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Transport Canada / Transports Canada

APPROVED -- APPROUVÉ

ON THE AUTHORITY OF THE CANADA SHIP[illegible] REGULATIONS THEREUNDER

DE LA LOI SUR LA [illegible] MARCHANDE DU CANADA ET DES RÈGLEMENTS CONNEXES.

ON BEHALF OF THE BOARD OF STEAMSHIP [illegible] DEPARTMENT OF TRANSPORT

POUR LE COMPTE DU BUREAU D'INSPECTION DES NAVIRES À VAPEUR, MINISTÈRE DES TRANSPORTS.

7 FEB. 2006

DATE

"SUBJECT TO THE OWNER, THE SHIPBUILDER OR NAVAL ARCHITECT BEING RESPONSIBLE FOR [illegible] OPERATING [illegible] SENTED HEREIN [illegible] DATA FROM WHICH [illegible] STATIONS [illegible] OWNER AND THAT A PROPER MEASURE OF STABILITY IS MAINTAINED FOR ALL CONDITIONS OF LOADING AND BALLASTING."

"SOUS RÉSERVE QUE LE PROPRIÉTAIRE, LE CONSTRUCTEUR NAVAL OU LE CONSTRUCTEUR DE NAVIRES SOIT RESPONSABLES DE [illegible] DES CONDITIONS D'EXPLOITATION SOUMISES [illegible] DES DONNÉES DE BASE [illegible] SUR LES CONDITIONS [illegible] ÉLABORÉES, IL INCOMBE AU PROPRIÉTAIRE ET AU CAPITAINE DE MAINTENIR UN DEGRÉ APPROPRIÉ DE STABILITÉ DANS TOUTES LES CONDITIONS DE CHARGEMENT ET DE LESTAGE."

Approvals By:	Rev.0	Rev.A	Rev.B

A. Inclining Experiment Report, No. EN04186-R01

References

Client:

Shoal Lakes First Nation

Kejick, Ontario

Project/Vessel:

M.V. Amik II

Title:

Trim & Stability Book

(Include Inclining Experiment Report)

Prepared By:	Report No.	Rev. 0	Date:	September 2004
			Scale:	Nil
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General Information

Vessel	Passenger/Car Ferry "Amik II"
Length for Hydrostatics	50'-0" (Aft end to Fwd end transom)
Breadth molded	24'-0"
Depth Molded	4'-0"
Official Number	
Gross Tonnage	
Class of Voyage	Minor Waters Class II
Passengers	43
Crew	2
Power	1 x 57 kw

Lightship Data	*Weight*	*VCG*	*LCG*
	L. Tons	*Ab. Base*	*Fwd AP*
As per Inclining Test 06/29/2004	31.95	2.702	23.623

Diesel Oil Capacity		*Weight*	*VCG*	*LCG*
	Litres	*L. Tons*	*Ab. Base*	*Fwd AP*
Fuel Oil Storage	450	0.37	5.50	1.50
Fuel Oil under Outboard Drive	100	0.08	4.50	1.83

Note: free surface moment negligible for these small tanks

Deadweight Distributions

(a) Passengers & Vehicles Distribution (Worst condition with passengers)

	No.	*Wt.(tons)*	*VCG(ft)*	*LCG(ft)*
Automobiles on Deck	4	8.00	7.28	32.00
Passengers inside vehicles	16	1.18	7.28	32.00
Passengers on open deck	27	1.99	7.28	30.00
Crew	2	0.15	13.40	7.50

(b) One Loaded Truck & 10 tons Provisions (Worst Cargo)

	No.	*Wt.(tons)*	*VCG(ft)*	*LCG(ft)*
Truck (60,000 lbs.)	1	26.79	9.00	31.50
Provisions		10.00	8.00	15.00
Crew	2	0.15	13.40	7.50

INSTRUCTIONS TO MASTER

1) General

Compliance with the stability criteria does not ensure immunity against capsizing regardless of the circumstances or absolve the master from his responsibilities. Masters should therefore exercise prudence and good seamanship having regard to the season of the year, weather forecasts and the water depths and should take the appropriate action as to speed and course warranted by the prevailing circumstances.

Before a voyage commences, care should be taken to ensure that doors and hatches which provide access to below deck spaces should be kept closed and secured at all times while underway. (Except for emergency access).

2) Operating With Maximum Deadweight

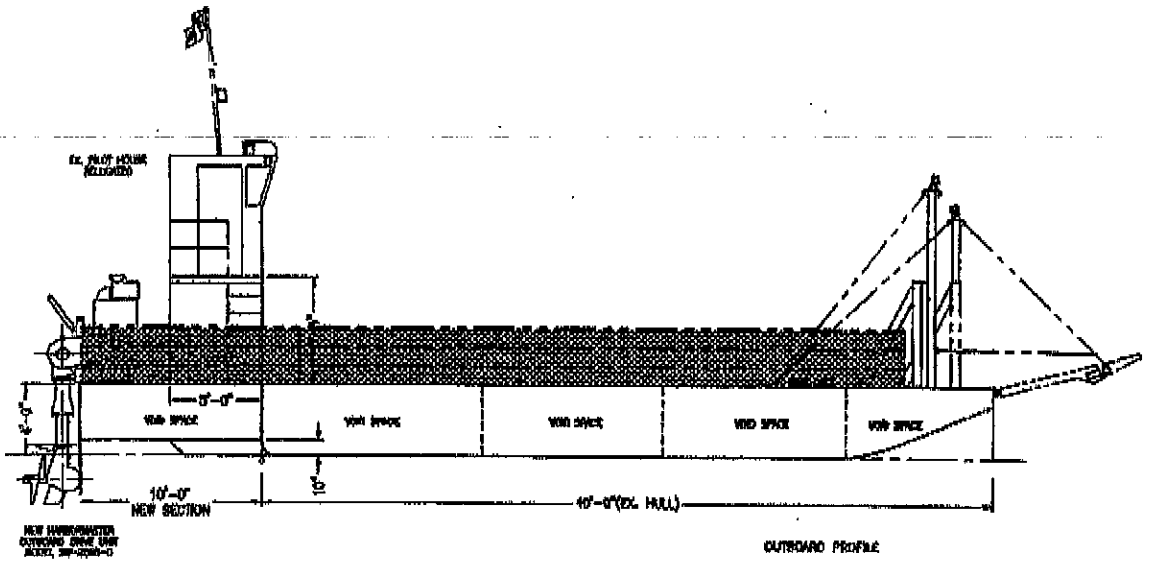
When the vessel is fully loaded with the maximum allowable vehicles and passengers, care must be given to ensure that the final distribution of deck load shall not cause the vessel to list more than 0.5 degree from either side.

3) Base Line, Datum, Drafts, Reference Lines and Downflooding point

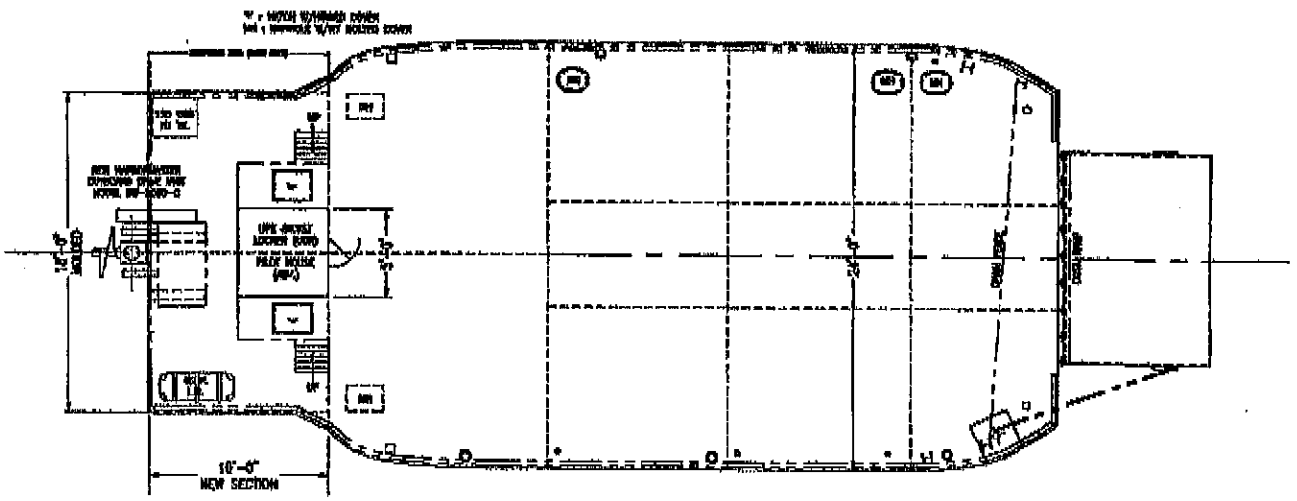
The following definitions are applicable to this vessel:

- Base Line – a line drawn passes through the top side of the keel plate. VCG, VCB, KMT, KML and the KN values are referenced to this line.
- Keel Line – the underside of the keel plate. Drafts as mentioned in this Stability Information Book refer to the Keel Line.
- Datum Line – a line drawn passes through the lowest point of the outboard drive propeller. This line is measured 2'- 6 1/4" below the Keel Line.
- Extreme drafts – are obtained by adding 2'- 6 1/4" to all drafts shown in this Booklet.
- Midship – is the mid point on the overall hull length of this ferry.
- Aft Perpendicular (Transom) – the aftermost location on the Main Deck. Longitudinal centres are referenced to this location.
- Fwd Perpendicular (Head log) – the forward most location on the Main Deck.
- Downflooding – Assumed exceeds 40 degrees for this vessel as all air pipes fitted with airtight caps and access hatches to the aft void spaces are to be closed during voyage.

