0349 Final Stability Calculation Booklet

According ISO 12217-1:2013

JE 50 MPC

Revision A

6970 / Jetten Yachting

Index

Preface

The information presented in this report is based on a Light Ship Weight, resulting from the inclining trial held by Jur den Hamer, 22-08-2014 at Jetten Marina, Sneek. It contains the calculations made to show compliance with the stability criteria as known for design category A, as well as the hydrostatic properties and stability calculations.

Sneek, 26-08-2014

Identification And Approval

General information of the ship			
Length of hull: (as in ISO 8666)	L_H	m	14.90
Beam Hull :	B_H	m	4.60
Length waterline in loaded arrival condition:	L_{WL}	m	14.23
		Design Category :	A
		Option selected:	1

Light Ship Particulars			
Empty craft mass	m_{EC}	kg	23510
Maximum load	m_L	kg	5386
Light craft condition mass	m_{LC}	kg	23610
Maximum load condition mass = mLC + mL	m_{LDC}	kg	28996
Loaded arrival condition mass	m_{LA}	kg	25424
Minimum operating condition mass	m_{MO}	kg	24160

In order to obtain the light ship weight an inclining test was held. Weight, LCG and VCG used in this calculation have been derived from this test.

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 & SB	4.950	1.750	2.700

Note : All centres are measured from ship's origin

Summary Stability Criteria

	Pass/Fail	% of Criteria	
Downflooding openings	PASS	-	-
Downflooding angle	PASS	173%	%
Downflooding Height test	PASS	163%	%
Offset load test	PASS	529%	%
Resistance to waves + wind	PASS	100%	%
Recess size	PASS	-	-
Habitable multihulls	NA	-	-
Motor sailers	NA	-	-
Flotation test	NA	-	-
Flotation material	NA	-	-
Detection & removal of water	PASS	-	-

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 A.

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

A boat given design category A is considered to be designed to operate in winds of Beaufort force 10 or less and the associated wave heights, and to survive in more severe conditions. Such conditions may be encountered on extended voyages, for example across oceans, or inshore when unsheltered from the wind and waves for several hundred nautical miles. Winds are assumed to gust to 28 m/s.

Appendices

Appendix 1 – Overview Loading Conditions

Minimum Operating Condition

INTACT STABILITY AT CONDITION 1
OPERATIONAL CONDITION : MINIMUM OPERATING CONDITION

SUMMARY OF LOADING

0.0 Cu.M. (0%) DIESEL OIL 0.0 Cu.M. (0%) FRESH WATER
0.0 Cu.M. (0%) SEWAGE
0.73 MT of BALLAST 0.30 MT of Misc. Weights

WEIGHT STATUS

Trim: Aft 0.028/13.950, Heel: zero

Part	Weight(MT)	LCG	TCG	VCG	FSM
LIGHT SHIP	23.51	6.737f	0.000	2.063	
BALLAST	0.73	6.737f	0.000	0.240	
CREW FOR MMOC	0.15	5.200f	0.000	3.000	
Stores, spare gear and ca	0.15	4.800f	0.000	0.950	
Total Weight	**24.53**	**6.716f**	**0.000**	**2.008**	

	Load	SpGr	Weight(MT)	LCG	TCG	VCG	
FO1	0.000	0.840	0.00				0.00
FO2	0.000	0.840	0.00				0.00
FW1	0.000	1.000	0.00				0.00
FW2	0.000	0.840	0.00				0.00
HO1	0.000	1.025	0.00				0.00
HO2	0.000	1.025	0.00				0.00
Total Tanks			**0.00**				**0.00**

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Aft 0.028/13.950, No Heel, VCG = 2.008

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	Buoyancy-Ctr. VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.182	24.53	6.714f	0.858	0.47	6.230f	0.41	23.32	0.907

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 13.95m.

Draft is from Baseline.

CRITICAL POINT STATUS

Baseline draft: 1.166 @ 14.40f, 1.194 @ 0.45f
Trim: Aft 0.028/13.950, Heel: zero

	Critical Points		LCP	TCP	VCP	Height
(1)	AFT DRAFT MARK FRAME 1		0.450f	0.000	0.000	-1.194
(2)	FWD DRAFT MARK FRAME 32		14.400f	0.000	0.000	-1.166
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800s	2.700	1.515
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800p	2.700	1.515

Distances in METERS.

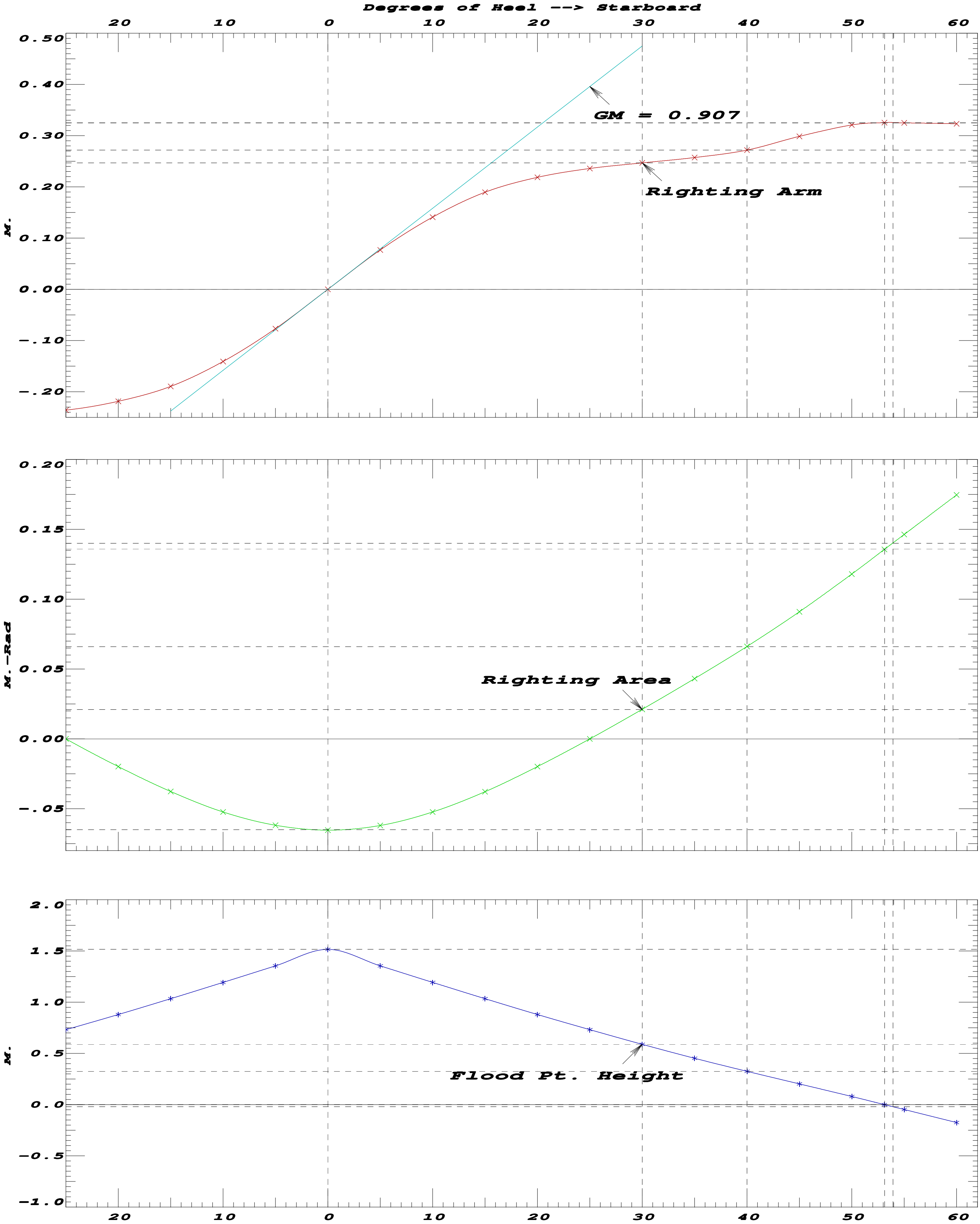
RIGHTING ARMS vs HEEL ANGLE

LCG = 6.716f TCG = 0.000 VCG = 2.008

Origin	Degrees of		Displacement	Righting Arms			Flood Pt
Depth	Trim	Heel	Weight(MT)	in Trim	in Heel	Area	Height
0.917	0.43f	25.00p	24.533	0.000	-0.236	0.0000	0.732 (3)
1.021	0.24f	20.00p	24.528	0.000	-0.219	-0.0198	0.880 (3)
1.103	0.06f	15.00p	24.530	0.000	-0.189	-0.0377	1.034 (3)
1.158	0.06a	10.00p	24.534	0.000	-0.141	-0.0523	1.193 (3)
1.187	0.11a	5.00p	24.535	0.000	-0.077	-0.0619	1.355 (3)
1.195	0.12a	0.00	24.535	0.000	0.000	-0.0653	1.515 (3)
1.187	0.11a	5.00s	24.535	0.000	0.077	-0.0620	1.355 (3)
1.158	0.06a	10.00s	24.535	0.000	0.141	-0.0524	1.193 (3)
1.103	0.06f	15.00s	24.532	0.000	0.189	-0.0379	1.034 (3)
1.021	0.24f	20.00s	24.529	0.000	0.219	-0.0199	0.880 (3)
0.917	0.43f	25.00s	24.527	0.000	0.236	-0.0000	0.732 (3)
0.793	0.65f	30.00s	24.525	0.000	0.247	0.0211	0.589 (3)
0.652	0.86f	35.00s	24.524	0.000	0.257	0.0431	0.453 (3)
0.495	1.06f	40.00s	24.524	0.000	0.272	0.0662	0.324 (3)
0.330	1.21f	45.00s	24.531	0.000	0.299	0.0910	0.202 (3)
0.164	1.31f	50.00s	24.534	0.000	0.321	0.1180	0.079 (3)
0.064	1.35f	53.11s	24.535	0.000	0.325	0.1356	0.000 (3)
0.042	1.35f	53.83s	24.538	0.000	**0.325**	0.1397	*-0.018* (3)
0.006	1.35f	55.00s	24.536	0.000	0.325	0.1463	*-0.049* (3)
-0.152	1.37f	60.00s	24.535	0.000	0.323	0.1747	*-0.175* (3)

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

	Critical Point		LCP	TCP	VCP
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800	2.700


Degrees of Heel --> Starboard
GM = 0.907
Righting Arm
M.
M.-Rad
Righting Area
Flood Pt. Height
M.

Loaded Arrival Condition

INTACT STABILITY AT CONDITION 2
OPERATIONAL CONDITION : LOADED ARRIVAL CONDITION

SUMMARY OF LOADING

0.3 Cu.M. (12%) DIESEL OIL 0.1 Cu.M. (15%) FRESH WATER
0.2 Cu.M. (48%) SEWAGE
0.90 MT of Desired Crew limit 1.00 MT of Provisions + person
0.01 MT of Stores, spare gear

WEIGHT STATUS

Trim: Fwd 0.014/13.950, Heel: Stbd 0.39 deg.

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	23.51	6.737f	0.000	2.063
Desired Crew limit at 75k	0.90	7.400f	0.000	3.000
Provisions + personal eff	1.00	7.400f	0.000	1.300
Stores, spare gear and ca	0.01	4.800f	0.000	0.950
Total Fixed	**25.43**	**6.785f**	**0.000**	**2.066**

	Load	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1	0.150	0.840	0.14	4.975f	0.615s	0.858	0.14
FO2	0.150	0.840	0.14	4.975f	0.602p	0.858	0.14
FW1	0.150	1.000	0.07	9.228f	0.553s	0.639	0.01
FW2	0.000	0.840	0.00				0.00
HO1	0.950	1.025	0.16	4.564f	0.654s	1.954	0.04
HO2	0.000	1.025	0.00				0.00
Total Tanks			**0.51**	**5.421f**	**0.277s**	**1.161**	**0.34**
Total Weight			**25.94**	**6.759f**	**0.005s**	**2.048**	
Free Surface Adjustment						**0.013**	
Adjusted CG				**6.759f**	**0.005s**	**2.061**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.014/13.950, Heel: Stbd 0.39 deg., VCG = 2.048

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	Buoyancy-Ctr. VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.212	25.93	6.760f	0.876	0.47	6.257f	0.41	22.32	0.788

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 13.95m.
Draft is from Baseline. True Free Surface included.

CRITICAL POINT STATUS

Baseline draft: 1.221 @ 14.40f, 1.206 @ 0.45f
Trim: Fwd 0.014/13.950, Heel: Stbd 0.39 deg.

	Critical Points		LCP	TCP	VCP	Height
(1)	AFT DRAFT MARK FRAME 1		0.450f	0.000	0.000	-1.206
(2)	FWD DRAFT MARK FRAME 32		14.400f	0.000	0.000	-1.221
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800s	2.700	1.477
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800p	2.700	1.501

Distances in METERS.

