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Swedish Accident Investigation Board

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General cargo ships MARINA-S and TINTO Collision on 25 April 2006 in the Baltic Sea

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Statens haverikommission har i samarbete med DMA, Opklarningsenheten i Danmark, undersökt en kollision mellan lastfartygen MARINA-S och TINTO som inträffade den 25 april 2006 i Östersjön på internationellt vatten.

Statens haverikommission överlämnar härmed enligt 14 § förordningen (1990:717) om undersökning av olyckor en rapport över undersökningen.

Carin Hellner Ylva Bexell

Statens haverikommission (SHK) Swedish Accident Investigation Board

Postadress	*Besöksadress*	*Telefon*	*Fax*	*E-postl*	*Internet*
P.O. Box 12538 102 29 Stockholm	Teknologgatan 8 C Stockholm	08-555 017 70	08-555 017 90	info@havkom.se	www.havkom.se

Statens haverikommission
Swedish Accident Investigation Board

Danish Maritime Authority

The joint Marine Accident Report by the Danish Division for Investigation of Maritime Accidents and the Swedish Accident Investigation Board

MARINA-S and TINTO
Collision on 25 April 2006

DANISH MARITIME AUTHORITY

Divsion for Investigation of Maritime Accidents. Danish Maritime Authority,
Vermundsgade 38 C, DK 2100 Copenhagen
Phone: +45 39 17 44 00, Fax: +45 39 17 44 16 CVR-nr.: 29 83 16 10
E-Mail: oke@dma.dk - www.dma.dk

Statens haverikommission
Swedish Accident Investigation Board

Statens haverikommission, Teknologgatan 8 C, Box 12538, 102 29 Stockholm
Telefon 08-555 017 70 Fax 08-555 017 90
E-post info@havkom.se

The report has been issued on 15 March 2007

DMA Case: 200604252

SHK Case: Int – 03/06

The final report will be available from the Swedish Accident Investigation Board and also available on Web sites: www.havkom.se (No appendices in the Internet version) and on www.dma.dk

Introduction

This joint marine accident report has been made in close cooperation between the Swedish Accident Investigation Board and the Danish Division for Investigation of Maritime Accidents.

The narratives prescribed in this report are based on independent interviews, which were made on the day after the accident.

This edition of the Marine Accident Report is the authentic version.

The Swedish Accident Investigation Board

The Swedish Accident Investigation Board investigates accidents and incidents with regard to safety. The sole objective of the investigations is the prevention of similar occurrences in the future. It is not the purpose of this activity to apportion blame or liability.

The Division for Investigation of Maritime Accidents

The Division for Investigation of Maritime Accidents is responsible for investigating accidents and serious occupational accidents on Danish merchant and fishing vessels. The Division also investigates accidents at sea on foreign ships in Danish waters.

Purpose

The purpose of the investigation is to clarify the actual sequence of events leading to the accident. With this information in hand, others can take measures to prevent similar accidents in the future.

The aim of the investigation is not to establish legal or economic liability.

The Division's work is separated from other functions and activities of the Danish Maritime Authority.

Reporting obligation

When a Danish merchant or fishing vessel has been involved in a serious accident at sea, the Division for Investigation of Maritime Accidents must be informed immediately.

Phone: 39 17 44 00
Fax: 39 17 44 16
E-mail: oke@dma.dk

Mobile phone: +45 2334 2301 (24 hours a day).

Glossary of Abbreviations

GPS	**Global Positioning System**
AIS	**Automatic Identification System**
ARPA	**Automatic Radar Plotting Aid**
OOW	**Officer of the Watch**
Nm	**Nautical miles**
EBL	**Electronic Bearing Line**
CPA	**Closest Point of Approach**

Contents

1 Summary

The Danish registered coaster MARINA-S and the Swedish registered coaster TINTO collided on 25 April 2006 at approximately 0530 hours.

In the morning of 25 April 2006, MARINA-S was southward bound in the sea area west of Gotland, Sweden and had, at the time of the collision, been underway for about 14 hours since the last port.

TINTO was northward bound and had been underway for about 44 hours.

Both ships were in ballast.

On both ships, the OOW was alone on the bridge and they had both been on watch since midnight.

The visibility had deteriorated during the morning. At the time of the collision, visibility was very poor.

The OOW on TINTO had neither observed MARINA-S by radar nor visually and he was not aware of the fact that the risk of a close quarter situation and a risk of collision existed. Therefore, no alterations of course or speed were made on board TINTO.

