



Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Bundesoberbehörde im Geschäftsbereich des Bundesministeriums
für Verkehr, Bau- und Wohnungswesen

Investigation Report
75/02

1 August 2003

Very serious marine casualty

Sinking of MY TAUCHER

on 7 September 2002
in the Bay of Mecklenburg

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1 Summary of the marine casualty

On 7 September 2002 at approx. 15.10 h CEST the motor yacht TAUCHER sank south of buoy KO 9 - T 66 at position 54°28,1' N 011°33,3' E. An emergency call was issued prior to sinking. The Master and the 11 sports divers on board were rescued by the Ro-Ro-vessel POLARIS and the SY MELOS.

2 Scene of the accident

Nature of incident:	Very serious marine casualty, here: sinking with total loss
Date:	7 September 2002
Location:	Position 54°28,1' N 011°33,3' E
Weather conditions:	Wind: S 4 bft, sea: 3, Wave height up to 1 m / visibility: 8 nm

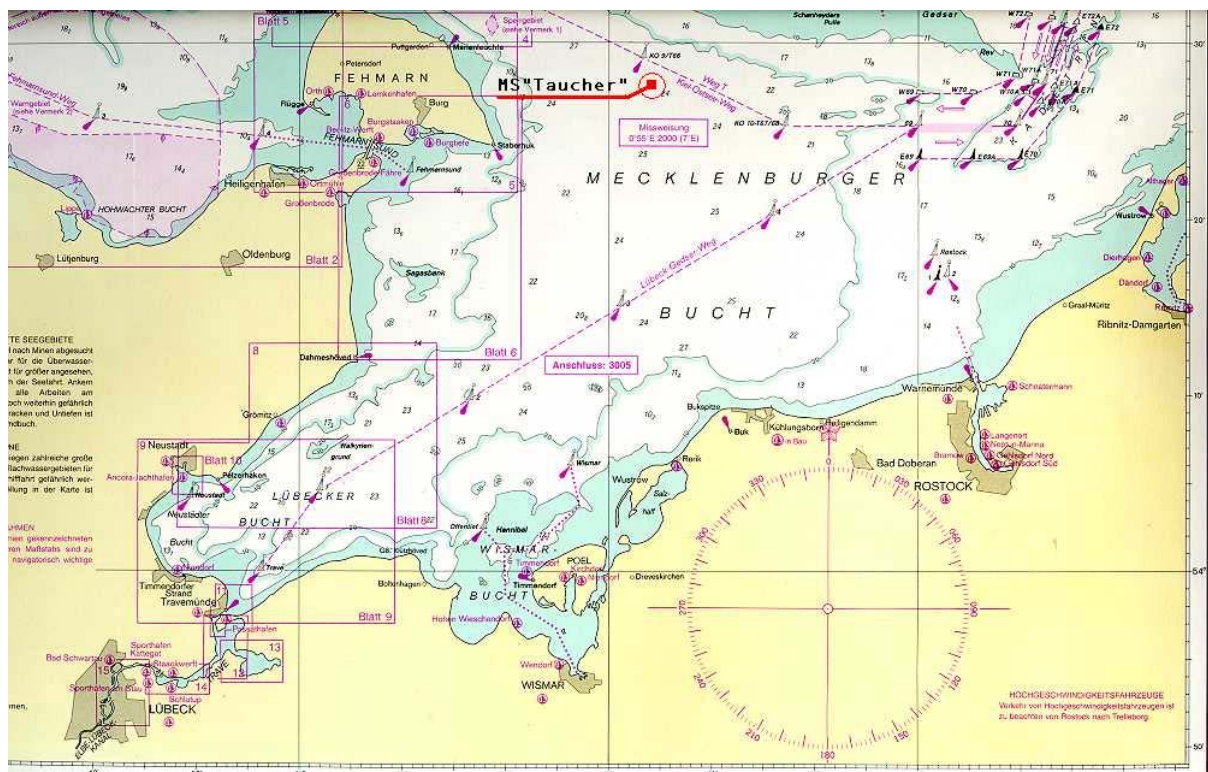


Figure 1: Casualty position

3 Vessel particulars and photos

Vessel particulars:

Type of vessel:	Steel motor yacht (ex police port boat)
Trade range:	Zone 2 (Flensburger Förde)
Building yard:	Schlesswerft
Year built:	1965
Flag:	Federal Republic of Germany
Shipping Register:	Kiel
Port of Registry:	Flensburg
Classification:	-
Structure:	Steel
GRT:	-
Length over all:	11.39 m
Engine type	Diesel
Engine rating:	92 kW
Crew:	1
Guests:	11
Personal injury:	None
Property damage:	Sinking, total loss

Figure 2: MY TAUCHER



Figure 3: MY TAUCHER



4 Voyage / course of the casualty

On 7 September 2002 at about 10.55 h CEST (acc. to the logbook) the boat left Puttgarden with 12 persons (Master, who was also the owner, and 11 sports divers) plus several sets of diving equipment with a total payload (persons and equipment) of approx. 1.6 t in weight. The sea voyage largely arranged via the Internet was to serve diving in the wreck VÄRING that is entered in the sea chart at buoy KO9 - T66 of the Kiel-Baltic Sea channel.

Three of the sports divers stated that the freeboard must not have been sufficient already at the start of the voyage, since there had been water on the aft deck, although the waves had not been even one meter high.

According to the details supplied by the Master of MY TAUCHER the boat drifted to position 54° 28,1'N 011° 33,3'E in the direct vicinity of the wreck for the diving activities. A 25 kg-heavy ground weight had been placed with a buoy at a distance of approx. 4 m from the wreck position entered in the sea chart with an approx. 40 m long line. The last diving activity had been completed at about 15.00 h CEST and all the divers were on board. The "A" flag that had been set was taken in.

Two sports divers were to take in the buoy and its bottom weight with the aid of the line in accordance with the instructions of the Master. Since taking in the ground weight in this way failed, the Master had the retaining line of the ground weight made fast on the boat clamp midships on the starboard side by the sports divers, turned the boat with a north-westerly course, and switched the engine to slow ahead in order to pull free the ground weight that had caught on the bottom.

This manoeuvre lasted about two to three minutes and due to the leverage action of the line set and the persons mainly aft on the starboard side there was an increase in the list to starboard.

When the Master noticed that the waterline on the starboard side was on a level with the deck he ordered several sports divers to the port bow area of the boat in order to trim the starboard stern.

Since the buoyancy was reduced, even a shift in the weight could not longer prevent fast infiltration of the sea water inside the boat. Neither the Master's call to cut the line to the bottom weight nor disengaging of the engine could prevent the vessel sinking.