RIGHTING ARMS vs HEEL ANGLE

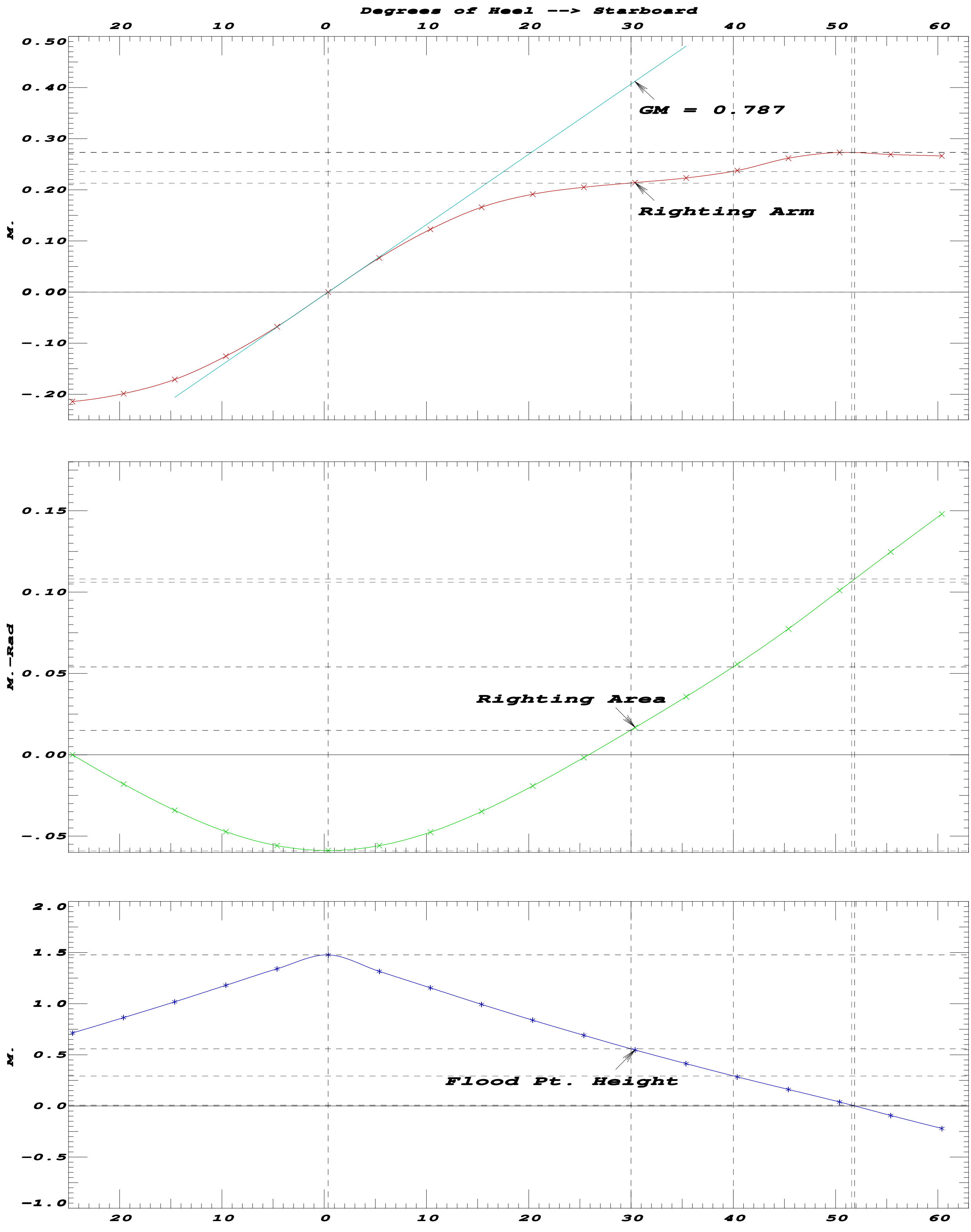
Fixed CG: LCG = 6.785f TCG = 0.000 VCG = 2.066

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Righting Arms in Trim	Righting Arms in Heel	Area	Flood Pt Height
0.944	0.55f	24.61p	25.935	0.000	-0.214	0.0000	0.714 (3)
1.044	0.37f	19.61p	25.929	0.000	-0.199	-0.0180	0.863 (3)
1.122	0.21f	14.61p	25.932	0.000	-0.171	-0.0342	1.018 (3)
1.174	0.10f	9.61p	25.934	0.000	-0.126	-0.0473	1.179 (3)
1.200	0.06f	4.61p	25.935	0.000	-0.068	-0.0558	1.341 (3)
1.206	0.06f	0.39s	25.937	0.000	0.000	-0.0588	1.477 (3)
1.197	0.07f	5.39s	25.935	0.000	0.067	-0.0559	1.316 (3)
1.167	0.11f	10.39s	25.935	0.000	0.123	-0.0476	1.154 (3)
1.112	0.23f	15.39s	25.933	0.000	0.166	-0.0349	0.994 (3)
1.030	0.39f	20.39s	25.930	0.000	0.191	-0.0192	0.840 (3)
0.926	0.58f	25.39s	25.928	0.000	0.205	-0.0018	0.691 (3)
0.802	0.78f	30.39s	25.927	0.000	0.214	0.0166	0.548 (3)
0.661	0.99f	35.39s	25.926	0.000	0.223	0.0356	0.413 (3)
0.504	1.17f	40.39s	25.926	0.000	0.238	0.0557	0.285 (3)
0.340	1.30f	45.39s	25.934	0.000	0.262	0.0774	0.162 (3)
0.178	1.38f	50.39s	25.935	0.000	0.273	0.1009	0.038 (3)
0.155	1.39f	51.10s	25.939	0.000	**0.273**	0.1042	0.020 (3)
0.132	1.39f	51.85s	25.935	0.000	0.273	0.1078	0.000 (3)
0.024	1.39f	55.39s	25.932	0.000	0.269	0.1246	*-0.092* (3)
-0.130	1.37f	60.39s	25.935	0.000	0.266	0.1480	*-0.219* (3)

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

Note: The Center of Gravity shown above is for the Fixed Weight of 25.43 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.

	Critical Point		LCP	TCP	VCP
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800	2.700


Degrees of Heel --> Starboard
20
10
0
10
20
30
40
50
60
0.50
0.40
0.30
0.20
0.10
0.00
-.10
-.20
M.
GM = 0.787
Righting Arm
0.15
0.10
0.05
0.00
-.05
M.-Rad
Righting Area
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
M.
Flood Pt. Height

Maximum Total Load

INTACT STABILITY AT CONDITION 3

OPERATIONAL CONDITION : LOADING DISPLACEMENT CONDITION

SUMMARY OF LOADING

2.2 Cu.M. (79%) DIESEL OIL 0.4 Cu.M. (95%) FRESH WATER
0.2 Cu.M. (48%) SEWAGE
0.90 MT of Desired Crew limit 1.00 MT of Provisions + person
0.15 MT of Stores, spare gear

WEIGHT STATUS

Trim: Aft 0.012/13.950, Heel: Stbd 1.19 deg.

Part	Load	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
LIGHT SHIP			23.51	6.737f	0.000	2.063	
Desired Crew limit at 75k			0.90	7.400f	0.000	3.000	
Provisions + personal eff			1.00	7.400f	0.000	1.300	
Stores, spare gear and ca			0.15	4.800f	0.000	0.950	
Total Fixed			**25.56**	**6.775f**	**0.000**	**2.060**	
	Load	**SpGr**	**Weight(MT)**	**LCG**	**TCG**	**VCG**	**FSM**
FO1	0.950	0.840	0.91	4.975f	0.870s	1.535	0.20
FO2	0.950	0.840	0.91	4.975f	0.861p	1.534	0.20
FW1	0.950	1.000	0.43	9.224f	0.753s	0.824	0.10
FW2	0.000	0.840	0.00				0.00
HO1	0.950	1.025	0.16	4.564f	0.658s	1.954	0.04
HO2	0.000	1.025	0.00				0.00
Total Tanks			**2.40**	**5.716f**	**0.182s**	**1.433**	**0.55**
Total Weight			**27.96**	**6.684f**	**0.016s**	**2.006**	
Free Surface Adjustment						**0.019**	
Adjusted CG				**6.684f**	**0.015s**	**2.025**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Aft 0.012/13.950, Heel: Stbd 1.19 deg., VCG = 2.006

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.255	27.97	6.683f	0.903	0.47	6.270f	0.42	20.89	0.735

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 13.95m.
Draft is from Baseline. True Free Surface included.

CRITICAL POINT STATUS

Baseline draft: 1.249 @ 14.40f, 1.260 @ 0.45f
Trim: Aft 0.012/13.950, Heel: Stbd 1.19 deg.

	Critical Points		LCP	TCP	VCP	Height
(1)	AFT DRAFT MARK FRAME 1		0.450f	0.000	0.000	-1.260
(2)	FWD DRAFT MARK FRAME 32		14.400f	0.000	0.000	-1.248
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800s	2.700	1.406
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800p	2.700	1.481

Distances in METERS.

RIGHTING ARMS vs HEEL ANGLE

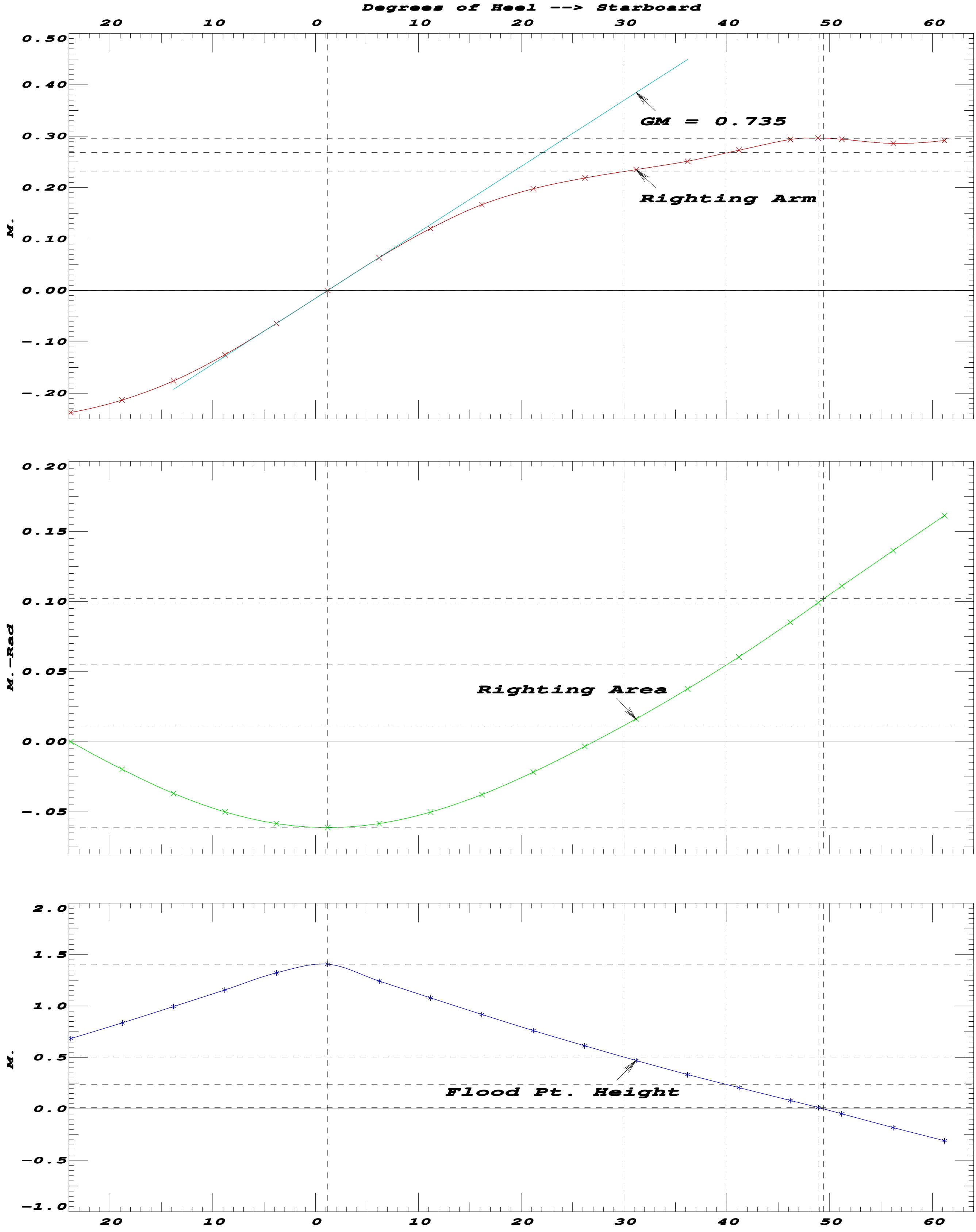
Fixed CG: LCG = 6.775f TCG = 0.000 VCG = 2.060

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Righting Arms in Trim	Righting Arms in Heel	Area	Flood Pt Height	
1.034	0.31f	23.81p	27.963	0.000	-0.237	0.0000	0.683	(3)
1.127	0.15f	18.81p	27.960	0.000	-0.213	-0.0197	0.836	(3)
1.195	0.03f	13.81p	27.963	0.000	-0.176	-0.0368	0.995	(3)
1.238	0.04a	8.81p	27.964	0.000	-0.125	-0.0500	1.158	(3)
1.257	0.05a	3.81p	27.965	0.000	-0.064	-0.0583	1.322	(3)
1.260	0.05a	1.19s	27.965	0.000	0.000	-0.0611	1.406	(3)
1.250	0.05a	6.19s	27.957	0.000	0.064	-0.0583	1.244	(3)
1.220	0.01a	11.19s	27.964	0.000	0.120	-0.0502	1.080	(3)
1.166	0.08f	16.19s	27.963	0.000	0.167	-0.0376	0.918	(3)
1.085	0.22f	21.19s	27.961	0.000	0.198	-0.0216	0.762	(3)
0.982	0.39f	26.19s	27.958	0.000	0.219	-0.0034	0.613	(3)
0.858	0.57f	31.19s	27.957	0.000	0.235	0.0164	0.470	(3)
0.717	0.75f	36.19s	27.957	0.000	0.251	0.0376	0.335	(3)
0.562	0.89f	41.19s	27.959	0.000	0.273	0.0605	0.207	(3)
0.401	0.99f	46.19s	27.963	0.000	0.293	0.0852	0.083	(3)
0.317	1.03f	48.89s	27.956	0.000	**0.296**	0.0991	0.014	(3)
0.301	1.03f	49.41s	27.964	0.000	0.296	0.1018	*-0.000*	(3)
0.248	1.03f	51.19s	27.966	0.000	0.294	0.1110	*-0.047*	(3)
0.103	0.98f	56.19s	27.964	0.000	0.286	0.1364	*-0.181*	(3)
-0.046	0.91f	61.19s	27.964	0.000	0.292	0.1615	*-0.308*	(3)

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

Note: The Center of Gravity shown above is for the Fixed Weight of 25.56 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.