KEY PLAN
AMIK II



OUTBOARD PROFILE



DECK PLAN

STABILITY CRITERIA

This vessel is required to comply with the following TCMS Stability Criteria:

STAB (5) - Standard of Stability for Passenger Vessels Carrying More Than 12 Passengers

(a) The area under the righting lever curve (GZ curve) should not be less than 0.055 metre-radians (10.34 ft. degrees) up to 30^0 angle of heel and not less than 0.09 metre-radians (16.92 ft. degrees) up to 40^0 or the angle of down flooding if this angle is less than 40^0.

Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30^0 and 40^0 or between 30^0 and the angle of down flooding, if this angle is less than 40^0, should not be less than 0.03 metre-radians (5.64 ft. degrees).

(b) The righting lever GZ should be at least 0.20 metres (0.66') at an angle of heel equal to or greater than 30^0, except where otherwise provided in (e).

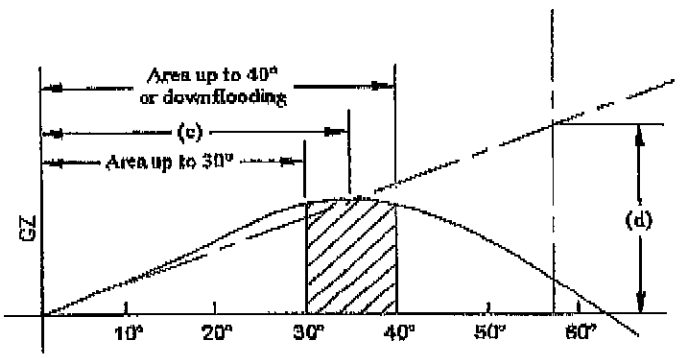
(c) The maximum righting lever should occur at an angle of heel preferably exceeding 30^0 but, except where otherwise provided in (e), not less than 25^0.

(d) The initial metacentric height (GM) should not be less than 0.15 metres (0.5 feet)

(e) For ferries and vessels of barge type hull form, on restricted service, where a limited range of stability may not permit compliance with (b) and (c), the Board may accept a righting arm curve having its maximum GZ value at less than 25^0 and having a value at 30^0 of less than .20 metres (.66') provided that:

(i) the range of the righting arm curve is not less than 40^0
(ii) the area under the righting arm curve within its range, or to the angle of downflooding if this be less, is not less than 0.18 m-rad (33.84 ft. degrees).

(f) An emergency passenger heeling condition will be further assessed unless the GZ at 10^0 is equal to or more than *BN/(40 x Displacement)*, where *B* is the vessel's beam in feet, *N* is the total number of passengers carried and *displacement* is in tons.



MV Amik II
en186.hgf

Keel Thk = 0.021 ft
Shell Thk = 0.016 ft
Drafts measured at LBP/2

HYDROSTATIC PARTICULARS

trim = 0.000
Sp Gr = 1.000
Longitudinal reference at Transom

Draft Ft.	Displt L.Tons	T.P.I Tons	L.C.F Ft.Ref	L.C.B Ft.Ref	V.C.B Ft. AB	MCTI Tons-ft	KMT Ft.	Awet Ft^2
1.000	23.13	2.362	23.767	26.595	0.513	7.61	55.159	1089
1.100	25.97	2.362	23.767	26.281	0.570	7.61	49.139	1098
1.200	28.81	2.362	23.767	26.029	0.626	7.61	44.334	1107
1.300	31.68	2.415	24.259	25.835	0.681	8.13	41.305	1140
1.400	34.58	2.415	24.259	25.701	0.736	8.13	37.904	1149
1.500	37.48	2.415	24.259	25.589	0.791	8.13	35.044	1158
1.600	40.38	2.415	24.259	25.492	0.844	8.13	32.608	1167
1.700	43.29	2.415	24.259	25.408	0.897	8.13	30.508	1177
1.800	46.26	2.484	24.893	25.361	0.951	8.82	29.413	1216
1.900	49.24	2.484	24.893	25.332	1.005	8.82	27.724	1226
2.000	52.23	2.484	24.893	25.307	1.058	8.82	26.236	1235
2.100	55.21	2.484	24.893	25.284	1.111	8.82	24.915	1245
2.200	58.23	2.517	25.196	25.275	1.164	9.17	23.989	1269
2.300	61.26	2.517	25.196	25.271	1.217	9.17	22.906	1278
2.400	64.28	2.517	25.196	25.267	1.270	9.17	21.930	1288
2.500	67.31	2.517	25.196	25.264	1.322	9.17	21.047	1298
2.600	70.35	2.580	25.771	25.263	1.375	9.86	20.607	1334
2.700	73.45	2.580	25.771	25.285	1.428	9.86	19.843	1344
2.800	76.55	2.580	25.771	25.305	1.481	9.86	19.146	1354
2.900	79.65	2.580	25.771	25.323	1.534	9.86	18.507	1364
3.000	82.75	2.580	25.771	25.340	1.587	9.86	17.919	1374
3.100	85.87	2.594	25.907	25.360	1.639	10.03	17.437	1390
3.200	88.99	2.594	25.907	25.379	1.692	10.03	16.933	1400
3.300	92.10	2.594	25.907	25.397	1.744	10.03	16.466	1410
3.400	95.22	2.594	25.907	25.414	1.796	10.03	16.034	1420
3.500	98.34	2.594	25.907	25.429	1.848	10.03	15.632	1430

Vcg = 0.000

RIGHTING LEVER <KN>

trim = 0.000

$GZ = KN - KGf \times \sin \phi$

Disp'ment L.Tons	Angle of inclination - degrees 5.0	10.0	15.0	20.0	25.0	30.0	40.0	50.0
25.0	4.435	6.580	7.517	8.108	8.307	8.284	7.900	7.155
30.0	3.666	6.148	7.217	7.729	7.953	7.933	7.568	6.831
35.0	3.191	5.716	6.855	7.394	7.525	7.565	7.180	6.545
40.0	2.893	5.360	6.577	7.039	7.168	7.120	6.843	6.256
45.0	2.604	5.004	6.217	6.667	6.802	6.774	6.501	5.926
50.0	2.374	4.671	5.836	6.282	6.424	6.422	6.117	5.618
55.0	2.188	4.347	5.436	5.888	6.043	6.067	5.808	5.418
60.0	2.033	4.017	5.023	5.486	5.558	5.595	5.459	5.112
65.0	1.903	3.704	4.598	4.978	5.135	5.189	5.109	4.777

NOTES ON THE CALCULATION OF STABILITY

For any given condition of loading the value of Transverse Metacentre (KMt) is lifted from the Hydrostatic Properties included in this booklet, interpolating as necessary for intermediate values of draft.

The initial GM_f is given by:

$GM_f = KM\,t - (KG\ solid + Free\ Surface\ Correction)$

Note that a minimum positive value of 6" must be maintained

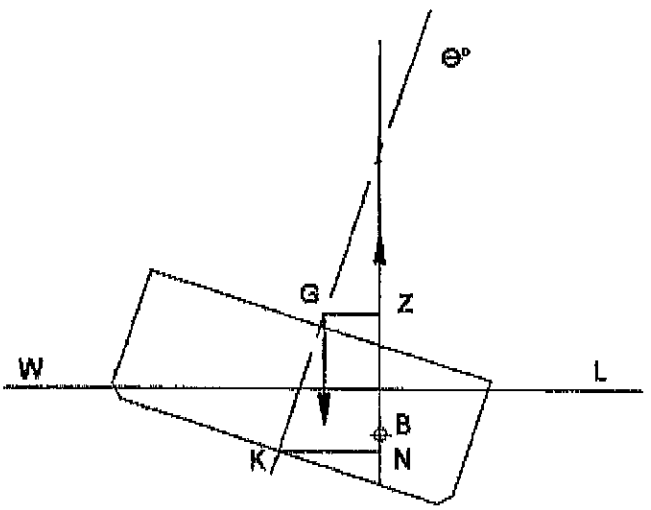
For large angle of stability the GZ curve is the indication of a stable ship.