The Master only recognised the massive infiltration of water inside the boat directly before the boat sank. He only had time to issue a short emergency call before the boat sagged almost vertically via the stern and went down after the air bubble escaped from the interior of the boat.

The stranded persons remained physically uninjured and drifted in the water for about 15 minutes before two of them were picked up by the SY MELOS and the remaining 10 by the Ro-Ro-vessel POLARIS.

Since the MY TAUCHER had sunk very quickly, the clothing consisted of what the shipwrecked persons had been wearing at the moment of sinking, i.e. two persons were wearing street garments and the rest underwear and diving suits.

The Federal Border Police (BGS) patrol boat BG 16 ALSFELD reached the scene of the accident shortly after and took over all the shipwrecked persons. The accident protocol was made out on board. All 12 persons left the patrol boat 16 ALSFELD in Puttgarden and drove home with the vehicles they had parked there.

5 Investigation

MY TAUCHER, year built 1965, was initially used as police port boat for the river police in Schleswig-Holstein (Kiel) and subsequently as WS 73 in Mecklenburg-Western Pomerania.

After the boat had been withdrawn from service it was sold by the State Police Office Mecklenburg-Western Pomerania in 1993. After this the boat was used commercially as a port ferry under the name "PETUH".

In the Inspection Report No. 33/99 of 10 May 1999 the Inland Shipping Employer's Accident Insurance, Hamburg, certified that the vessel was licensed under the conditions issued for trade as a port ferry for a maximum of 14 persons in "Zone 2" (Flensburger Förde).

It was ascertained that with sufficiently intact stability and a maximum of 14 persons there was a necessary remaining freeboard of 0.34 m, and exceeding the maximum list angle of 7° by approx. 1% could be accepted. The following ship's safety measures were among those specified as conditions to be fulfilled up to the next inspection on 1 May 2004:

- Cut-outs in the stern to be sealed or a safety distance of 0.80 m to be guaranteed (distance between waterline at greatest immersion and top edge of side wall/bulkhead).

The present Master acquired the port ferry PETUH in December 1999 for his own use as a leisure craft. According to the contract the boat was bought as seen, with the exclusion of all guarantee claims. It cannot be proven whether or not the new owner knew the above ship's safety conditions for operating the port ferry. It is proven that the new owner did not carry out any structural ships changes to seal the cut-outs in the stern.

Only a lifebuoy and automatic jacket were ascertained on board as rescue equipment.

The Master did not instruct all the other persons on board concerning the rescue equipment available on board prior to starting the sea voyage.

The Federal Border Police Office (Bundesgrenzschutzamt See) in Neustadt, Holstein, was requested for official aid to clarify the cause of the sinking. The police divers thereupon conducted diving operations at the wreck on 11 September 2002 and on 5 March 2003, but these provided no information about the cause.

In addition a local survey of a sister vessel was carried out in the Kiel marina on 21 February 2003. The theory developed with the staff present that water could have infiltrated unnoticed into the interior of the vessel via a leaky exhaust system could not be verified by the aforementioned second diving operation.

6 Summary of the casualty

This was a case of total loss. The owner declined to raise the vessel.

7 Analysis

There are round apertures for engine compartment exhaust air in the stern (approx. 1.37 m above the base with a diameter of approx. 0.10 m). These openings cannot be closed during operation. From the calculated ship's position at the time of the sinking (Annex) there was a freeboard to these openings of 0.35 m.

According to the expert calculation (Annex) the increase of speed to break out the anchor stone resulted in an additional aft trim of approx. 5° or 0.12 m, so that during the manoeuvre the engine compartment exhaust air apertures were only about 0.23 m above the water surface.

By scowing the anchor stone with the stern to the sea in the prevailing weather and sea conditions there was probably heavy infiltration of sea water, unnoticed, through the engine compartment exhaust air apertures in the stern.

With his "ahead" manoeuvre the Master wanted to pull free the bottom weight that had caught on the ground. He probably did not consider the wind direction from the south at 4 bft, the wave height up to 1 m, and as a result the possibility of water infiltration into the engine room via the exhaust air apertures in the stern.

The change in trim and centre of gravity due to the total payload of persons and equipment of at least 1.587 t and 0.235 t diesel and lubricant oil, as well as the manoeuvre to pull the bottom weight free, led to a further negative change in the aft freeboard. Thus it was possible for approx. 2 tonnes of sea water to infiltrate via the exhaust air apertures (which according to the instructions by the Inland Vessels Employers' Accident Insurance from the year 1999 should have been sealed) in the stern into the engine compartment.

After this, further flooding of the exhaust air apertures in the stern that were now below the waterline could no longer be checked. As the buoyancy of the boat decreased, the boat would evidently sag via the stern with approx. 6 tonnes of accumulated sea water in the engine room. The entire flooding and further infiltration of sea water via the apertures above deck up to final sinking of the boat would then happen very quickly after this (see Annexes).

From a certain water mass (approx. 2t) in the engine room it was no longer possible to prevent further flooding through these apertures and - as a result - sinking of the boat (Annex).

The Master only recognised the massive intake of water into the interior of the boat too late and directly before the boat sank.

To summarise it should be said that the infiltration of sea water could have been noticed. Lifting of the vessel, as the diving operations showed, would probably not provide any further findings clarifying the cause of the accident and would therefore be incommensurate.

8 Recommendations

- Independently of private or commercial use the operator must check whether the vessel used is sufficiently stable and free from leaks for voyages in the sea area.
- The operator/master must ensure adequate closing status in all wind, sea and voyage conditions.
- On voyages in the sea area there must always be sufficient freeboard/safety distance to interior ventilation and other openings that can be flooded.
- Bilge alarms should be provided in rooms that are not protected against sea and are not constantly monitored.
- There should always be sufficient and freely accessible rescue equipment ready for all persons on board.
- Prior to starting a sea voyage the master should instruct and familiarise all persons with the rescue equipment on board.

Sources

The Investigation Report is based on the investigations of the Bundesstelle für Seeunfalluntersuchung (Federal Bureau of Maritime Casualty Investigation), and:

- of the Bundesgrenzschutzamt See, (Federal Border Police) Neustadt
- of the Bundesamt für Seeschifffahrt und Hydrographie (Federal Office for Navigation and Hydrography), Hamburg
- and Survey Report by the firm SDC Ship Design & Consult GmbH, Hamburg

The investigation was conducted in conformity with the law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law - SUG) of 24 June 2002. According to this the sole objective of the investigation is to prevent future accidents and malfunctions. The investigation does not serve to ascertain fault, liability or claims.

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Annex 1: Summary by Messrs. SDC Hamburg

Stability and trim expertise on the sinking of MY TAUCHER

1 General Information

MY TAUCHER sank in the Baltic Sea on 8 September 2002.

