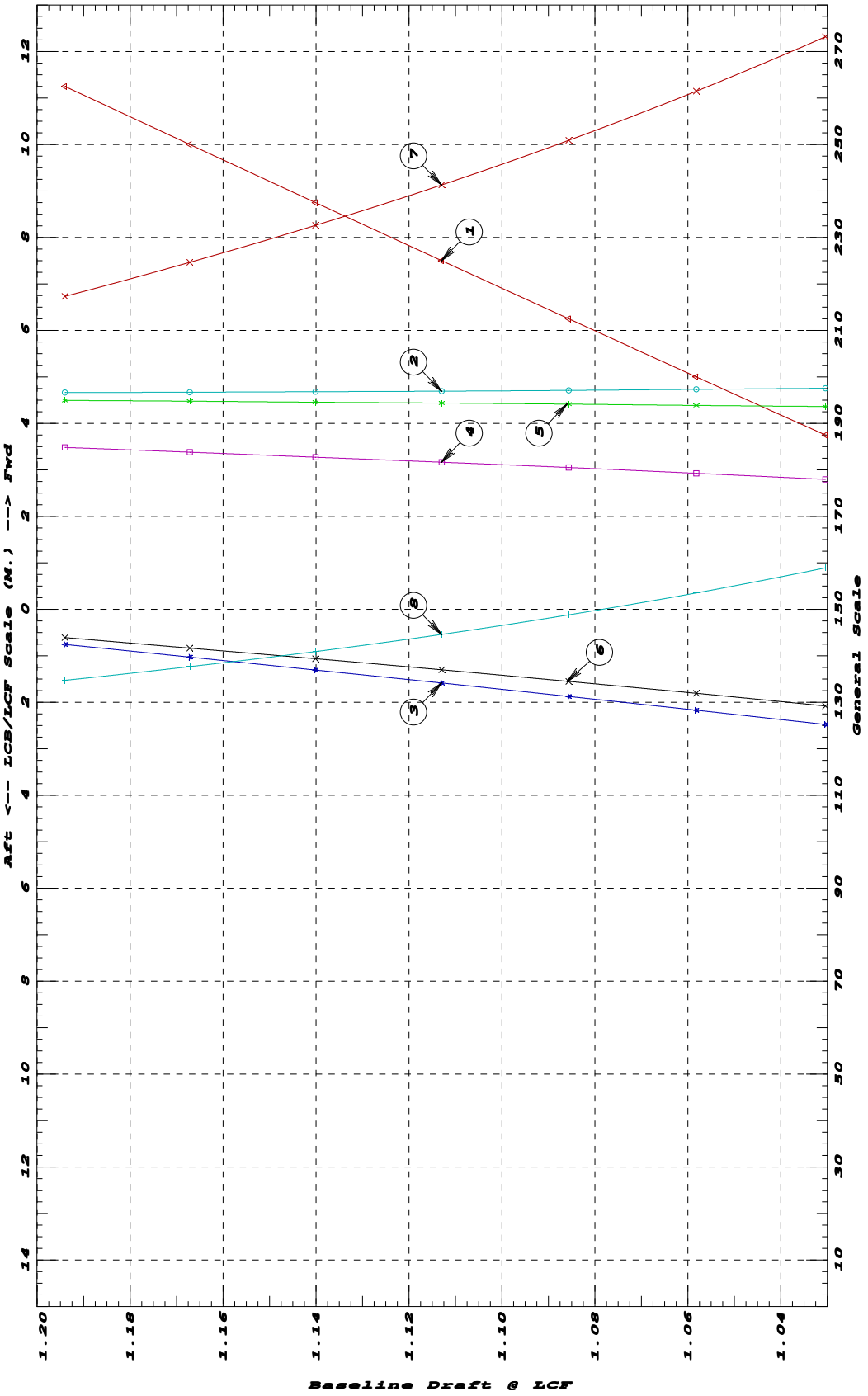
HYDROSTATIC PROPERTIES

Trim: Aft 0.145/11.100, No Heel, VCG = 0.000

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.030	15.00	4.755f	0.751	0.36	4.363f	0.26	19.12	3.178
1.058	16.00	4.731f	0.770	0.36	4.389f	0.26	18.30	3.071
1.086	17.00	4.712f	0.787	0.36	4.413f	0.27	17.56	2.976
1.113	18.00	4.696f	0.805	0.36	4.436f	0.27	16.89	2.892
1.140	19.00	4.683f	0.822	0.37	4.456f	0.28	16.28	2.819
1.167	20.00	4.672f	0.838	0.37	4.476f	0.28	15.72	2.753
1.194	21.00	4.663f	0.855	0.37	4.495f	0.29	15.21	2.695

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 11.10m.
Draft is from Baseline.

HYDROSTATIC PROPERTIES at 0.15 M. AFT TRIM



(1) Displacement 1=.08 MT
(2) LCB (use top scale)
(3) VCB (KB) 1=.006 M.
(4) Immersion 1=.002 MT/cm
(4) WPA 1=.195 Sq.M.
(5) LCF (use top scale)
(6) Moment/Trim 1=.002 M.-MT/cm
(7) KML 1=.07 M.
(8) KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base Plane

