



**HELLENIC REPUBLIC
HELLENIC BUREAU FOR MARINE CASUALTIES' INVESTIGATION**



**MARINE CASUALTY SAFETY INVESTIGATION REPORT
04/2018**

GROUNDING AND FOUNDERING OF TUG BOAT VIKING



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Contents

Foreword	3
Glossary of possible Abbreviations and Acronyms	4
1. Executive Summary	5
2. Factual information	7
2.1 Ship particulars.....	7
2.1.1 VIKING.....	7
2.1.2 NEPTUN KHAN	8
2.2 Voyage Particulars.....	8
2.3 Marine Casualty information	9
2.4 Shore authority involvement and emergency response.....	9
3. Narrative	10
3.1 Voyage segment from Alexandria to the S of Crete	10
3.2 Drifting towards the coast.....	11
3.3 Grounding.....	12
3.4 Abandonment and sinking of the VIKING	13
3.5 The crew members.....	15
3.6 VIKING's particulars.....	15
3.6.1 Vessel layout.....	15
3.6.2 Voyage particulars	15
3.7 Cooperation in the investigation.....	16
4. Analysis	17
4.1 Operational ability of VIKING and her crew	17
4.2 Selecting a place of refuge and keeping position	17
4.2.1 Risk assessment	18
4.2.2 Work/rest hours	18
4.3 Emergency handling	19
5. Actions Taken	20
6. Conclusions	21
7. Safety Recommendations	21

Foreword

The Hellenic Bureau for Marine Casualties' Investigations (HBMCI) was established by Law 4033/2011 (Government Gazette 264/12.22.2011), in the context of implementing EU Directive 2009/18/EC. HBMCI conducts technical investigations into marine casualties or marine incidents with the sole objective to identify and to ascertain through respective analysis, the circumstances and contributing factors that led to them and to draw useful conclusions and lessons learned that may lead, if necessary, to safety recommendations addressed to parties involved or stakeholders interested in the marine casualty, aiming to prevent similar future marine accidents.

The conduct of Safety Investigations into marine casualties or incidents is independent from criminal, discipline, administrative or civil proceedings whose purpose is to apportion blame or determine liability. This investigation report has been produced without taking under consideration any administrative, disciplinary, judicial (civil or criminal) proceedings and with no litigation in mind. It does not constitute legal advice in any way and should not be construed as such. It seeks to understand the sequence of events which occurred on the 7th of December 2018 and resulted in the examined very serious marine casualty. Fragmentary or partial use of the contents of this report, for other purposes than those produced may lead to misleading conclusions. The investigation report has been prepared in accordance with the format of Annex I of respective Law (Directive 2009/18/EC) and all times quoted are local time (LT) unless otherwise stated (UTC +2).

Under the above framework HBMCI has been examining the grounding and foundering of the tug boat VIKING and the towed dredger NEPTUN KHAN, which occurred on the 7th of December 2018, at the sea area of Mesaras Gulf (South of Crete Island).

Glossary of possible Abbreviations and Acronyms

1	A/B	Able seaman
2	AIS	Automatic identification system
3	Bf	Force of wind in Beaufort scale
4	CoC	Certificate of Competency
5	D/G	Diesel Generator
6	DOC	Document of Compliance
7	GMDSS	Global maritime distress and safety system
8	GPS	Global positioning system
9	GT	gross tonnage
10	HCG	Hellenic Coast Guard
11	IMO	International Maritime Organization
12	ISM	International Management Code for the safe operation of ships and for pollution prevention
13	knots	unit of speed equal to one nautical mile (1.852 km) per hour
14	KW	Kilowatt
15	LT	local time
16	nm	nautical miles
17	2/O	2 nd Officer
18	C/O	Chief Officer
19	O(s)OW	Officer(s) on the watch
20	O/S	Ordinary Seaman
21	PPE	Personal protection equipment
22	SMC	Safety management certificate
23	SMS	Safety management system
24	SOLAS	Convention for the Safety of Life at Sea 1974, as amended
25	STCW	International Convention on Standards of Training, Certification and Watchkeeping for seafarers
26	UTC	Coordinated Universal Time
27	VDR	Voyage Data Recorder
28	VHF	Very high frequency (radio)

1. Executive Summary

On the 6th of December 2018, at approximately 19.00, the Coast Guard Authority of Agia Galini (Grete island, Greece) received a call via VHF from the tug boat VIKING, requesting permission to deviate from her route and enter the Greek territorial waters to take safe refuge near the coast due to adverse weather conditions. VIKING was towing the dredger NEPTUNE KHAN, from the port of Alexandria (Egypt) which she departed on the 2nd of December, to Palma de Mallorca (Spain). The voyage plan would include an intermediate stop to Tunis, for supplies, however due to the bad weather forecast the master decided to take safe refuge until the weather improves.

The VIKING was instructed by the Coast Guard authorities, to choose a place of refuge but keep a distance from the coast around 1.5 nm for safety reasons. The tug boat then entered the Gulf of Mesaras (S of Crete island) and from 00.25 remained at anchor at the predefined distance from the coast, approximately 1.5 nm W of the fishing port of Agia Galini.