With the aid of the "NAPA" program system that is also used by leading classification societies, an attempt was made to reconstruct the course of the casualty.

The calculations take into account free heeling and free trim and the effect of the free surfaces in partly filled tanks. This leads to physically correct hydrostatic results. Dynamic effects caused by wind and waves cannot be taken into account by calculations.

The investigation is based on the documents available concerning the vessel. Since some information on the vessel is lacking, some assumptions had to be made.

2 Initial floating position

2.1 Vessel form

The vessel form was reconstructed with the aid of the following drawings available:

- General Layout Plan (port ferry)
- Main frame (river police port boat)
- Iron longitudinal section (river police port boat)

2.2 Empty weight of vessel

With the aid of the weight calculation of the building yard the weight of the empty vessel was assumed as 6.2 t.

The centre of gravity was estimated for the individual weights and then calculated.

With the aid of the photos available a floating position with standard equipment was estimated:

- Draft aft bottom edge rubbing strip equivalent to 0.90 m
- Draft forward equivalent to the stem contour 0.70 m
- Heeling approx. 1.2° to starboard

It was assumed that the fuel tank was 50% full. This results in a vessel weight with standard equipment without fuel of 8.5 t (Annex Load Case C20).

3 Floating position at the time of sinking

According to the documents of the Federal Border Police Sea in addition to the standard equipment 12 persons with diving equipment of 1.587 t and 0.235 t diesel and fuel oil were on board.

This results in a floating position with a draft aft of 1.02 m and forward of 0.70 m, and a heel of 1.4° to starboard (Annex Load Case C21).

4 Closing condition

There are round apertures for the engine compartment exhaust air approx. 1.37 m above the base in the stern with a diameter of approx. 0.10 m. These apertures cannot be closed in operation.

The Inland Shipping Employers' Accident Insurance Hamburg required already in 1994 of the previous owner, who wanted to use the vessel as a ferry boat, that these apertures should be 0.80 m above the waterline. This requirement results in a maximum draft aft of 0.57 m.

According to the design draft of 0.72 m in accordance with the General Plan, these apertures are 0.65 m above the waterline.

The calculated floating position for the vessel at the time of sinking (Annex Load Case C21) results in a freeboard to these openings of 0.35 m.

The engine compartment supply air also enters via an unprotected aperture in the aft deck approx. 1.72 above the base.

The hatch on the aft deck to the aft peak and the three-part engine compartment hatch were closed and assumed to be watertight.

The open cockpit is protected over the deck at the side by a bulwark approx. 0.2 m high above deck. In the case of an aft trim the cockpit also runs full if the water level at the aft edge of the cockpit only stands at main deck height.

The door to the cabin was reportedly open.

5 Course of the casualty

According to the statements by witnesses it was not possible for two persons to lift the anchor stone, i.e. the retaining force was greater than approx. 100 kg.

The 40 m long anchor line was then made fast on a clamp (starboard, halfway along the ship's length) and with slow speed ahead an attempt was made to scow the anchor stone. According to the statement by witnesses there was a substantial list.

At an engine rating of 125 HP, a stand thrust of approx. 1000 kg can be produced. The vertical component of this force with a line length of 40 m and a water depth of

25 m comes to 800 kg. Assuming slow speed at 30% power, this results in a vertical force of 250 kg that leads to a heeling angle of 5.2°. (Annex Load Case C22).

The engine room exhaust air apertures are then still 230 mm over a smooth water surface. The freeboard to the cockpit is then approx. 560 mm.

If the boat was held with the bow against the sea in the attempt to lift the anchor stone, the probability that water infiltrated through the exhaust apertures into the engine room is slight. The boat was lying at anchor for a few hours with only a slightly larger freeboard to the apertures.

If the boat was held with the stern to the sea during the attempt to lift the anchor stone, at a wave height of 0.7 m to 1.0 m water can infiltrate through these apertures into the engine room and collect there.

After approx. 2 t water has accumulated in the engine room these apertures are under the still waterline hydrostatically too, and further flooding cannot be checked.

Following an accumulation of approx. 6 t water in the engine room, further flooding in the cockpit can no longer be checked. As a result of the waves it can be assumed that water collected in the cockpit already before this.

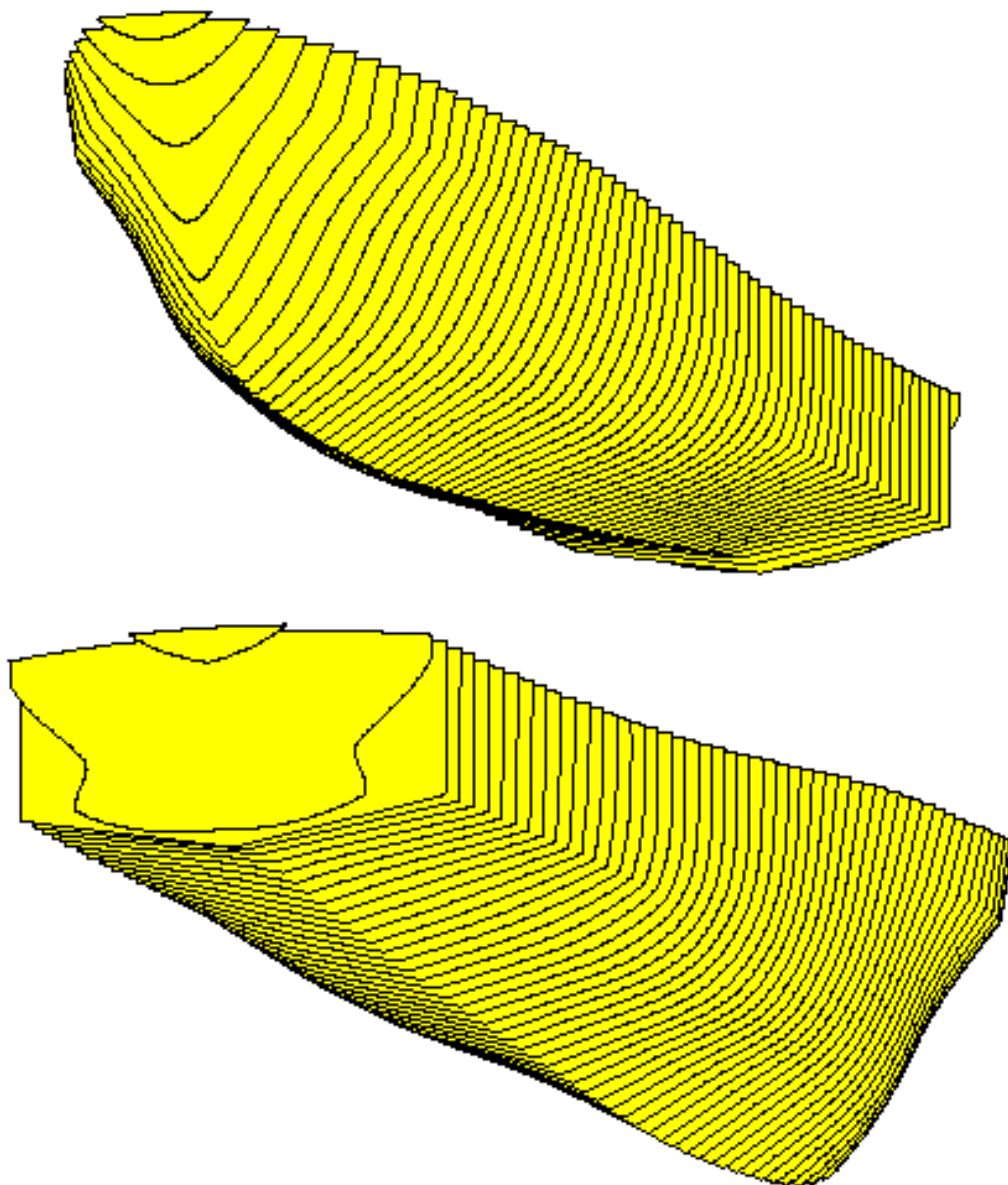
After flooding of the cockpit and the cabin - through the open door - the vessel can no longer float.