TRIM 1.00 DEGREE

A NEGATIVE SIGN IS ATTRIBUTED TO TRIM BY STEM

HYDROSTATIC PROPERTIES

Trim: Aft 0.194/11.100, No Heel, VCG = 0.000

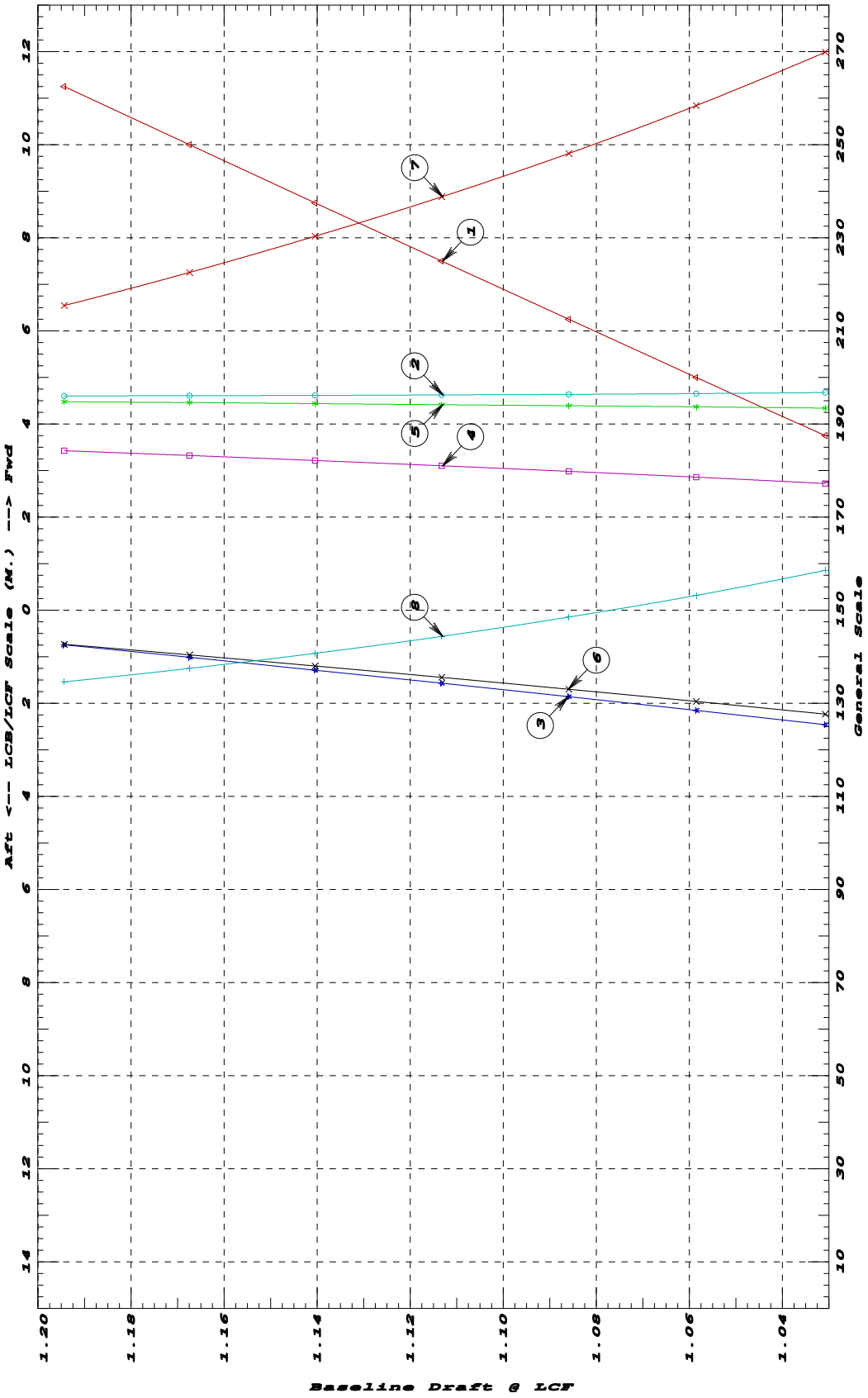
LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	KML	KMT
1.031	15.00	4.675f	0.752	0.35	4.340f	0.26	18.89	3.171
1.058	16.00	4.655f	0.771	0.36	4.368f	0.26	18.09	3.064
1.086	17.00	4.639f	0.789	0.36	4.393f	0.27	17.37	2.970
1.113	18.00	4.626f	0.806	0.36	4.416f	0.27	16.72	2.888
1.140	19.00	4.616f	0.823	0.36	4.439f	0.28	16.13	2.815
1.167	20.00	4.607f	0.839	0.37	4.459f	0.28	15.58	2.749
1.194	21.00	4.601f	0.855	0.37	4.478f	0.29	15.08	2.692

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.

Trim is per 11.10m.

Draft is from Baseline.

HYDROSTATIC PROPERTIES at 0.19 M. AFT TRIM



(1) Displacement 1=.08 MT
(2) LCB (use top scale)
(3) VCB (KB) 1=.006 M.
(4) Immersion 1=.002 MT/cm
(4) WPA 1=.195 Sq.M.
(5) LCF (use top scale)
(6) Moment/Trim 1=.002 M.-MT/cm
(7) KML 1=.07 M.
(8) KMT 1=.02 M.

Specific Gravity = 1.025 Assumed KG = 0.00 M.
Trim is per 11.1 M. "K" = Base plane

Appendix 3 – Down Flooding Height

6.1.2 DOWNFLOODING HEIGHT (LOADED DISPLACEMENT CONDITION)

WEIGHT STATUS

Trim: Fwd 0.46 deg., Heel: zero

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	16.62	4.955f	0.000	1.656
CREWLIMIT	0.75	5.000f	2.100s	2.500
MAXIMUM TOTAL LOAD	0.75	5.000f	0.000	2.000
Total Fixed	**18.12**	**4.959f**	**0.087s**	**1.705**

	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1.C	823.6	0.840	0.69	4.783f	0.000	0.547	1.79
FW1.C	607.4	1.000	0.61	6.495f	0.000	0.588	0.66
Total Tanks			**1.30**	**5.583f**	**0.000**	**0.566**	**2.45**
Total Weight			**19.42**	**5.001f**	**0.081s**	**1.629**	
Free Surface Adjustment						**0.126**	
Adjusted CG				**5.000f**	**0.081s**	**1.755**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.46 deg., No Heel, VCG = 1.629

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ Deg trim	GML	GMT
1.151	19.42	5.007f	0.828	0.37	4.543f	5.11	15.08	1.056

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Draft is from Baseline. True Free Surface included.

CRITICAL POINT STATUS

Baseline draft: 1.115 @ Origin
Trim: Fwd 0.46 deg., Heel: zero

	Critical Point		LCP	TCP	VCP	Height
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950s	2.200	1.054
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950p	2.200	1.054

Distances in METERS.

Appendix 4 – Offset Load Test

6.2 A-SYMMETRIC LOADING AT LOADED DISPLACEMENT
LC1: CREW LOADED AT FWD POSITION 75%

WEIGHT STATUS

Trim: Fwd 0.15 deg., Heel: Stbd 4.78 deg.

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	16.62	4.955f	0.000	1.656
MAXIMUM TOTAL LOAD	0.75	5.000f	0.000	2.000
10 PERSONS (85kg)	0.85	3.105f	0.000	2.500
Total Fixed	**18.22**	**4.871f**	**0.000**	**1.710**

	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1.C	823.4	0.840	0.69	4.770f	0.024s	0.548	0.01
FW1.C	607.3	1.000	0.61	6.492f	0.016s	0.588	0.01
Total Tanks			**1.30**	**5.575f**	**0.020s**	**0.566**	**0.03**
Total Weight			**19.52**	**4.917f**	**0.001s**	**1.633**	
Free Surface Adjustment						**0.001**	
Adjusted CG				**4.917f**	**0.001s**	**1.635**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.15 deg., Heel: Stbd 4.78 deg., VCG = 1.633

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ Deg trim	GML	GMT
1.152	19.52	4.921f	0.836	0.37	4.563f	4.96	14.55	1.150

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Draft is from Baseline. True Free Surface included.