The OOW on MARINA-S observed TINTO the first time by radar in a distance of approximately 5.5 nm. Action taken by the OOW on MARINA-S did not avoid a close quarter situation from happening and when TINTO was observed visually at very close range, the collision could not be avoided by actions of MARINA-S alone.

TINTO hit MARINA-S on its port side in an angle of approximately 90 deg. between the ships.

MARINA-S started to list to port shortly after the collision and capsized and foundered within minutes.

The 4 crewmembers of MARINA-S immediately evacuated the ship. The ship's life raft was launched. During the evacuation, the crew got separated. Two persons managed to get into the raft and the other two were in the water. All of the crew climbed on board TINTO by a pilot ladder after they had been in the water and the raft for 20 – 30 minutes.

2 The Investigation

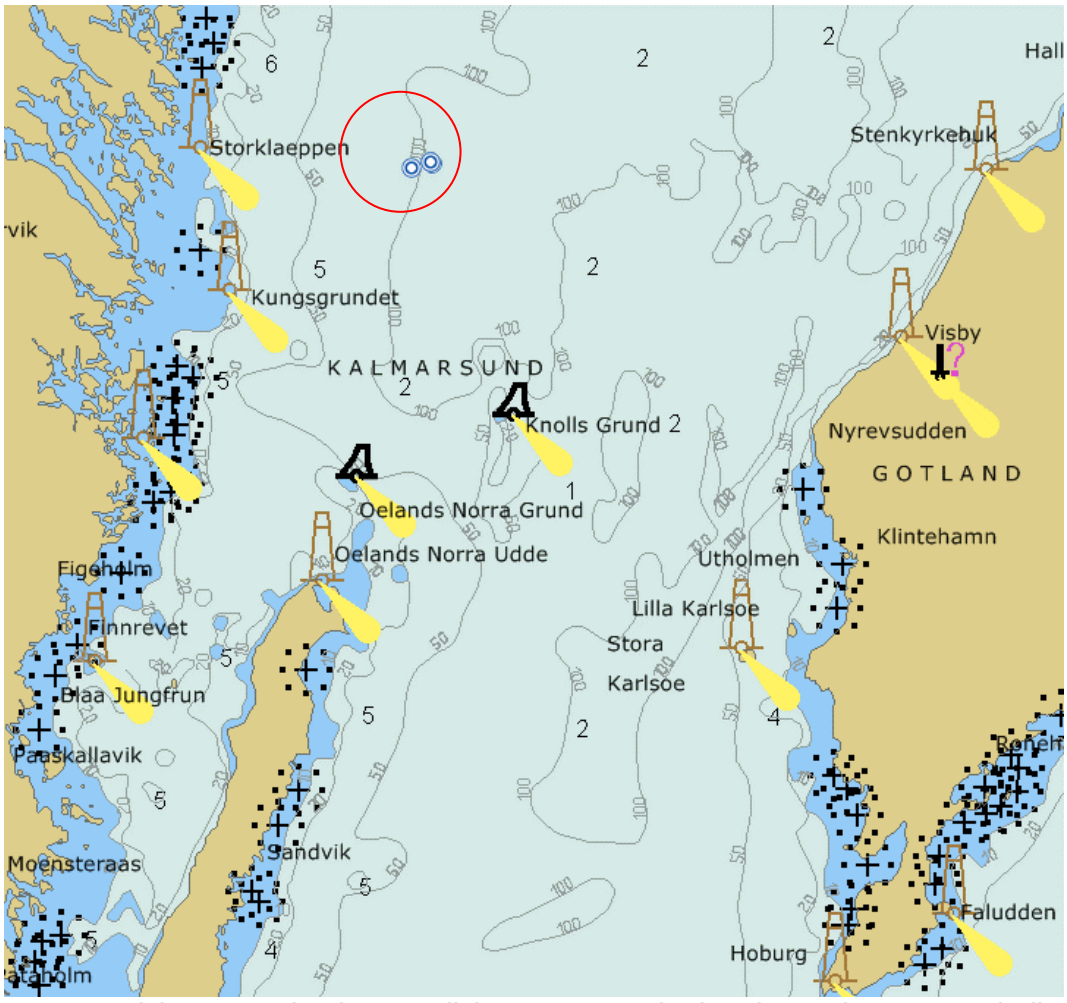
The Swedish Accident Investigation Board and the Danish Division for Investigation of Maritime Accidents have cooperated closely during the investigation of the accident and in the preparation of the joint report.