	Critical Point		LCP	TCP	VCP
(3)	ER VENTILATION PS	FLOOD	4.950f	1.800	2.700


Degrees of Heel --> Starboard
20
10
0
10
20
30
40
50
60
0.50
0.40
0.30
0.20
0.10
0.00
-.10
-.20
M.
GM = 0.735
Righting Arm
0.20
0.15
0.10
0.05
0.00
-.05
M.-Rad
Righting Area
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
M.
Flood Pt. Height

Appendix 2 – ISO worksheets

ISO 12217-1 NON-SAILING BOATS OF LENGTH GREATER THAN OR EQUAL TO 6 m

CALCULATION WORKSHEET No. 1

Design: 6970, JE 50 MPC

Design Category intended: **A**	**Monohull / multihull:**		**Monohull**	
Item	**Symbol**	**Unit**	**Value**	**Ref.**
Length of hull as in ISO 8666	L_H	m	14.90	3.3.1
Length waterline in loaded arrival condition	L_{WL}	m	14.233	3.3.2
Empty craft condition mass	m_{EC}	kg	23510	3.4.1
Standard equipment		kg	100	3.5.12
Water ballast in tanks which are notified in the owner's manual to be filled whenever the boat is afloat		kg	0	3.4.2
Light craft condition mass = m_{EC} + standard equipment + ballast	m_{LC}	kg	23610	3.4.2
Mass of:				
Desired Crew Limit	CL		12	3.5.3
Mass of:				
desired Crew Limit at 75 kg each		kg	900	3.4.4
provisions + personal effects (Consumables)		kg	1000	3.4.4
drinking water (95% of maximum capacity)		kg	868	3.4.4
fuel (95% of maximum capacity)		kg	1815	3.4.4
lubricating and hydraulic oils		kg	0	3.4.4
black water and grey water (95% of maximum capacity)		kg	303	3.4.4
any other fluids carried aboard (eg: in bait tanks)		kg	-	3.4.4
stores, spare gear and cargo (if any) (Non-Consumables)		kg	500	3.4.4
optional equipment and fittings not included in basic outfit		kg	0	3.4.4
inflatable liferaft(s) in excess of essential safety equipment		kg	0	3.4.4
other small boats carried aboard		kg	0	3.4.4
margin for future additions		kg	-	3.4.4
Maximum load = sum of above masses	m_L	kg	5386	3.4.4
Maximum load condition mass = m_{LC} + m_L	m_{LDC}	kg	28996	3.4.5
mass to be removed for Loaded Arrival Condition		kg	3572	3.4.6
Loaded arrival condition mass m LA	m_{LA}	kg	25424	3.4.6
Mass of:				
minimum number of crew according to 3.4.3		kg	150	3.4.3a)
non-consumable stores and equipment normally aboard		kg	500	3.4.3b)
inflatable liferaft		kg	0	3.4.3
Load to be included in Minimum Operating Condition	m'_L	kg	650	3.4.3
Light craft condition mass	m_{LC}	kg	23510	3.4.2
Mass in the Minimum Operating Condition = m LC + m'L	m_{MO}	kg	24160	3.4.3
Is boat sail or non-sail?				3.1.2, 5.2
reference sail area according to ISO 8666	AS	m2	37.65	3.3.8
sail area / displacement ratio = AS /(m LDC) 2/3		-	0.0400	3.1.2, 5.2
CLASSIFIED AS [non-sail if AS/(m LDC) 2/3 < 0,07]	SAIL/NON-SAIL ?		NON-SAIL	3.1.2, 5.2
NB: If NON-SAIL, continue using these worksheets, if SAIL, use ISO 12217-2				

ISO 12217-1 CALCULATION WORKSHEET No. 2 TESTS TO BE APPLIED

Question			Answer	Ref.
Is boat fully enclosed?	(see definition in ref.)	YES/NO?	YES	3.1.6
Is boat partially protected?	(see definition in ref.)	YES/NO?	NO	3.1.7

Item	Symbol	Unit	Value	Ref.
Windage area in minimum operating condition	A_{LV}	m^2	37.65	3.3.7
Length waterline in loaded arrival condition	L_{WL}	m	14.233	3.3.2
Beam of hull	B_H	m	4.60	3.3.3
Ratio $A_{LV}/(L_{WL} B_H)$		-	0.58	

Choose any ONE of the following options, and use all the worksheets indicated for that option.

Option		1	2	3	4	5	6
categories possible		**A and B**	C and D	B	C and D	C and D	C and D
decking or covering		**fully enclosed**	fully enclosed	any amount	any amount	Partially protected	any amount
Downflooding openings		**3**	3	3	3	3	3
Downflooding angle		**3**		3			
Downflooding	all boats	**3**	3	3	3a	3	3
Height test	Annex A method	**4**	4	4	4a	4	4
Offset load test		**5**	5	5	5	5	5
Resistance to waves + wind		**6**		6			
Heel due to wind action			7b		7b	7b	7b
Recess size		**8**	8c				
Habitable multihulls		**9**	9	9	9	9	9
Motor sailers		**9**	9	9	9	9	9
Flotation test				10	10		
Flotation material				10	10		
Detection & removal of water		**11**	11	11	11	11	11
SUMMARY		**12**	12	12	12	12	12

a. The downflooding height test is not required to be conducted on the following Category C and D boats:

I. those which, when tested in accordance with normative annex F.4, have been shown to support, in addition to the mass required by F.2 and Table F.5, an additional equivalent dry mass (kg) of (75·CL + 10% of dry weight of stores and equipment included in the maximum total load), or

II. those boats that do not take on water when heeled to 90° from the upright in the light craft condition.

b. The application of Worksheet 7 is only required for boats where $A_{LV}/(L_{WL} B_H) > 0,55$.

c. Only required for boats of design category C

Option selected	1

ISO 12217-1 CALCULATION WORKSHEET No. 3 **DOWNFLOODING**

Downflooding Openings: (all boats)

Question			Answer	Ref.
Have all appropriate downflooding openings been identified?		YES/NO	YES	3.2.1
Have potential downflooding openings within the boat been identified?		YES/NO	YES	6.1.1.4
Do all closing appliances satisfy ISO 12216?		YES/NO	YES	6.1.1.1
Hatches or opening type windows are not fitted below minimum height above waterline?		YES/NO	YES	6.1.1.2
Seacocks comply with requirements?		YES/NO	YES	6.1.1.3
Are all openings on Category A or B boats fitted with closing appliances? (Except openings for ventilation and engine combustion)		YES/NO	YES	6.1.1.5
Categories possible: A or B if all are YES, C or D if first five are YES			YES	6.1.1

Downflooding Angle: (Categories A and B only)

Item	Symbol	Unit	Value	Ref.
Required value: (where φ_O = attained angle from offset load test)				6.1.3
Category A = larger of (φO + 25)° or 30°	φD_R	degrees	30	Table 3
Area of openings permitted to be submerged $=1{,}2 L_H B_H F_M$		cm2	131.6	6.1.3
Actual downflooding angle: at mass = m_{MO}	φD_A	degrees	53.11	6.1.3
at mass = m_{LA}	φD_A	degrees	51.85	6.1.3
Method used to determine φ_{DA}:	C.2 Theoretical calculation			Ann. C
Design Category possible on Downflooding Angle			A	6.1.3

Downflooding Height: (All except exempt boats)

Requirement			Basic requirement	Reduced value for small openings	Reduced value at outboard	Increased value at bow
applicable to			all options	all options (only using figures)	options 3, 4	options 3, 4, 6
ref.			6.1.2.2 a)	6.1.2.2 d)	6.1.2.2 c)	6.1.2.2 b)
obtained from Figs. 3 + 4 or annex A?			0.876	0.657	0.701	1.007
maximum area of small openings ($50 L_{H}{}^2$)(mm2)=				11101		
Required downflood Height hD(R) (m)	Fig. 3/ann. A	**Category A**	**0.876**	**0.657**	**0.701**	**1.008**
	Fig. 3/ann. A	Category B	0.876	0.657	0.701	1.008
	Fig. 3/ann. A	Category C	0.745	0.559	0.596	0.857
	Fig. 4/ann. A	Category D	0.400	0.300	0.320	0.460
Actual Downflooding Height h_D			1.428	1.428	1.428	1.428
Design Category possible			A	A	A	A
Design Category possible on Downflooding Height = lowest of above						A

This method may only be applied by calculation; requirements must be fulfilled for both conditions LC1 and LC2

Preparation (curves of moments in Nm)

Question		Answer	Ref.
Mass and centre-of-gravity of the boat calculated for conditions LC1 and LC2?	YES/NO	YES	B.3.2.2
Curves of righting moments calculated according to annex D?	YES/NO	YES	B.3.2.3
Crew heeling moment curve calculated with 961 CL (B_C/2 - 0,2) cosΦ or where the crew area includes side decks less than 0,4m wide with 480 CL BC cosΦ ?	YES/NO	YES	B.3.2.4

Test data:

Item	Symbol	Unit	LC1	LC2	Ref.
Maximum transverse distance between the outboard extremities of any part of the crew area	B_C	m	4.60		B.3.2.4 & B.3.1.7
Heel angle at the point of intersection between crew heeling moment curve and curve of righting moment	φ_C	degrees	2.45	2.45	
Maximum permitted heel angle	$\varphi_{o(R)}$	degrees	12.9		B.3.2.5
Value of downflooding angle	φ_D	degrees	50.59	50.59	B.3.2.5
Value of minimum freeboard margin at φ_C	h_f	m	1.190	1.95	
Minimum required freeboard margin	$h_{F(R)}$	m	0.000	0.000	6.2.2 table 4
Righting moment up to φ_D		Nm	80516	80516	
Crew heeling moment at φ_D		Nm	22006	22006	

Requirements:

Question		Answer		Ref.
Is $\varphi_C < \varphi_{O(R)}$	YES/NO	YES	YES	B.3.2.5
Is $h_F > h_{F(R)}$	YES/NO	YES	YES	B.3.2.5
Is max righting moment up to φ_D > crew heeling moment at φ_D	YES/NO	YES	YES	B.3.2.5
Offset load test passed, if all questions above are answered with 'Yes'	PASS/ FAIL	PASS	PASS	B.3.2.5

ISO 12217-1 CALCULATION WORKSHEET No. 6a **RESISTANCE TO WAVES+WIND**

NB: This sheet is to be completed for both Minimum Operating and Loaded Arrival Conditions.

Input data: **Design Categories A and B only**

Item	Symbol	Unit	m_{LA}	m_{MO}	Ref.
Minimum operating mass	m_{MO}	kg		24160	3.4.3
Loaded arrival mass	m_{LA}	kg	25424		3.4.6
Displacement volume (= m_{MO} /1 025 or m_{LA}/1 025)	V_D	m³	24.804	23.571	3.4.7
Windage area (of above water profile of boat)	A_{LV}	m²	37.010	37.650	3.3.7
Windage area to be used (not to be < 0,55 $L_H B_H$)	A'_{LV}	m²	37.70	37.70	6.3.2
Length waterline	L_{WL}	m	14.233	14.217	3.3.2
Lever between centroids of above and below water areas	h	m	1.85	1.85	6.3.2
Downflooding angle	Phi_D	degrees	64.3	66.4	3.2.2

Item	Symbol	Unit	Cat A	Cat B	Ref.
Calculation wind speed	v_W	m/s	28	21	3.5.1

(continued on worksheet 6b)

ISO 12217-1 CALCULATION WORKSHEET No. 6b

RESISTANCE TO WAVES+WIND

NB: This sheet is to be completed for both Minimum Operating and Loaded Arrival Conditions.