For any given angle of heel (θ) the ordinate of the GZ curve may be found by correcting the KN value. KN values are obtained from the tables of Righting Levers (KN) included in this booklet, interpolating as necessary for intermediate values of displacement.

The righting lever (GZ) is found by correcting the KN value for the height of the vertical centre of gravity as follows:

$GZ = KN - KG\,(fluid) \times \sin(\theta)$

Where KG fluid = KG solid + Free Surface Correction



CONDITION NO 1 : Lightship (Non-operating)

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	F.S.M.
Deadweight	0.00	0.000	0.000	0.0
Lightship	31.95	2.702	23.623	0.0
Total Weight	31.95	2.702	23.623	0.0

TRIM & STABILITY SUMMARY

Run File = EMPTY.RUN
Env File = EN186.ENV
HGF File = EN186.HGF

Displacement = 31.95 L Tons
Specific Gravity = 1.0000
Draft @ Ref --@ Mid --@ LBP
Initial Heel----Downflooding
(ft) 1.668 1.292 0.916
0.00 to stbd 40.00
(Long'l Ref at Stern or AP-- Drafts to USK)

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GMl
2.702	23.623	0.000	2.362	37.352	**37.352**	143.18

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
0.703	23.620	0.000	23.767	0.000	1118.98	7.61

SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	1.292	0.752	0.000	0.00	30	-0.770	2.624	6.355	158.07
5	1.292	0.752	3.236	8.51	35	-1.400	3.147	6.034	189.08
10	1.134	1.009	5.432	30.59	40	-2.101	3.809	5.622	218.25
15	0.771	1.302	6.304	60.16	45	-2.921	4.523	5.152	245.21
20	0.302	1.697	6.607	92.66	50	-3.886	5.353	4.628	269.68
25	-0.212	2.142	6.571	125.68	55	-5.087	6.427	4.061	291.42

Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

Transport Canada Marine Safety Criteria STAB(5)	Required	Attained
Area under GZ curve to 30 degrees (F. deg)	>= 10.34	158.07
Area under GZ curve to 40 degrees (F. deg)	>= 16.92	218.25
Area between 30 & 40 degress	>= 5.64	60.18
Min. GZ Value at 30 degrees of heel (Ft.)	>= 0.66	6.35
Angle at maximum righting arm (degrees)	>= 25	22.00
Initial GMt (Ft.)	>= 0.50	37.35

CONDITION NO 2 : Light Operating Condition

	Item	Weight	V.C.G.	L.C.G.	F.S.M.
1	Fuel Storage	0.37	5.500	1.500	0
2	FO Day Tank	0.08	4.500	1.830	0
3	Crew	0.15	13.400	7.500	0

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	F.S.M.
Deadweight	0.60	7.342	3.044	0.0
Lightship	31.95	2.702	23.623	0.0
Total Weight	32.55	2.788	23.244	0.0

TRIM & STABILITY SUMMARY

Run File = EN186A.RUN
Env File = EN186.ENV
HGF File = EN186.HGF

Displacement = 32.55 L Tons
Specific Gravity = 1.0000
Draft @ Ref --@ Mid --@ LBP
Initial Heel----Downflooding
(ft) 1.754 1.310 0.866
0.00 to stbd 40.00
(Long'l Ref at Stern or AP-- Drafts to USK)

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GM1
2.788	23.244	0.000	2.362	36.548	**36.548**	140.40

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
0.721	23.236	0.000	23.767	0.000	1121.17	7.61

SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	1.310	0.888	0.000	0.00	30	-0.705	3.063	6.234	155.36
5	1.310	0.888	3.161	8.29	35	-1.321	3.672	5.909	185.75
10	1.157	1.187	5.343	29.94	40	-2.006	4.419	5.496	214.30
15	0.800	1.526	6.215	59.07	45	-2.808	5.249	5.027	240.63
20	0.341	1.987	6.501	91.10	50	-3.752	6.216	4.503	264.48
25	-0.161	2.504	6.456	123.56	55	-4.925	7.456	3.938	285.59

Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

Transport Canada Marine Safety Criteria STAB(5)	Required	Attained
Area under GZ curve to 30 degrees (F. deg)	>= 10.34	155.36
Area under GZ curve to 40 degrees (F. deg)	>= 16.92	214.30
Area between 30 & 40 degress	>= 5.64	58.94
Min. GZ Value at 30 degrees of heel (Ft.)	>= 0.66	6.23
Angle at maximum righting arm (degrees)	>= 25	21.00
Initial GMt (Ft.)	>= 0.50	36.55

CONDITION NO 3 : 43 Passengers & 4 Cars (Worst condition with passengers)

	Item	Weight	V.C.G.	L.C.G.	F.S.M.
1	4 Cars on Deck	8.00	7.280	32.000	0
2	Passengers (16)	1.18	7.280	32.000	0
3	Passengers (27)	1.99	7.280	30.000	0
4	Fuel Storage	0.37	5.500	1.500	0
5	FO Day Tank	0.08	4.500	1.830	0
6	Crew	0.15	13.400	7.500	0

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	F.S.M.
Deadweight	11.77	7.283	30.186	0.0
Lightship	31.95	2.702	23.623	0.0
Total Weight	43.72	3.935	25.390	0.0

TRIM & STABILITY SUMMARY

Run File = EN186B.RUN
Env File = EN186.ENV
HGF File = EN186.HGF

Displacement = 43.71 L Tons
Specific Gravity = 1.0000

Draft @ Ref	@ Mid	@ LBP	Initial Heel	Downflooding
(ft) 1.717	**1.715**	**1.713**	0.00 to stbd	40.00

(Long'l Ref at Stern or AP-- Drafts to USK)

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GMl
3.935	25.390	0.000	2.415	26.288	**26.288**	109.88

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
0.905	25.388	0.000	24.259	0.000	1178.11	8.13

SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	1.715	0.004	0.000	0.00	30	0.583	0.544	4.925	126.30
5	1.715	0.062	2.310	5.86	35	0.253	0.644	4.530	149.96
10	1.647	0.142	4.403	22.73	40	-0.133	0.767	4.080	171.50
15	1.430	0.280	5.271	47.21	45	-0.567	0.897	3.579	190.66
20	1.162	0.363	5.404	74.19	50	-1.093	1.095	3.043	207.23
25	0.884	0.451	5.235	100.84	55	-1.739	1.281	2.477	221.04

Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

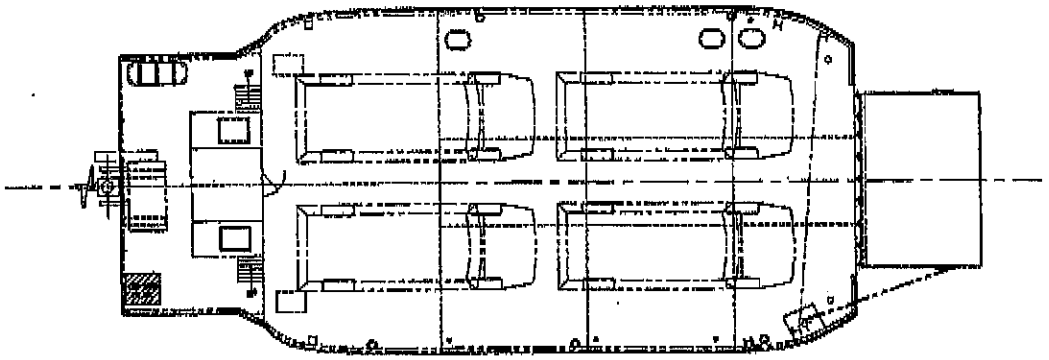
Transport Canada Marine Safety Criteria STAB(5)	Required	Attained
Area under GZ curve to 30 degrees (F. deg)	>= 10.34	126.30
Area under GZ curve to 40 degrees (F. deg)	>= 16.92	171.50
Area between 30 & 40 degress	>= 5.64	45.21
Min. GZ Value at 30 degrees of heel (Ft.)	>= 0.66	4.93
Angle at maximum righting arm (degrees)	>= 25	18.00
Initial GMt (Ft.)	>= 0.50	26.29

Stab(5).5 Required GZ @ 10 degrees for passenger heeling calculation
Min. GZ = BN / 40 x Displacement where B = 24.0
= 24 x 45 / (40 x 43.72) = 0.61' N = 45