The investigators have interviewed the master and the OOW on both ships, examined the radar equipment on board TINTO, received AIS information and received information on VHF radio communication between the ships. MARINA-S' life raft was examined. The investigation concerning the events leading to the collision is mainly based on the involved persons' description.

3 Factual Information

3.1 Accident data

Type of accident	Collision and foundering of MARINA-S
Character of the accident	Very serious
Time and date of the accident	25 April 2006 at 0530 (UTC +2)
Position of the accident	57°49,6´ N 017°19,6´ E
Area of accident	The Baltic Sea
Scene of accident	



Source: Diving report by the Swedish Coast Guard. The above chart extract indicates the position of the collision and the position where MARINA-S was located by the Swedish Coast Guard on 26 April 2006 on a depth of 100 metres. The wreck was located on position 57°49,710´ N 017°19,502´ E

Injured persons	None
Ship abandoned	The crew of MARINA-S abandoned ship using the ship's life raft
IMO Casualty Class	Very serious

3.2 Navigation data

MARINA-S

Stage of navigation	Navigation in open waters
Port of departure	Västerås
Date and time of departure	24 April at 1510 hours
Approximately draught of the time of the accident	2.50 m forward 3.00 m aft.
Pilot on board	No

TINTO

Stage of navigation	Navigation in open waters
Port of departure	Sandvika, Oslo
Date and time of departure	23 April at 0100 hours (pilot St. Ferder)
Draught at the time of the accident	1.70 m forward 2.90 m aft.
Pilot on board	No

3.3 Ship data

Name	MARINA-S	TINTO
Home port	Hals	Örnsköldsvik
Call sign	OUZE6	SMVP
IMO No	7042631	7608710
Registration No	D 3430	-
Register	DIS	-
Flag State	Denmark	Sweden
Construction year	1970	1977
Type of ship	General Cargo Ship	General Cargo Ship
Tonnage	494 GT (199,92 GRT)	1191 GT (499 GRT)
Classification	Det Norske Veritas	Det Norske Veritas
Length (LOA)	41,10 m	74,74 m
Engine power	496 KW	1125 HP
Hull construction	Double bottom (Boxhold)	Double bottom
Trading permit	Coastal trade off EU-countries and Norway within GMDSS sea area A1 and A2	Baltic and North Sea
Regulation	The Danish Maritime Authority, Notice B	The Swedish Maritime Administration

3.4 Weather data

Wind – direction and speed	Var. 1-3 m/s
Sea	Calm
Current	No
Visibility	Dense fog
Light/dark	Dark (dawn)

3.5 The Crew

MARINA-S

Number of crewmembers	4
Number of crewmembers certified to act as bridge watch	2
Watch on the bridge	2-shift
Minimum Safe Manning	1 Master II/3 – Master (Home Trade) Certificate of Competency as Second Hand - II/3 2 ordinary seamen
Occupation on board the ship at the time of the accident.	Age, Certificate of Competency, other certificates, training, sailing time.
The master	Danish citizen, age 73, Certificate of Competency as Master (Home Trade) since 1958. Sailing as fisherman until 1962. Mate and later master in the merchant fleet since 1963. Has been master on MARINA-S since 1990.
The chief officer	Polish citizen, age 48, Certificate; mate first class, started at sea in 1984 as AB – first contract as mate was in 2000, have been on German vessels (3000 GT) for about two years as 2nd mate, first contract on MARINA-S was in 2002.
Cook / OS	Russian citizen, age 45, signed on approx. one week prior to the collision, first time on board MARINA-S. The master has no information of competency or experience for the crewmember.
AB	Filipino citizen, age 47, has 7 years of experience as OS / AB, signed on approx. 1 month prior to the collision, first time on board.

TINTO

Number of crewmembers	5
Number of crewmembers certified to act as bridge watch	2
Watch on the bridge	2-shift
Minimum Safe Manning	
Occupation on board the ship at the time of the accident (crewmembers relevant to the accident	Age, Certificate of Competency, other certificates, training, sailing time.
The master	Age 59, Certificate; Master unlimited, has been working at sea since 1965. Employed as master in the company since 2000.
The chief officer	Age 43, Sailing since 1990, Certificate; Deck Officer Class VI issued in 1997, has been alternating mainly as deck officer on small cargo ships and as AB-seaman on passenger ships since certified. He signed on TINTO on 3 April 2006.