CRITICAL POINT STATUS

Baseline draft: 1.140 @ Origin
Trim: Fwd 0.15 deg., Heel: Stbd 4.78 deg.

	Critical Point		LCP	TCP	VCP	Height
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950s	2.200	0.883
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950p	2.200	1.208

Distances in METERS.

FREEBOARD STATUS

Baseline draft: 1.140 @ Origin
Trim: Fwd 0.15 deg., Heel: Stbd 4.78 deg.
Least freeboard is 0.874 m. located at 3.636f

RESIDUAL Rrighting ARMS vs HEEL ANGLE

Total CG: LCG = 4.917f TCG = 0.001s VCG = 1.633
Free Surface Adjustment: 0.001
Adjusted CG: LCG = 4.917f TCG = 0.001s VCG = 1.635

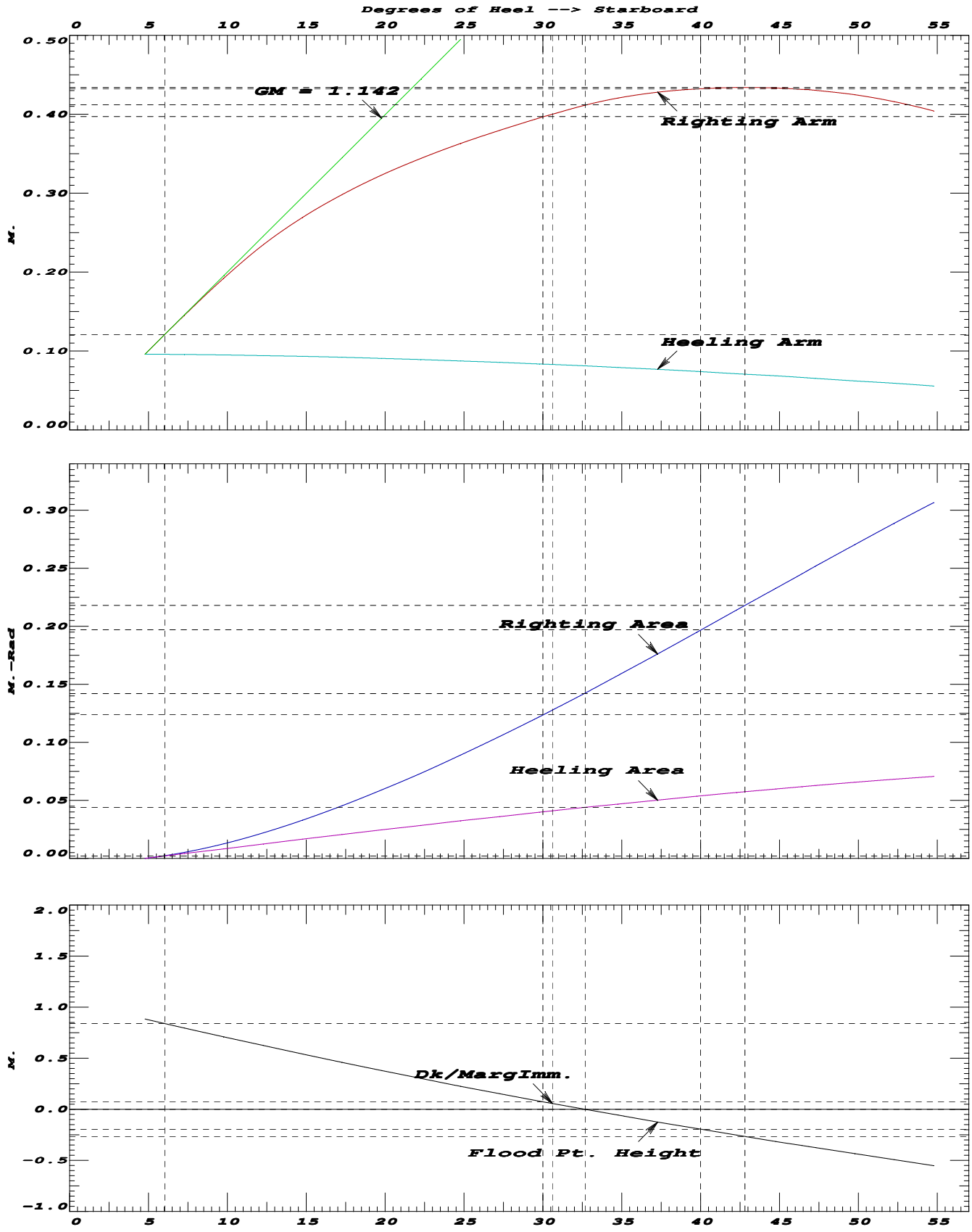
Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel	Area	Flood Pt Height	
1.137	0.15f	4.78s	19.517	0.000	0.000	0.0000	0.883	(1)
1.128	0.16f	7.28s	19.517	0.000	0.050	0.0011	0.796	(1)
1.114	0.19f	9.78s	19.517	0.000	0.098	0.0043	0.710	(1)
1.094	0.23f	12.28s	19.517	0.000	0.141	0.0095	0.625	(1)
1.070	0.26f	14.78s	19.517	0.000	0.176	0.0164	0.541	(1)
1.041	0.30f	17.28s	19.517	0.000	0.206	0.0248	0.460	(1)
1.008	0.34f	19.78s	19.517	0.000	0.232	0.0343	0.380	(1)
0.969	0.38f	22.28s	19.517	0.000	0.255	0.0450	0.302	(1)
0.926	0.42f	24.78s	19.517	0.000	0.275	0.0566	0.226	(1)
0.878	0.47f	27.28s	19.517	0.000	0.294	0.0690	0.152	(1)
0.825	0.51f	29.78s	19.517	0.000	0.312	0.0822	0.080	(1)
0.808	0.53f	30.60s	19.517	0.000	0.317	0.0867	Dk/MargImm.	
0.769	0.56f	32.28s	19.517	0.000	0.328	0.0962	0.011	(1)
0.760	0.57f	32.68s	19.517	0.000	0.330	0.0984	*-0.000*	(1)
0.710	0.61f	34.78s	19.517	0.000	0.341	0.1108	*-0.057*	(1)
0.648	0.66f	37.28s	19.517	0.000	0.351	0.1259	*-0.124*	(1)
0.583	0.73f	39.78s	19.517	0.000	0.358	0.1414	*-0.189*	(1)
0.514	0.81f	42.28s	19.517	0.000	0.362	0.1571	*-0.253*	(1)
0.442	0.90f	44.78s	19.517	0.000	0.365	0.1730	*-0.315*	(1)
0.392	0.98f	46.42s	19.517	0.000	**0.365**	0.1834	*-0.355*	(1)
0.366	1.02f	47.28s	19.517	0.000	0.365	0.1889	*-0.376*	(1)
0.289	1.14f	49.78s	19.517	0.000	0.363	0.2048	*-0.435*	(1)
0.212	1.25f	52.28s	19.517	0.000	0.357	0.2205	*-0.494*	(1)
0.136	1.36f	54.78s	19.517	0.000	0.349	0.2359	*-0.553*	(1)

Distances in METERS. Specific Gravity = 1.025. Area in m.-Rad.