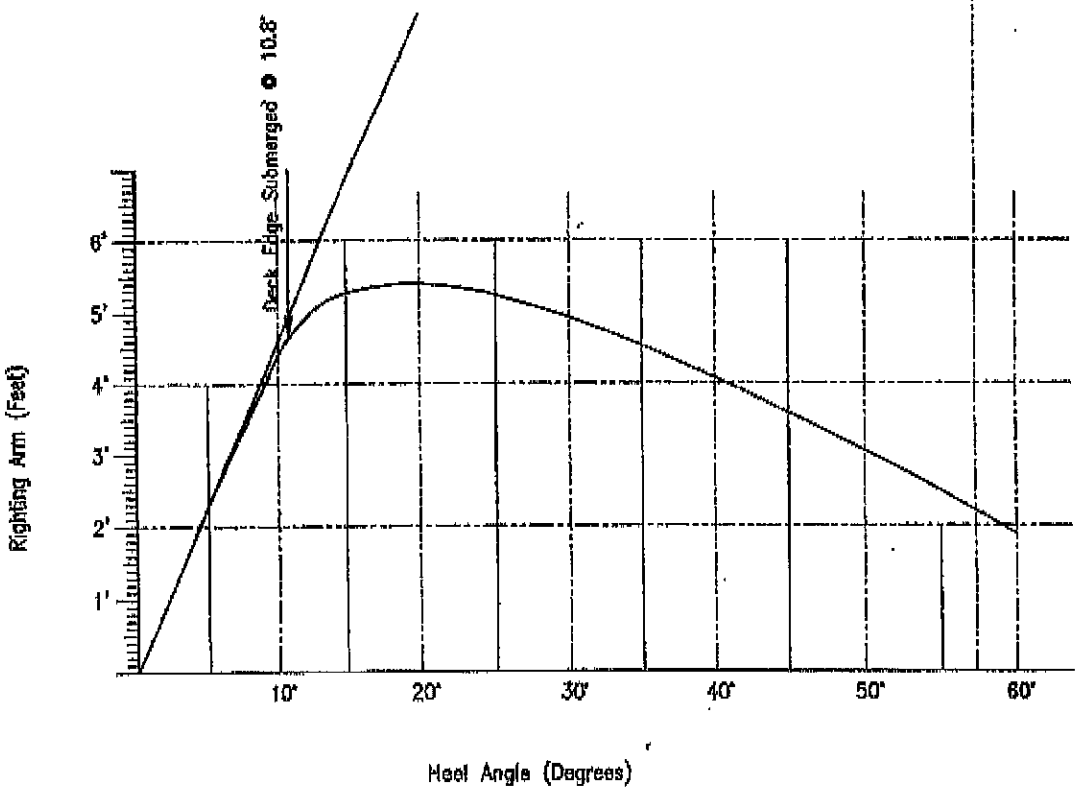
Since actual GZ at 10 degrees is greater than the required GZ, this condition does not require to ivestigate the effect of passenger heeling

Condition No. 3 – 43 Passengers & 4 Cars (Worst condition with passengers)

27 passengers outside
16 passengers inside vehicles



DECK PLAN



CONDITION NO 4 : Full Load without passengers (Worst cargo)

	Item	Weight	V.C.G.	L.C.G.	F.S.M.
1	Loaded Truck	26.79	9.000	31.500	0
2	Provisions	10.00	8.000	15.000	0
3	Fuel Storage	0.37	5.500	1.500	0
4	FO Day Tank	0.08	4.500	1.830	0
5	Crew	0.15	13.400	7.500	0

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	F.S.M.
Deadweight	37.39	8.706	26.630	0.0
Lightship	31.95	2.702	23.623	0.0
Total Weight	69.34	5.939	25.245	0.0

TRIM & STABILITY SUMMARY

Run File = EN186C.RUN
Env File = EN186.ENV
HGF File = EN186.HGF
Specific Gravity = 1.0000

Displacement = 69.34 L Tons
Draft @ Ref --@ Mid --@ LBP
(ft) 2.573 2.567 2.561
Initial Heel----Downflooding
0.00 to stbd 40.00
(Long'l Ref at Stern or AP-- Drafts to USK)

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GMl
5.939	25.245	0.000	2.517	14.560	**14.560**	75.45

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
1.358	25.243	0.000	25.196	0.000	1304.11	9.17

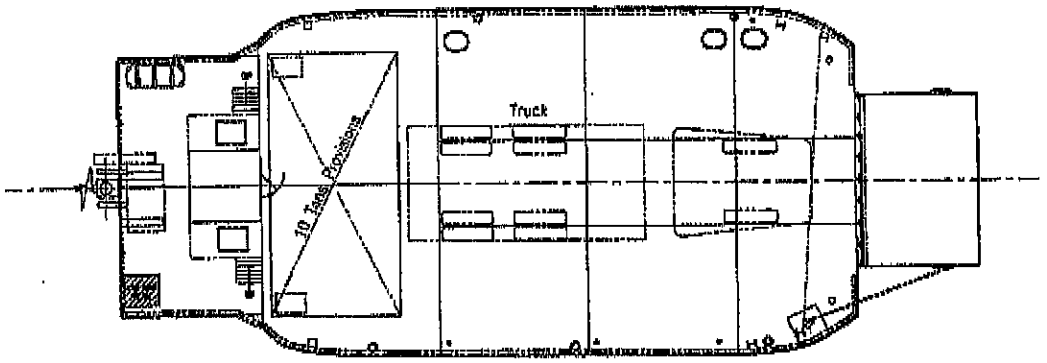
SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	2.567	0.012	0.000	0.00	30	3.495	0.258	1.839	61.08
5	2.567	0.012	1.282	3.28	35	3.776	0.347	1.393	69.17
10	2.588	0.116	2.372	12.50	40	4.103	0.408	0.915	74.95
15	2.774	0.178	2.715	25.41	45	4.472	0.472	0.425	78.31
20	3.002	0.178	2.564	38.81	50	4.920	0.546	-0.077	79.21
25	3.238	0.258	2.241	50.85	55	5.470	0.634	-0.581	79.21

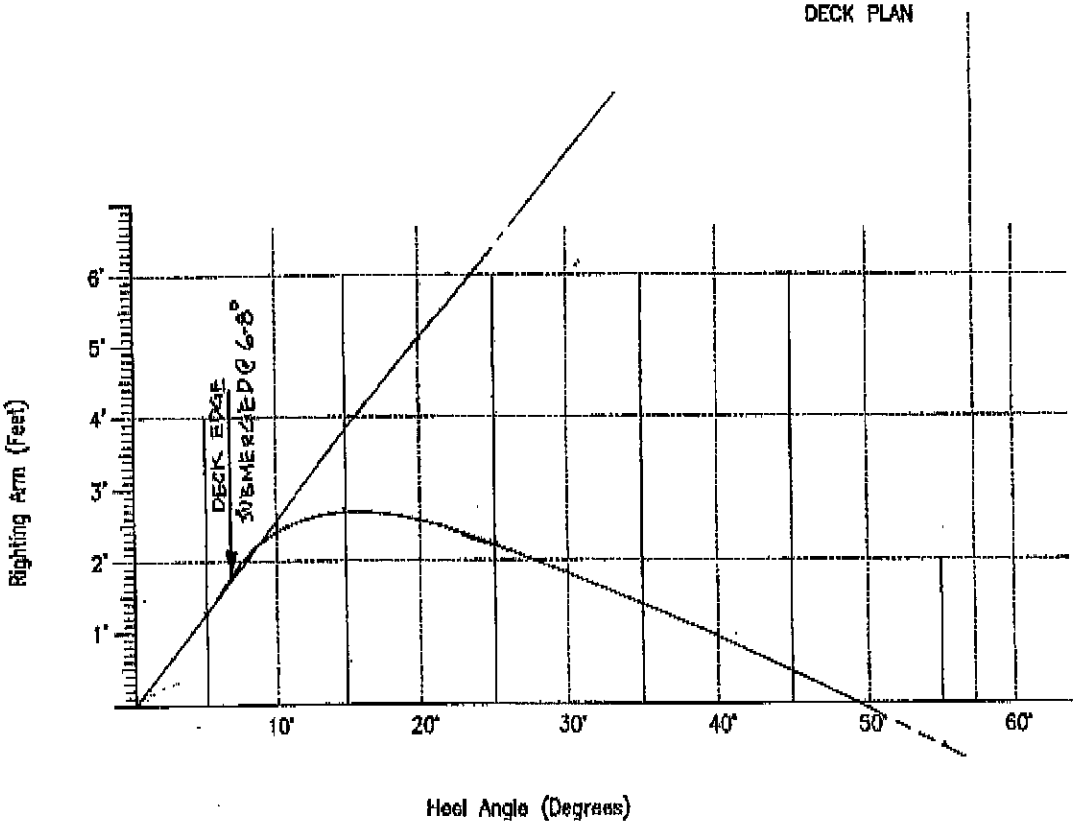
Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

Transport Canada Marine Safety Criteria STAB(6)	Required	Attained
Area under GZ curve to 30 degrees (F. deg)	>= 10.34	61.08
Area under GZ curve to 40 degrees (F. deg)	>= 16.92	74.95
Area between 30 & 40 degress	>= 5.64	13.87
Min. GZ Value at 30 degrees of heel (Ft.)	>= 0.66	1.84
Angle at maximum righting arm (degrees)	>= 25	16.00
Initial GMt (Ft.)	>= 0.50	14.56

Condition No. 4 – Full Load w/o passengers (Worst Cargo)

