UNDERKEEL CLEARANCE CALCULATIONS FOR SHALLOWEST POINTS OF THE PASSAGE

	LAT							
	LONG							
	or AREA / CATZOC AREA							
1	Lowest Tide for Date Range or							
	Highest Tide for Date Range(whichever is applicable)							
2	Assumed Datum Depth (Chart Data)							
3	Depth Water Available (1 + 2)							
4	Vessel's Maximum Draft Saltwater							
5	Adjusted Draft for Salinity							
6	Increase due to Rolling and Pitching (If applicable)							
7	Underkeel Clearance Excluding Squat (3-5)							
8	Underkeel Clearance Required CATZOC AREA A1/A2: 10% CATZOC AREA B: 15% CATZOC AREA C/D: 25% CATZOC AREA U: 30%							
9	Maximum Allowed Squat (7 –8)							
10	Correspondent Speed for Allowed Squat							

If the required UKC is accomplished with specific tidal height only, report the time frames of the safe passage:

DATE:		**FROM:**		**TO:**		**HEIGHT**		**DATE:**		**FROM:**		**TO:**		**HEIGHT**	
DATE:		**FROM:**		**TO:**		**HEIGHT**		**DATE:**		**FROM:**		**TO:**		**HEIGHT**	
DATE:		**FROM:**		**TO:**		**HEIGHT**		**DATE:**		**FROM:**		**TO:**		**HEIGHT**	

OVERHEAD CLEARANCE CALCULATION

	LAT	29 58.8 N	30 00 N	30 00 N				
	LONG	093 52.2 W	093 59.9 W	093 59.9 W				
	or AREA	BRIDGE	CABLES	CABLES				
1	Calculated static air draft in SW	36.33	36.33					
2	Density allowance for FW & BW (-)	0.15	0.15					
3	Air draft adjusted for salinity	36.18	36.18					
4	Overhead Obstruction vertical clearance given by charts	43.5	49.9					
5	Static Overhead Clearance (4-3)	7.32	13.72					
6	Proficted height of Tide on Lowest Tide for Date range OR Predicted height of Tide on Highest Tide for Date Range (whichever is applicable).	0.30	0.30					
7	Final Static* Overhead Clearance (5-6)	7.02	13.42					

If the required overhead clearance is accomplished with specific tidal height only, report the time frames of the safe passage:

DATE:		FROM:		TO:		HEIGHT		DATE:		FROM:		TO:		HEIGHT	
DATE:		FROM:		TO:		HEIGHT		DATE:		FROM:		TO:		HEIGHT	
DATE:		FROM:		TO:		HEIGHT		DATE:		FROM:		TO:		HEIGHT	

*** Increase of overhead clearance due to squat is not included in the calculation cause it is considered as an additional safety factor.**

AIR DRAFT CALCULATION

The air draft at any trim *(highest point located aft)* can be calculated as follows.

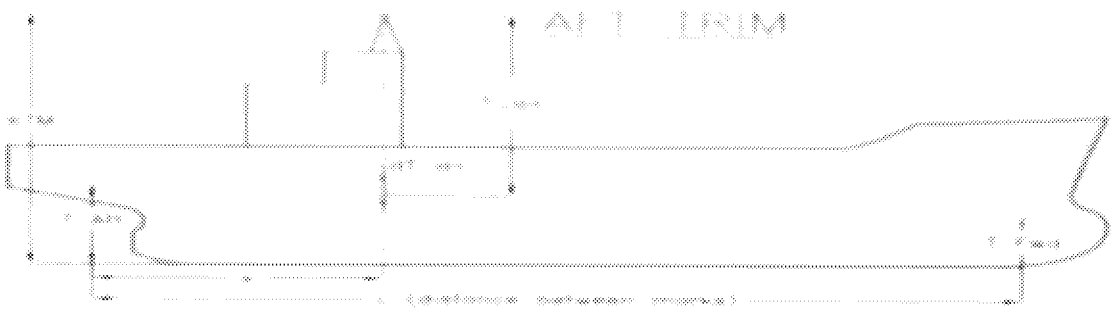
L	**206.2= Distance between forward and aft marks (m)**
T_{aft}	**8.20= Draft at aft marks**
T_{Fwd}	**8.20 = Draft at forward marks**
t	**0.0 = Trim between marks (m) (-) therefore stern trim is negative**
x	**40.04= Distance from aft marks to highest point (aft = -ve)**
KTM	**44.38= Distance from the keel to the high point (mast)**
T_{air}	**36.18= Air Draft**