Note: The Weight and Center of Gravity used for the righting arms above include tank loads. However, the tank load centers were NOT ALLOWED TO SHIFT with heel and trim changes. Rather, a constant Free Surface Moment of 0.0 m.-MT was applied to artificially modify the CG.

Note: The Residual Righting Arms shown above are in excess of the overturning arms derived from these moments (in m.-MT):
Stbd. heeling moment = 1.88Cos(heel)

	Critical Point		LCP	TCP	VCP
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950	2.200



6.2 A-SYMMETRIC LOADING AT LOADED DISPLACEMENT
LC2: CREW LOADED AT AFT POSITION 25%
Note: Light ship weight reset to 15.02 METRIC TONS
Note: Weight item "MAXIMUM TOTAL LOAD" replaced.
Note: Weight item "10 PERSONS (85kg) " replaced.

WEIGHT STATUS

Trim: Fwd 1.44 deg., Heel: Stbd 4.82 deg.

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	15.02	5.057f	0.000	1.591
MAXIMUM TOTAL LOAD	0.75	5.000f	0.000	2.000
10 PERSONS (85kg)	0.85	9.315f	0.000	2.500
Total Fixed	**16.62**	**5.273f**	**0.000**	**1.656**

	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1.C	823.4	0.840	0.69	4.781f	0.023s	0.548	0.02
FW1.C	607.3	1.000	0.61	6.494f	0.016s	0.588	0.01
Total Tanks			**1.30**	**5.582f**	**0.020s**	**0.566**	**0.04**
Total Weight			**17.92**	**5.295f**	**0.001s**	**1.577**	
Free Surface Adjustment						**0.002**	
Adjusted CG				**5.295f**	**0.001s**	**1.579**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 1.44 deg., Heel: Stbd 4.82 deg., VCG = 1.577

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ Deg trim	GML	GMT
1.111	17.92	5.314f	0.814	0.36	4.746f	4.76	15.23	1.240

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Draft is from Baseline. True Free Surface included.

CRITICAL POINT STATUS

Baseline draft: 0.991 @ Origin
Trim: Fwd 1.44 deg., Heel: Stbd 4.82 deg.

	Critical Point		LCP	TCP	VCP	Height
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950s	2.200	0.943
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950p	2.200	1.270

Distances in METERS.

FREEBOARD STATUS

Baseline draft: 0.991 @ Origin
Trim: Fwd 1.44 deg., Heel: Stbd 4.82 deg.
Least freeboard is 0.920 m. located at 5.465f

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

Total CG: LCG = 5.295f TCG = 0.001s VCG = 1.577
Free Surface Adjustment: 0.002
Adjusted CG: LCG = 5.295f TCG = 0.001s VCG = 1.579