6 Summary

In the initial floating position the unprotected apertures for the engine room exhaust were only 0.35 m above the waterline.

When the vessel is moving or anchoring with the bow against the sea this value appears to have been sufficient.

In the manoeuvre to lift the anchor stone the vessel was held by the anchor line so that water infiltrated through the aforementioned apertures into the engine room due to the waves. After a certain amount of water entered the engine room it was not possible to prevent further flooding through these apertures, and after this further flooding in the cockpit, and the vessel sank.



Plot without scale !

Trim calculation

Building No. 224 SH., 265 SH and 266 SH

<i>Teil</i>	<i>Gewicht in t</i>	<i>Hebel</i>	<i>Moment</i>
<i>Stahlrumpf</i>	<i>2,749</i>	<i>5,69</i>	<i>15,656</i>
<i>Leichtmetall (Deck u. Aufbau)</i>	<i>0,579</i>	<i>4,85</i>	<i>2,803</i>
<i>Motorenanlage</i>	<i>1,339</i>	<i>2,36</i>	<i>3,160</i>
<i>Ruderanlage</i>	<i>0,162</i>	<i>1,46</i>	<i>0,237</i>
<i>E-Anlage</i>	<i>0,383</i>	<i>4,46</i>	<i>1,706</i>
<i>Holzausbau</i>	<i>0,363</i>	<i>6,39</i>	<i>2,320</i>
<i>Ausrüstung u. Beschläge</i>	<i>0,288</i>	<i>6,37</i>	<i>1,834</i>
<i>Isolierung</i>	<i>0,146</i>	<i>3,38</i>	<i>0,493</i>
<i>Farbe u. Glas</i>	<i>0,180</i>	<i>6,10</i>	<i>1,098</i>
<i>2 Personen</i>	<i>0,150</i>	<i>7,0</i>	<i>1,050</i>
<i>½ Brennstoff</i>	<i>0,185</i>	<i>5,44</i>	<i>1,006</i>
	<i>6,524</i>	<i>4,80</i>	<i>31,363</i>
<i>Verdrängungsschwerpunkt vor Spt. 0 = 4,87m</i> <i>Gewichtsschwerpunkt $\frac{31,363}{6,524} = 4,80m$ vor Spt 0</i>			

Part	Weight in t	Lever	Moment
Steel hull			
Light metal (deck and superstructure)			
Engine			
Rudder system			
Electric system			
Joinery work			
Equipment and fittings			
Insulation			
Paint and glass			
2 persons			
½ fuel			
Displacement centre of gravity before frame 0			
Centre of gravity before frame 0			

	Gewicht	LCG	L-Mom	VCG	V-Mom
Stahlrumpf	2.749	5.69	15.642	1.05	2.886
Leichtmetall (Deck + Aufb:	0.579	4.85	2.808	1.9	1.100
Motorenanlage	1.339	2.36	3.160	0.9	1.205
Rudieranlage	0.162	1.46	0.237	0.2	0.032
E-Anlage	0.383	4.46	1.708	0.9	0.345
Holzausbau	0.363	6.39	2.320	1.2	0.436
Ausrüstung u. Beschläge	0.288	6.37	1.835	1.7	0.490
Isolierung	0.146	3.38	0.493	1.1	0.161
Farbe+Glas	0.18	6.1	1.098	1.2	0.216
LSW	6.189	4.73	29.300	1.11	6.871

Gewicht = Weight

Steel hull
Light metal (deck and superstructure)
Engine
Rudder system
Electric system
Joinery work
Equipment and fittings
Insulation
Paint and glass

1 Loading Conditions

1.1 Summary

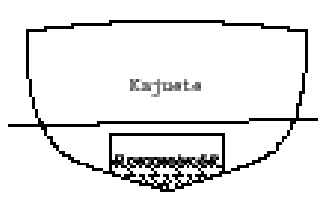
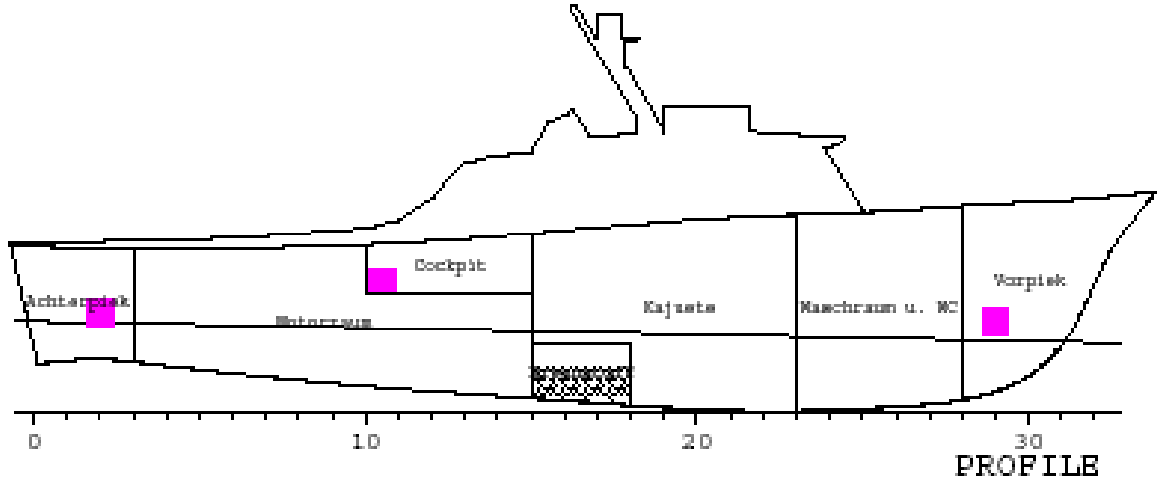
COND.	DESCRIPTION									
C20	Leeres Schiff n. Archiv-Photo									
C21	12 Pers. an Bord, LSW nach Photo									
C22	12 Pers. an Bord, LSW n. Photo, Ankerkraft 0.25t									