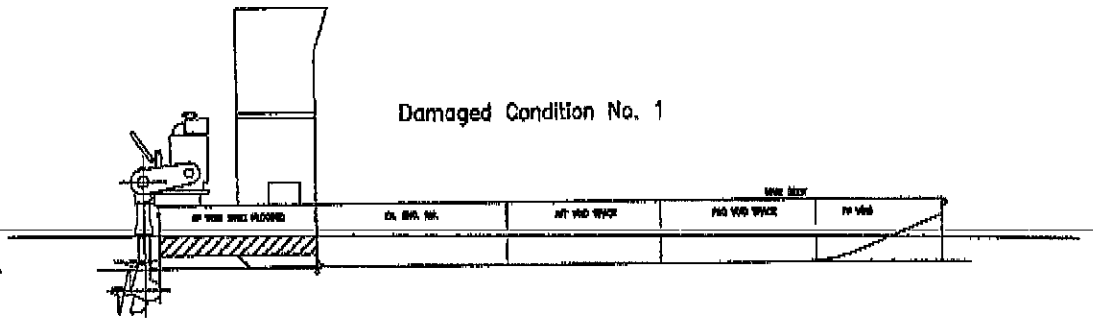


DECK PLAN

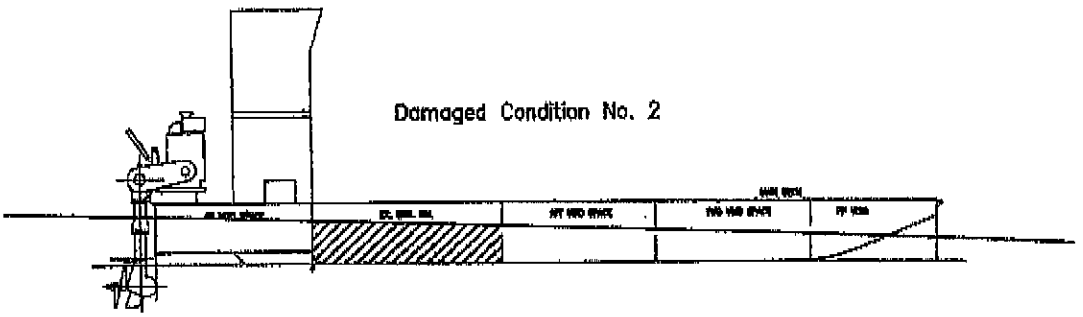


Summary of Damaged Conditions

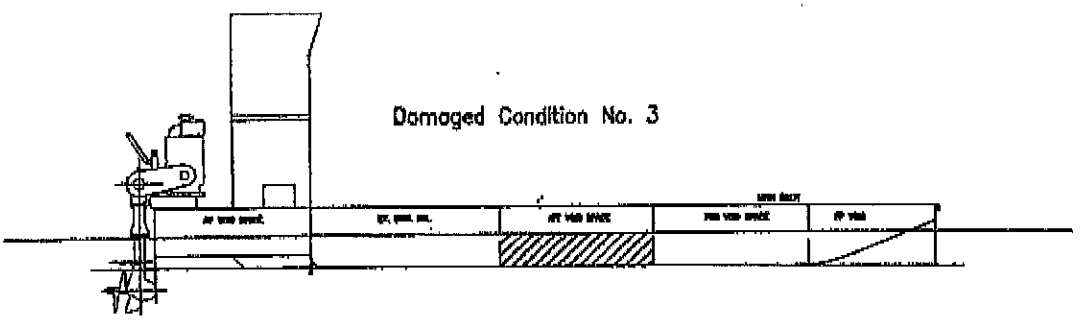
Damaged Condition No. 1



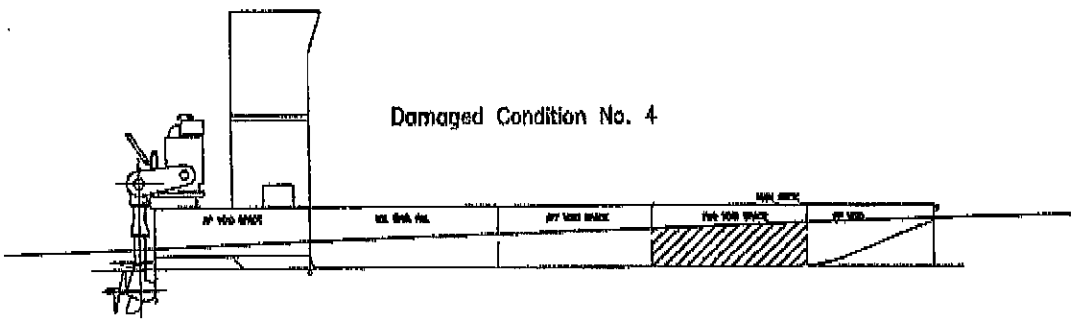
Damaged Condition No. 2



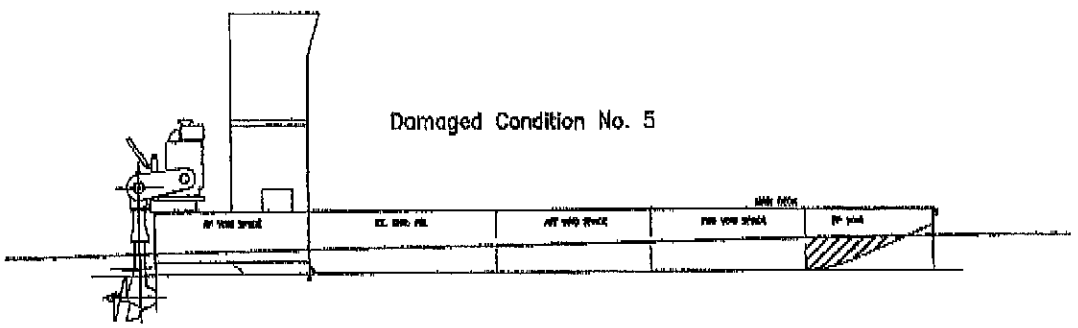
Damaged Condition No. 3



Damaged Condition No. 4



Damaged Condition No. 5



Vessel : M.V. Amik II

Assessment of Heeling Moments as per TCMS TP10943 Standard

(i) Moment due to crowding of passengers

2.7 sq. ft. per person & 165 lbs per each passenger

Total pass+crew = 45 Required deck area = 121.5 ft^2

Passenger Distribution	Area	Eff Len	Width	tcg off CL
Ship side along railings	121.50	36.50	3.33	10.34
total =	3.31	tons	@	10.34

Hence, total passenger heeling moment = 34.27 tons-ft

(ii) Moment due to launching of all fully loaded davit-launched survival craft on one side

~ not applicable for this vessel ~

(iii) Moment due to wind pressure

- wind pressure of 120 N/m^2 (2.5 lbs/ft^2)

Region	Area	Vcg	momt
1. Deck house	66.00	10.50	693.00
2. Railing & Vehicle	200.00	6.50	1300.00
3. Main Hull above light draft	133.50	2.67	356.45
4. End ramp & rigging	25.00	11.00	275.00
5. Outboard drive & aft block	35.00	7.00	245.00
total	459.50	6.24	2869.45

centre of pressure assumed at 1/2 draft = 0.67 ft.

Hence, total wind heeling moment = 459.5 x 2.5 x (6.24-0.67)/2240

2.86 tons-ft

DAMAGED CONDITION NO 1 : Aft Peak Starboard Flooded (u = 0.95)
Deadweight as intact condition no. 3

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	F.S.M.
Deadweight	11.77	7.283	30.186	0.0
Lightship	31.95	2.702	23.623	0.0
Total Weight	43.72	3.935	25.390	0.0

DAMAGED COMPARTMENT DATA (at equilibrium condition)

	Buoyancy	v.c.b.	l.c.b.	t.c.b.	bmt	bml
2nd part	-2.96	1.46	4.92	4.56	5.42	6.70

TRIM & STABILITY SUMMARY

Run File = EN186B.RUN
Env File = EN186.ENV
HGF File = AMIKAP.HGF

Displacement = 43.68 L Tons
Specific Gravity = 1.0000
Draft @ Ref --@ Mid --@ LBP
Initial Heel----Downflooding
(ft) 2.105 1.807 1.508
0.68 to stbd 40.00
(Long'l Ref at Stern or AP-- Drafts to USK)

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GMl
3.935	25.390	0.000	2.217	24.761	**24.761**	87.31

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
0.934	25.373	0.033	25.978	-0.402	1188.65	6.50

SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	1.803	0.556	-0.290	0.00	30	1.400	5.186	4.238	108.51
5	1.829	0.862	1.857	4.06	35	1.239	6.301	3.880	128.83
10	1.829	1.357	3.832	18.35	40	1.066	7.588	3.458	147.20
15	1.753	2.191	4.619	39.76	45	0.852	9.020	3.004	163.37
20	1.646	3.114	4.709	63.35	50	0.609	10.765	2.511	177.17
25	1.523	4.144	4.537	86.52	55	0.298	12.852	1.999	188.46

Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

Damaged Stability Criteria as per TP10943	Required	Attained
Margin line at final stage of flooding	above WL	OK
Final angle of equilibrium (unsymmetrical flood)	< 7 deg.	0.68 deg.
Range of positive residual RA (degrees)	>= 15.0	Large
Area under GZ curve up to df or 22 degrees (f.d)	>= 2.82	72.75
Minimum Residial GMt (inches)	>= 2	24.76'

PS : Residual RA is to be obtained after correction to the greatest of the following heeling moment:

	(ton-ft)
(i) Crowding of all passengers towards one side	34.27
(ii) The launching of all survival craft on one side	n.a
(iii) Due to wind pressure	2.86

Hence, GZreqd. = 34.27/43.68 + 0.13' = 0.91' / condition acceptable

DAMAGED CONDITION NO 2 : Existing Engine Room Flooded (u = 0.95)
Deadweight as intact condition no. 3

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	T.C.G.	F.S.M.
Deadweight	11.77	7.283	30.186	0.000	0.0
Lightship	31.95	2.702	23.623	0.000	0.0
Total Weight	43.72	3.935	25.390	0.000	0.0

DAMAGED COMPARTMENT DATA (at equilibrium condition)

	Buoyancy	v.c.b.	l.c.b.	t.c.b.	bmt	bml
2nd part	-19.32	1.32	16.02	0.00	17.63	4.48

TRIM & STABILITY SUMMARY

Run File = EN186B.RUN
Env File = EN186.ENV
HGF File = AMIKER.HGF
Specific Gravity = 1.0000

Displacement = 43.70 L Tons
Draft @ Ref --@ Mid --@ LBP
(ft) 3.173 2.356 1.538
(Long'l Ref at Stern or AP-- Drafts to USK)

Initial Heel----Downflooding
0.00 to stbd 40.00

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GMl
3.935	25.390	0.000	1.798	18.796	**18.796**	93.08

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
1.280	25.393	0.000	27.055	0.000	1243.06	6.88

SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	2.356	1.635	0.000	0.00	30	2.602	5.528	3.438	90.29
5	2.345	1.698	1.664	4.22	35	2.696	6.660	3.111	106.68
10	2.350	1.969	3.182	16.39	40	2.790	7.989	2.746	121.34
15	2.396	2.655	3.806	34.09	45	2.908	9.472	2.348	134.08
20	2.459	3.519	3.858	53.48	50	3.037	11.280	1.927	144.78
25	2.528	4.498	3.698	72.41	55	3.204	13.496	1.486	153.32

Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

Damaged Stability Criteria as per TP10943	Required	Attained
Margin line at final stage of flooding	above WL	OK
Final angle of equilibrium (unsymmetrical flood)	< 7 deg.	0
Range of positive residual RA (degrees)	>= 15.0	Large
Area under GZ curve up to df or 22 degrees (f.d)	>= 2.82	61.08
Minimum Residial GMt (inches)	>= 2	18.80

PS : Residual RA is to be obtained after correction to the greatest of the following heeling moment:

	(ton-ft)
(i) Crowding of all passengers towards one side	34.27
(ii) The launching of all survival craft on one side	n.a
(iii) Due to wind pressure	2.86

Hence, GZreqd. = 34.27/43.68 + 0.13' = **0.91' / condition acceptable**

DAMAGED CONDITION NO 3 : Aft Void Space Flooded (u = 0.95)
Deadweight as intact condition no. 3

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	T.C.G.	F.S.M.
Deadweight	11.77	7.283	30.186	0.000	0.0
Lightship	31.95	2.702	23.623	0.000	0.0
Total Weight	43.72	3.935	25.390	0.000	0.0

DAMAGED COMPARTMENT DATA (at equilibrium condition)

	Buoyancy	v.c.b.	l.c.b.	t.c.b.	bmt	bml
2nd part	-13.69	1.08	27.02	0.00	22.21	3.86

TRIM & STABILITY SUMMARY

Run File = EN186B.RUN
Env File = EN186.ENV
HGF File = AMIKAV.HGF

Displacement = 43.71 L Tons
Specific Gravity = 1.0000
Draft @ Ref --@ Mid --@ LBP
Initial Heel----Downflooding
(ft) 2.040 2.171 2.303
0.00 to stbd 40.00
(Long'l Ref at Stern or AP-- Drafts to USK)

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GMl
3.935	25.390	0.000	1.990	20.696	**20.696**	122.95

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
1.173	25.395	0.000	24.718	0.000	1265.40	9.04

SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	2.171	-0.263	0.000	0.00	30	2.037	-0.394	3.880	100.88
5	2.171	-0.263	1.797	4.52	35	2.005	-0.476	3.534	119.43
10	2.141	-0.136	3.536	17.87	40	1.971	-0.567	3.140	136.14
15	2.118	-0.136	4.274	37.67	45	1.932	-0.670	2.711	150.77
20	2.092	-0.245	4.333	59.45	50	1.873	-0.788	2.257	163.20
25	2.065	-0.318	4.161	80.73	55	1.813	-0.923	1.778	173.30

Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

Damaged Stability Criteria as per TP10943	**Required**	**Attained**
Margin line at final stage of flooding	above WL	OK
Final angle of equilibrium (unsymmetrical flood)	< 7 deg.	0
Range of positive residual RA (degrees)	>= 15.0	Large
Area under GZ curve up to df or 22 degrees (f.d)	>= 2.82	68.07
Minimum Residial GMt (inches)	>= 2	.

PS : Residual RA is to be obtained after correction to the greatest of the following heeling moment:

	(ton-ft)
(i) Crowding of all passengers towards one side	34.27
(ii) The launching of all survival craft on one side	n.a
(iii) Due to wind pressure	2.86

Hence, GZreqd. = 34.27/43.72 + 0.13' = 0.91' / condition acceptable

DAMAGED CONDITION NO 4 : Fwd Void Space Flooded (u = 0.95)
Deadweight as intact condition no. 3

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	T.C.G.	F.S.M.
Deadweight	11.77	7.283	30.186	0.000	0.0
Lightship	31.95	2.702	23.623	0.000	0.0
Total Weight	43.72	3.935	25.390	0.000	0.0

DAMAGED COMPARTMENT DATA (at equilibrium condition)

	Buoyancy	v.c.b.	l.c.b.	t.c.b.	bmt	bml
2nd part	-16.85	1.33	37.11	0.00	18.05	3.13

TRIM & STABILITY SUMMARY

Run File = EN186B.RUN
Env File = EN186.ENV
HGF File = AMIKFV.HGF

Displacement = 43.72 L Tons
Specific Gravity = 1.0000
Draft @ Ref --@ Mid --@ LBP
Initial Heel----Downflooding
(ft) 1.372 2.256 3.140
0.00 to stbd 40.00
(Long'l Ref at Stern or AP-- Drafts to USK)

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GMl
3.935	25.390	0.000	2.066	21.476	**21.476**	112.91

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
1.241	25.383	0.000	23.073	0.000	1305.82	8.31

SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	2.256	-1.768	0.000	0.00	30	2.441	-5.735	3.627	95.95
5	2.256	-1.768	1.860	4.78	35	2.486	-6.926	3.299	113.28
10	2.259	-2.046	3.390	18.04	40	2.539	-8.266	2.924	128.86
15	2.306	-2.739	4.004	36.75	45	2.611	-9.865	2.511	142.46
20	2.348	-3.644	4.058	57.13	50	2.684	-11.701	2.076	153.93
25	2.387	-4.612	3.902	77.08	55	2.783	-14.009	1.617	163.17

Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

Damaged Stability Criteria as per TP10943	**Required**	**Attained**
Margin line at final stage of flooding	above WL	OK
Final angle of equilibrium (unsymmetrical flood)	< 7 deg.	0
Range of positive residual RA (degrees)	>= 15.0	Large
Area under GZ curve up to df or 22 degrees (f.d)	>= 2.82	65.20
Minimum Residial GMt (inches)	>= 2	21.476

PS : Residual RA is to be obtained after correction to the greatest of the following heeling moment:

	(ton-ft)
(i) Crowding of all passengers towards one side	34.27
(ii) The launching of all survival craft on one side	n.a
(iii) Due to wind pressure	2.86

Hence, GZreqd. = 34.27/43.72 + 0.13' = 0.91' / **condition acceptable**

DAMAGED CONDITION NO 5 : Fore Peak Flooded (u = 0.95)
Deadweight as intact condition no. 3

SUMMARY OF WEIGHTS & CENTERS

Item	Weight	V.C.G.	L.C.G.	T.C.G.	F.S.M.
Deadweight	11.77	7.283	30.186	0.000	0.0
Lightship	31.95	2.702	23.623	0.000	0.0
Total Weight	43.72	3.935	25.390	0.000	0.0