However, from 03.00, of the 7th of December it became obvious to the C/O who was on watch, that the convoy (tug boat and towed dredger) were drifting towards the coast. The Master was called and while the distance from the coast was by then approximately 1.2 nm attempts were made to keep the convoy in position. Despite such efforts the convoy continued drifting towards the coast and at 04.20 the VIKING requested from the Coast Guard for assistance. Although several vessels from the whereabouts were notified, they were not possible to approach the area due to the wind (N 7-8 Bf) and sea condition. At approximately 05.00 LT the distance from the coast was only 50 m and thereafter the dredger first grounded on the rocks, along with the tug boat a few minutes later between 05.40 and 06.00, at the position of the coastal inlet of Mesaras Gulf (Lat.: 34° 59.9' N – Long.: 024° 44.8' E).

The crew of the tug boat had already stopped the engines and secured all valves for fuel and lubricants' tanks and abandoned the ship directly to the coast with the assistance of the local authorities.

On board the VIKING there were 20 MT (Metric Tones) of diesel oil and 400 Ltr (Litres) of lub oil, while the NEPTUNE KHAN was empty of cargo and fuel. According to information by the local Coast Guard authority, both tug boat and dredger sank in the above referred sea area, due to adverse weather conditions in the following hours. During the evacuation, one of the 08 crew-members was in need of first aid, which was provided by the shore authorities (an ambulance arrived shortly in the casualty area).

The dredger NEPTUNE KHAN was salvaged after some months, by her owners.

Investigation on the causes of the grounding and sinking of the tug boat and the towed dredger revealed that under the prevailing adverse weather, a combination of inadequate risk assessment by the Master and C/O of the VIKING, lack of support from established processes for contingencies in case of bad weather and emergency handling, fatigue and commercial pressure resulted in the casualty.

HBMCI made a recommendation to the ownership company to establish relevant processes in order to support the Masters and officers on board its other vessels in case of adverse weather and emergency situations, during ocean towage.

2. Factual information

Note:

This report is mainly based on information from the evidence that have derived from the interviewing process of the crew members of the tug boat, the data and photographs collected by the local Coast Guard Authorities (Coast Guard Authority of Kokkinos Pyrgos) and the data available from the Integrated Maritime Data Environment (IMDatE), available on EMSA portal.



Figure 1: tug boat VIKING

2.1 Ship particulars

2.1.1 VIKING

Vessel's name:	VIKING
Type of vessel:	Tug boat
Flag:	Tunisia
Port of registry:	n/a
IMO number:	8139364
Call sign:	3V5261
DOC company (operator):	SOTRAMAR (SOCIETE TUNISIENNE DE REMORQUAGE D'ASSISTANCE ET DE TRAVEAUX MARITIME)
IMO company no.:	0103849
Date of construction:	1957
Shipyard/Place of built:	n/a
Classification society:	Bureau Veritas
Length overall:	26.90 (m)
Breadth overall:	6.64 (m)
Gross tonnage (registered):	123
Net tonnage:	n/a
Number/brand of main engines:	1 internal combustion engine / SKL VD 29/24
Main Engine max. output:	2413 (BHP)
Hull material:	Steel
Bollard pull (static)	32 Tons (313.81 KN)



Figure 2: Dredger NEPTUN KHAN

2.1.2 NEPTUN KHAN

Vessel's name:	NEPTUN KHAN
Type of vessel:	Dredger
Flag:	Spain
Port of registry:	n/a
IMO number:	8955134
Call sign:	ECJR
DOC company (operator):	NAVIERA DAEDALUS, S.L.
IMO company no.:	n/a
Date of construction:	1999
Shipyard/Place of built:	n/a
Classification society:	n/a
Length overall:	40.00 (m)
Breadth overall:	8.50 (m)
Gross tonnage (registered):	268
Net tonnage:	n/a
Number/brand of main engines:	No engine
Main Engine max. output:	---
Hull material:	Steel

2.2 Voyage Particulars

Port of departure:	Alexandria (Egypt)
Port of destination:	Palma de Mallorca (Spain)
Type of voyage:	International
Cargo/passengers information:	NEPTUN KHAN (unmanned) was towed by VIKING
Safe Manning:	6
Manning:	8

2.3 Marine Casualty information

Type of marine incident:	Grounding - foundering
IMO Classification:	Very Serious marine casualty
Date, time	07-12-2018, 08.10 LT
Location	Southern Crete Island (Mesaras Gulf)
Position (approx..)	34.9996 N, 024.7469 E
Ship's voyage segment:	Rocky coast
Place on board:	Vessel side and bottom
Human factor data:	(See analysis part)
Consequences to individuals:	1 person in need of first aid
Consequences to environment:	None
Consequences to property:	Loss of tug boat, foundering of dredger (later on salvaged)

2.4 Shore authority involvement and emergency response

Who was involved	<ul style="list-style-type: none"> Local HCG authorities (Agia Galini, Kokkinos Pyrgos) JRCC Piraeus Local ambulance service Local fire brigade
Means used:	<ul style="list-style-type: none"> VHF communication Land vehicles (HCG, ambulance and fire brigade)
Speed of response	On time (according to the needs)
Actions taken	<ul style="list-style-type: none"> Offer of permission for safe refuge Continuous monitoring of the situation Response to assistance to tug boat by activating local emergency search and rescue plan HCG and Fire brigade officers dispatched on the shore
Results achieved	<ul style="list-style-type: none"> Local vessels were unable to approach and offer assistance to avoid the grounding of the tug boat or evacuate crew, due to adverse weather conditions All crew members were safely evacuated to the shore 1 crew member was provided with first aid on the spot

3. Narrative

3.1 Voyage segment from Alexandria to the S of Crete

VIKING was a conventionally propelled tug boat under the flag of Tunisia, built in 1983 and owned by SOTRAMAR, a Tunisian company, based in Sfax, which activates mostly in tow and port operations. On the 2nd of December 2018 the VIKING departed the port of Alexandria (Egypt), with a crew of 8 people, towing the Spanish flagged dredger NEPTUNE KHAN (unmanned vessel without propulsion), with destination the port of Palma de Mallorca (Spain). The voyage plan would include an intermediate stop at Tunis for supplies.