COND.	DISP	DW	CARGO	BUNKER	BW	T	TR	GM	KGCORR
	t	t	t	t	t	m	m	m	m
C20	8.7	2.5	0.0	0.2	0.0	0.80	-0.20	0.74	1.08
C21	10.3	4.1	1.6	0.2	0.0	0.86	-0.32	0.51	1.20
C22	10.5	4.3	1.6	0.2	0.0	0.87	-0.33	0.49	1.22

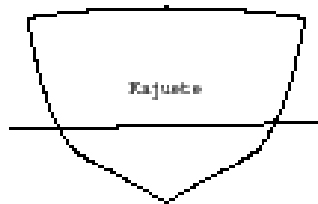
C20 = empty vessel according to archive photo
C21 = 12 persons on board, LSW acc. to photo
C22 = 12 persons on board, LSW acc. to photo, anchor force 0.25t

Annex 2: Load case C20 (Messrs. SDC) empty vessel

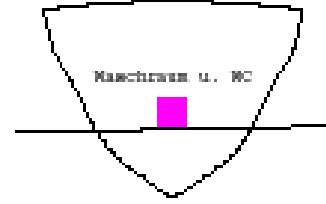
1.2 Cond. C20, Leeres Schiff n. Archiv-Photo



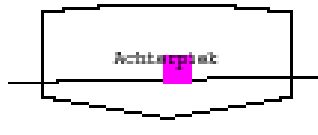
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X=#21



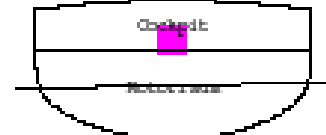
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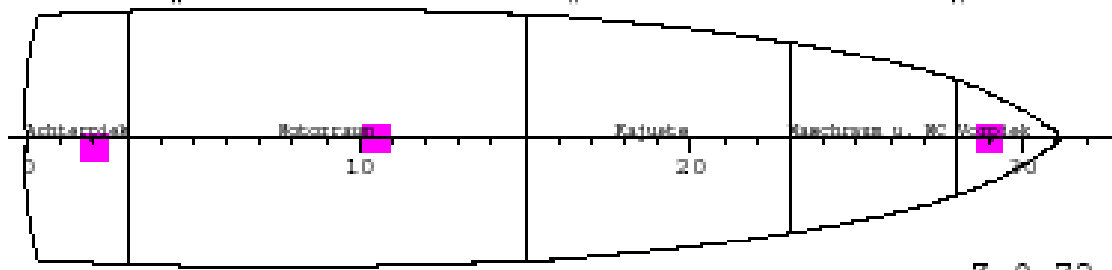
X=#1



X=#6



X=#11



Z=0.72

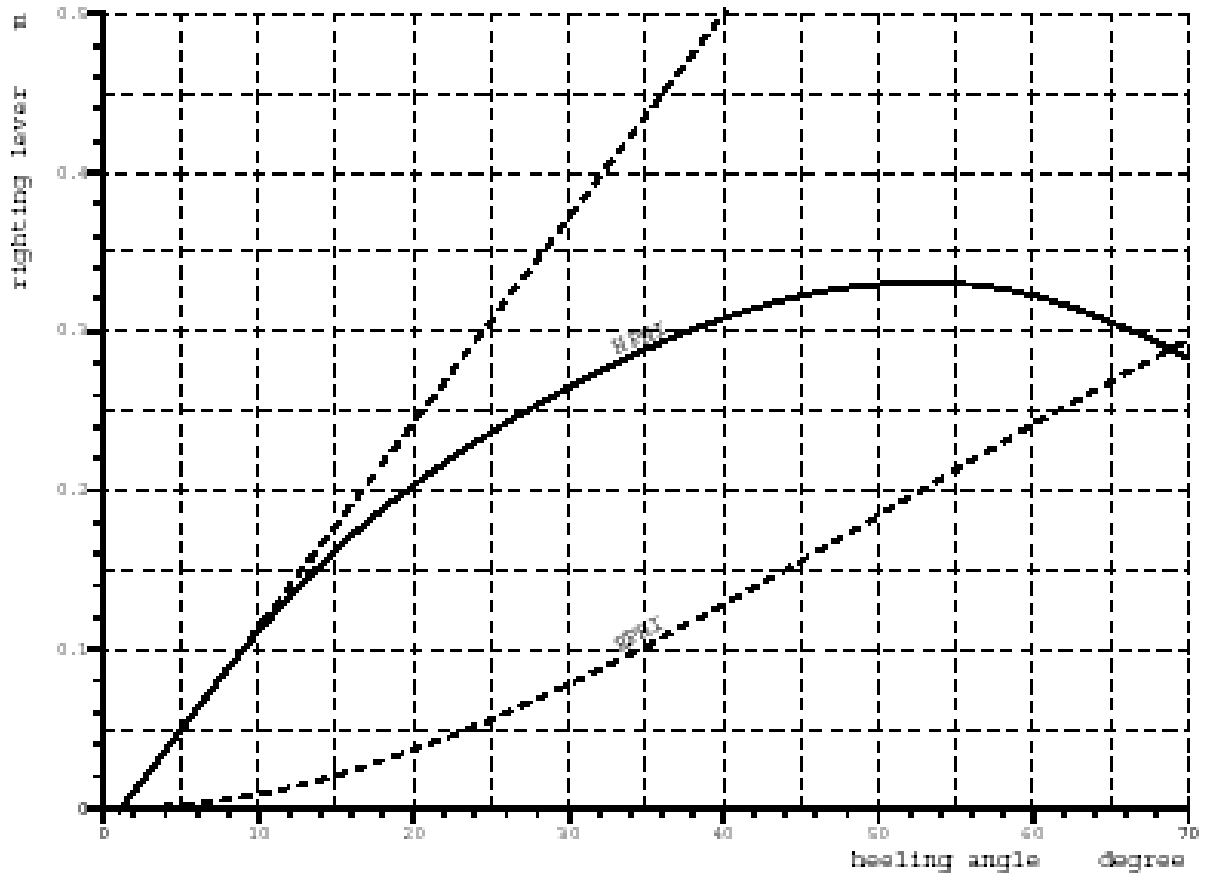
LOAD	PURP	MASS	XM	YM	ZM	FRSM
		t	m	m	m	tm
ACC	Accommodation	0.000	0.00	0.00	0.00	0
AUSR	Standard Ausruestung	2.300	3.05	-0.06	1.03	0
DO	Diesel Oil	0.211	5.04	0.00	0.31	0
MMA	Machinery	0.000	0.00	0.00	0.00	0
STO	Stores	0.000	0.00	0.00	0.00	0
TOTAL		2.511	3.22	-0.05	0.97	0
Lightweight		6.189	4.73	0.00	1.11	
Deadweight		2.511	3.22	-0.05	0.97	
Total weight		8.700	4.29	-0.01	1.07	