3.6 Narratives

MARINA-S

The following sequence of events is based on the Danish investigation division's interview of the master and the chief officer on 26 April 2006 in Västervik

MARINA-S departed Västerås, Sweden, on 24 April in the afternoon at 1510 hours in ballast bound for Stettin, Poland.

The master had the watch on the bridge from departure and until 2400 hours.

The chief officer relieved the master before midnight and took over the watch from 0000 hours.

At midnight the weather was calm, south-easterly wind 3 m/s and visibility was 4-6 nautical miles.

The traffic situation was normal. There were about 4 targets on the radar. None of those were close to own ship.

Both the master and the chief officer were navigating by traditional paper charts. The navigation was assisted by means of electronic charts.

The voyage plan was made to the bridge of Kalmarsund. Waypoints and courses were inserted in the paper charts. The electronic charts were used to maintain overview of the sea area from the coning position.

The position was inserted into the paper chart every half hour. The last position was inserted at 0500 hours from the GPS.

Visibility changed at about 0400 hours. Visibility decreased in the period from 0400 to 0500 hours. At 0500 hours, visibility was very poor, 3 - 4 cables.

During the entire watch there were two radars working, one in the centre of the bridge and one nearby on the port side. The radar in the centre was on range 6 nm offset and "head up" mode. The other was on 3 nm range.

A target was observed on the port bow in a distance of 5.5 nm on the radar in the centre. Own ships gyro course was 204, and the speed was about 9 knots.
The target was observed 20 – 30° on the port bow.

The chief officer determined by the means of the EBL and the range marker that there was danger of collision. The bearing to the target did not change.

When the target was about 3.5 nm from own ship, the chief officer reduced the speed to about 6 knots.

The chief officer was expecting that the other vessel (which later proved to be TINTO) would alter course to starboard as it was approaching on MARINA-S' port bow.

As there apparently was no change in the bearing, the chief officer tried to contact the other vessel (which later proved to be TINTO) by the VHF channel 16 but received no answer.

The chief officer sounded the fog signal several times by the ship's whistle. He heard no fog signal from other ships.

When the distance was about 2.5 nm between the vessels, the chief officer altered gyro course from 204 to 220° and changed from automatic steering to hand steering.

The ship was seen visually in a distance of about 3 cables. Only the bow was seen.

Immediately after the visual observation, the chief officer made hard a starboard.

TINTO hit MARINA-S on the port side about amidships.

The collision occurred after 0500 hours.

The master, who was asleep, woke up by the loud crash and went straight to the bridge.

Both the master and the chief officer are uncertain about the exact time of the collision and the times of the following events.

When the master came to the bridge, he saw the other ship (that later proved to be TINTO) with its stem into the hull of MARINA-S about amidships.

TINTO

The following sequence of events is based on the Swedish Accident Investigation Board's *interview of the master and the chief officer on 26 April 2006 in Västervik.*

TINTO disembarked the pilot at St. Ferder, off Oslo, Norway, on 23 April 2006 at 0155 hours local time bound for Oxelösund, situated on the east coast of Sweden. The ship was intended to load pleasure boat pontoons for Sandvika.

The weather during the voyage had been calm, mostly with clouds and rain. Visibility had varied from good / moderate to poor with fog patches. In the afternoon on 24 April, visibility had deteriorated again and dense fog prevailed early in morning of 25 April and also at the time of the collision.

At 0000 hours on 25 April, the chief officer had relieved the master on the bridge. At 0217, the chief officer altered course at Ängjärnsudde, off the north-eastern part of Öland, and set course 006º towards Gustav Dalén lighthouse, the approach of the archipelago leading in to Oxelösund some 80 nm ahead. The speed was normal seagoing speed, about 10.4 knots.

Compared to earlier watches throughout the voyage, this night watch was calm with light traffic and in open sea.

The only person on the bridge was the chief officer and he has stated that he left the bridge for a quick check in the engine room at 0500 hours after having checked the ship's position. After having returned to the bridge, he had a look on the radar screen, made a quick change of range down to 6 nm and then he put the radar range back on 12 nm. On the radar screen, the chief officer saw the echo of ASPOE, an overtaking vessel that he had tracked for quite a long period of the watch. ASPOE was approximately 6 nm ahead of TINTO. The chief officer also saw ASPOE displayed on the AIS plotting screen. He saw no other echoes on radar.