Rolling in beam waves and wind: Design Categories A and B only

Item	Symbol	Unit	m_{LA}	m_{MO}	Ref.
Second wind heel equilibrium angle		degrees	134.0	132.0	Fig 6
Least value of φD, 50deg or second wind heel equilibrium ang	φ_{A2}	degrees	50.0	50.0	Fig 6
Wind heeling moment = 0,53 A'LV h vW or = 0,30 A'_{LV} (A'_{LV} / L_{WL} + T_M) v	M_w	Nm	28978	28978	6.3.2
Assumed roll angle Category A = (25 + 20/V_D) Category B = (20 + 20/V_D)	φ_R	degrees	25.8	25.8	6.3.2
Area A_1 (see Figure 6) A_1 any Figure 6	A_1	Nmrad	804	754	Fig 6
Area A_2 (see Figure 6) A_2 any Figure 6	A_2	Nmrad	807	874	Fig 6
Ratio of A_2/A_1 — 6.3.2		-	1.003	1.159	6.3.2
Is ratio of A_2/A_1 greater than or equal to 1,0? YES / NO 6.3.2		YES / NO	YES	YES	6.3.2

Resistance to waves:

Item	Symbol	Unit	m_{LA}	m_{MO}	Ref.
Least value of φ_D, φ_V or 50°		degrees	50	50	6.3.3
Heel angle when righting moment is maximum	φ_{GZmax}	degrees	51.1	53.83	6.3.3
If φ_{GZmax} is greater than or equal to 30°: Max. value of righting moment at 30°	RM_{30}	kNm	57.5	63.5	6.3.3a)
Required value of righting moment		kNm	25	25	6.3.3a)
Is $RM_{30°}$ greater than or equal to required max. value?		PASS/FAIL	PASS	PASS	6.3.3 b)
Value of righting lever at 30º = RM_{30}/(9,806 m)	GZ_{30}	m	0.213	0.274	3.5.10
Required value of righting lever at 30º		m	0.200		6.3.3a)
Is $GZ_{30°}$ greater than or equal to required max. value?		PASS/FAIL	PASS	PASS	6.4.3a)
If φ_{GZmax} is less than 30°: max. value of righting moment	RM_{max}	kNm	-	-	6.3.3 b)
Required value RM_{max} (A = 750/φ_{GZmax}, B = 210/φ_{GZmax})		kNm	-	-	6.3.3 b)
Is RM_{max} greater than or equal to required max. value?		PASS/FAIL	-	-	6.3.3 b)
max. value of righting lever = RM_{max}/(9,806 m*)	Gz_{max}	m	-	-	3.5.10
Required max. value of righting lever = 6/φ_{GZmax}		m	-	-	6.3.3 b)
Is GZ_{max} greater than or equal to required max value?		PASS/FAIL	-	-	6.3.3 b)

Design Category given: NB: Boat must have ratio of A2/A1 greater than or equal to 1,0, and also get PASS twice under resistance to waves.	**A**

ISO 12217-1 CALCULATION WORKSHEET No. 7 HEEL DUE TO WIND ACTION

NB: This sheet is to be completed for both Minimum Operating and Loaded Arrival Conditions.

Initial check: Design Categories C and D only

Item	Symbol	Unit	Value at m_{MO}	Ref.
Windage area (NOT subject to minimum of 0,55 LWL BH)	A_{LV}	m2	37.65	3.3.7
Length waterline	L_{WL}	m	14.217	3.3.2
Beam of hull B_H	B_H	m	4.60	3.3.3
Ratio $A_{LV}/(L_{WL} B_H)$		-	0.58	
Is ratio $A_{LV}/(L_{WL} B_H)$ equal to or greater than 0,55?		YES/NO	YES	6.4
If answer is NO, no further assessment is required.				

Calculation of wind heeling moment:

Item	Symbol	Unit	m_{LA}	m_{MO}	Ref.
Length waterline	$_{LWL}$	m	14.233	14.217	3.3.2
Draught at the mid-point of L_{WL}	T_M	m	1.212	1.167	6.3.2
Lever between centroids of above and below water areas	h	m	1.85	1.85	6.3.2
Calculation wind speed (17 m/s for cat C, 13 m/s for cat D)	v_w	m/s	0	0	3.5.1
Wind heeling moment = $0,53\ A_{LV}\ h\ v_W^2$ or = $0,30 A_{LV}(A_{LV}/L_{WL} + T_M)\ v_W^2$	M_W	Nm	0.0	0.0	6.3.2, 6.4.2

Angle of heel due to wind:

Item	Symbol	Unit	m_{LA}	m_{MO}	Ref.
FROM RIGHTING MOMENT CURVE: angle of heel due to wind	φ_W	degrees	NA	NA	6.4.3
OR ALTERNATIVELY: wind heeling moment M_W divided by 9,806		kgm	NA	NA	
Angle of heel due to wind when moment above applied	φ_W	degrees	NA	NA	6.4.3
Maximum permitted angle of heel during offset load test (from Worksheet 5)	$\varphi_{O(R)}$	degrees	NA		6.2.3
Downflooding angle	φ_D	degrees	NA	NA	3.2.2
Maximum permitted heel due to wind = lesser of $0,7\varphi_{O(R)}$ and $0,7\varphi_D$		degrees	NA	NA	6.4.3
Is angle of heel due to wind less than permitted value?	YES/NO		NA	NA	6.4.3
Design Category possible on wind heeling =			NA		

ISO 12217-1 CALCULATION WORKSHEET No. 8a **RECESS SIZE**

NB: This sheet is to be completed for the Loaded Arrival Condition.

Item	Symbol	Unit	Value		Ref.
			Recess 1	Recess 2	
Angle of vanishing stability > 90° ?		YES/NO	YES	YES	6.5.1a)
Depth recess < 3% max breadth of the recess over >35% of periphery?		YES/NO	NO	NO	6.5.1b)
Bulwark height < B_H/8 and has ≥ 5% drainage area in the lowest 25%?		YES/NO	NO	NO	6.5.1c)
Drainage area per side (m²) divided by recess volume (m³)			NO	NO	6.5.1d)
Height position of drainage area (lowest 25% / lowest 50% / full depth)			NO	NO	6.5.1d)
Drainage area meets requirements 1) and 2)?		YES/NO	NO	NO	6.5.1d)
Recess exempt from size limit?		YES/NO	YES	YES	6.5.1
SIMPLIFIED METHOD: Use 1), 2) or 3) below.			**Zone 1**	**Zone 2**	
Requirement: from results below, design category possible =			-	-	6.5.2.1
Average freeboard to loaded waterline at aft end of recess	F_A	m	-	-	6.5.2.1
Average freeboard to loaded waterline at sides of recess	F_S	m	-	-	6.5.2.1
Average freeboard to loaded waterline at forward end of recess	F_F	m	-	-	6.5.2.1
Average freeboard to recess periphery = (FA + 2FS + FF) / 4	F_R	m	-	-	6.5.2.1
Category A permitted percentage loss in metacentric height (GMT) = 250 FR / LH			-	-	6.5.2.1
Category B permitted percentage loss in metacentric height (GMT) = 550 FR / LH			-	-	6.5.2.1
Category C permitted percentage loss in metacentric height (GMT) = 1 200 FR / LH			-	-	6.5.2.1

Continued on worksheet 8b

ISO 12217-1 CALCULATION WORKSHEET No. 8b RECESS SIZE

NB: This sheet is to be completed for the Loaded Arrival Condition.

Item	Symbol	Unit	Value		Ref.
SIMPLIFIED METHOD: Use 1), 2) or 3) below.			**Zone 1**	**Zone 2**	
1) Loss of *GM*T used?		YES / NO	n/a	n/a	6.5.2.2
Second moment of area of free-surface of recess SMA_{RECESS} m4 6.5.2	SMA_{RECESS}	m^4	-	-	6.5.2.2
Metacentric height of boat at m_{LA}	GM_T	m	-	-	
Calculated percentage loss in metacentric height (GM_T) =			-	-	6.5.2.2
2) Second moment of areas used?		YES / NO	n/a	n/a	
Second moment of area of free-surface of recess	SMA_{RECESS}	m^4	-	-	
Second moment of area of waterplane of boat at m_{LA} SMA_{WP} m4 6.5.	SMA_{WP}	m^4	-	-	6.5.2.3
Calculated percentage loss in metacentric height (GM_T) =			-	-	6.5.2.2
3) Recess dimensions used?		YES / NO	n/a	n/a	6.5.2.4
maximum length of recess at the retention level (see 3.5.11)	l	m			6.5.2.4
maximum breadth of recess at the retention level (see 3.5.11)	b	m			6.5.2.4
Calculated percentage loss in metacentric height (GM_T) =					6.5.2.4
DIRECT CALCULATION METHOD used?		YES / NO	n/a	n/a	6.5.3
percentage full of water = 60 – 240 F/L_H			-	-	6.5.3a)
wind heeling moment for intended design category	MW	N·m	-	-	6.5.3b)
crew heeling moment at ☐ GZmax		N·m	-	-	6.5.3c)
maximum swamped righting moment up to least of ☐ D ☐ V or 50°		N·m	-	-	6.5.3d)
required margin of righting moment over heeling moment		N·m	-	-	6.5.3d)
actual margin of righting moment over heeling moment		N·m	-	-	6.5.3d)
design category possible			-	-	6.5.3d)
Design category achieved			A	A	

ISO 12217-1 CALCULATION WORKSHEET No.11

DETECTION + REMOVAL OF WATER

Item	Unit	Re-sponse	Ref.
The internal arrangement facilitates the drainage of water to bilge suction point(s), to a location from which it may be bailed rapidly, or directly overboard?	YES / NO	YES	6.9.1
Is boat provided with means of removing water from the bilges in accordance with ISO 15083?	YES / NO	YES	6.9.3
Table 2 option used for assessment:		1	6.9.3
Can water in boat be detected from helm position?	YES / NO	NO	6.9.3
Method(s) used: direct visual inspection		YES	6.9.3
transparent inspection panels		NO	6.9.3
bilge alarms		YES	6.9.3
indication of the operation of automatic bilge pumps		YES	6.9.3
Other means (specify):			6.9.3

ISO 12217-1 CALCULATION WORKSHEET No. 12 — SUMMARY

Design Description:	JE 50 MPC					
Design Category intended:	A	**Crew limit:**	12		**Date:**	26-08-2014
Sheet	**Item**			**Symbol**	**Unit**	**Value**
1	**Length of hull:** (as in ISO 8666)			L_H	m	14.90
1	**Length waterline** in loaded arrival condition**:**			L_{WL}	m	14.233
1	**Mass:**					
1	Empty craft mass			m_{EC}	kg	23510
1	Maximum load			m_L	kg	5386
1	Light craft condition mass			m_{LC}	kg	23610
1	Maximum load condition mass = $m_{LC} + m_L$			m_{LDC}	kg	28996
1	Loaded arrival condition mass			m_{LA}	kg	25424
1	Minimum operating condition mass			m_{MO}	kg	24160
1	**Is boat sail or non-sail?**				SAIL/NON-SAIL	NON-SAIL
2	**Option selected:**					1
3	**Downflooding openings:** Are all requirements met?				YES / NO	YES
		Unit	**Requ'd**	**Actual** m_{MO}	**Actual** m_{LA}	**Pass/ Fail**
3	**Downflooding angle:** (Cats A & B only)	deg	≥30	53.11	51.85	PASS
3 & 4	**Downflooding height:** Worksheet used:					
3 & 4	basic requirement	m	≥	0.876	0.876	PASS
3 & 4	reduced height for small openings (sheet 4 only)	m	≥	0.657	0.657	PASS
3 & 4	reduced height at outboard (options 3 + 4 only)	m	≥	0.701	0.701	PASS
3 & 4	increased height at bow (options 3, 4, 6 only)	m	≥	1.007	1.007	PASS
5	**Offset load test:**					
5	testing for least stability: maximum heel angle	degrees	<		2.45	PASS
5	testing for least freeboard: heeled freeboard	mm	≥		1.19	PASS
5	maximum crew limit for stability				12	
5	maximum crew limit for freeboard				12	
6	**Resistance to waves+wind:** (options 1, 3) at m_{LA} and at m_{MO}					
6	**Rolling in beam waves and wind:** ratio A2 /A1	-	≥ 1.0	1.159	1.003	PASS
6	**Resistance to waves:** value of φGZ_{max}	degrees	-	53.83	51.1	PASS
6	value of RM_{30} or Rm_{max}	N*m	>	63.5	57.5	PASS
6	value of GZ_{30} or G_{zmax}	m	≥	0.274	0.213	PASS
7	**Heel due to wind:** (options 2, 4, 5, 6) at m LA and at m MO					
7	Is ratio $A_{LV}/(L_{WL} B_H)$ ≤ 0,55?		YES /NO	NO	NO	NA
7	If YES: at mLA: heel angle due to wind	degrees	<	-	-	NA
7	if required at mMO: heel angle due to wind	degrees	<	-	-	NA
8	**Recess size:** (options 1 & 2 except category D)					
8	Simplified Method: max reduction in GM_T	%	≤	-		NA
8	Direct Calculation: margin righting over heeling momt	N*m	≥	-		NA

ISO 12217-1 CALCULATION WORKSHEET No. 12 *(continued)* **SUMMARY**

Sheet	Item		Pass/Fail
9	**Habitable Multihulls:** Is Category C boat vulnerable to inversion?	YES / NO	NA
	Complies with Part 2 clause 7.12 for inverted buoyancy?	PASS/FAIL	NA
	Complies with Part 2 clause 7.13 for means of escape?	PASS/FAIL	NA
9	**Motor Sailers**		
	Complies with requirement for excess of RM_{MAX} over M_W?	PASS/FAIL	NA
10	**Flotation test:** (options 3 and 4 only) All preparations completed?	YES / NO	NA
	Swamped stability: 5 min after swamping, does boat heel less than 45°?		NA
	Load test: 5 min after swamping, does boat float level with 2/3 periphery showing?		NA
	Flotation elements: do all elements comply with all the requirements?		NA
11	**Detection & removal of water** are all requirements satisfied?	YES / NO	YES
NB: Boat must pass all requirements applicable to selected option to be given intended Design Category.			
Design Category given: A	Assessed by:	VRIPACK	

Appendix 3 – Offset Load Test

6.2 A-SYMMETRIC LOADING AT LOADED DISPLACEMENT
LC1: CREW LOADED AT AFT POSITION 25%

WEIGHT STATUS

Trim: Fwd 0.43 deg., Heel: Stbd 6.55 deg.