F L O A T I N G P O S I T I O N

Draught moulded	0.802 m	KM	1.82 m
Trim	-0.195 m	KG	1.07 m
Heel, PS=+	-1.2 deg		
TA	0.900 m	GMD	0.75 m
TF	0.705 m	GMCORR	-0.01 m
Trimming moment	-3 tcm	GM	0.74 m

RCR	TEXT	REQ	ACTV UNIT	STAT
AREA0.055	Area > 0.055 mrad up to 30 deg	0.055	0.078 mrad	OK
MINCMD.35	Min. GM > 0.35m	0.350	0.738 m	OK
RANGE60	pos. range of stability > 0.6m	60.000	68.840 deg	OK
DFLOOD	keine Niederflutung durch Geff.	0.000	0.376 m	OK

TANK	DBS	MASS	FILL	XM	YM	ZM	FRSM
		t	%	m	m	m	tm
Diesel Oil (RHO=0.86)							
Brenn.Brennstofftank #15.		0.211	49.0	5.04	0.00	0.31	0

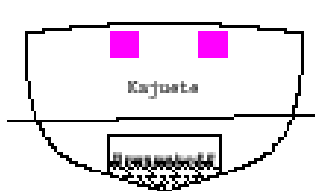
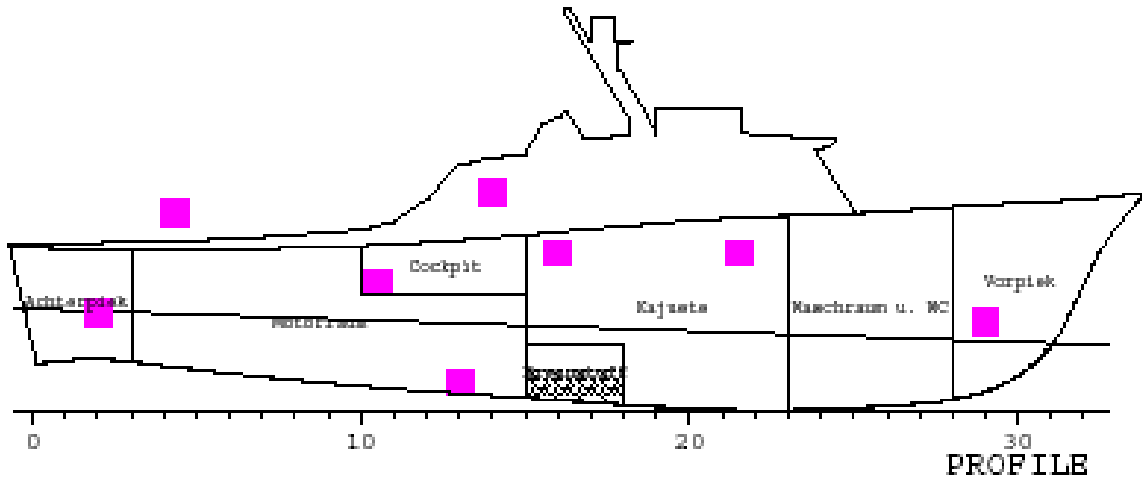


HEEL degree	KM m	KG*sin(PHI) m	FSMOM tm	DGZ m	HPHI m	EPHI rad*m
0.0	0.000	0.000	0.0	0.000	-0.015	0.000
5.0	0.158	0.093	0.0	0.001	0.049	0.002
10.0	0.314	0.186	0.0	0.002	0.111	0.009
20.0	0.587	0.365	0.0	0.004	0.203	0.037
30.0	0.817	0.534	0.0	0.005	0.265	0.078
40.0	1.012	0.687	0.0	0.006	0.308	0.128
50.0	1.163	0.819	0.0	0.006	0.330	0.184
60.0	1.260	0.925	0.0	0.005	0.322	0.241
70.0	1.297	1.004	0.0	0.005	0.283	0.295

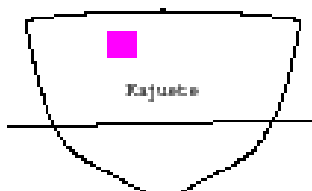
Annex 3: Load case C21 (Messrs. SDC) at the time before the anchor stone towing manoeuvre with engine power

AZ: 75/02

1.3 Cond. C21, 12 Pers. an Bord, LSW nach Photo



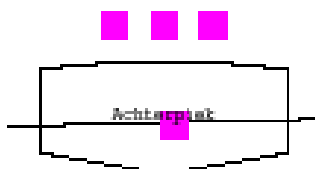
X=#16



X=#21



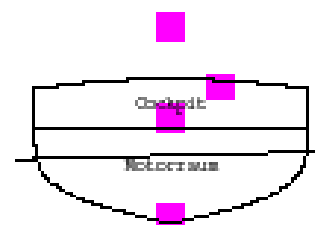
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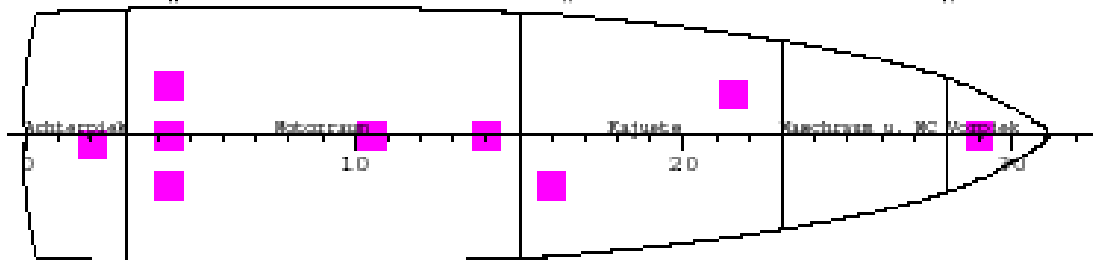
X=#1