According to the chief officer, there was no music or public radio playing on the bridge and he is certain that at least one of the VHF's was put on channel 16. TINTO was not sounding fog signals at any time. The chief officer has stated that he felt fully comfortable with the traffic situation and that the only concerns he had was to avoid falling asleep during the last hour of the watch. To sharpen his mind, he had opened the bridge wing door a bit and had put the kettle on for a cup of tea in an adjacent pantry and was awaiting the call out of navigational warnings from Stockholm radio at 0533 hours.

At the moment of the collision, the chief officer was standing in front of the electronic chart display, which is placed on the aft part of the bridge, and he was facing aft. Until the moment of the collision, he had not been aware of the presence of any other vessel in the vicinity apart from ASPOE. He had not observed MARINA-S by means of the radar or on the AIS. He had not heard anything on the VHF that could have alerted him to the presence of MARINA-S or of the developing situation. He had not heard any fog signals through the open bridge wing door. It came as a chock when the collision happened.

3.7 Rescue/evacuation operation

MARINA-S

The master came to the bridge shortly after the collision and he immediately took action for abandonment of the ship via the ship's life raft.

It was very difficult to launch the raft from its stowing position on the starboard side of the ship. The lashings on the container were very tight due to the ship's increasing list to port and it was difficult to open the snap hook in order to get the lashings off.

The two ships were parting from each other and MARINA-S was starting to list to port side. The port side list increased very rapidly, and the ship capsized and sank within approximately 3 minutes.

The crew managed to release the raft, and they jumped into the sea.

None of the crewmembers had time to put on their immersion suits or life vests.

The master pulled the 30 metre painter/inflation line for the inflation of the raft in the water.

The roof of the raft did not inflate automatically.

The crew got separated. The chief officer and the cook drifted away from the raft. It was difficult for them to see each other due to dense fog.

The AB clung on to a piece of wreckage and swam towards the raft.

The master and the AB climbed on top of the raft, which was partly filled with water.

The master feared that they would loose visual contact with TINTO in the fog.

At first it seemed that the distance to TINTO was increasing, but then it came closer and reached their position at the raft. The master and the AB climbed on board via the pilot ladder. They were perished with cold and it was very difficult to get on board. They had been in the water / on the raft for 20 – 30 minutes.

The master and the AB had not seen the chief officer and the cook after they got separated. It turned out that they had already been taken on board TINTO.

On board TINTO they were given treatment of hyperthermia, and they were brought to Västervik.

TINTO arrived Västervik on 25 April at approximately 1010 hours.

TINTO

Immediately after the collision the chief officer of TINTO put the handle for the pitch propeller in zero position and ran down to inform the master, who was in his cabin and had just come out of the shower. The master, the ship's cook and at least one of the seamen were awake at the time of the collision. The chief officer then immediately returned to the bridge to call the Swedish Maritime Search and Rescue Centre to inform them about the collision.

When the master arrived on the bridge few moments later, he could see that the two vessels were drifting apart and that MARINA-S had already begun to list to port. According to the chief officer, MARINA-S had been hit amidships in the port side in an angle of 90 degrees. This was also the impression that the master had when he arrived to the bridge. The master could not se any damage on MARINA-S, and he assumed that the damage was submerging as the list and draught increased when the vessels separated.

A pilot ladder was rigged amidships on the starboard side of TINTO on the initiative and by the seamen, who were already awake. Two persons, who turned out to be the chief officer and the cook of Marina-S, were seen swimming in the water and were helped on board. A life raft was also observed from the ship's bridge and monitored. It was after Marina-S had foundered, TINTO could manoeuvre safely up to the raft to pick up the master and the AB.

3.8 Use of radars

MARINA-S

Two Furuno radars were in operation. None of the radars were ARPA radars.

TINTO was observed for the first time on the radar on the port bow in a distance of 5.5 nm and 22 – 30 deg. on the port bow.

There were no plotting facilities. The chief officer did not obtain any course and speed information on TINTO. The chief officer, however, determined by the means of the EBL and the range marker that there was danger of collision. The ascertained CPA was close to own ship and the bearing to TINTO did not change.

When the target was about 3.5 nm from MARINA-S, the chief officer reduced the speed from 9 to about 6 knots.