Part	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
LIGHT SHIP			23.51	6.737f	0.000	2.063	
BALLAST			0.62	6.737f	0.000	0.240	
Desired Crew limit at 85k			1.02	10.462f	0.000	3.000	
Provisions + personal eff			1.00	7.400f	0.000	1.300	
Stores, spare gear and ca			0.15	4.800f	0.000	0.950	
Total Fixed			**26.31**	**6.896f**	**0.000**	**2.021**	
FO1	1114.8	0.840	0.94	4.975f	0.882s	1.559	0.03
FO2	1114.8	0.840	0.94	4.975f	0.856p	1.558	0.03
FW1	447.7	1.000	0.45	9.227f	0.758s	0.829	0.00
FW2	447.6	0.840	0.38	9.227f	0.744p	0.829	0.00
Total Tanks			**2.70**	**6.274f**	**0.031s**	**1.336**	**0.06**
Total Weight			**29.00**	**6.838f**	**0.003s**	**1.957**	
Free Surface Adjustment						**0.002**	
Adjusted CG				**6.838f**	**0.003s**	**1.959**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.43 deg., Heel: Stbd 6.55 deg., VCG = 1.957

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	Buoyancy-Ctr. VCB	Weight/ cm	LCF	Moment/ Deg trim	GML	GMT
1.274	28.99	6.845f	0.927	0.47	6.363f	10.22	20.20	0.728

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

CRITICAL POINT STATUS

Baseline draft: 1.227 @ Origin
Trim: Fwd 0.43 deg., Heel: Stbd 6.55 deg.

	Critical Points		LCP	TCP	VCP	Height
(1)	ER VENTILATION PS	FLOOD	4.950f	1.750p	2.700	1.626
(1)	ER VENTILATION PS	FLOOD	4.950f	1.750s	2.700	1.227
(2)	ER VENTILATION SB	FLOOD	4.950f	1.750s	2.700	1.227
(2)	ER VENTILATION SB	FLOOD	4.950f	1.750p	2.700	1.626

Distances in METERS.

FREEBOARD STATUS

Baseline draft: 1.227 @ Origin
Trim: Fwd 0.43 deg., Heel: Stbd 6.55 deg.
No deck-edge data.

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

Total CG: LCG = 6.838f TCG = 0.003s VCG = 1.957
Free Surface Adjustment: 0.002
Adjusted CG: LCG = 6.838f TCG = 0.003s VCG = 1.959

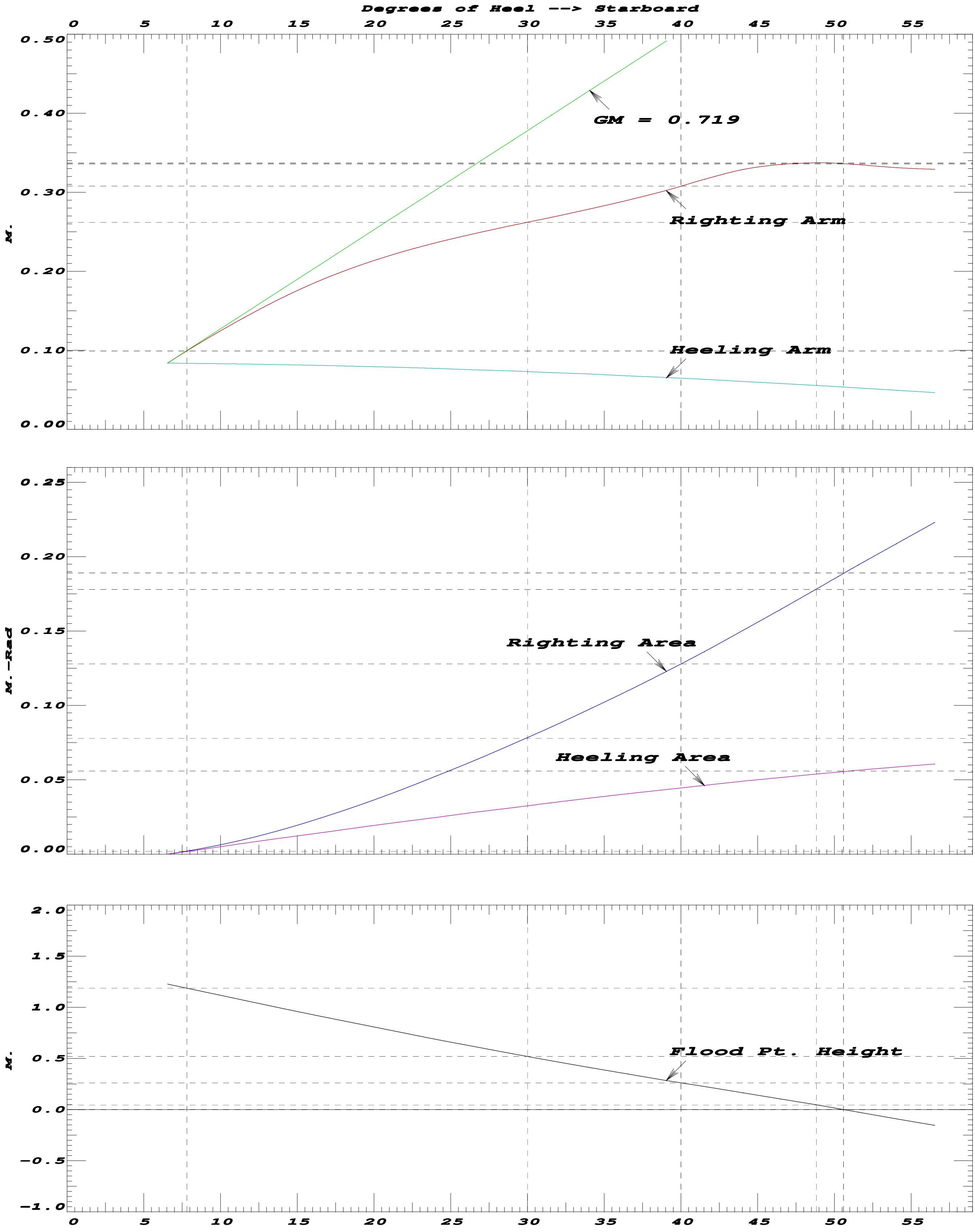
Origin	Degrees of		Displacement	Residual Arms			Flood Pt
Depth	Trim	Heel	Weight(MT)	in Trim	in Heel	Area	Height
1.218	0.43f	6.55s	28.993	0.000	0.000	0.0000	1.228 (1)
1.205	0.44f	9.05s	29.002	0.000	0.031	0.0007	1.148 (1)
1.186	0.47f	11.55s	29.001	0.000	0.059	0.0026	1.068 (1)
1.161	0.51f	14.05s	29.001	0.000	0.085	0.0058	0.989 (1)
1.129	0.57f	16.55s	29.001	0.000	0.108	0.0100	0.912 (1)
1.091	0.64f	19.05s	29.001	0.000	0.128	0.0151	0.835 (1)
1.046	0.71f	21.55s	29.001	0.000	0.144	0.0211	0.761 (1)
0.996	0.80f	24.05s	29.000	0.000	0.159	0.0277	0.687 (1)
0.941	0.88f	26.55s	29.000	0.000	0.172	0.0349	0.616 (1)
0.881	0.97f	29.05s	29.000	0.000	0.184	0.0427	0.546 (1)
0.816	1.05f	31.55s	29.000	0.000	0.196	0.0510	0.478 (1)
0.747	1.14f	34.05s	29.000	0.000	0.209	0.0599	0.412 (1)
0.674	1.22f	36.55s	29.000	0.000	0.222	0.0693	0.347 (1)
0.598	1.29f	39.05s	29.000	0.000	0.237	0.0793	0.285 (1)
0.519	1.35f	41.55s	29.001	0.000	0.253	0.0900	0.224 (1)
0.439	1.40f	44.05s	29.001	0.000	0.268	0.1014	0.164 (1)
0.359	1.44f	46.55s	29.001	0.000	0.277	0.1133	0.103 (1)
0.281	1.47f	49.05s	29.001	0.000	0.282	0.1255	0.040 (1)
0.234	1.48f	50.59s	29.002	0.000	0.283	0.1331	0.000 (1)
0.206	1.48f	51.55s	29.002	0.000	0.282	0.1378	*-0.025* (1)
0.132	1.46f	54.05s	29.002	0.000	0.282	0.1501	*-0.090* (1)
0.059	1.43f	56.55s	29.002	0.000	0.283	0.1624	*-0.155* (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 0.1 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 = 2.45Cos(heel)

	Critical Point		LCP	TCP	VCP
(1)	ER VENTILATION PS	FLOOD	4.950f	1.750	2.700


Degrees of Heel --> Starboard
0
5
10
15
20
25
30
35
40
45
50
55
M.
0.50
0.40
0.30
0.20
0.10
0.00
GM = 0.719
Righting Arm
Heeling Arm
M.-Rad
0.25
0.20
0.15
0.10
0.05
0.00
Righting Area
Heeling Area
M.
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
Flood Pt. Height

6.2 A-SYMMETRIC LOADING AT LOADED DISPLACEMENT
LC2: CREW LOADED AT FWD POSITION 75%

WEIGHT STATUS

Trim: Fwd 0.43 deg., Heel: Stbd 6.55 deg.

Part	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
LIGHT SHIP			23.51	6.737f	0.000	2.063	
BALLAST			0.62	6.737f	0.000	0.240	
Desired Crew limit at 85k			1.02	10.462f	0.000	3.000	
Provisions + personal eff			1.00	7.400f	0.000	1.300	
Stores, spare gear and ca			0.15	4.800f	0.000	0.950	
Total Fixed			**26.31**	**6.896f**	**0.000**	**2.021**	
	Ltrs.	**SpGr**	**Weight(MT)**	**LCG**	**TCG**	**VCG**	**FSM**
FO1	1114.8	0.840	0.94	4.975f	0.882s	1.559	0.03
FO2	1114.8	0.840	0.94	4.975f	0.856p	1.558	0.03
FW1	447.7	1.000	0.45	9.227f	0.758s	0.829	0.00
FW2	447.6	0.840	0.38	9.227f	0.744p	0.829	0.00
Total Tanks			**2.70**	**6.274f**	**0.031s**	**1.336**	**0.06**
Total Weight			**29.00**	**6.838f**	**0.003s**	**1.957**	
Free Surface Adjustment						**0.002**	
Adjusted CG				**6.838f**	**0.003s**	**1.959**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.43 deg., Heel: Stbd 6.55 deg., VCG = 1.957

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ Deg trim	GML	GMT
1.274	29.00	6.845f	0.928	0.47	6.363f	10.22	20.19	0.728

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

CRITICAL POINT STATUS

Baseline draft: 1.227 @ Origin
Trim: Fwd 0.43 deg., Heel: Stbd 6.55 deg.

	Critical Points		LCP	TCP	VCP	Height
(1)	ER VENTILATION PS	FLOOD	4.950f	1.750p	2.700	1.626
(1)	ER VENTILATION PS	FLOOD	4.950f	1.750s	2.700	1.227
(2)	ER VENTILATION SB	FLOOD	4.950f	1.750s	2.700	1.227
(2)	ER VENTILATION SB	FLOOD	4.950f	1.750p	2.700	1.626

Distances in METERS.

FREEBOARD STATUS

Baseline draft: 1.227 @ Origin
Trim: Fwd 0.43 deg., Heel: Stbd 6.55 deg.
No deck-edge data.

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

Total CG: LCG = 6.838f TCG = 0.003s VCG = 1.957
Free Surface Adjustment: 0.002
Adjusted CG: LCG = 6.838f TCG = 0.003s VCG = 1.959