Change in air draft (from the draft at aft marks)

$$\delta T_{air} = \frac{t * x}{L}$$

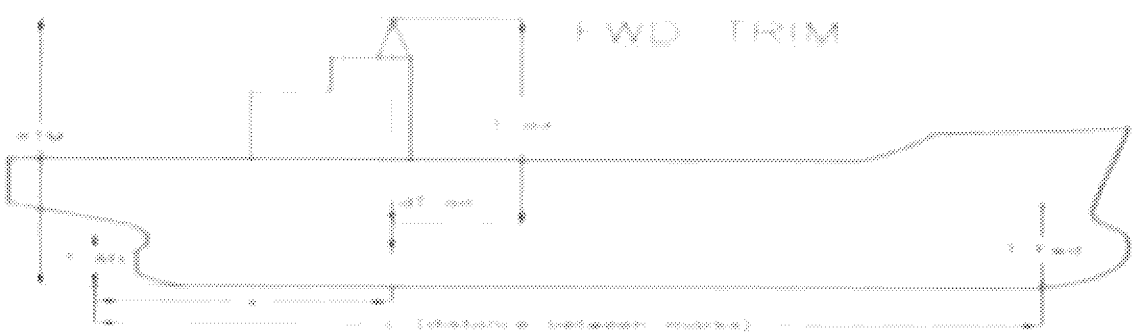
Therefore the new air draft is calculated as follows

$$Aft\ Trim:\ T_{air} = KTM - T_{Aft} + \delta T_{air}$$



or

$$Fwd\ Trim:\ T_{air} = KTM - T_{Aft} - \delta T_{air}$$



SQUAT CALCULATION (CONFINED WATERS)

DRAFT (Meters)	SPEED (KNOTS)														
	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0
6.00 M	0.06	0.13	0.24	0.37	0.53	0.72	0.94	1.18	1.46	1.77	2.11	2.48	2.87	3.29	3.74
6.50 M	0.06	0.13	0.24	0.37	0.53	0.72	0.94	1.19	1.47	1.78	2.12	2.48	2.88	3.31	3.76
7.00 M	0.06	0.13	0.24	0.37	0.53	0.73	0.95	1.20	1.48	1.79	2.13	2.50	2.90	3.33	3.78
7.50 M	0.06	0.13	0.24	0.37	0.53	0.73	0.95	1.20	1.49	1.80	2.14	2.52	2.91	3.34	3.80
8.00 M	0.06	0.13	0.24	0.37	0.54	0.73	0.96	1.21	1.50	1.81	2.15	2.53	2.93	3.37	3.83
8.50 M	0.06	0.14	0.24	0.38	0.54	0.74	0.96	1.22	1.50	1.82	2.17	2.54	2.95	3.38	3.85
9.00 M	0.06	0.14	0.24	0.38	0.54	0.74	0.97	1.22	1.51	1.83	2.18	2.56	2.96	3.40	3.87
9.50 M	0.06	0.14	0.24	0.38	0.55	0.75	0.97	1.23	1.52	1.84	2.19	2.57	2.98	3.42	3.90
10.00 M	0.06	0.14	0.24	0.38	0.55	0.75	0.98	1.24	1.53	1.85	2.20	2.59	3.00	3.44	3.92
10.50 M	0.06	0.14	0.25	0.38	0.55	0.75	0.98	1.25	1.54	1.86	2.21	2.60	3.01	3.46	3.94
11.00 M	0.06	0.14	0.25	0.39	0.56	0.76	0.99	1.25	1.55	1.87	2.23	2.61	3.03	3.48	3.96
11.50 M	0.06	0.14	0.25	0.39	0.56	0.76	0.99	1.26	1.55	1.88	2.24	2.63	3.05	3.50	3.98
12.00 M	0.06	0.14	0.25	0.39	0.56	0.77	1.00	1.27	1.56	1.89	2.25	2.64	3.07	3.52	4.00
12.50 M	0.06	0.14	0.25	0.39	0.57	0.77	1.00	1.27	1.57	1.90	2.26	2.65	3.08	3.53	4.02
13.00 M	0.06	0.14	0.25	0.39	0.57	0.77	1.01	1.28	1.58	1.91	2.27	2.67	3.09	3.55	4.04
13.50 M	0.06	0.14	0.25	0.39	0.57	0.78	1.01	1.29	1.58	1.92	2.27	2.68	3.10	3.57	4.06