When the distance was about 2.5 nm between the ships, the chief officer altered the gyro course to 220º and changed from automatic to hand steering.

TINTO

There are two sets of radars on the bridge. One daylight radar, Furuno 2110 with full ARPA, and an old Atlas radar with only fixed range and bearing facilities. The Atlas radar was rarely used and was not in operation in the morning the collision occurred. The main reason for not using the Atlas radar was, according to the master, the noise it made when running. The chief officer had never used the Atlas radar and he also had had the impression that it “did not work so well”. The Atlas radar was planned to be replaced in relatively near future.

The Furuno radar, which was in use, had had a breakdown about a month earlier and was therefore fairly recently serviced and equipped with a new processor card. It worked well according to both the master and the chief officer, who also stated that he had been able to spot echoes from both buoys and fishing gear on the radar screen during the voyage. There where no blind sectors on the radar known to either of the officers.

The radar, which is auto tuned, was operated in “ocean” mode according to the chief officer and at the time of the collision it was set on 12 nm range, using A/C Auto (Anti Clutter Automatic mode). At about 0217 hours when the course was altered, the chief officer saw the echo from the spindle buoy Ängjärnsudde on the radar screen. There is also a note in the log book from 0300 hours in the morning of 25 April of a position measured as a bearing of 329 degrees and distance 5.5 nm to the buoy of Ölands Norra grund.

The setting “ocean” mode includes a function where an incoming echo is memorized in the radar processor unit and monitored for six sweeps. Only if the echo is targeted in a logic position in the following sweeps, it will be displayed on the screen. When set on “ocean” mode the radar does not display any pronounced echo during several sweeps, and the echo is fully presented only after about 12 seconds.

The radar was checked a few days after the accident, on arrival to Oxelösund, by a local authorized Furuno retailer on behalf of the company. The technician states that the radar was working well, but the video signal was a little weak and was therefore adjusted. There were also some adjustments made to the standard configurations of the radar to enhance its performance. A month after the collision, the chief officer added to his statement to the local police regarding the purpose of the radar check in Oxelösund, claiming that the radar was in need of service due to malfunction. Neither the master nor the shipowner has supported this statement.

3.9 Communication

According to his statement, the chief officer on MARINA-S tried to contact the other vessel (which proved to be TINTO) by VHF channel 16 after having observed that there was a danger of collision and that TINTO was in a distance of 3.5 nm.

According to his statement, the chief officer on TINTO was listening continuously on VHF channel 16. He heard no call from MARINA-S.

In recordings of channel 16 received from MRCC Gothenburg via the Swedish Maritime Administration, there was communication between MARINA-S and TINTO after the collision. There is no recording of communication between the two ships prior to the collision. According to the chief officer on MARINA-S, he sounded the fog signal several times by the ship’s whistle. He heard no fog signal from other ships.

According to the chief officer on TINTO, he did not hear any signal from other ships prior to the collision. A door had been open on the bridge and it was very quiet that morning.
The chief officer on TINTO has stated that he did not sound any signal prior to the collision.

3.10 Ownership and company structure

MARINA-S was owned by a jointly owned shipping company. The owners are relatives to the master. The master, who was the sole master, handled tasks regarding the management of the ship. There was no safety management system (ISM-system) in operation or any requirement for such a system according to international or flag State regulations.