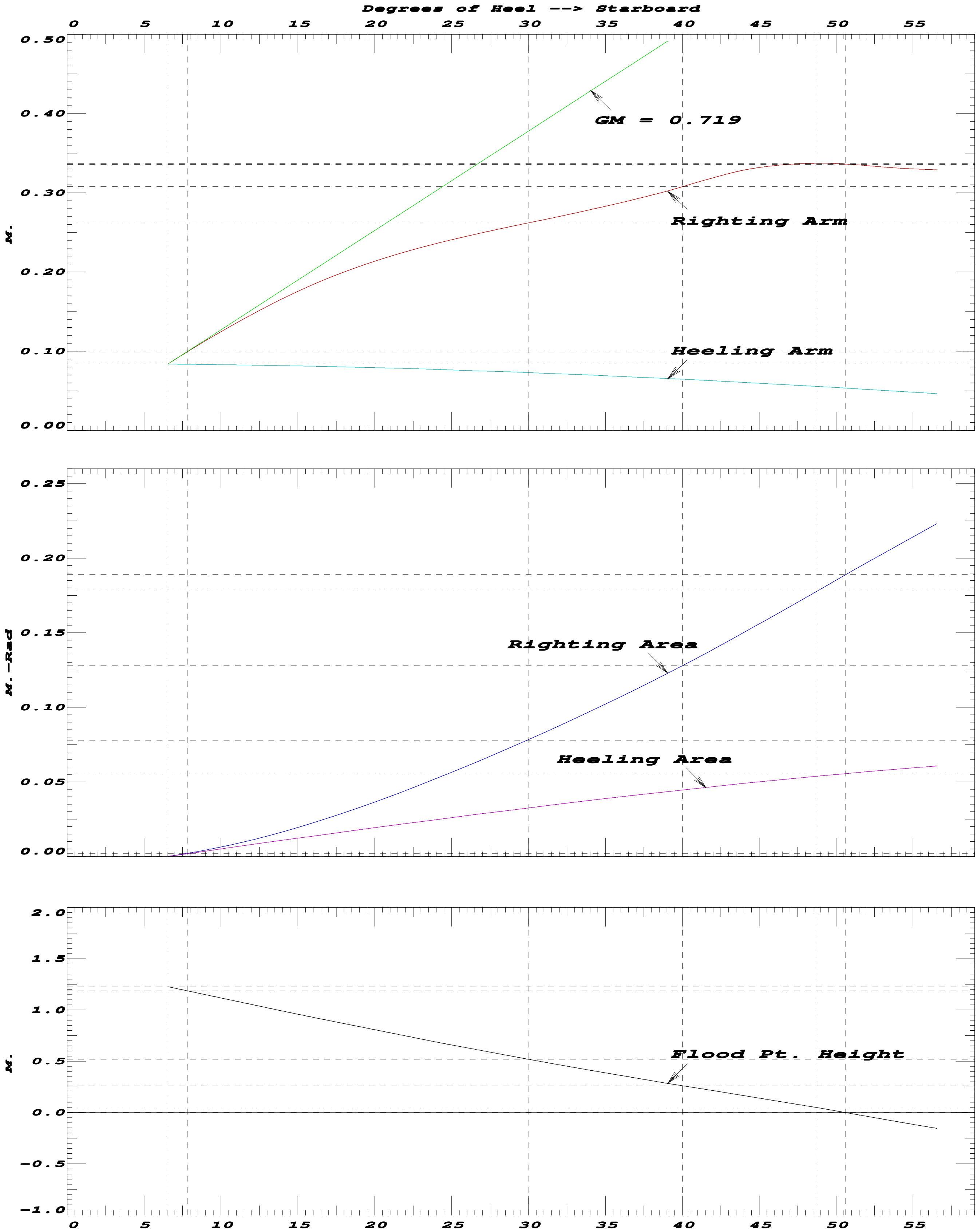
Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Residual Arms in Trim	Residual Arms in Heel	Area	Flood Pt Height
1.218	0.43f	6.55s	29.002	0.000	0.000	0.0000	1.227 (1)
1.205	0.44f	9.05s	29.002	0.000	0.031	0.0007	1.148 (1)
1.186	0.47f	11.55s	29.001	0.000	0.059	0.0026	1.068 (1)
1.161	0.51f	14.05s	29.001	0.000	0.085	0.0058	0.989 (1)
1.129	0.57f	16.55s	29.001	0.000	0.108	0.0100	0.912 (1)
1.091	0.64f	19.05s	29.001	0.000	0.128	0.0151	0.835 (1)
1.046	0.71f	21.55s	29.001	0.000	0.144	0.0211	0.761 (1)
0.996	0.80f	24.05s	29.000	0.000	0.159	0.0277	0.687 (1)
0.941	0.88f	26.55s	29.000	0.000	0.172	0.0349	0.616 (1)
0.881	0.97f	29.05s	29.000	0.000	0.184	0.0427	0.546 (1)
0.816	1.05f	31.55s	29.000	0.000	0.196	0.0510	0.478 (1)
0.747	1.14f	34.05s	29.000	0.000	0.209	0.0599	0.412 (1)
0.674	1.22f	36.55s	29.000	0.000	0.222	0.0693	0.347 (1)
0.598	1.29f	39.05s	29.000	0.000	0.237	0.0793	0.285 (1)
0.519	1.35f	41.55s	29.001	0.000	0.253	0.0900	0.224 (1)
0.439	1.40f	44.05s	29.001	0.000	0.268	0.1014	0.164 (1)
0.359	1.44f	46.55s	29.001	0.000	0.277	0.1133	0.103 (1)
0.281	1.47f	49.05s	29.001	0.000	0.282	0.1255	0.040 (1)
0.234	1.48f	50.59s	29.002	0.000	0.283	0.1331	0.000 (1)
0.206	1.48f	51.55s	29.002	0.000	0.282	0.1378	*-0.025* (1)
0.132	1.46f	54.05s	29.002	0.000	0.282	0.1501	*-0.090* (1)
0.059	1.43f	56.55s	29.002	0.000	0.283	0.1624	*-0.155* (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 0.1 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 = 2.45Cos(heel)

	Critical Point		LCP	TCP	VCP
(1)	ER VENTILATION PS	FLOOD	4.950f	1.750	2.700


Degrees of Heel --> Starboard
GM = 0.719
Righting Arm
Heeling Arm
M.
Righting Area
Heeling Area
M.-Rad
Flood Pt. Height
M.

Appendix 4 – Resistance to Waves & Wind

6.3 RESISTANCE TO WAVES AND WIND
AT MINIMUM OPERATING CONDITION

SUMMARY OF LOADING

0.0 Ltrs. (0%) DIESEL OIL 0.0 Ltrs. (0%) FRESH WATER
0.0 Ltrs. (0%) SEWAGE
0.15 MT of CREW FOR MMOC 0.62 MT of BALLAST

WEIGHT STATUS

Trim: Aft 0.016/13.950, Heel: zero

Part			Weight(MT)	LCG	TCG	VCG	FSM
LIGHT SHIP			23.51	6.737f	0.000	2.063	
CREW FOR MMOC			0.15	7.400f	0.000	3.000	
BALLAST			0.62	6.737f	0.000	0.240	
Total Weight			**24.28**	**6.741f**	**0.000**	**2.022**	
	Ltrs.	**SpGr**	**Weight(MT)**	**LCG**	**TCG**	**VCG**	
Total Tanks			**0.00**				**0.00**

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Aft 0.016/13.950, No Heel, VCG = 2.022

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.177	24.28	6.740f	0.855	0.47	6.233f	0.41	23.52	0.905

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 13.95m.
Draft is from Baseline.

HEELING MOMENT specification

Heeling Moment	
2.95s m.-MT	
Constant heeling moment to starboard	2.95

Roll angle = 25.81 degrees.

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 6.741f TCG = 0.000 VCG = 2.022

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Residual Arms in Trim	Residual Arms in Heel	Area	Flood Pt Height
1.054	0.20f	17.32p	24.275	0.000	-0.323	0.0000	
1.092	0.12f	14.82p	24.284	0.000	-0.307	-0.0137	
1.124	0.05f	12.32p	24.284	0.000	-0.285	-0.0267	
1.148	0.00a	9.82p	24.285	0.000	-0.259	-0.0385	
1.165	0.04a	7.32p	24.285	0.000	-0.229	-0.0492	
1.177	0.06a	4.82p	24.285	0.000	-0.195	-0.0584	
1.183	0.07a	2.32p	24.285	0.000	-0.158	-0.0661	
1.184	0.07a	0.18s	24.281	0.000	-0.119	-0.0722	1.516 (3)
1.182	0.07a	2.68s	24.285	0.000	-0.080	-0.0765	1.438 (3)
1.175	0.06a	5.18s	24.285	0.000	-0.043	-0.0792	1.360 (3)
1.163	0.03a	7.68s	24.285	0.000	-0.010	-0.0803	1.282 (3)
1.158	0.02a	8.49s	24.285	0.000	0.000	-0.0804	1.256 (3)
1.145	0.00	10.18s	24.285	0.000	0.020	-0.0801	1.203 (3)
1.120	0.06f	12.68s	24.285	0.000	0.045	-0.0787	1.125 (3)
1.087	0.13f	15.18s	24.284	0.000	0.066	-0.0762	1.049 (3)
1.048	0.22f	17.68s	24.284	0.000	0.081	-0.0730	0.974 (3)
1.004	0.31f	20.18s	24.283	0.000	0.093	-0.0692	0.900 (3)
0.954	0.41f	22.68s	24.283	0.000	0.102	-0.0649	0.827 (3)
0.898	0.51f	25.18s	24.283	0.000	0.108	-0.0603	0.756 (3)
0.838	0.62f	27.68s	24.283	0.000	0.113	-0.0555	0.686 (3)
0.774	0.73f	30.18s	24.282	0.000	0.118	-0.0505	0.618 (3)
0.704	0.84f	32.68s	24.282	0.000	0.122	-0.0452	0.551 (3)
0.631	0.94f	35.18s	24.282	0.000	0.127	-0.0398	0.485 (3)
0.554	1.05f	37.68s	24.282	0.000	0.133	-0.0341	0.422 (3)
0.474	1.15f	40.18s	24.282	0.000	0.141	-0.0282	0.360 (3)
0.391	1.23f	42.68s	24.283	0.000	0.152	-0.0218	0.300 (3)
0.308	1.30f	45.18s	24.284	0.000	0.167	-0.0148	0.241 (3)
0.224	1.35f	47.68s	24.285	0.000	0.181	-0.0072	0.183 (3)
0.147	1.40f	50.00s	24.285	0.000	0.189	0.0003	0.127 (3)
0.141	1.40f	50.18s	24.285	0.000	0.189	0.0009	0.122 (3)
0.060	1.43f	52.68s	24.285	0.000	0.194	0.0092	0.061 (3)
0.009	1.45f	54.30s	24.285	0.000	**0.195**	0.0147	0.020 (3)
-0.016	1.45f	55.10s	24.285	0.000	0.194	0.0174	*-0.000* (3)
-0.019	1.45f	55.18s	24.285	0.000	0.194	0.0177	*-0.002* (3)
-0.097	1.46f	57.68s	24.282	0.000	0.193	0.0262	*-0.065* (3)
-0.180	1.48f	60.18s	24.285	0.000	0.191	0.0346	*-0.124* (3)
-0.266	1.50f	62.68s	24.285	0.000	0.188	0.0428	*-0.179* (3)
-0.353	1.49f	65.18s	24.285	0.000	0.181	0.0509	*-0.231* (3)
-0.440	1.45f	67.68s	24.285	0.000	0.173	0.0586	*-0.279* (3)
-0.527	1.40f	70.18s	24.285	0.000	0.163	0.0659	*-0.325* (3)
-0.615	1.34f	72.68s	24.284	0.000	0.154	0.0729	*-0.368* (3)
-0.706	1.28f	75.18s	24.284	0.000	0.149	0.0795	*-0.406* (3)
-0.801	1.23f	77.68s	24.284	0.000	0.150	0.0860	*-0.439* (3)
-0.899	1.18f	80.18s	24.285	0.000	0.157	0.0926	*-0.466* (3)
-0.998	1.13f	82.68s	24.284	0.000	0.164	0.0996	*-0.491* (3)
-1.094	1.06f	85.18s	24.284	0.000	0.167	0.1068	*-0.515* (3)
-1.164	0.99f	87.06s	24.285	0.000	0.168	0.1123	*-0.531* (3)
-1.186	0.97f	87.68s	24.285	0.000	0.168	0.1142	*-0.537* (3)
-1.209	0.95f	88.31s	24.285	0.000	0.168	0.1160	*-0.542* (3)
		0.19s	24.284	0.000	0.166	0.1214	*-0.557* (3)

-1.363	0.76f	92.69s	24.285	0.000	0.162	0.1286	-0.576 (3)
-1.447	0.63f	95.19s	24.285	0.000	0.156	0.1356	-0.594 (3)
-1.527	0.49f	97.69s	24.285	0.000	0.149	0.1422	-0.610 (3)
-1.604	0.33f	100.19s	24.281	0.000	0.141	0.1486	-0.624 (3)
-1.677	0.17f	102.69s	24.281	0.000	0.132	0.1545	-0.637 (3)
-1.747	0.02a	105.19s	24.280	0.000	0.122	0.1600	-0.648 (3)
-1.813	0.21a	107.69s	24.280	0.000	0.111	0.1651	-0.657 (3)
-1.875	0.41a	110.19s	24.279	0.000	0.100	0.1697	-0.664 (3)
-1.933	0.63a	112.69s	24.278	0.000	0.089	0.1739	-0.668 (3)
-1.988	0.85a	115.19s	24.278	0.000	0.077	0.1775	-0.670 (3)
-2.041	1.08a	117.69s	24.277	0.000	0.064	0.1805	-0.670 (3)
-2.090	1.31a	120.19s	24.277	0.000	0.052	0.1831	-0.666 (3)
-2.137	1.55a	122.69s	24.276	0.000	0.040	0.1851	-0.659 (3)
-2.181	1.79a	125.19s	24.276	0.000	0.029	0.1866	-0.650 (3)
-2.224	2.01a	127.69s	24.276	0.000	0.018	0.1877	-0.636 (3)
-2.266	2.23a	130.19s	24.277	0.000	0.007	0.1882	-0.619 (3)
-2.299	2.39a	132.20s	24.285	0.000	0.000	0.1883	-0.602 (3)
-2.307	2.43a	132.69s	24.285	0.000	-0.002	0.1883	-0.597 (3)