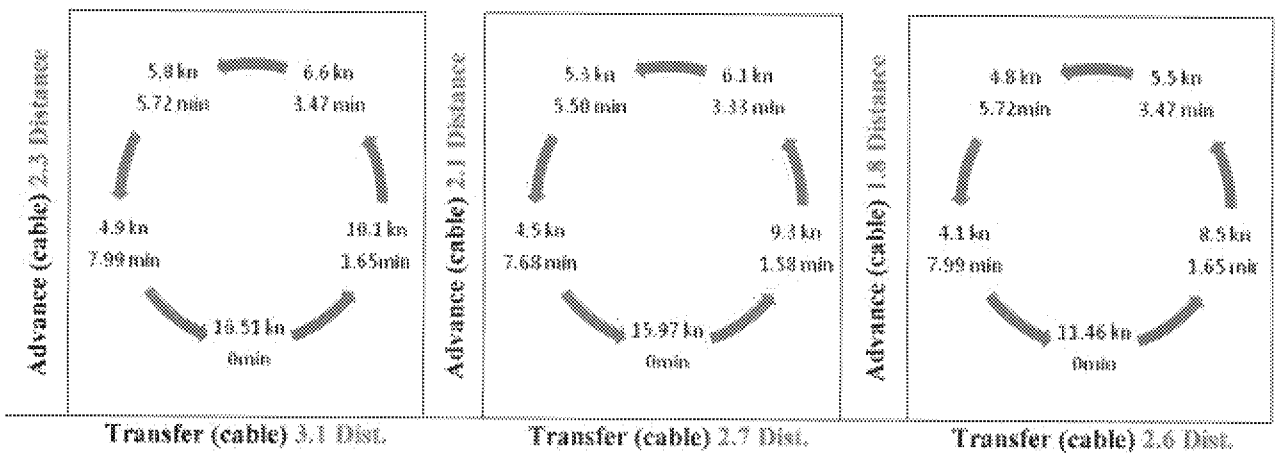
SQUAT CALCULATION (OPEN WATERS)

DRAFT (Meters)	SPEED (KNOTS)														
	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0
6.00 M	0.03	0.07	0.12	0.18	0.26	0.36	0.47	0.59	0.73	0.88	1.05	1.24	1.43	1.64	1.87
6.50 M	0.03	0.07	0.12	0.18	0.26	0.36	0.47	0.60	0.74	0.89	1.06	1.24	1.44	1.65	1.88
7.00 M	0.03	0.07	0.12	0.18	0.27	0.36	0.47	0.60	0.74	0.89	1.06	1.25	1.45	1.66	1.89
7.50 M	0.03	0.07	0.12	0.19	0.27	0.36	0.48	0.60	0.74	0.90	1.07	1.26	1.46	1.67	1.90
8.00 M	0.03	0.07	0.12	0.19	0.27	0.37	0.48	0.61	0.75	0.91	1.08	1.26	1.47	1.68	1.91
8.50 M	0.03	0.07	0.12	0.19	0.27	0.37	0.48	0.61	0.75	0.91	1.08	1.27	1.47	1.69	1.93
9.00 M	0.03	0.07	0.12	0.19	0.27	0.37	0.48	0.61	0.76	0.91	1.09	1.28	1.48	1.70	1.94
9.50 M	0.03	0.07	0.12	0.19	0.27	0.37	0.49	0.62	0.76	0.92	1.10	1.29	1.49	1.71	1.95
10.00 M	0.03	0.07	0.12	0.19	0.28	0.37	0.49	0.62	0.77	0.93	1.10	1.29	1.50	1.72	1.96
10.50 M	0.03	0.07	0.12	0.19	0.28	0.38	0.49	0.62	0.77	0.93	1.11	1.30	1.51	1.73	1.97
11.00 M	0.03	0.07	0.12	0.19	0.28	0.38	0.49	0.63	0.77	0.94	1.11	1.31	1.52	1.74	1.98
11.50 M	0.03	0.07	0.12	0.19	0.28	0.38	0.50	0.63	0.78	0.94	1.12	1.31	1.52	1.75	1.99
12.00 M	0.03	0.07	0.12	0.20	0.28	0.38	0.50	0.63	0.78	0.95	1.13	1.32	1.53	1.76	2.00
12.50 M	0.03	0.07	0.13	0.20	0.28	0.38	0.50	0.64	0.79	0.95	1.13	1.33	1.54	1.77	2.01
13.00 M	0.03	0.07	0.13	0.20	0.28	0.39	0.50	0.64	0.79	0.95	1.14	1.33	1.55	1.78	2.02
13.50 M	0.03	0.07	0.13	0.20	0.28	0.40	0.50	0.65	0.79	0.95	1.14	1.34	1.55	1.79	2.03