X=#6



X=#11



Z=0.72

LOAD	PURP	MASS	KM	YM	ZM	FRSM
		t	m	m	m	tm
ACC	Accommodation	0.000	0.00	0.00	0.00	0
AUSR	Standard Ausrüstung	2.300	3.05	-0.06	1.03	0
DO	Diesel Oil	0.189	5.04	0.00	0.30	0
GEAROI		0.015	3.87	0.00	0.30	0
MMA	Machinery	0.000	0.00	0.00	0.00	0
PAI	Passengers + Luggage	1.575	2.78	-0.00	1.89	0
STO	Stores	0.000	0.00	0.00	0.00	0

TOTAL		4.079	3.04	-0.03	1.32	0

Lightweight		6.189	4.73	0.00	1.11	
Deadweight		4.079	3.04	-0.03	1.32	
Total weight		10.268	4.06	-0.01	1.19	

F L O A T I N G P O S I T I O N

Draught moulded	0.860	m	KM	1.72	m
Trim	-0.323	m	KG	1.19	m
Heel, PS=+	-1.4	deg			
TA	1.021	m	GMD	0.52	m
TF	0.698	m	GMCORR	-0.01	m
Trimming moment	-5	tonm	GM	0.51	m

RCR	TEXT	REQ	ACTV	UNIT	STAT
AREA0.055	Area > 0.055 mrad up to 30 deg	0.055	0.058	mrad	OK
MINGMD.35	Min. GM > 0.35m	0.350	0.514	m	OK
RANGE60	pos. range of stability > 0.6m	60.000	68.568	deg	OK
DFLOOD	keine Niederflutung durch Coeff.	0.000	0.310	m	OK

HOLD	DES	MASS	FILL	XM	YM	ZM
		t	l	m	m	m

Passengers + Luggage (RHO=1)						
		0.233	0.0	1.00	-0.50	2.00
		0.280	0.0	1.00	0.50	2.00
		0.432	0.0	1.00	0.00	2.00
		0.250	0.0	4.86	-0.50	1.60
		0.130	0.0	4.20	0.00	2.20
		0.250	0.0	6.68	0.40	1.60

SUBTOTAL		1.575		2.78	-0.00	1.89

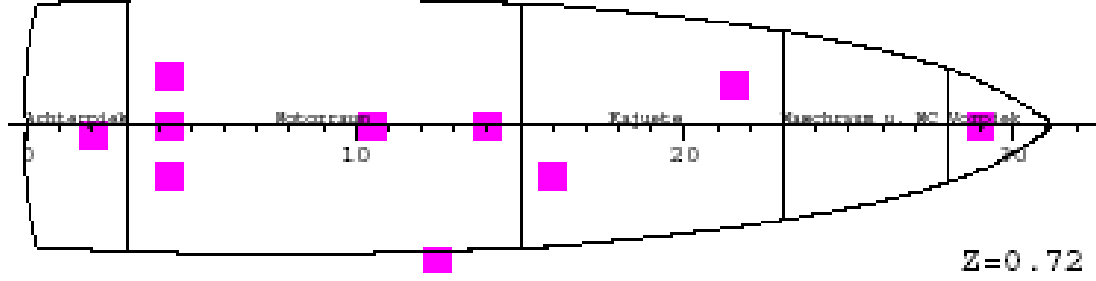
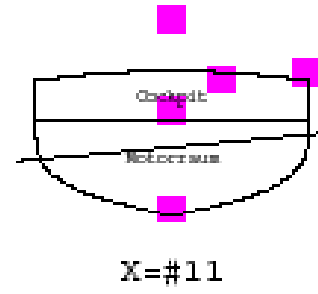
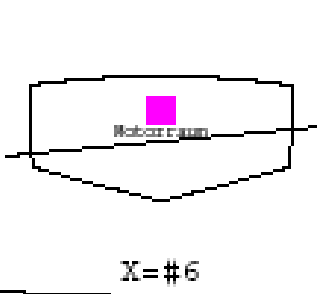
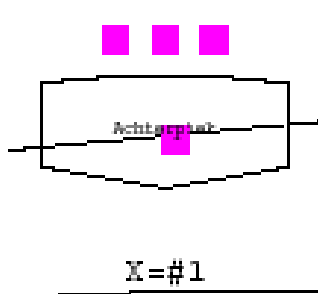
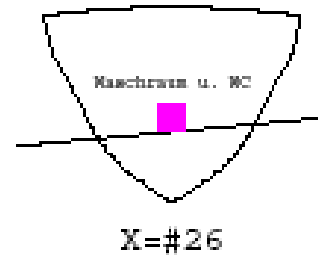
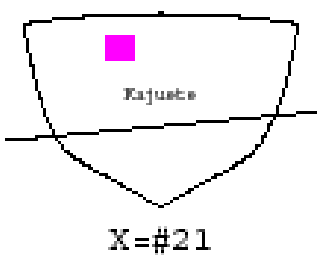
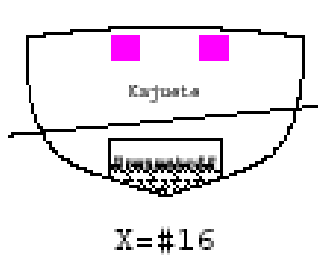
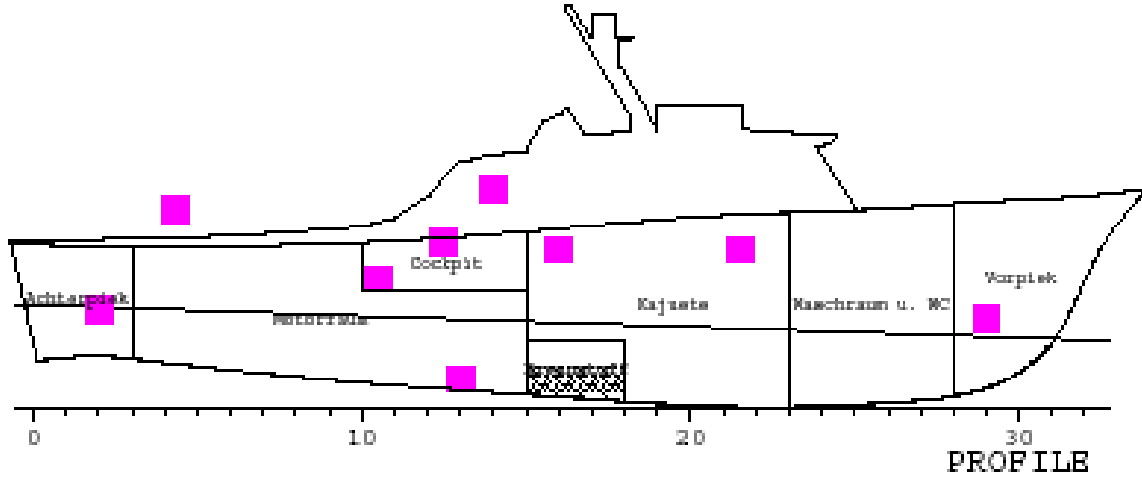
TANK	DES	MASS	FILL	XM	YM	ZM	PRSM
		t	l	m	m	m	tm