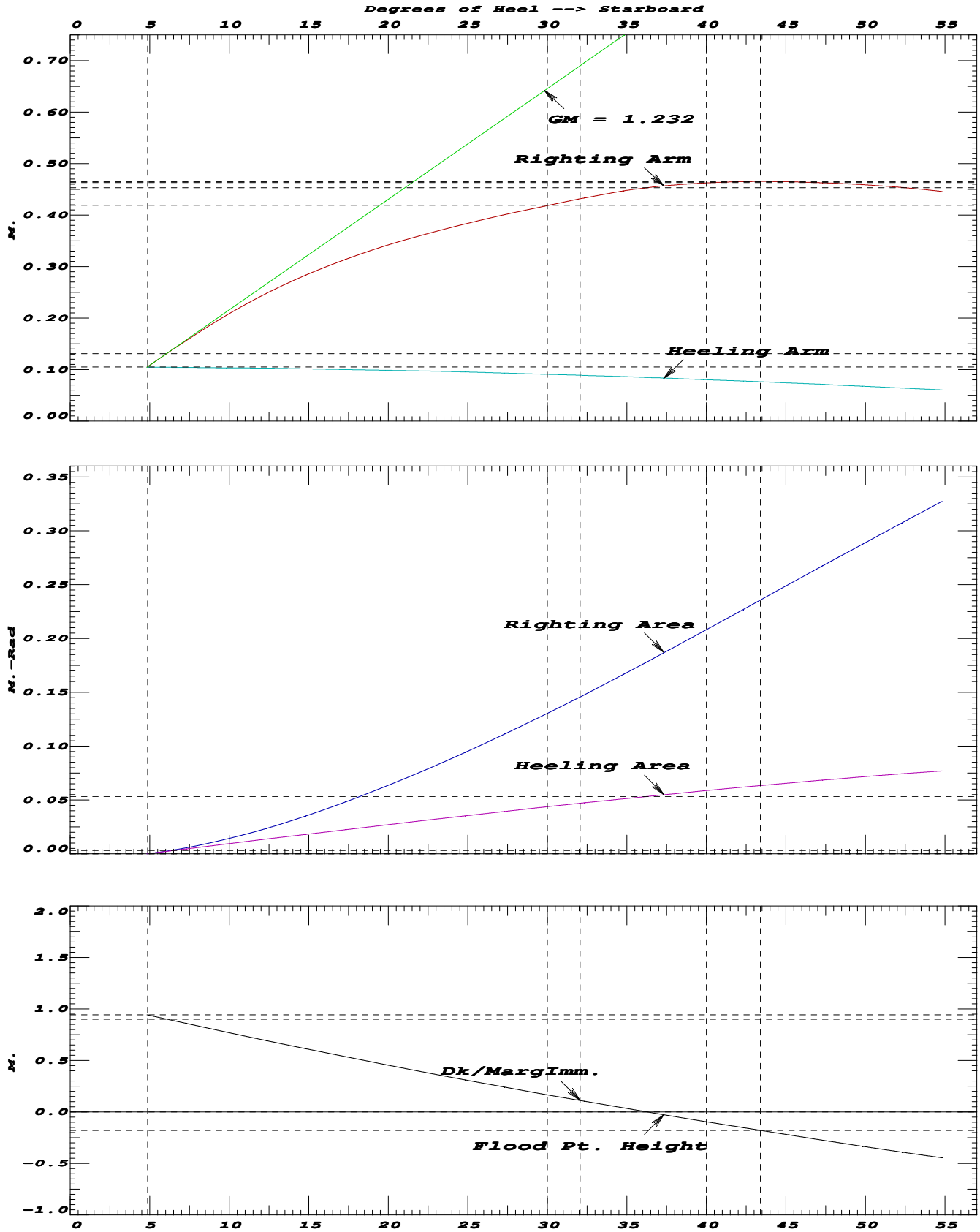
Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel	Area	Flood Pt Height	
0.987	1.44f	4.82s	17.917	0.000	0.000	0.0000	0.943	(1)
0.972	1.51f	7.32s	17.917	0.000	0.053	0.0011	0.858	(1)
0.952	1.59f	9.82s	17.916	0.000	0.102	0.0045	0.775	(1)
0.925	1.68f	12.32s	17.916	0.000	0.145	0.0100	0.693	(1)
0.893	1.78f	14.82s	17.916	0.000	0.182	0.0171	0.613	(1)
0.855	1.89f	17.32s	17.916	0.000	0.214	0.0257	0.535	(1)
0.813	1.99f	19.82s	17.916	0.000	0.241	0.0357	0.459	(1)
0.767	2.09f	22.32s	17.916	0.000	0.266	0.0468	0.384	(1)
0.717	2.19f	24.82s	17.916	0.000	0.287	0.0588	0.311	(1)
0.664	2.27f	27.32s	17.916	0.000	0.307	0.0718	0.240	(1)
0.607	2.35f	29.82s	17.916	0.000	0.326	0.0857	0.171	(1)
0.554	2.42f	32.05s	17.917	0.000	0.343	0.0987	Dk/MargImm.	
0.547	2.43f	32.32s	17.917	0.000	0.345	0.1003	0.104	(1)
0.484	2.50f	34.82s	17.917	0.000	0.361	0.1157	0.038	(1)
0.446	2.54f	36.29s	17.917	0.000	0.369	0.1251	*-0.000*	(1)
0.418	2.57f	37.32s	17.917	0.000	0.373	0.1317	*-0.027*	(1)
0.350	2.66f	39.82s	17.916	0.000	0.382	0.1482	*-0.090*	(1)
0.280	2.75f	42.32s	17.917	0.000	0.387	0.1650	*-0.153*	(1)
0.207	2.85f	44.82s	17.917	0.000	0.390	0.1820	*-0.215*	(1)
0.131	2.96f	47.32s	17.917	0.000	0.391	0.1990	*-0.275*	(1)
0.107	3.00f	48.11s	17.917	0.000	**0.391**	0.2044	*-0.293*	(1)
0.053	3.09f	49.82s	17.917	0.000	0.391	0.2161	*-0.333*	(1)
-0.028	3.23f	52.32s	17.917	0.000	0.389	0.2331	*-0.390*	(1)
-0.110	3.38f	54.82s	17.917	0.000	0.385	0.2500	*-0.445*	(1)

Distances in METERS. Specific Gravity = 1.025. Area in m.-Rad.

Note: The Weight and Center of Gravity used for the righting arms above include tank loads. However, the tank load centers were NOT ALLOWED TO SHIFT with heel and trim changes. Rather, a constant Free Surface Moment of 0.0 m.-MT was applied to artificially modify the CG.

Note: The Residual Righting Arms shown above are in excess of the overturning arms derived from these moments (in m.-MT):
Stbd. heeling moment = 1.88Cos(heel)

	Critical Point		LCP	TCP	VCP
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950	2.200



Appendix 5 - Resistance To Waves And Wind (Cat. B)

6.3 RESISTANCE TO WAVES AND WIND AT MINIMUM LOADED DISPLACEMENT

SUMMARY OF LOADING

0.0 Ltrs. (0%) DIESEL OIL 0.0 Ltrs. (0%) FRESH WATER
0.0 Ltrs. (0%) SEWAGE
0.25 MT of Misc. Weights

WEIGHT STATUS

Trim: Aft 0.01 deg., Heel: zero

Part	Weight(MT)	LCG	TCG	VCG	FSM
LIGHT SHIP	16.62	4.955f	0.000	1.656	
CREW MASS	0.15	2.800f	0.000	3.800	
NON CONSUMABLES	0.10	5.000f	0.000	2.000	
Total Weight	**16.87**	**4.936f**	**0.000**	**1.677**	

Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	
Total Tanks		**0.00**				**0.00**

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Aft 0.01 deg., No Heel, VCG = 1.677

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ Deg trim	GML	GMT
1.081	16.87	4.936f	0.784	0.36	4.469f	4.86	16.50	1.324

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Draft is from Baseline.

HEELING MOMENT specification

Heeling Moment 1.40s m.-MT	
Constant heeling moment to starboard	1.40

Roll angle = 21.16 degrees.

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 4.936f TCG = 0.000 VCG = 1.677

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Residual Arms in Trim	Residual Arms in Heel	Area	Flood Pt Height
0.954	0.33f	17.51p	16.867	0.000	-0.390	0.0000	
1.019	0.18f	12.51p	16.865	0.000	-0.333	-0.0316	
1.062	0.05f	7.51p	16.866	0.000	-0.248	-0.0571	
1.080	0.00a	2.51p	16.866	0.000	-0.140	-0.0743	
1.080	0.00a	2.49s	16.866	0.000	-0.026	-0.0816	1.033 (1)
1.078	0.00f	3.65s	16.866	0.000	0.000	-0.0818	0.993 (1)
1.062	0.05f	7.49s	16.866	0.000	0.082	-0.0791	0.862 (1)
1.019	0.18f	12.49s	16.865	0.000	0.167	-0.0681	0.695 (1)
0.954	0.33f	17.49s	16.864	0.000	0.224	-0.0508	0.535 (1)
0.872	0.48f	22.49s	16.867	0.000	0.262	-0.0295	0.382 (1)
0.774	0.62f	27.49s	16.864	0.000	0.289	-0.0054	0.235 (1)
0.660	0.76f	32.49s	16.864	0.000	0.311	0.0209	0.096 (1)
0.567	0.86f	36.15s	16.866	0.000	0.325	0.0412	*-0.000* (1)
0.532	0.90f	37.49s	16.866	0.000	0.329	0.0489	*-0.035* (1)
0.393	1.06f	42.49s	16.866	0.000	0.335	0.0779	*-0.161* (1)
0.389	1.07f	42.66s	16.866	0.000	**0.335**	0.0788	*-0.165* (1)
0.244	1.26f	47.49s	16.867	0.000	0.331	0.1070	*-0.281* (1)
0.165	1.39f	50.00s	16.866	0.000	0.327	0.1214	*-0.339* (1)
0.085	1.52f	52.49s	16.866	0.000	0.321	0.1355	*-0.396* (1)
-0.076	1.77f	57.49s	16.866	0.000	0.301	0.1628	*-0.507* (1)
-0.240	2.04f	62.49s	16.861	0.000	0.265	0.1876	*-0.612* (1)
-0.404	2.28f	67.49s	16.862	0.000	0.214	0.2086	*-0.709* (1)
-0.564	2.45f	72.49s	16.865	0.000	0.151	0.2247	*-0.799* (1)
-0.721	2.58f	77.49s	16.865	0.000	0.080	0.2348	*-0.880* (1)
-0.873	2.67f	82.49s	16.866	0.000	0.005	0.2386	*-0.953* (1)
-0.882	2.68f	82.79s	16.867	0.000	0.000	0.2386	*-0.957* (1)
-1.020	2.74f	87.49s	16.866	0.000	-0.074	0.2355	*-1.016* (1)