For this voyage a Certificate of Safe Towage had been issued by the International Register of Shipping, on the 29th of November 2018, for compliance with the IMO Guidelines for safe ocean towage (MSC/Circ.884) while the VIKING had acquired a permission to carry out the voyage Sfax (Tunisia) – Alexandria (Egypt) – Palma de Mallorca (Spain) – Sfax (Tunisia) from the Tunisian flag authorities, issued on the 21st of November 2018.

The convoy (hereinafter: convoy is both the VIKING with the towed NEPTUNE KHAN) kept an average speed of 3 to 4 knots, with navigation mainly on auto-pilot and the duration of the voyage was scheduled to be around 20 or more days, covering a total distance of more than 1510 nm. The tow connection consisted of the 2 tow lines, which were connected with wires at the end to the tug boat and with a double rope bond on each bow quarter side of the dredger. The length of the tow lines used was approximately 100 m.

Between the 5th and the 6th of December while the convoy was on route in international waters at the sea area S of Crete island (Greece), the vessel received a weather forecast for strong winds (N 8-9 Bf) from NAVTEX and quite soon the convoy started facing deteriorating weather conditions. The speed was kept at an average of 3.5 knots since the tug boat was rolling due to the sea conditions.

At approximately 19.00 the Master contacted the local Coast Guard authorities (HCG Station of Agia Galini) by VHF and requested for permission to enter the Greek territorial waters to seek for a safe refuge area and avoid the adverse weather. By 20.00 the permission had been granted and the instruction to select a position at a distance of 1.5 nm from the coast had been provided by the Coast Guard authorities, so VIKING changed her heading to make way towards the S coast of Crete.

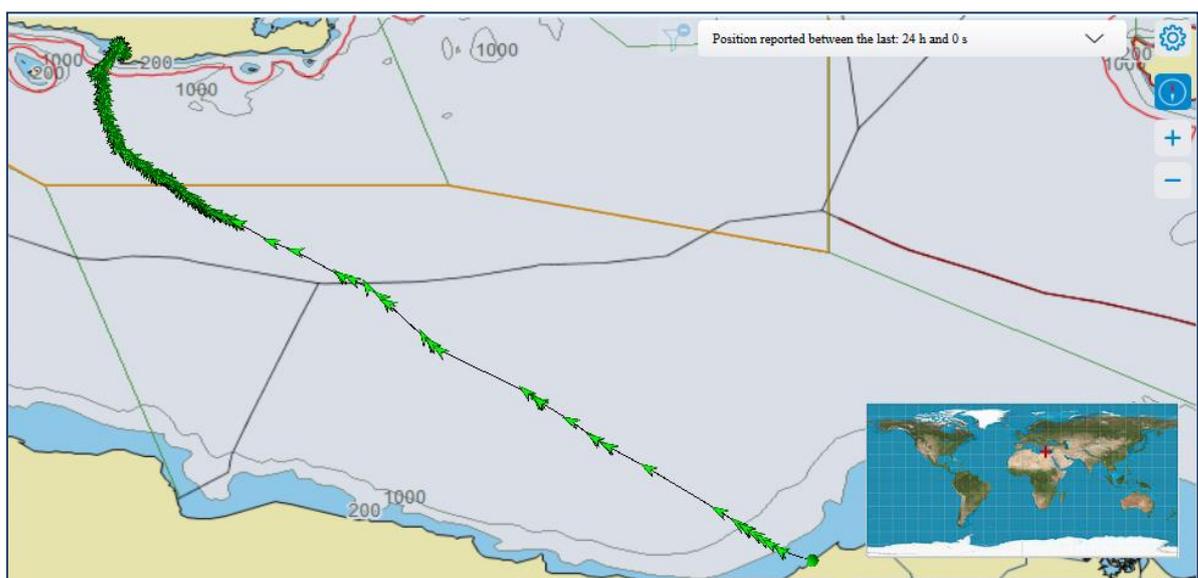


Figure 3: The route followed by the convoy of T/B VIKING and towed vessel, from Alexandria (Egypt) to the S of Crete island (Greece) (source: EMSA/IMDatE)

By 21.00 the vessel encountered winds of N direction with force around 9 Bf. At approximately 00.25 of the 7th of December, the convoy had arrived at the position chosen by the Master of VIKING, within the Gulf of Mesaras, where she anchored, at a distance of 1.5 nm from the coast. The vessel encountered strong winds at that area with gusts exceeding 50 knots. For anchoring they used one anchor which the Master had assessed to be enough to hold the convoy in position.

The Master handed over the watch to the Chief Officer in order to take some rest.

3.2 Drifting towards the coast

Due to the wind and sea conditions, the convoy was continuously drifting towards the coast as shown in the next figure.

At approximately 03.00 of the 7th of December the Chief Officer called the Master on the bridge and they tried to hold the convoy in position by using the anchor and the engines. At that time the VIKING was 1.2 nm from the coast.