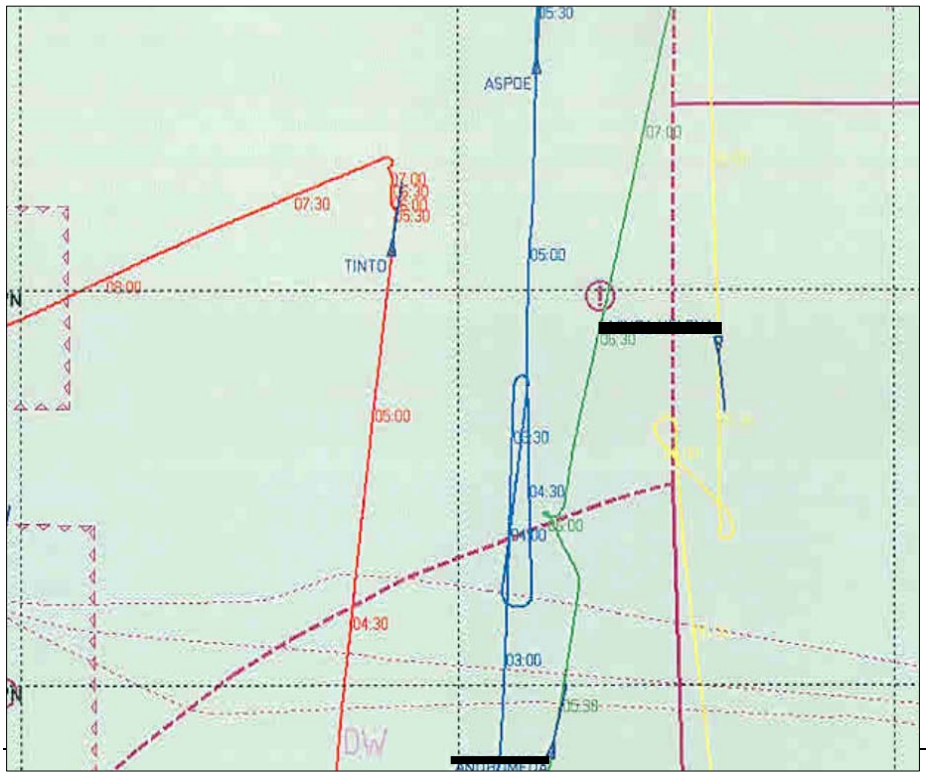
TINTO is one of two ships within the company. The organisation is small and informal and different tasks regarding the management of the ship are mutually agreed on by the master and the ship owner on an ad hoc basis. There is no safety management system (ISM-system) in operation or any requirement for such a system according to international or flag State regulations.

3.11 Automatic Identification System (AIS)

According to SOLAS Regulation V/19.2.4 all ships with a gross tonnage of 300 or more, which operates in international trade, shall be fitted with AIS.

MARINA-S was not fitted with AIS. The gross register tonnage of 199,92 has been measured in accordance with the Danish national rules which were in force prior to the coming into force of the International Convention on Tonnage Measurement of ships, 1969.

TINTO was fitted with AIS. TINTO´s movements are indicated by the track history (the red line) in the extract below. The track of the overtaking ship ASPOE is shown in blue. Times indicated are local time. According to the AIS information, TINTO´s course and speed remained unchanged until the moment of the collision.



Screen dump from the Swedish Maritime Administration's AIS recordings.

Names on two other AIS ships have been extracted.

3.12 Bridge watchkeeping and fatigue

MARINA-S

MARINA-S arrived Vesterås on Friday 21 April. The entire crew had the weekend off.

Discharging was started Monday morning. The chief officer started working at approximately 0715 hours.

MARINA-S departed Vesterås 24 April at 1510 hours.

After departure, the chief officer helped making ready for sea, had a shower, went to the mess room to get something to eat and then relieved the master on the bridge for about 15 minutes.

When the master came back to the bridge, the chief officer and the master discussed the day's work.

The chief officer went to bed at about 1800 hours and woke up at 2340 hours. He was on the bridge approximately 10 minutes later and took over the bridge watch at midnight.

The chief officer was alone on the bridge from about midnight and until the collision occurred at 0530 hours.

The hours of work and rest had been recorded on board MARINA-S.

MARINA-S had recently been fitted with a "dead-man-alarm". The alarm was activated by a key on the bridge and was set to an interval of resetting of 6 minutes. Furthermore, the bridge area was connected to a motion censor.

TINTO

The bridge watchkeeping at sea was divided between the master and the chief officer on a six-hours-on /six-hours-off system. The master had the watch between 0600-1200 hours and from 1800 hours to midnight, and the chief officer had the watch from midnight till 0600 hours and from 1200 hours to 1800 hours. The watch system changed when in port.

There were no records of hours of rest and work made on board, and no company follow up on such records, despite of national and international requirements. The lack of recording routines had not been detected or remarked on by the Swedish Maritime Administration during inspection and certification of the vessel.

According to his recollection, the work/sleep pattern of the chief mate since the day of departure Oslo was as follows:

Saturday on 22 April 2006
Worked during the day. After having been awake for about 16 hours, the mate went to bed at 2015 hours and fell asleep approximately fifteen minutes later.

Sunday on 23 April 2006
Was awake from 0045 hours, on watch from 0100 to 0600 hours. Fell asleep between 0630 and 0700 hours. He was awake again from 1130 hours, on watch from 1200 to 1800 hours and then he went to bed at about 1900 hours and slept until 2345 hours.