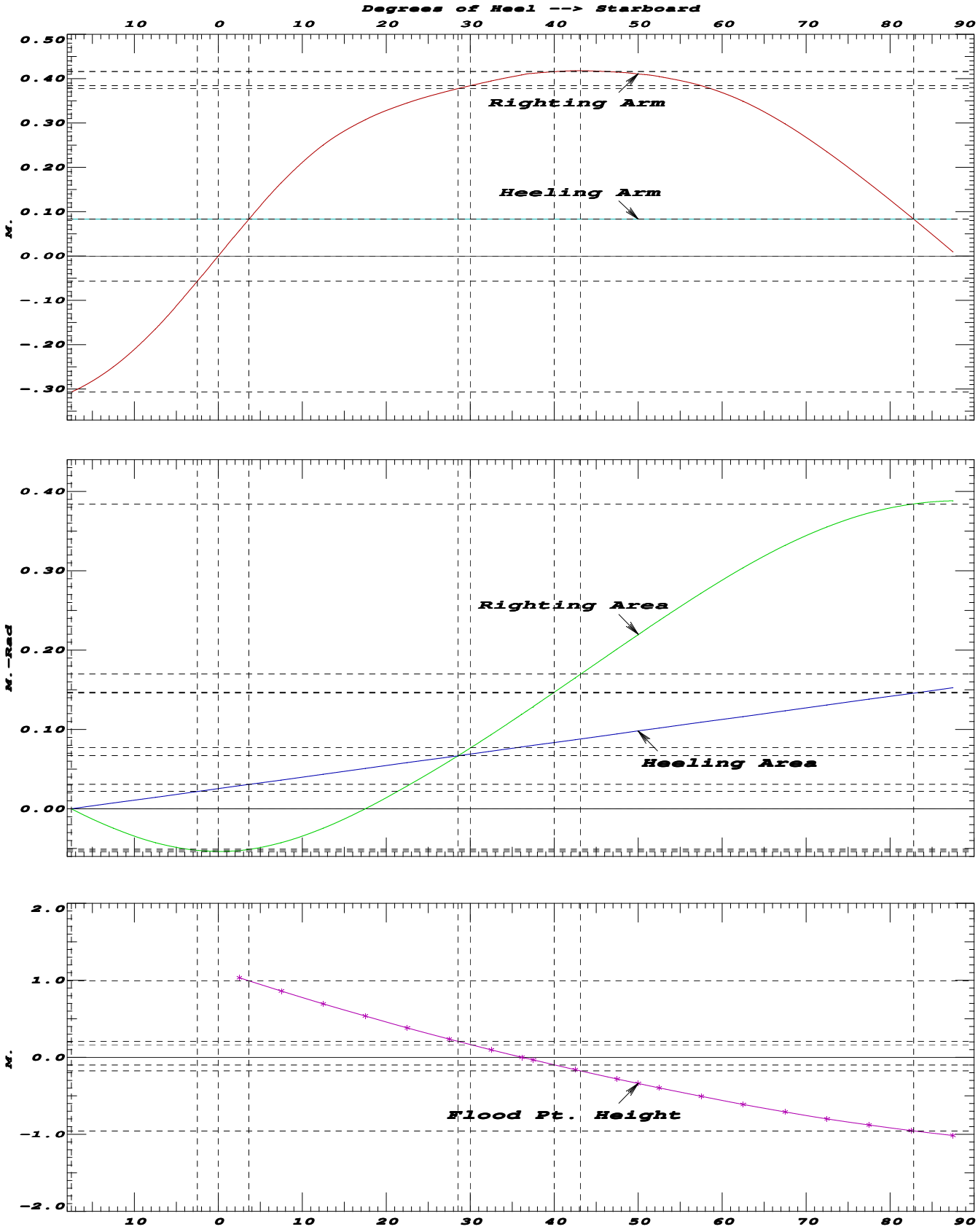
Distances in METERS. Specific Gravity = 1.025. Area in m.-Rad.

Note: The Weight and Center of Gravity used for the righting arms above include tank loads. However, the tank load centers were NOT ALLOWED TO SHIFT with heel and trim changes.

Note: The Residual Righting Arms shown above are in excess of the overturning arms derived from these moments (in m.-MT):
Stbd heeling moment = 1.41

	Critical Point		LCP	TCP	VCP
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950	2.200

LIM	STABILITY CRITERION	Min/Max	Attained
(1)	**Res. Ratio from Roll to abs 50 deg or Flood**	> **1.000**	**1.503 P**
(2)	**Res. Area Ratio from Roll to RAzero or Flood**	> **1.000**	**1.503 P**



6.3 RESISTANCE TO WAVES AND WIND AT MAXIMUM LOADED DISPLACEMENT

SUMMARY OF LOADING

823.6 Ltrs. (98%) DIESEL OIL 607.4 Ltrs. (98%) FRESH WATER
0.0 Ltrs. (0%) SEWAGE
0.75 MT of CREWLIMIT 0.75 MT of MAXIMUM TOTAL LOAD

WEIGHT STATUS

Trim: Fwd 0.46 deg., Heel: zero

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	16.62	4.955f	0.000	1.656
CREWLIMIT	0.75	5.000f	0.000	2.500
MAXIMUM TOTAL LOAD	0.75	5.000f	0.000	2.000
Total Fixed	**18.12**	**4.959f**	**0.000**	**1.705**

	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1.C	823.6	0.840	0.69	4.783f	0.000	0.547	1.79
FW1.C	607.4	1.000	0.61	6.495f	0.000	0.588	0.66
Total Tanks			**1.30**	**5.583f**	**0.000**	**0.566**	**2.45**
Total Weight			**19.42**	**5.001f**	**0.000**	**1.629**	
Free Surface Adjustment						**0.126**	
Adjusted CG				**5.000f**	**0.000**	**1.755**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.46 deg., No Heel, VCG = 1.629

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ Deg trim	GML	GMT
1.151	19.41	5.007f	0.828	0.37	4.543f	5.11	15.08	1.056

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Draft is from Baseline. True Free Surface included.