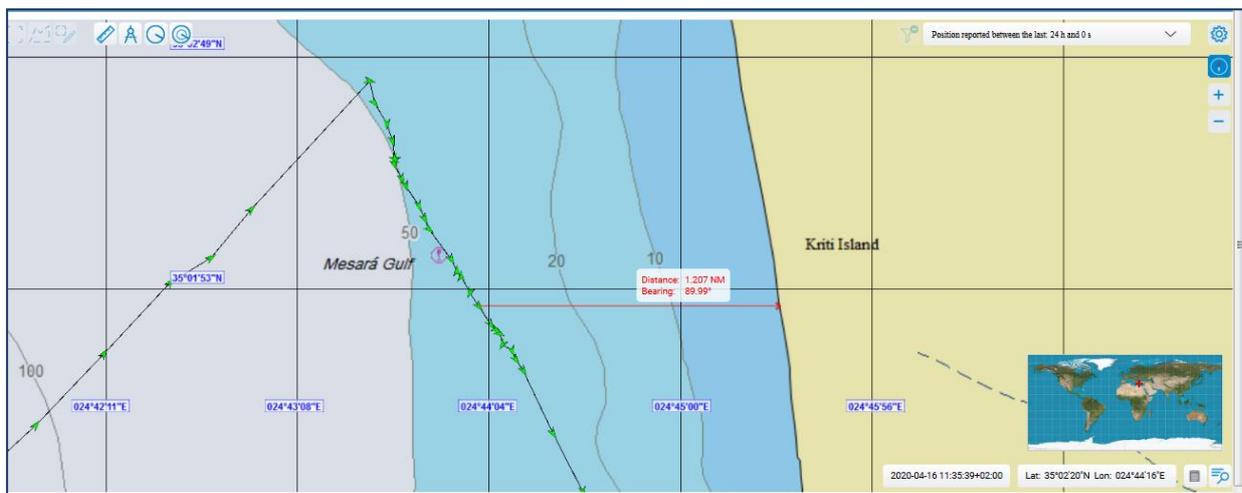


Figure 4: The position of the VIKING from the coast when the Master was summoned to take control.

(source: EMSA/IMDatE)

The Master took control of the engines, while the C/O was managing the anchor (heaving and dropping as per Master's order). Despite such efforts the convoy continued to drift towards the coast.

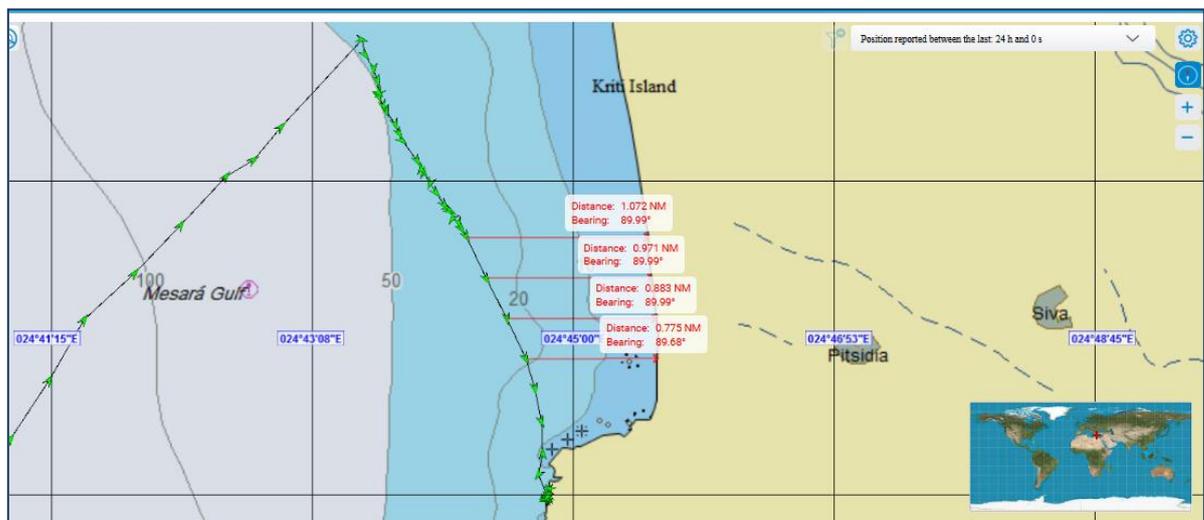


Figure 5: The continuous drifting of the convoy towards the coast. The four positions marked with their distance from the coast are within the time period from 04.10 to 04.38 (1 position every approx.10 minutes)

The Master tried to call for assistance from any tug boat or other vessel in the vicinity via VHF channel 16. However, no tug boat existed near the area, since only fishing ports exist in the specific part of the island, while the adverse weather conditions were deterrent for any fishing vessel to offer effective and imminent assistance.

Thereafter the convoy continued to drift towards the rocky coast.

3.3 Grounding

While attempts to move the convoy away from the coast were ongoing but without result, the towed dredger was the first to ground on the sea bottom near the coast, with her port side towards the coast. However, attempts to save the tug boat continued.

Within 30 to 40 minutes the tug boat had drifted south of the grounded dredger and since attempts to move the vessel away from the coast were unsuccessful, the Master chose to remain near the coast and since grounding seemed inevitable, at least ensure that in case of abandonment the proximity to the coast would be minimal.

At 05.40 the VIKING grounded on the sea bottom a few meters from the rocky coast, with her port side towards the coast. The Master then ordered to check the vessel for damages, while he reported the grounding to the Coast Guard authorities, requesting for immediate assistance. The C/O checked below deck and found out that the vessel had suffered damage to her hull and water ingress was ongoing.