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

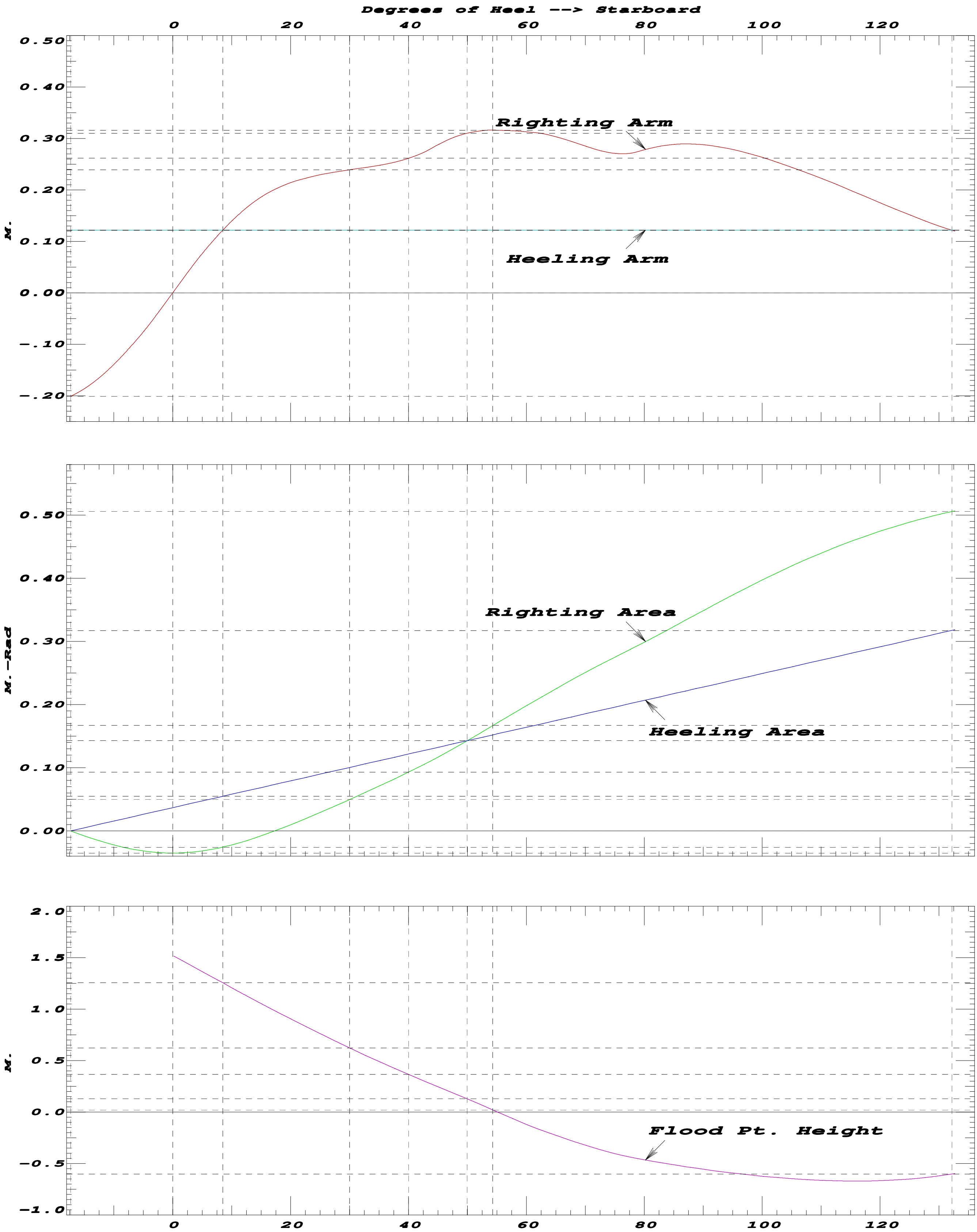
Note: The Weight and Center of Gravity used for the righting arms above include tank loads. However, the tank load centers were NOT ALLOWED TO SHIFT with heel and trim changes.

Note: The Residual Righting Arms shown above are in excess of the overturning arms derived from these moments (in m.-MT):
Stbd heeling moment = 2.95

	Critical Point		LCP	TCP	VCP
(3)	ER VENTILATION PS	FLOOD	4.950f	1.750	2.700

LIM	STABILITY CRITERION		Min/Max	Attained
(1)	**Res. Ratio from Roll to abs 50 deg or Flood**	>	**1.000**	**1.003 P**
(2)	**Res. Area Ratio from Roll to RAzero or Flood**	>	**1.000**	**1.217 P**

6970 - JE_50 MPC



6.3 RESISTANCE TO WAVES AND WIND
AT LOADED ARRIVAL CONDITION

SUMMARY OF LOADING

273.3 Ltrs. (10%) DIESEL OIL 45.8 Ltrs. (10%) FRESH WATER
302.5 Ltrs. (95%) SEWAGE
0.62 MT of BALLAST 0.90 MT of Desired Crew limit
0.10 MT of Provisions + person 0.50 MT of Stores, spare gear

WEIGHT STATUS

Trim: Fwd 0.007/13.950, Heel: zero

Part	Weight(MT)	LCG	TCG	VCG
LIGHT SHIP	23.51	6.737f	0.000	2.063
BALLAST	0.62	6.737f	0.000	0.240
Desired Crew limit at 75k	0.90	7.400f	0.000	2.800
Provisions + personal eff	0.10	6.700f	0.000	1.300
Stores, spare gear and ca	0.50	7.400f	0.000	0.950
Total Fixed	**25.64**	**6.773f**	**0.000**	**2.020**

	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	FSM
FO1	113.8	0.840	0.10	4.975f	0.500s	0.800	0.09
FO2	113.8	0.840	0.10	4.975f	0.500p	0.800	0.09
FW1	45.8	1.000	0.05	9.227f	0.528s	0.618	0.01
FW2	45.8	0.840	0.04	9.227f	0.528p	0.618	0.01
HO1	151.3	1.025	0.16	4.564f	0.652s	1.954	0.04
HO2	151.2	1.025	0.16	4.564f	0.652p	1.954	0.04
Total Tanks			**0.59**	**5.369f**	**0.007s**	**1.385**	**0.29**
Total Weight			**26.22**	**6.742f**	**0.000**	**2.006**	
Free Surface Adjustment						**0.011**	
Adjusted CG				**6.742f**	**0.000**	**2.016**	

Distances in METERS. Moments in m.-MT.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.007/13.950, No Heel, VCG = 2.006

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ cm trim	GML	GMT
1.218	26.22	6.742f	0.880	0.47	6.257f	0.42	22.13	0.819

Distances in METERS. Specific Gravity = 1.025. Moment in m.-MT.
Trim is per 13.95m.
Draft is from Baseline. True Free Surface included.

HEELING MOMENT specification

Heeling Moment	
2.95s m.-MT	
Constant heeling moment to starboard	2.95

Roll angle = 25.76 degrees.

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

Total CG: LCG = 6.742f TCG = 0.002s VCG = 2.006
Free Surface Adjustment: 0.009
Adjusted CG: LCG = 6.742f TCG = 0.000 VCG = 2.014

Origin	Degrees of		Displacement	Residual Arms			Flood Pt
Depth	Trim	Heel	Weight(MT)	in Trim	in Heel	Area	Height
1.094	0.25f	17.35p	26.214	0.000	-0.308	0.0000	
1.130	0.17f	14.85p	26.220	0.000	-0.291	-0.0131	
1.160	0.11f	12.35p	26.220	0.000	-0.268	-0.0253	
1.182	0.07f	9.85p	26.220	0.000	-0.242	-0.0364	
1.198	0.05f	7.35p	26.220	0.000	-0.213	-0.0464	
1.209	0.03f	4.85p	26.221	0.000	-0.181	-0.0550	
1.214	0.03f	2.35p	26.222	0.000	-0.147	-0.0622	
1.215	0.03f	0.15s	26.221	0.000	-0.111	-0.0678	1.478 (3)
1.213	0.03f	2.65s	26.221	0.000	-0.075	-0.0718	1.400 (3)
1.208	0.03f	5.15s	26.221	0.000	-0.041	-0.0744	1.322 (3)
1.196	0.05f	7.65s	26.221	0.000	-0.009	-0.0754	1.242 (3)
1.192	0.05f	8.41s	26.221	0.000	0.000	-0.0755	1.218 (3)
1.180	0.08f	10.15s	26.220	0.000	0.020	-0.0752	1.163 (3)
1.156	0.12f	12.65s	26.220	0.000	0.045	-0.0738	1.085 (3)
1.126	0.18f	15.15s	26.220	0.000	0.067	-0.0713	1.007 (3)
1.089	0.26f	17.65s	26.220	0.000	0.084	-0.0680	0.931 (3)
1.047	0.34f	20.15s	26.219	0.000	0.098	-0.0640	0.856 (3)
0.998	0.43f	22.65s	26.219	0.000	0.108	-0.0595	0.783 (3)
0.944	0.52f	25.15s	26.219	0.000	0.116	-0.0547	0.711 (3)
0.885	0.62f	27.65s	26.219	0.000	0.123	-0.0494	0.640 (3)
0.822	0.72f	30.15s	26.218	0.000	0.129	-0.0439	0.572 (3)
0.754	0.82f	32.65s	26.218	0.000	0.135	-0.0382	0.504 (3)
0.682	0.92f	35.15s	26.218	0.000	0.142	-0.0321	0.439 (3)
0.606	1.01f	37.65s	26.218	0.000	0.149	-0.0258	0.376 (3)
0.526	1.10f	40.15s	26.218	0.000	0.158	-0.0191	0.314 (3)
0.445	1.17f	42.65s	26.219	0.000	0.171	-0.0119	0.254 (3)
0.363	1.23f	45.15s	26.220	0.000	0.184	-0.0042	0.195 (3)
0.281	1.28f	47.65s	26.220	0.000	0.192	0.0040	0.134 (3)
0.205	1.31f	50.00s	26.221	0.000	0.196	0.0120	0.076 (3)
0.201	1.31f	50.15s	26.221	0.000	0.196	0.0125	0.073 (3)
0.172	1.32f	51.07s	26.221	0.000	**0.197**	0.0157	0.049 (3)
0.123	1.33f	52.65s	26.221	0.000	0.196	0.0211	0.009 (3)
0.112	1.33f	53.01s	26.221	0.000	0.195	0.0223	0.000 (3)
0.048	1.32f	55.15s	26.219	0.000	0.193	0.0296	*-0.055* (3)
-0.026	1.30f	57.65s	26.221	0.000	0.191	0.0380	*-0.120* (3)
-0.103	1.28f	60.15s	26.220	0.000	0.192	0.0463	*-0.181* (3)
-0.188	1.30f	62.65s	26.220	0.000	0.194	0.0547	*-0.238* (3)
-0.205	1.30f	63.13s	26.220	0.000	0.194	0.0563	*-0.248* (3)
-0.275	1.29f	65.15s	26.221	0.000	0.191	0.0631	*-0.289* (3)
-0.362	1.26f	67.65s	26.221	0.000	0.184	0.0713	*-0.338* (3)
-0.450	1.22f	70.15s	26.221	0.000	0.177	0.0792	*-0.384* (3)
-0.541	1.17f	72.65s	26.220	0.000	0.172	0.0868	*-0.425* (3)
-0.635	1.12f	75.15s	26.220	0.000	0.171	0.0943	*-0.462* (3)
-0.732	1.08f	77.65s	26.220	0.000	0.176	0.1019	*-0.493* (3)
-0.832	1.05f	80.15s	26.220	0.000	0.183	0.1097	*-0.520* (3)
-0.930	1.00f	82.65s	26.220	0.000	0.187	0.1177	*-0.546* (3)
-1.025	0.93f	85.15s	26.220	0.000	0.188	0.1259	*-0.570* (3)
		5.77s	26.220	0.000	0.188	0.1280	*-0.576* (3)

-1.118	0.84f	87.65s	26.220	0.000	0.187	0.1341	-0.593 (3)
-1.207	0.75f	90.15s	26.221	0.000	0.183	0.1422	-0.614 (3)
-1.294	0.64f	92.65s	26.220	0.000	0.177	0.1500	-0.633 (3)
-1.379	0.52f	95.15s	26.220	0.000	0.169	0.1576	-0.651 (3)
-1.460	0.38f	97.65s	26.220	0.000	0.160	0.1648	-0.667 (3)
-1.538	0.24f	100.15s	26.218	0.000	0.150	0.1716	-0.681 (3)
-1.612	0.08f	102.65s	26.217	0.000	0.140	0.1779	-0.694 (3)
-1.683	0.09a	105.15s	26.217	0.000	0.128	0.1837	-0.704 (3)
-1.750	0.27a	107.65s	26.216	0.000	0.116	0.1891	-0.713 (3)
-1.813	0.47a	110.15s	26.215	0.000	0.104	0.1939	-0.720 (3)
-1.873	0.67a	112.65s	26.214	0.000	0.092	0.1981	-0.724 (3)
-1.929	0.89a	115.15s	26.214	0.000	0.079	0.2019	-0.726 (3)
-1.981	1.11a	117.65s	26.213	0.000	0.067	0.2050	-0.725 (3)
-2.031	1.34a	120.15s	26.212	0.000	0.054	0.2077	-0.722 (3)
-2.078	1.57a	122.65s	26.211	0.000	0.043	0.2098	-0.715 (3)
-2.122	1.81a	125.15s	26.211	0.000	0.031	0.2114	-0.706 (3)
-2.164	2.04a	127.65s	26.211	0.000	0.021	0.2125	-0.693 (3)
-2.204	2.27a	130.15s	26.212	0.000	0.012	0.2132	-0.676 (3)
-2.244	2.48a	132.65s	26.212	0.000	0.003	0.2136	-0.655 (3)
-2.265	2.59a	134.00s	26.221	0.000	0.000	0.2136	-0.642 (3)
-2.284	2.68a	135.15s	26.219	0.000	-0.002	0.2136	-0.630 (3)