DAMAGED COMPARTMENT DATA (at equilibrium condition)

	Buoyancy	v.c.b.	l.c.b.	t.c.b.	bmt	bml
2nd part	-4.89	1.39	44.17	0.00	35.44	2.57

TRIM & STABILITY SUMMARY

Run File = EN186B.RUN
Env File = EN186.ENV
HGF File = AMIKFP.HGF

Displacement = 43.70 L Tons Specific Gravity = 1.0000
Draft @ Ref --@ Mid --@ LBP Initial Heel----Downflooding
(ft) 1.438 1.878 2.319 **0.00 to stbd** 40.00
(Long'l Ref at Stern or AP-- Drafts to USK)

VCGs	LCG	TCG	TPI	GMt	GMt(f)	GMl
3.935	25.390	0.000	2.195	23.513	**23.513**	83.53

VCB	LCB	TCB	LCF	TCF	Wetted Area	MCTI
0.967	25.395	0.000	22.273	0.000	1236.05	6.22

SUMMARY OF HEEL vs DRAFT, TRIM, GZ & AREA

Degs	Draft	Trim	GZ(ft)	Area	Degs	Draft	Trim	GZ(ft)	Area
0	1.878	-0.881	0.000	0.00	30	1.404	-3.917	4.300	111.78
5	1.878	-0.881	2.051	5.19	35	1.257	-4.887	3.928	132.37
10	1.844	-1.109	3.946	20.24	40	1.085	-5.884	3.508	150.98
15	1.765	-1.604	4.695	42.11	45	0.905	-7.130	3.038	167.35
20	1.659	-2.274	4.766	66.04	50	0.678	-8.613	2.541	181.31
25	1.537	-3.059	4.595	89.49	55	0.409	-10.386	2.018	192.72

Notes: GZ Draft is referenced to midship at centerline at heel.
Trim is total over LBP and is +ve by stern, -ve by head

Damaged Stability Criteria as per TP10943	**Required**	**Attained**
Margin line at final stage of flooding	above WL	OK
Final angle of equilibrium (unsymmetrical flood)	< 7 deg.	0
Range of positive residual RA (degrees)	>= 15.0	Large
Area under GZ curve up to df or 22 degrees (f.d)	>= 2.82	75.51
Minimum Residial GMt (inches)	>= 2	23.51

PS : Residual RA is to be obtained after correction to the greatest of the following heeling moment:

	(ton-ft)
(i) Crowding of all passengers towards one side	34.27
(ii) The launching of all survival craft on one side	n.a
(iii) Due to wind pressure	2.86

Hence, GZreqd. = 34.27/43.72 + 0.13' = **0.91' / condition acceptable**

Prints Issued	Rev.0	Rev.A	Rev.B

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1. Basic Information
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3. Freeboard Readings
4. Draft Readings for Hydrostatics
5. Inclining Weights
6. Pendulums
7. Hydrostatics As Inclined
8. Results of Deflection Readings
9. As Inclined KG & LCG
10. Weights Correction
11. Weights to Re-position
12. Lightship Summary

Appendix: Key Plan of Inclining Test

Approvals By:	Rev.0	Rev.A	Rev.B

References

Client:

Shoal Lakes First Nation

Kejick, Ontario

Project/Vessel:

M.V. Amik II

Title:

Report on Inclining Experiment Conducted on June 29, 2004

Prepared By:	Report No. Rev. 0		
KAM Technology	EN04186-R01	Date:	August 2004
		Scale:	Nil
3 Keholme Cresc. Thorold		Job No,	EN04186
Ontario Canada L2V 4C1		Calc.	KY
	Total pages including cover 8	Checked	

(1) Basic Information

Name of Vessel	Passenger/car Ferry "Amik II"
Dimensions	50'- 0" x 24' Beam x 4'-0" Depth
Voyage	Minor Waters II
Official Number	
Gross Tonnage	

(2) Inclining Experiment

Date	June 29, 2004
Place	Shoal Lakes, Ontario
Weather	Sunny, light wind on stern
Water	Calm, specific gravity = 1.000
Vessel Condition	Vessel complete with stern extension & thruster unit. Vessel ready for operating. All bilges dry. Fuel oil capacity as noted in page 7
Conducted By	Kevin Yik - Contract Naval Architect, KAM Technology
Witnessed By	Brian Kennedy - Surveyor, Transport Canada Marine Safety

(3) Freeboard Readings

Locations	*Port*	*Ctr.*	*Stbd*	*mean*
New transom (AP)	28.00	-	29.00	28.50
Existing transom	29.50	-	30.50	30.00
Head log (FP)	34.50	-	33.25	33.88

(4) Draft Readings for Hydrostatics

(Keel thickness is 1/4")

Locations	*Deck ab.Base*	*Freeb'd (in)*	*Draft Ab.Base*	*Keel Daft(ft)*
at AP	48.25	28.50	19.75	1.667
at old transom	48.25	30.00	18.25	1.542
at FP	48.25	33.88	14.37	1.218

Trim over LBP of 50' = 0.448 ft.

mean draft at midship = 1.443 ft.

Check: at old transom = 1.667 - .448 x 10/50 = 1.577 ft.

as compared with 1.542', the accuracy is considered acceptable.

(5) Inclining Weights

Wt. no.	(lbs)	vcg ab deck	vcg ab Base	lcg from AP	tcg off CL	Transverse Lever
1	2713	3.28	7.30	40.10	10.25' P	20.500
2	2373	3.28	7.30	25.10	10.25' P	20.500
3	1845	3.28	7.30	32.60	10.25' S	20.500
4	2130	3.28	7.30	17.60	10.25' S	20.500

distance in feet

(6) Pendulums

Forward pendulum hanged from the ramp support post

Length = 3010 mm

Aft pendulum hanged from the pilot house top

Length = 3548 mm

(7) Hydrostatic As-Inclined

en186.hgf/M.V. Amik II

Keel Thk = 0.021 ft
Shell Thk = 0.016 ft
Drafts measured at LBP/2

HYDROSTATIC PARTICULARS
==========

trim = 0.448
Sp Gr = 1.000

Draft Ft.	Displt L.Tons	T.P.I Tons	L.C.F Ft.Ref	L.C.B Ft.Ref	V.C.B Ft. AB	MCTI Tons-ft	KMT Ft.	Awet Ft^2
1.243	30.34	2.362	23.767	24.542	0.662	7.61	42.127	1113
1.343	33.18	2.362	23.767	24.475	0.716	7.61	38.585	1122
1.443	**36.02**	**2.362**	**23.767**	**24.419**	**0.769**	**7.61**	**35.617**	**1131**
1.543	38.92	2.415	24.259	24.401	0.822	8.13	33.793	1164

(8) Results of Deflection Readings

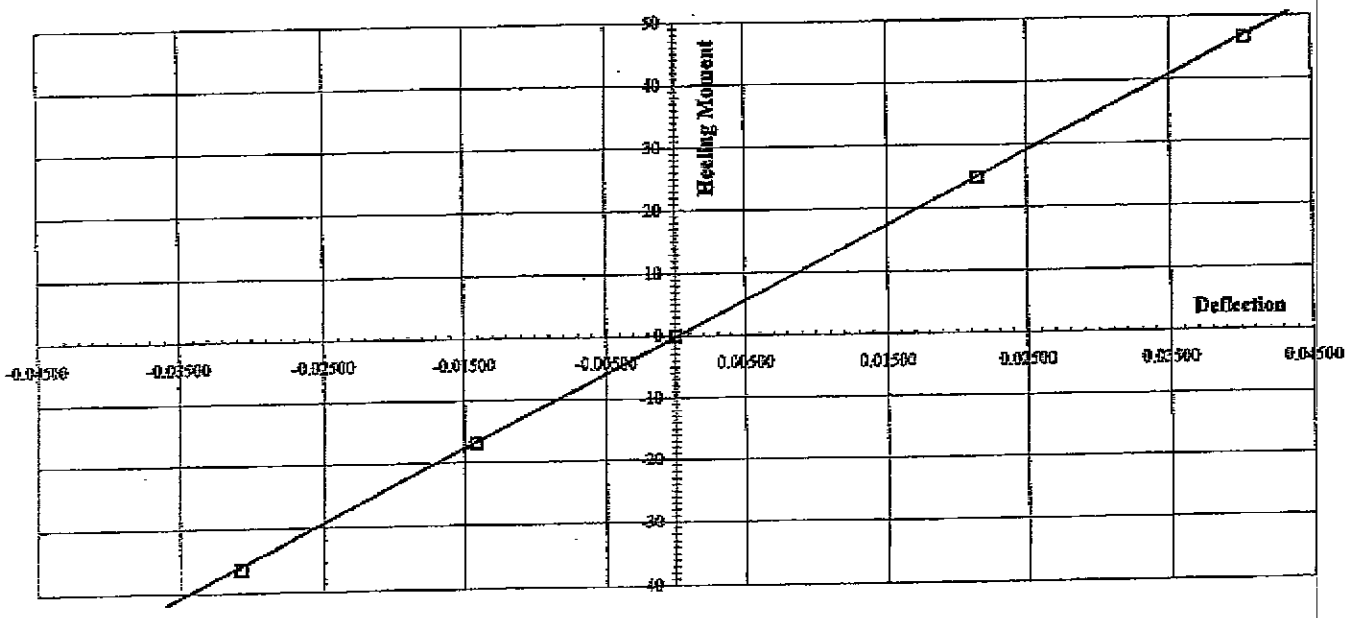
Fwd pendulum 3010 Aft pend. 3548 (mm)