The Master ordered to stop the engines and secure all vessel's fuel and lubricant tanks. Then he ordered to prepare the STBD life raft for abandonment and wait for assistance from the shore. However, due to the wave impact and the water ingress, the VIKING started to girt towards her STBD side, rendering within a few minutes the life raft not possible to deploy.

It should be noted here, that as visual evidence reveals, the tow line from the dredger remained attached to the tug boat, even after the grounding of the latter.



Figure 6: Captures during the grounding of VIKING; in the left image, the two lines indicated are the ones used for abandonment and the tow line, still attached to the dredger. In the right image the tow line is discerned floating (within red ellipse).



Figure 7: Capture after the sinking of VIKING. The tow line to the dredger is still floating, attached on VIKING (red ellipse).

3.4 Abandonment and sinking of the VIKING

At that point, vehicles of the Coast Guard authorities and local Fire Brigade had arrived on the coast side, since nearby vessels and Coast Guard patrol or SAR boats could not safely approach the area from the sea side, due to the adverse weather and sea conditions.

The crew of VIKING abandoned the vessel one by one, with the assistance of the Coast Guard and Fire Brigade officers by the use of a line thrown from the tug boat towards the coast. All of them reached the coast safely and the VIKING remained semi-foundered on her STBD side. One crew member was provided with first aid by the crew of an ambulance which had arrived at the scene, without further need of hospitalization.



Figure 8: capture during the abandonment of VIKING.

Within the next hours the VIKING foundered due to the water ingress and wave impact, while the dredger also foundered due to the same conditions.



Figure 9: Both VIKING (left capture) and NEPTUNE KHAN (right capture) foundered following their grounding on the rocky coast.



Figure 10: VIKING and NEPTUNE KHAN foundered; being still connected with the towing line they were drifting together under the waves' impact

Anti-pollution measures were taken the soonest possible; no pollution was reported from the sinking of the two vessels.

The managing company of NEPTUNE KHAN salvaged the vessel on the 13th of February 2019.



Figure 11: capture of the NEPTUNE KHAN on the salvage platform

3.5 The crew members

The key crew members that were interviewed for the accident are the following:

1. **Master:** the 65 years-old, Tunisian Master had served on board the VIKING for 1 and a half year. He had accumulated 33 years of experience on board tug boats as Master, 6 years on cargo vessels as 2nd Mate and 5 years on passenger ships. He had a pretty good knowledge of the vessel. He could not communicate very well in English and for his interview a translator was used. At the time of the accident he was at the bridge.
2. **Chief Officer:** the 26 years-old, Tunisian C/O had 1 month on the VIKING as Chief Officer. In the past he had served on navy ships for 6 years, 1 year on cargo ship as deck officer cadet, 1 year as Chief Officer on a small cargo vessel (below 500 GT) and 3 months as a Master on board a tug boat. He could speak and understand English very well. At the time of the accident he was on deck, following the instructions of the Master and handling the anchor.
3. **Chief Engineer:** The Chief Engineer was 25 years old, also Tunisian. He had almost 6 months on the VIKING and it was his first time on board a tug boat. He could speak and understand English well and at the time of the accident he was in the engine room, following the instructions of the Master.

The rest of the crew included: and engine officer, an oiler, an A/B who also acted as cook and 2 A/Bs who acted as watchmen, all of them of Tunisian nationality.

It should be mentioned here that information on the seafarers' experience is based on their statements. Also, all the aforementioned crew members held proper certificates for their ranks and duties under the Tunisian administration, while the number of crew covered the minimum safe manning provisions as per number and duties, according to the Minimum Safe Manning document issued by the Tunisian administration, which provided for a total 6 crew (Master, C/O, C/E, oiler, A/B, cook).

3.6 VIKING's particulars

3.6.1 Vessel layout

The VIKING was a typical tug boat, with simple built and layout, with a common propulsion and steering system. The navigational equipment included 2 radars, GPS, compass and depth meter, while the communications' equipment included 3 VHF devices, VSS sound reception system, NAVTEX and AIS.

The towing arrangement, including the emergency release mechanism, was mechanical-hydraulic.

No problems of any nature, concerning the operation of the vessel and her equipment were reported.

The working language on board the vessel was Arabic.

3.6.2 Voyage particulars

The VIKING had issued a permission to sail for a single international voyage, from Sfax (Tunisia) to Alexandria (Egypt), then Palma de Mallorca (Spain) and eventually return to Sfax. The permission was issued by the Tunisian administration, as the vessel carried the Tunisian flag, on the 21st of November 2018 and was valid for 2 months.

Moreover, for the specific voyage for the towage of NEPTUNE KHAN from the VIKING and in terms of safety provisions, a certificate of Safe Towage, from the International Register of Shipping had been issued on the 29th of November 2018, with validity until the 28th of February 2019. This certificate mentioned that it was issued under the IMO guidelines For Safe Ocean Towing (MSC/Circ.884) and included recommendations of safe towage, as shown in the next figure.