Diesel Oil (RHO=0.86)							
Brenn.Brannstofftank #15.		0.189	44.0	5.04	0.00	0.30	0

Annex 4: Load case C22 (Messrs. SDC) at the time of the anchor stone towing manoeuvre with engine power

AZ: 75/02

1.4 Cond. C22, 12 Pers. an Bord, LSW n. Photo, Ankerkraft 0.25t



HOLD	DES	MASS	FILL	XM	YM	ZM
		t	%	m	m	m

Passengers + Luggage (RHO=1)						
		0.230	0.0	1.00	-0.50	2.00
		0.280	0.0	1.00	0.50	2.00
		0.430	0.0	1.00	0.00	2.00
		0.250	0.0	4.86	-0.50	1.60
		0.130	0.0	4.20	0.00	2.20
		0.250	0.0	6.68	0.40	1.60

SUBTOTAL		1.570		2.78	0.00	1.89

TANK	DES	MASS	FILL	XM	YM	ZM	FRSM
		t	%	m	m	m	tn

Diesel Oil (RHO=0.86)							
Brenn.Brennstofftank #15.		0.189	44.0	5.04	0.00	0.30	0

Annex 5: Stability calculations (Messrs. SDC) after sea water intake up to sinking

RESULTS

CASE	STAGE	PHASE	SIDE	T m	TR n	HEEL degree	NFL t
IC22/DL	INTACTREQ		SB	0.864	-0.328	-5.0	0.0
IC22/DL	1	1	SB	0.874	-0.335	-5.3	0.2
IC22/DL	1	2	SB	0.882	-0.349	-5.7	0.5
IC22/DL	1	3	SB	0.890	-0.369	-6.1	0.7
IC22/DL	1	4	SB	0.897	-0.393	-6.9	1.0
IC22/DL	1	5	SB	0.904	-0.419	-7.8	1.2
IC22/DL	1	6	SB	0.911	-0.447	-8.7	1.5
IC22/DL	1	7	SB	0.919	-0.476	-9.6	1.8
IC22/DL	1	8	SB	0.927	-0.507	-10.4	2.2
IC22/DL	1	9	SB	0.936	-0.540	-11.1	2.5
IC22/DL	1	10	SB	0.946	-0.575	-11.8	2.9
IC22/DL	1	11	SB	0.957	-0.613	-12.3	3.3
IC22/DL	1	12	SB	0.970	-0.654	-12.7	3.8
IC22/DL	1	13	SB	0.984	-0.702	-13.1	4.2
IC22/DL	1	14	SB	0.998	-0.756	-13.7	4.7
IC22/DL	1	15	SB	1.014	-0.822	-14.6	5.3
IC22/DL	1	16	SB	1.028	-0.912	-16.0	5.9
IC22/DL	1	17	SB	1.047	-1.026	-17.3	6.6
IC22/DL	1	18	SB	1.076	-1.153	-17.3	7.3
IC22/DL	1	19	SB	1.117	-1.307	-16.3	8.0
IC22/DL	1	20	SB	1.172	-1.536	-13.9	8.8
IC22/DL	1	EQ	SB	1.263	-1.936	-8.0	9.6

RELEVANT OPENINGS

PHASE	STAGE	NAME	X m	Y m	Z m	IMMA degree	IMMR m
1	1	OMASCHR. STB	-0.42	-1.000	1.370	17.6	0.216
1	1	OCOCKPIT. S.	2.88	-1.200	1.600	31.4	0.539
2	1	OMASCHR. STB	-0.42	-1.000	1.370	16.5	0.194
2	1	OCOCKPIT. S.	2.88	-1.200	1.600	30.6	0.520
3	1	OMASCHR. STB	-0.42	-1.000	1.370	15.3	0.166
3	1	OCOCKPIT. S.	2.88	-1.200	1.600	29.8	0.497
4	1	OMASCHR. STB	-0.42	-1.000	1.370	14.1	0.130
4	1	OCOCKPIT. S.	2.88	-1.200	1.600	29.0	0.466
5	1	OMASCHR. STB	-0.42	-1.000	1.370	12.8	0.090
5	1	OCOCKPIT. S.	2.88	-1.200	1.600	28.1	0.431
6	1	OMASCHR. STB	-0.42	-1.000	1.370	11.4	0.049
6	1	OCOCKPIT. S.	2.88	-1.200	1.600	27.2	0.396
7	1	OMASCHR. STB	-0.42	-1.000	1.370	10.0	0.007
7	1	OCOCKPIT. S.	2.88	-1.200	1.600	26.3	0.360
8	1	OMASCHR. STB	-0.42	-1.000	1.370	8.4	-0.035
8	1	OCOCKPIT. S.	2.88	-1.200	1.600	25.4	0.325
9	1	OMASCHR. STB	-0.42	-1.000	1.370	6.7	-0.078
9	1	OCOCKPIT. S.	2.88	-1.200	1.600	24.4	0.290
10	1	OMASCHR. STB	-0.42	-1.000	1.370	4.8	-0.121
10	1	OCOCKPIT. S.	2.88	-1.200	1.600	23.4	0.256
11	1	OMASCHR. STB	-0.42	-1.000	1.370	2.8	-0.165
11	1	OCOCKPIT. S.	2.88	-1.200	1.600	22.3	0.223
12	1	OMASCHR. STB	-0.42	-1.000	1.370	0.6	-0.209
12	1	OCOCKPIT. S.	2.88	-1.200	1.600	21.2	0.191
13	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-0.257
13	1	OCOCKPIT. S.	2.88	-1.200	1.600	20.0	0.156
14	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-0.315
14	1	OCOCKPIT. S.	2.88	-1.200	1.600	18.7	0.114
15	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-0.384
15	1	OCOCKPIT. S.	2.88	-1.200	1.600	17.2	0.063
16	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-0.479
16	1	OCOCKPIT. S.	2.88	-1.200	1.600	15.6	-0.008
17	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-0.589
17	1	OCOCKPIT. S.	2.88	-1.200	1.600	13.8	-0.087
18	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-0.687
18	1	OCOCKPIT. S.	2.88	-1.200	1.600	11.8	-0.143
19	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-0.785
19	1	OCOCKPIT. S.	2.88	-1.200	1.600	9.2	-0.186
20	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-0.905
20	1	OCOCKPIT. S.	2.88	-1.200	1.600	5.3	-0.222
EQ	1	OMASCHR. STB	-0.42	-1.000	1.370	-	-1.077
EQ	1	OCOCKPIT. S.	2.88	-1.200	1.600	-	-0.242