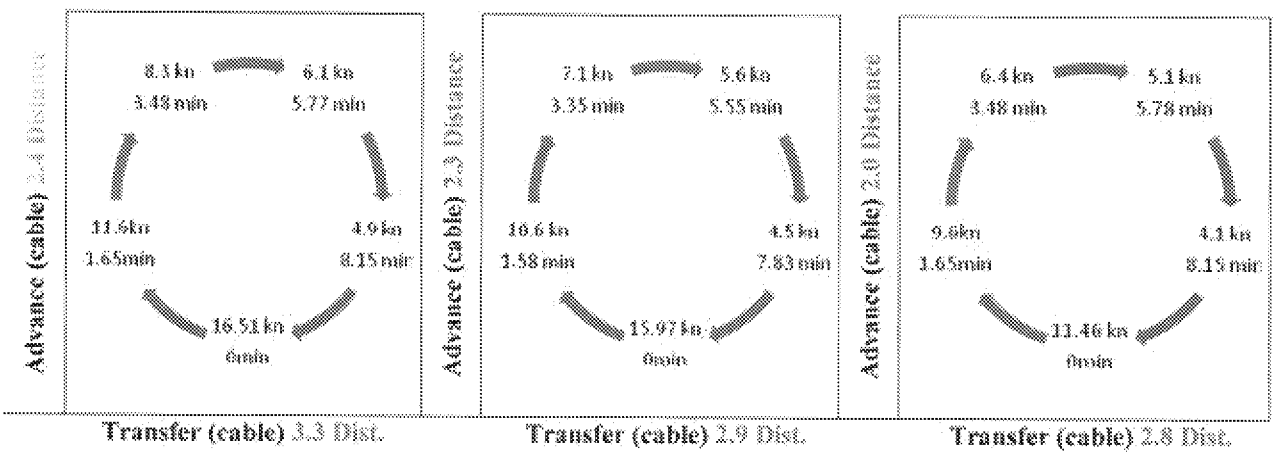
TURNING CIRCLE

BALLAST CONDITION			LOADED CONDITION			SHALLOW WATER, FULLY LOADED		
Initial speed	16.51	knts	Initial speed	15.97	knts	Initial speed	11.46	knts
Advance	2.3 2.4	Cables	Advance	2.1 2.3	Cables	Advance	1.8 2.0	Cables
Tactical diameter	3.1 3.3	Cables	Tactical diameter	2.7 2.9	Cables	Tactical diameter	2.6 2.8	Cables

PORT TURN



STRB TURN



ROLLING & PITCHING TABLES

FORMULA FOR INCREASE IN DRAFT DUE TO ROLL(LIST)

The formula for calculating the increase in draft for "X" degrees of list (roll) is:

Draft Increase = Vessel Beam ÷ 2 x Sine of List Angle

Example: Vessel Beam : 32.20 mtrs - Increase in Draft Due to 2° List = Draft Increase: 0.56 mtrs

INCREASE IN DRAFT DUE TO ROLL					
BEAM (m)	DEGREE OF LIST				
	2°	4°	6°	8°	10°
25	0.44	0.87	1.09	1.74	2.17
28	0.49	0.98	1.22	1.95	2.43
32	0.56	1.12	1.39	2.23	2.78
36	0.62	1.22	1.52	2.38	2.92
42	0.72	1.43	1.77	2.78	3.43

FORMULA FOR INCREASE IN DRAFT DUE TO PITCH

The formula for calculating the increase in draft for "X" degrees of pitch is:

Draft Increase = Vessel Length ÷ 2 x Sine of Pitch Angle ***
***(Formula assumes tipping center is at midpoint. That means, that the clinometers is placed in the middle of the vessel)

Example: Vessel : 230 mtrs - Increase in Draft Due to 1° Pitch = Draft Increase: 2 mtrs

INCREASE IN DRAFT DUE TO PITCH			
LBP (m)	DEGREE OF PITCH***		
	1°	2°	3°
160	1.40	2.79	4.19
180	1.57	3.14	4.71
200	1.75	3.49	5.23
220	1.92	3.84	5.79
250	2.18	4.36	6.29

ICE NAVIGATION APPENDIX

Additional appraisal and planning requirements in case of intended navigation in ice conditions

	Done
Considerations taken in account for the intended route being affected by ice growth and/or ice movement that threatens the safety of the ship (*)	
Seasonal changes noted	
It is ensured that ice navigation is unavoidable	
Ice data integrated into ECDIS (**)	
If need of icebreaker is anticipated, relevant contacts ensured (incl. use of Code of Signals)	
Special ice standing orders are issued by the Master and acknowledged by the Bridge team?	
Position fixing methods examined in detail to ensure primary and secondary systems being possible in all conditions	
Bridge Team made aware of the changing environmental conditions and of the possibility of encountering moving ice formations	
Weather reports continuous monitoring ensured	
Consideration given for reducing speed prior to entering areas of pack ice	
Consideration given for TSS being suspended in ice conditions? (***)	
Provisions taken for recording and conveying as appropriate information about ice observations (incl. photos etc)	

(*) Standard information could be enhanced by facsimile ice chartlets and/or ice reports, as issued by USCG, International Ice Patrol, Punta Arenas Radio, Kiel Harbour Radio and Antarctica weather/research stations or the Meteorological Office.

(**) Where Great Circle or rhumb line tracks intersect with known ice limits in the ice season, such ice limits should be marked on the charts.

(***) Relevant information is available in NAVTEX.