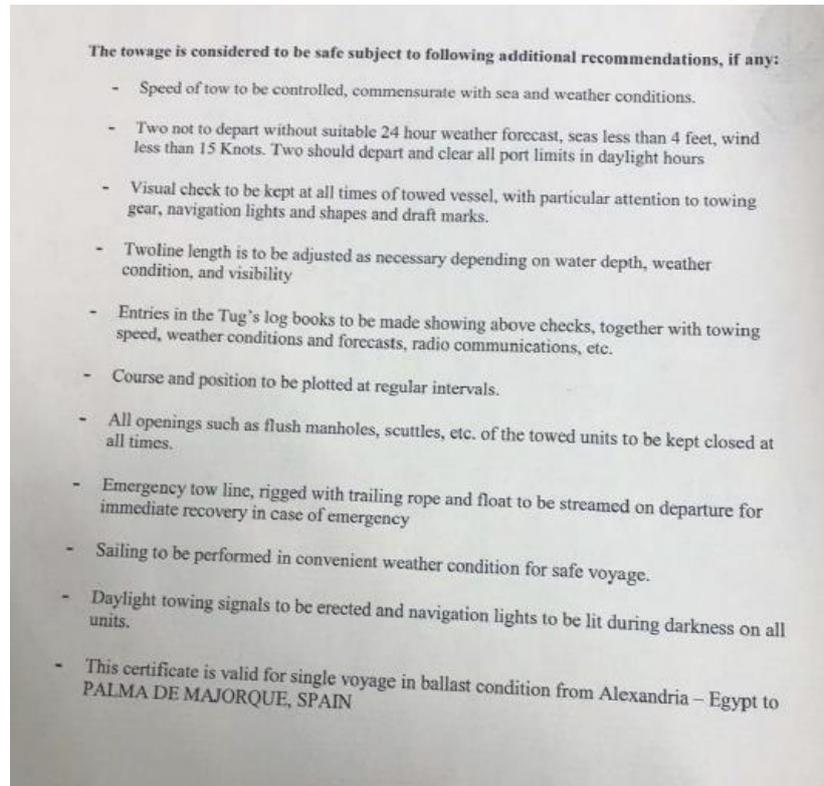


Figure 12: recommendations for a safe towage for the voyage from Alexandria to Palma de Mallorca, on the Safe Towage Certificate

3.7 Cooperation in the investigation

The HBMCI started its safety investigation, under EU Dir.2009/18/EC and the IMO CIC, on the day of the accident. Initial data was collected and a notification was sent to the Substantially Interested States (Tunisia and Spain) on the 10th of December 2018, followed by a request for assistance in gathering data, evidence and information from the owner companies of the VIKING and the NEPTUNE KHAN on the 12th of December. The Spanish accident investigation body (CIAIM) acknowledged the notification and assumed the role of Substantially Interested State, while it forwarded a request for data to the owner company of NEPTUNE KHAN. There was no reply from the Tunisian state authorities and from the owner company of the VIKING, despite several attempts from HBMCI's part.

The reply for provision of information and certificates was provided by the owner company of the NEPTUNE KHAN, through the CIAIM after repeated requests, more than 1 year after the accident (18 October 2019).

It should be noted here that the VIKING's log book was not collected by the crew during abandonment and was not found. Other documents, which were carried on the shore when the tug boat was abandoned, were collected by the investigators with the assistance of local Coast Guard authorities.

4. Analysis

The analysis of the examined marine casualty aims to identify the factors and causes that contributed to the marine casualty, taking into account the sequence of events and the collection of information during the investigation process.

4.1 Operational ability of VIKING and her crew

As mentioned in paragraph 3.6.2, the VIKING had been certified for one international voyage, towing the NEPTUNE KHAN, with a Safe Towing Certificate. This certificate was reportedly issued under the provisions of MSC/Circ.884, entitled "Guidelines for Safe Ocean Towing". This circular contains guidelines for ocean towing which have an advisory status and includes some provisions and processes to be followed on board.

From the evidence obtained during the investigation, the levels of adherence to the provisions of the above circular on board the VIKING have been questioned whatsoever. In paragraph 6.2 of the circular there is reference of "[...] a contingency plan to cover the onset of adverse weather, particularly in respect of arrangements for heaving to or taking shelter [...]". In terms of contingency planning on VIKING, everything came up reportedly to the Master's decision, based on his experience and assessment of the situation (which is further examined in the next chapter), without further support in terms of contingency plans or processes.

There are also doubts on the level of English knowledge of the Master, which is a provision of STCW (Code Part A, Ch.IV, Section A-IV/2) on radio operators. It should be noted that the Master kept the 06.00-12.00 and 18.00-24.00 watch, on a 6 on – 6 off system with the Chief Officer; however during the interview he could not demonstrate the knowledge of spoken English. Thereafter, based on the provisions of the aforementioned circular on ocean towing, in paragraph 5.1, "[...] should be manned to operate the towing vessel on a 24 – hour basis in accordance with the STVW Code", such manning was questionable.

Further on, as per paragraph 11.5 of the circular, a towing log should be kept with information according to Appendix B of the circular; however, such information were not kept on board, as the Master and Chief Officer were not aware of such an obligation or commitment.

Consequently, the operational ability of the VIKING and her crew, based on the advisory provisions of the MSC/Circ.884 which provides safety measures for ocean towing, were questionable, especially in terms of contingency planning, which would support any decision making of the Master; this is considered a contributing factor to the accident.

4.2 Selecting a place of refuge and keeping position

The adverse weather on the convoy of VIKING and NEPTUNE KHAN was definitely one of the factors that contributed to the accident. Upon receiving the weather forecast and of course by monitoring the weather and sea conditions, the Master of VIKING decided to change her route and head towards to S of Crete Island in order to take shelter.

With the refuge place selected within the Gulf of Mesaras and the VIKING remaining at anchor, the Master assessed that the state of the convoy was safe and handed over the watch to the Chief Officer, around 00.25. At that point the convoy was approximately 1.5 nm W off the coast.