No.	Shift Across Main Deck		Weight (L.Tons)	Distance (ft)	Moment (ton-ft)	Deflection Readings Fwd mm	x/L	Aft mm	x/L	mean Deflec	P/S Moment	Net Deflec	Net Mount
1	Weight #1	Port to Stbd	1.211	20.50	24.8288	64	0.02126	77	0.02170	0.02148	24.8288	0.02148	24.8288
2	Weight #2	Port to Stbd	1.059	20.50	21.7172	56	0.01860	68	0.01917	0.01889	21.7172	0.04037	46.5460
3	Weight #2	Stbd to Port	1.059	20.50	21.7172	56	0.01860	68	0.01917	-0.01889	-21.7172	0.02148	24.8288
4	Weight #1	Stbd to Port	1.211	20.50	24.8288	64	0.02126	77	0.02170	-0.02148	-24.8288	0.00000	0.0000
5	Weight #3	Stbd to Port	0.824	20.50	16.8850	43	0.01429	50	0.01409	-0.01419	-16.8850	-0.01419	-16.8850
6	Weight #4	Stbd to Port	0.951	20.50	19.4933	49	0.01628	60	0.01691	-0.01660	-19.4933	-0.03078	-36.3783
7	Weight #4	Port to Stbd	0.951	20.50	19.4933	49	0.01628	60	0.01691	0.01660	19.4933	-0.01419	-16.8850
8	Weight #3	Port to Stbd	0.824	20.50	16.8850	43	0.01429	50	0.01409	0.01419	16.8850	0.00000	0.0000
		Total Moments			165.8487		0.14086		0.14374				
		Mean moment/Def				1177.37		1153.786					

+ve Deflection to stbd side

-ve Deflection to port side

Mean moment/Deflectn. between fwd & aft pendulums = 1165.578



Moment Vs Tangent Plotting

(9) As Inclined KG & LCG

Hydrostatics:		Displacement	KMt	LCB	VCB
		36.02 L. Tons	35.617	24.419	0.769
GMt	= 1165.578/36.02		32.359	ft.	(= w x d /tanθ/disp)
KG	= KMt - GMt		3.258	ft.	
Free surface moments:		Negligible	0		
FS corrn	= total FS/disp		0.000	ft.	
KG corr.	= KG - FS corr		3.258	ft.	ab. Base
BG	= KG - VCB		2.489	ft.	
LCG	=LCB + BG x sin ϕ		24.441	ft.	fwd FP

ϕ = Trim angle = $\tan^{-1}(.448/50)$ = 0.513 degrees

(10) Weights Correction

Description	Observed		Weight L.Tons	KG (ft) ab. base	Vert Mt (L.T-ft)	LCG (ft) aft FP	Long Mt (L.T-ft)
Inc.wt.#1			-1.211	7.3	-8.84	40.10	-48.56
Inc.wt.#2			-1.059	7.3	-7.73	25.10	-26.58
Inc.wt.#3			-0.824	7.3	-6.02	32.60	-26.86
Inc.wt.#4			-0.951	7.3	-6.94	17.60	-16.74
Inclining party (4P)	660 lbs		-0.295	11.30	-3.33	29.00	-8.56
Fuel Oil storage	186 litres		-0.156	4.50	-0.70	3.50	-0.55
Life jackets	100 lbs		0.04	7.50	0.33	7.50	0.33
Life Platform (45p)	400 lbs		0.18	5.50	0.98	2.50	0.45
Work boat w/outb'd	450 lbs		0.20	6.00	1.21	7.00	1.41
Total weight correction		=	**-4.07**	**7.623**	-31.04	**30.855**	-125.66

(11) Weights to Re-position

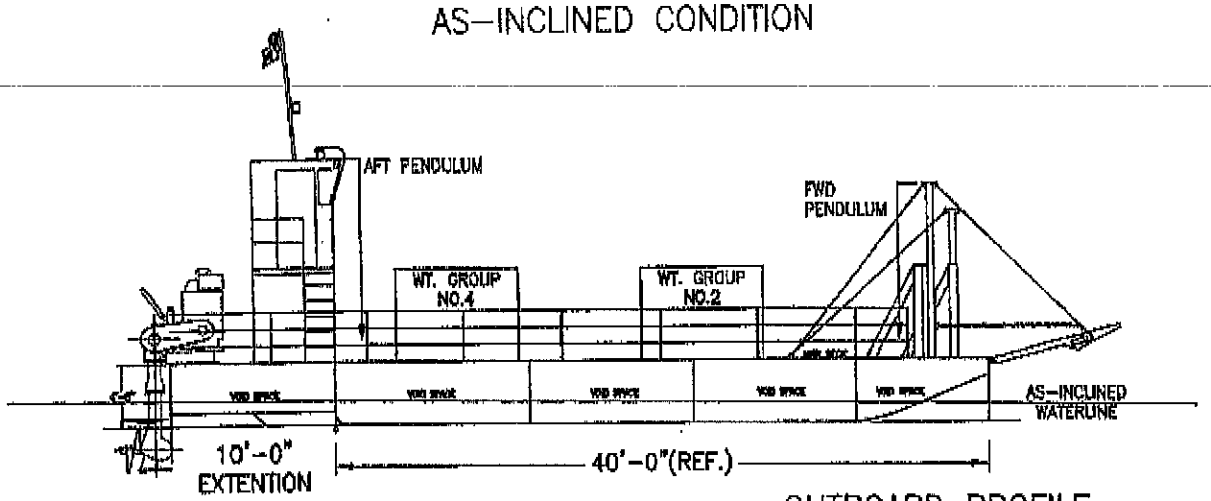
Nil

(12) Lightship Summary

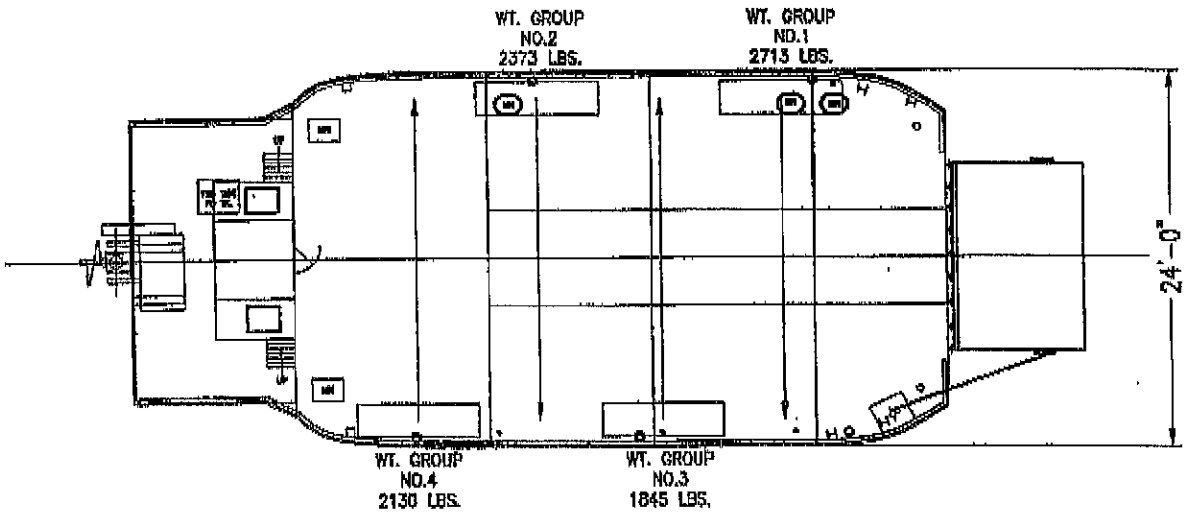
	Weight L.Tons	KG (ft) ab. base	Vert Mt (L.T-ft)	LCG (ft) aft FP	Long Mt (L.T-ft)
As-inclined Vessel	36.02	3.258	117.35	24.441	880.36
Weights Correction	-4.07	7.623	-31.04	30.855	-125.66
Lightship	**31.9**	**2.702**	86.31	**23.623**	754.71

Note: Lightship includes liquids in machinery system, ship's gear, and stores that are permanently stowed onboard.

M.V. AMIK II
AS-INCLINED CONDITION



OUTBOARD PROFILE



DECK PLAN