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

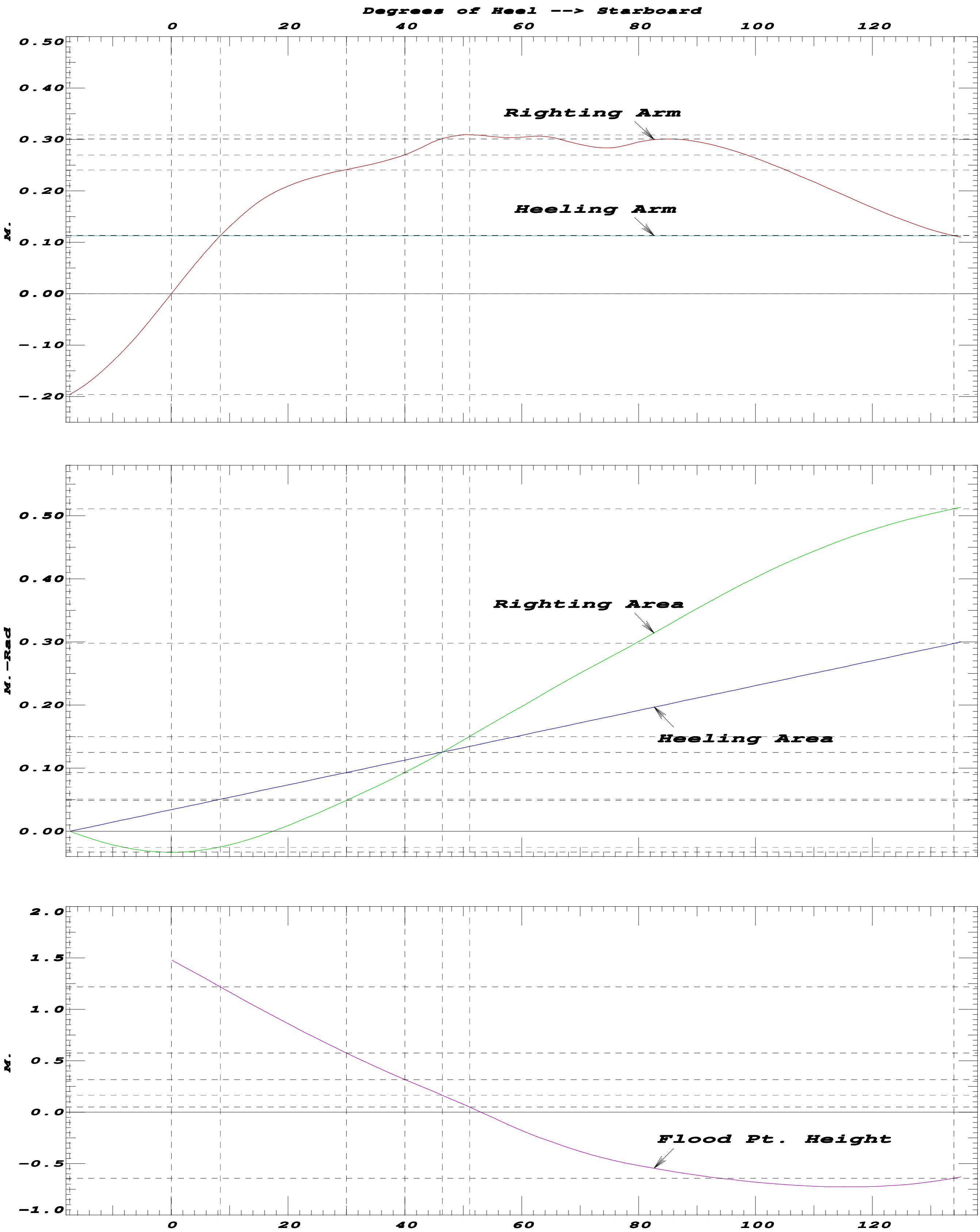
Note: The Weight and Center of Gravity used for the righting arms above include tank loads. However, the tank load centers were NOT ALLOWED TO SHIFT with heel and trim changes. Rather, a constant Free Surface Moment of 0.2 m.-MT was applied to artificially modify the CG.

Note: The Residual Righting Arms shown above are in excess of the overturning arms derived from these moments (in m.-MT):
Stbd heeling moment = 2.95

	Critical Point		LCP	TCP	VCP
(3)	ER VENTILATION PS	FLOOD	4.950f	1.750	2.700

LIM	STABILITY CRITERION		Min/Max	Attained
(1)	**Res. Ratio from Roll to abs 50 deg or Flood**	>	**1.000**	**1.159 P**
(2)	**Res. Area Ratio from Roll to RAzero or Flood**	>	**1.000**	**1.296 P**

6970 - JE_50 MPC



Appendix 5 – Hydrostatic properties

HYDROSTATIC PROPERTIES

No Trim, No Heel, VCG = 0.000

LCF Draft	Displacement Weight(MT)	Buoyancy-Ctr. LCB	VCB	Weight/ cm	LCF	Moment/ Deg trim	KML	KMT
1.250	27.71	6.705f	0.899	0.47	6.270f	11.17	23.10	2.770

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

Part: HULL Component: HULL.C Side: CL Effectiveness: 1.000

Origin Depth: 1.250
Trim: zero Heel: zero

HULL.C COMPONENT FORM

Volume = 26.51 Cubic m. LCB = 6.758f TCB = 0.000 VCB = 0.913
Wetted Surface: 56.78 Square m.

B L O C K D I M E N S I O N S

Length = 14.416 Breadth = 4.050 Depth (deepest point) = 1.072
Length/Breadth = 3.56 Length/Depth = 13.45 Breadth/Depth = 3.779
Breadth - Length/10 = 2.609 m. Block Coefficient = 0.424
Displacement-Length Ratio = 252.8 Length-Volume Ratio = 4.84

W A T E R P L A N E

Area = 46.14 Square m. LCA = -6.270 TCA = -0.000
Moments of Inertia: IL = 6.002E+02 m.^4 IT = 5.057E+01 m.^4
Length = 14.416 Breadth = 4.050 Waterplane Coefficient = 0.790

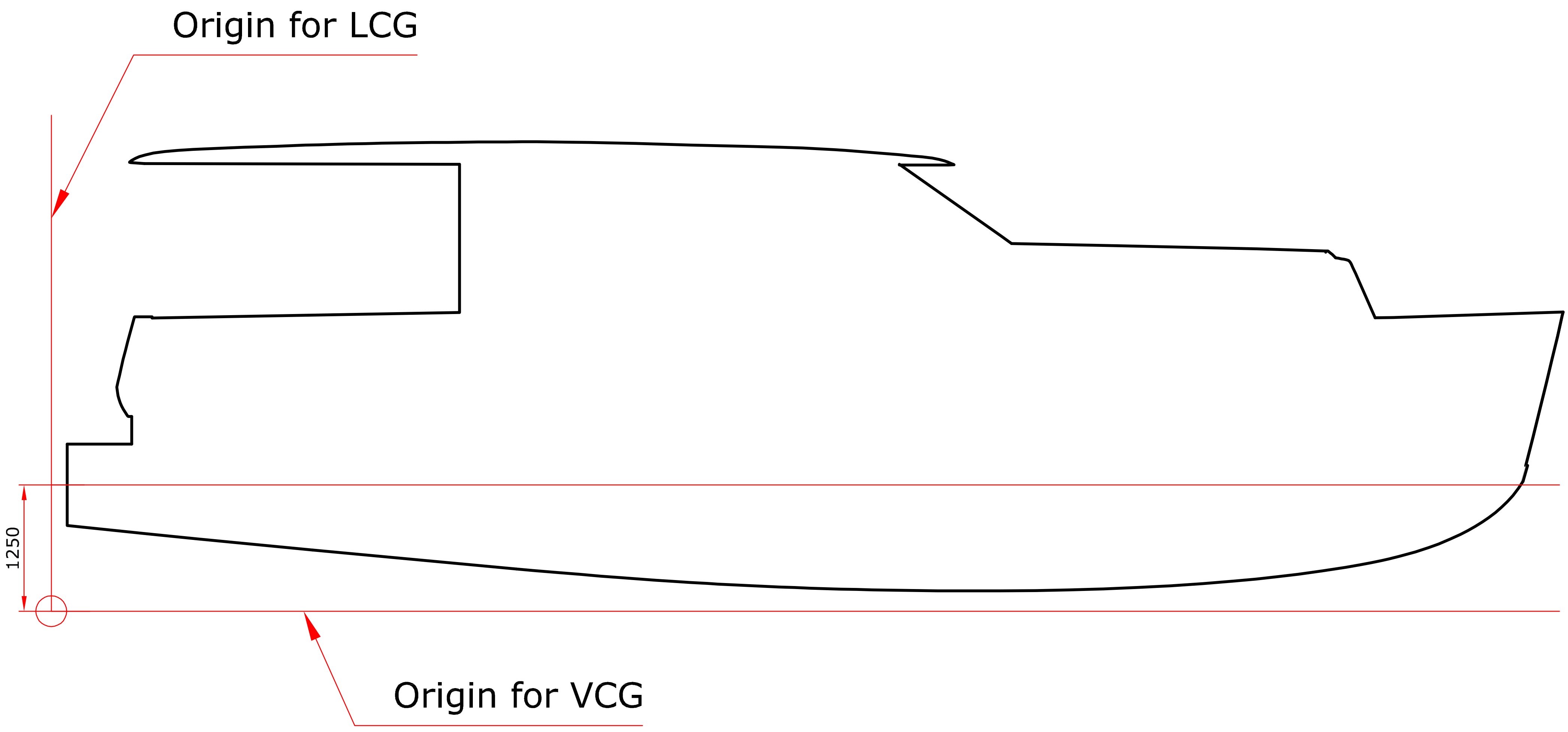
M A X I M U M S E C T I O N

Area = 2.69 Square m. Coefficient = 0.686

P R I S M A T I C C O E F F I C I E N T S

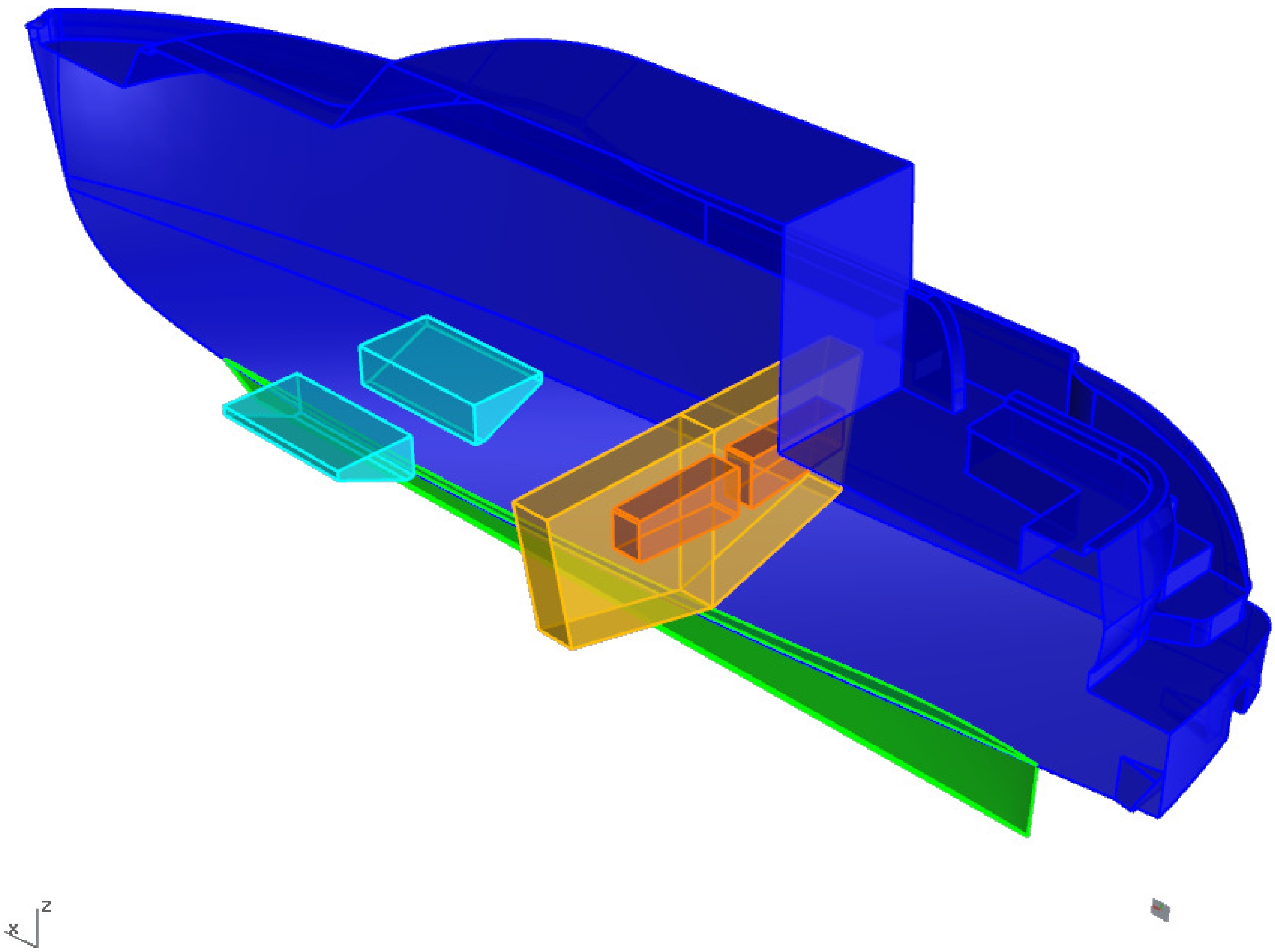
Cp = 0.683 Cvp = 0.536

Appendix 6 – Basepoint Definition



Origin for LCG
1250
Origin for VCG

Appendix 7 – Tank arrangement



Maximum Storage Capacity

WEIGHT STATUS

Trim: zero, Heel: zero

Part	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	RefHt
FO1	1137.5	0.840	0.96	4.975f	0.871s	1.574	
FO2	1137.5	0.840	0.96	4.975f	0.871p	1.574	
Total Tanks			**1.91**	**4.975f**	**0.000**	**1.574**	
Total Weight			**1.91**	**4.975f**	**0.000**	**1.574**	

Distances in METERS.

WEIGHT STATUS

Trim: zero, Heel: zero

Part	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	RefHt
FW1	456.9	1.000	0.46	9.225f	0.753s	0.832	
FW2	456.8	0.840	0.38	9.225f	0.753p	0.832	
Total Tanks			**0.84**	**9.225f**	**0.066s**	**0.832**	
Total Weight			**0.84**	**9.225f**	**0.066s**	**0.832**	

Distances in METERS.

WEIGHT STATUS

Trim: zero, Heel: zero

Part	Ltrs.	SpGr	Weight(MT)	LCG	TCG	VCG	RefHt
HO1	159.3	1.025	0.16	4.564f	0.653s	1.965	
HO2	159.2	1.025	0.16	4.564f	0.653p	1.965	
Total Tanks			**0.33**	**4.564f**	**0.000**	**1.965**	
Total Weight			**0.33**	**4.564f**	**0.000**	**1.965**	

Distances in METERS.