The Chief Officer who remained on watch notified the Master at approximately 03.00, when the convoy was at 1.2 nm from the coast, but had already drifted for more than 1 nm, under the waves' and wind's impact.

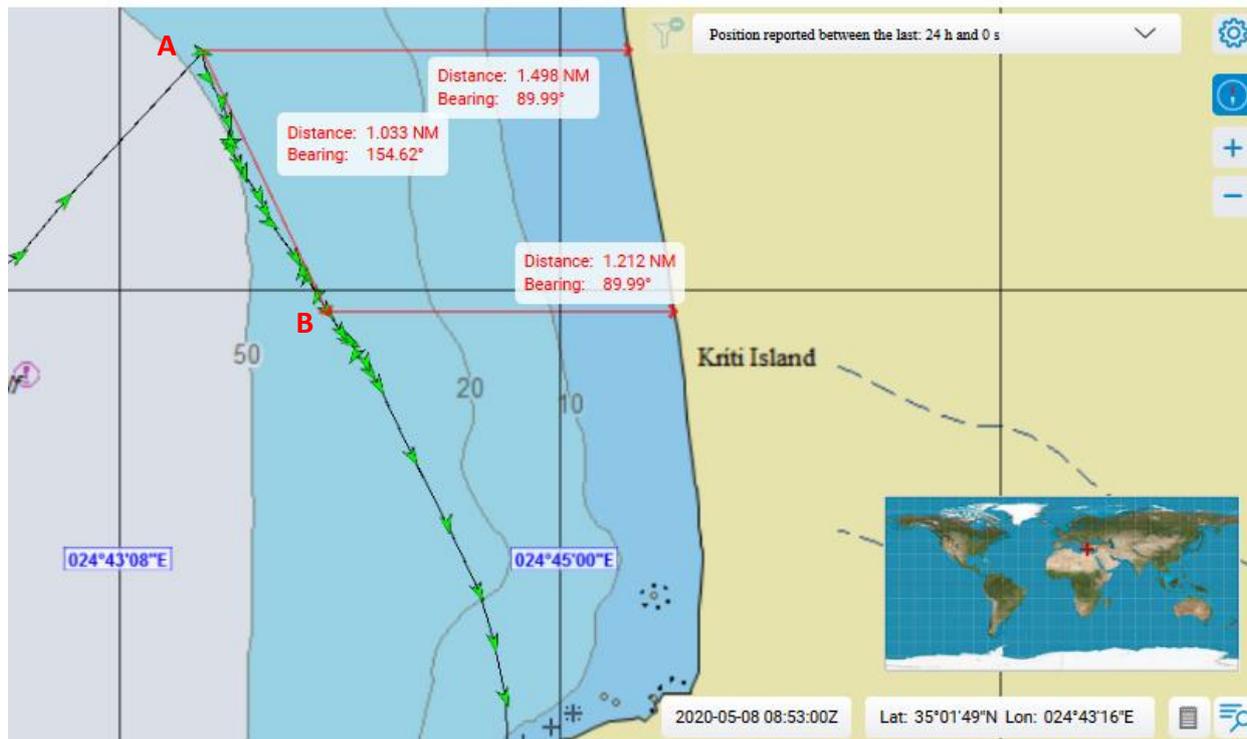


Figure 13: Depiction of the drifting of the VIKING from the time the Master handed over the watch (position A), to when he has summoned on the bridge by the C/O (position B)

Thereafter, the Master assumed the control of the watch and tried without success to move the convoy by using the engines. He then requested for help via VHF, after 03.00 and with wind force at 9 Bf, drifting at a distance less than 1.2 nm from the coast.

4.2.1 Risk assessment

The facts that took place from the anchoring position until the request for assistance by the Master reveal a case of inadequate risk assessment. The situation of the convoy as it appeared was not safe and secured before the handover of the watch to the Chief Officer, while the threshold of declaring the necessity of remedial actions and calling the Master at the bridge was not set at a reversible – for the developing situation – point, thus the Chief Officer called the Master after of more than 2 hours of continuous drift of the convoy and a drifting distance of more than 1 nm.

In addition to the fact that no contingency plan existed on board for adverse weather conditions (see chapter 4.1 above), the Master and Chief Officer were left without further support on risk assessment and decision making in the case of bad weather and taking shelter. Their experience and situational awareness were their only aids for deciding and acting, but under the existing conditions such proved inadequate.

Therefore, keeping in mind the adverse weather and sea conditions, the insufficient risk assessment by the Master and Chief Officer, their situational awareness concerning the safety of the convoy and lack of support from the company on contingencies due to bad weather are all considered contributing factors to the accident.

4.2.2 Work/rest hours

The Master and Chief Officer who were in respect in charge of the watch, worked on a 6 on – 6 off schedule using an A/B as watchman during their shift.

Such a schedule is in agreement with the STCW provisions on work/rest hours (Code Part A, CH.VIII, Sections A-VIII/1) and is accepted by administrations during the minimum safe manning certification

for a vessel. In particular the minimum safe manning for the VIKING requested for 1 officer (apart from the Master) to be on board.

However, research studies and respective scientific articles and publications¹ have revealed that when established over a multiple day schedule, the 6 on – 6 off system creates conditions of accumulation of fatigue on seafarers and has been well accepted to have contributed to accidents. This type of fatigue is attributed mainly in the lack of adequate sleep, as the 6 hour resting period does not correspond to 6 hours of sleep and the studies have identified that the circadian rhythm of humans is often disturbed due to lack of at least 6-hour continuous sleep periods, when applied for multiple days.