HEELING MOMENT specification

Heeling Moment 1.42s m.-MT	
Constant heeling moment to starboard	1.42

Roll angle = 20.99 degrees.

RESIDUAL Rrighting ARMS vs HEEL ANGLE

Total CG: LCG = 5.000f TCG = 0.001s VCG = 1.629
Free Surface Adjustment: 0.002
Adjusted CG: LCG = 5.000f TCG = 0.001s VCG = 1.631

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Residual Arms in Trim	Residual Arms in Heel	Area	Flood Pt Height
1.005	0.68f	17.36p	19.412	0.000	-0.375	0.0000	
1.062	0.58f	12.36p	19.416	0.000	-0.311	-0.0299	
1.098	0.49f	7.36p	19.417	0.000	-0.222	-0.0534	
1.113	0.46f	2.36p	19.417	0.000	-0.123	-0.0686	
1.113	0.46f	2.64s	19.417	0.000	-0.020	-0.0748	0.964 (1)
1.111	0.46f	3.63s	19.417	0.000	0.000	-0.0750	0.930 (1)
1.097	0.49f	7.64s	19.417	0.000	0.079	-0.0722	0.791 (1)
1.059	0.58f	12.64s	19.416	0.000	0.167	-0.0614	0.621 (1)
1.001	0.69f	17.64s	19.416	0.000	0.229	-0.0440	0.458 (1)
0.925	0.79f	22.64s	19.416	0.000	0.274	-0.0219	0.301 (1)
0.831	0.89f	27.64s	19.415	0.000	0.309	0.0036	0.153 (1)
0.720	0.99f	32.64s	19.416	0.000	0.339	0.0319	0.013 (1)
0.709	1.00f	33.14s	19.417	0.000	0.341	0.0349	*-0.000* (1)
0.597	1.10f	37.64s	19.416	0.000	0.356	0.0623	*-0.121* (1)
0.461	1.25f	42.64s	19.417	0.000	0.360	0.0936	*-0.249* (1)
0.425	1.30f	43.89s	19.417	0.000	0.360	0.1015	*-0.280* (1)
0.312	1.47f	47.64s	19.416	0.000	0.356	0.1249	*-0.371* (1)
0.239	1.59f	50.00s	19.417	0.000	0.350	0.1395	*-0.427* (1)
0.157	1.72f	52.64s	19.417	0.000	0.341	0.1554	*-0.489* (1)
0.003	1.94f	57.64s	19.416	0.000	0.315	0.1841	*-0.604* (1)
-0.152	2.15f	62.64s	19.415	0.000	0.280	0.2102	*-0.715* (1)
-0.311	2.39f	67.64s	19.412	0.000	0.233	0.2326	*-0.818* (1)
-0.468	2.59f	72.64s	19.414	0.000	0.176	0.2506	*-0.912* (1)
-0.623	2.74f	77.64s	19.416	0.000	0.111	0.2631	*-0.996* (1)
-0.773	2.86f	82.64s	19.416	0.000	0.040	0.2697	*-1.071* (1)
-0.852	2.90f	85.33s	19.417	0.000	0.000	0.2707	*-1.108* (1)
-0.918	2.93f	87.64s	19.417	0.000	-0.035	0.2700	*-1.137* (1)

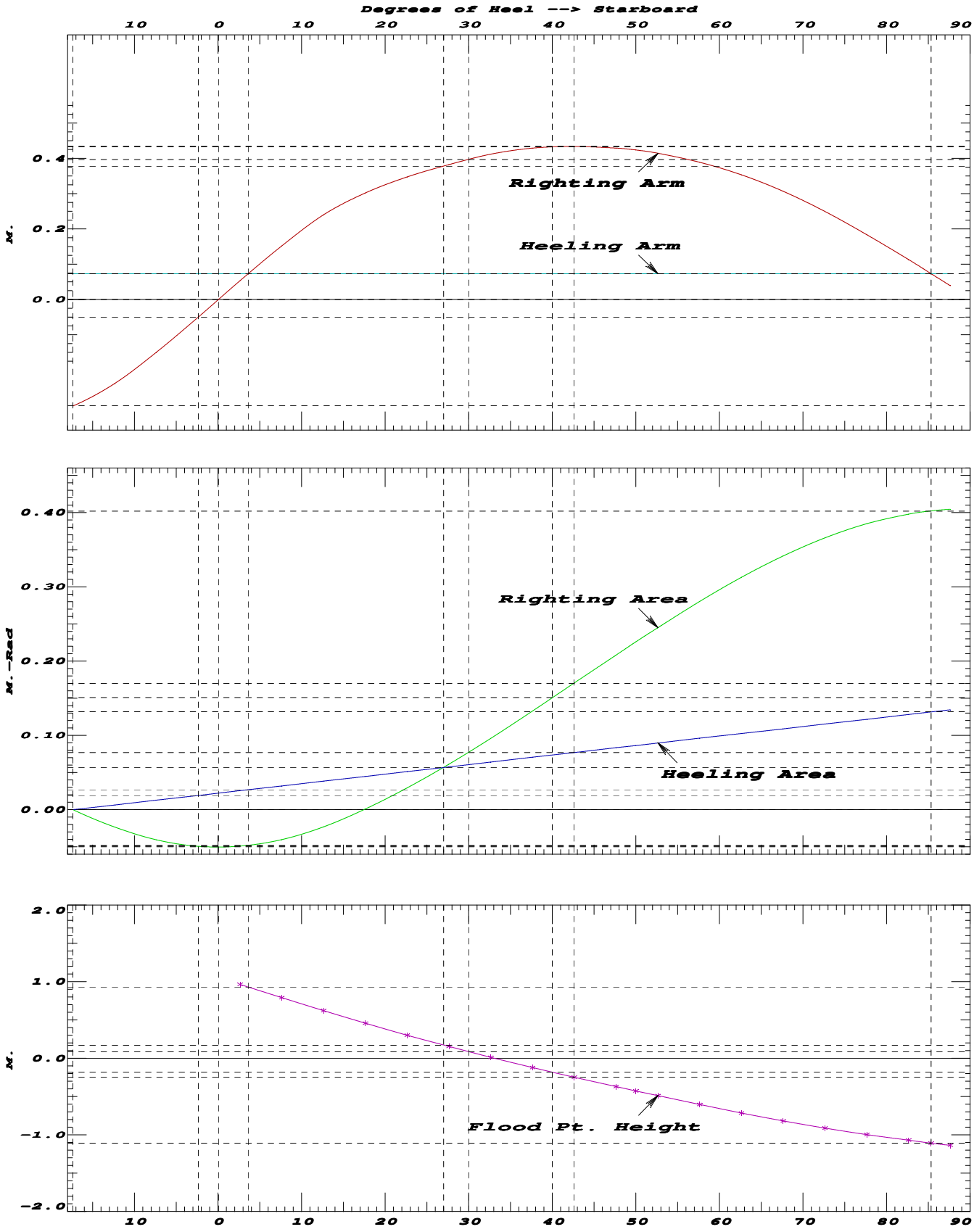
Distances in METERS. Specific Gravity = 1.025. Area in m.-Rad.

Note: The Weight and Center of Gravity used for the righting arms above include tank loads. However, the tank load centers were NOT ALLOWED TO SHIFT with heel and trim changes. Rather, a constant Free Surface Moment of 0.0 m.-MT was applied to artificially modify the CG.

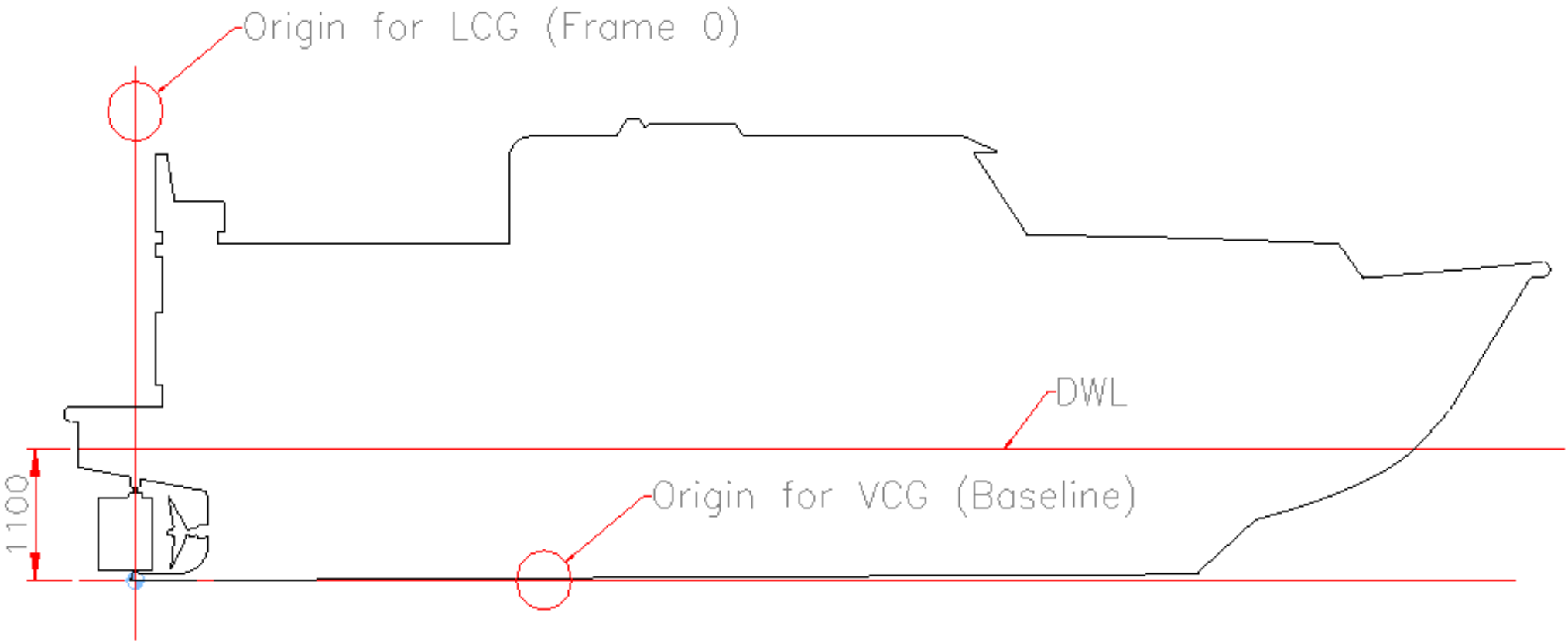
Note: The Residual Righting Arms shown above are in excess of the overturning arms derived from these moments (in m.-MT):
Stbd heeling moment = 1.42

	Critical Point		LCP	TCP	VCP
(1)	ER VENTILATION PS	FLOOD	3.900f	1.950	2.200

LIM	STABILITY CRITERION	Min/Max	Attained
(1)	**Res. Ratio from Roll to abs 50 deg or Flood**	> **1.000**	**1.465 P**
(2)	**Res. Area Ratio from Roll to RAzero or Flood**	> **1.000**	**1.465 P**



Appendix 6 – Basepoint Definition


Origin for LCG (Frame 0)
DWL
Origin for VCG (Baseline)
1100

Appendix 7 – Tank arrangement

Maximum Storage Capacity

WEIGHT STATUS

Trim: zero, Heel: zero

Part			Weight(MT)	LCG	TCG	VCG	
	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	RefHt
FO1.C	840.3	0.840	0.71	4.769f	0.000	0.550	
Total Weight			**0.71**	**4.769f**	**0.000**	**0.550**	

Distances in METERS.

WEIGHT STATUS

Trim: zero, Heel: zero

Part			Weight(MT)	LCG	TCG	VCG	
	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	RefHt
FW1.C	619.8	1.000	0.62	6.492f	0.000	0.591	
Total Weight			**0.62**	**6.492f**	**0.000**	**0.591**	

Distances in METERS.

WEIGHT STATUS

Trim: zero, Heel: zero

Part			Weight(MT)	LCG	TCG	VCG	
	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	RefHt
HO1.C	317.6	1.025	0.33	5.078f	0.000	1.890	
Total Weight			**0.33**	**5.078f**	**0.000**	**1.890**	

Distances in METERS.