The VIKING was on route since the 2nd of December, namely for 5 consecutive days, which may have affected the levels of fatigue of both the Master and the Chief Officer, thus lowering their levels of alertness or their ability to perceive, assess, plan and act under the prevailing situation and evolution of conditions in respect to safety. This hypothesis may well substantiate and contribute in turn to the factors presented in the previous chapter.

Therefore the work/rest hour schedule (6 on – 6 off) employed on the VIKING over the voyage from Alexandria to the S of Crete is considered a contributing factor related with fatigue of the bridge officers (Master and C/O).

4.3 Emergency handling

Once the Master was at the bridge and tried to move the convoy by using the VIKING's engines without success, the situation was clearly declared as emergency. Thereafter, the Master continuing his attempts to move the convoy away from the coast requested for assistance via VHF and contacted the local Coast Guard authorities.

However, direct assistance was not possible at the time of the emergency due to the adverse weather and sea conditions and the inexistence of vessels that could effectively assist in towage in the proximity of the convoy. Under the circumstances, the Master decided not to release the towed dredger, as evidence revealed (see figures 6 and 7 in chapter 3.3) and this had an impact in the safety of the tug boat itself, as she was not clear of the towed object which in the chain of events grounded first on the rocks, thereafter acting as an anchor and dragging the tug boat towards the coast.

The decision not to release the towed dredger was entirely on the Master, as the investigation revealed that there were not any contingency plans or instructions behind the operation, as already highlighted in chapters 4.1 and 4.2.1 and in particular any processes for handling or releasing the towed object in cases of emergency. Although releasing the dredger could ensure better chances for the tug boat to avoid grounding and even though the Master had quite an experience at sea and on tug boats, his decision to continue the towage was ambiguous and chain of events reveal that the Master tried to save the dredger up until the last minute.

Moreover, when evacuation of the VIKING was ordered by the Master, after both the tug boat and the dredger were beyond their saving thresholds, having grounded and suffered damages which

¹ Namely relevant studies include:

1. Marine Accident Investigation Branch, (2004), *"Bridge Watchkeeping Safety Study"*
2. Claire A. Eriksen, Mats Gillberg & Peter Vestergren (2006), *"Sleepiness and Sleep in a Simulated "Six Hours On/Six Hours Off" Sea Watch System"*, Chronobiology International, 23:6, 1193-1202, DOI: 10.1080/07420520601057981
3. Andrew P. Smith, Paul H. Allen and Emma J. Wadsworth, *"A Comparative Approach to Seafarers' Fatigue"*, Centre for Occupational and Health Psychology, Cardiff University Chronobiology International. 2006;23(6):1193-202.
4. Captain Paul Drouin AFNI, *"Down with six on/six off"*, Seaways, April 2011

caused irreversible water ingress, the VIKING had already girted to a point that the life raft was no longer usable. Thus abandonment was carried out with a non-conventional way, by the use of a rope to the coast and the support of local Coast Guard and Fire Brigade officers, yet under conditions that were critical in terms of the safety.

A hypothesis is made here, that the Master took his decisions under the lack of processes relevant to emergency handling in combination with commercial pressure, meaning the pressure to try to deliver the task and duty he had undertaken in full and putting as the highest priority to avoid causing commercial damage to the company he was working for, especially by “losing” the towed dredger. This context of the Master’s decision is considered a contributing factor to the accident.

5. Actions Taken

No actions were reported to have been taken by the interested parties, during the evidence collection as well as during the consultation period, prior to the publication of this report.

6. Conclusions

**The following conclusions, safety measures and safety recommendations should not under any circumstances be taken as a presumption of blame or liability.
Their sequence of should not be considered as an order of priority or importance.**

- 6.1** After the VIKING changed her route to take refuge due to deteriorating weather within the Gulf of Mesaras, she remained on anchor with the towed dredger at 1.5 nm from the coast, but under the wave and wind impact the convoy began drifting towards the coast. (§3.1, 3.2)
- 6.2** Attempts of the Master to move the convoy away from the coast by using the VIKING's engines were unsuccessful. Both the dredger and the tug boat grounded (§3.3)
- 6.3** No contingency plans for bad weather existed on board, despite the advisory provisions of MSC/Circ.884, under which the VIKING was certified for her voyage. (§4.1)
- 6.4** Insufficient risk assessment by the Master and Chief Officer, situational awareness and lack of support from the company on contingencies due to adverse weather are all considered contributing factors to the accident. (§4.2.1)
- 6.5** The work/rest hour schedule (6 on – 6 off) employed on the VIKING over the voyage from Alexandria to the S of Crete is considered a contributing factor related with fatigue of the bridge officers, which affected their actions and decisions and contributed to the accident. (§4.2.2)
- 6.5** The Master is considered to have taken his decisions under the lack of processes relevant to emergency handling, in combination with commercial pressure. (§4.3)

7. Safety Recommendations

Taking into consideration the analysis and the conclusions derived from the safety investigation conducted, the HBMCI decided to issue the following recommendations on this accident:

7.1 The company of the tug boat VIKING is recommended to:

02/2018: Establish processes for ocean towage (based on the advisory provisions MSC/Circ.883) concerning contingencies due to bad weather and emergency handling with reference in particular to conditions of releasing the towed object, in order to support the decision making of Masters and Officers on board its vessels and ensure their safety.

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Accident Investigation Report 04/2018

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