Monday on 24 April 2006
He was on watch from 0000 to 0600 hours, went to bed at about 0700 hours. He woke up at 1000 hours and worked until lunch. On watch from 1200 to 1800, went to bed at 2000 hours and slept until 2345

Tuesday on 25 April 2006
On watch from 0000 hours and until the moment of collision at approximately 0530 hours on 26 April 2006.

There was no designated look-out posted on the bridge when the collision occurred. The chief officer was alone and had been so during the watch. It was understood in the company that look-outs was rarely posted on board.

3.13 Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREG) -

COLREG Rule 19 - *Conduct of vessels in restricted visibility* - applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.

According to information from the two ships, visibility was very poor at the time of the collision and visibility had been restricted for some time prior to the collision.

COLREG Rules 4 to 8 – *Conduct of Vessels in any Condition of Visibility* are also applicable in this situation.

COLREG Rule 35 – Sound signals in restricted visibility.

3.14 Consequences

According to statements from both ships, MARINA-S was hit by TINTO on its port side approximately amidships in an angle of about 90 degrees between the ships.

According to the chief officer of TINTO, he had not been aware of the presence of MARINA-S. Therefore, he did not have time to take effective action to avoid the collision, neither by course alteration nor by reducing speed. TINTO, which was at full seagoing speed at the time of the collision, penetrated the hull of MARINA-S with its bulb stem.

Underwater recordings have shown that MARINA-S has a hole on the port side approximately amidships under the waterline. The shape of the hole shows the damage made by TINTO's bulb stem and indicates that the bulb stem hit MARINA-S direct from the side in an even angle.

TINTO suffered some damage to the bulb stem and minor damage to the bow area. After temporary repairs the ship was permitted and certified by the classification society to go back in service until the next planned docking, which had been scheduled for a few months later.

3.15 Life-Saving Appliances on board MARINA-S

MARINA-S was fitted with an 8-persons life raft. The raft was placed on the starboard side boat deck.

Lifejackets and immersion suits were placed in each of the crewmembers' cabins.

In spite of the problems with realeasing the life raft, the crew managed to release the raft manually. The master pulled out the painter line in the water, and the raft was inflated. The master noticed that the roof of the raft did not inflate.

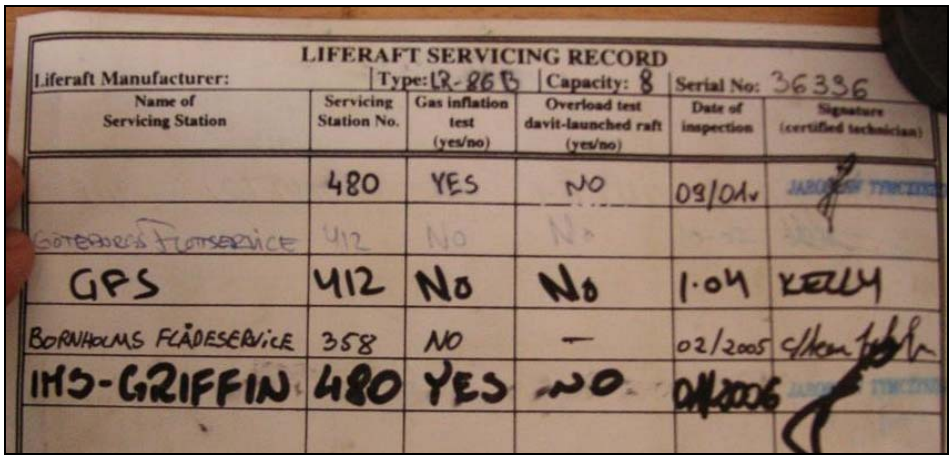
When the Swedish Coastguard recovered the raft it was noted that the raft was full of seawater. The raft itself was inflated and the rings were hard. The supporters to the roof were not inflated.

The raft is of the type DSB LR 86-B, manufactured in August 1991.

Picture of the raft - taken during a test of the inflation system at Raffel & Co in Denmark.

According to the technician at Raffels, which is certified to perform reinspection on this type of raft, the roof should have inflated automatically.

At the test, the raft was inflated by means of presure air and the all functions was as normal. The lower ring inflated first, then the upper ring and finally the roof. There were minor damages to the outside of the raft, most probably due to handling of the raft when it was recovered. The raft mantained the presure after it had been inflated.



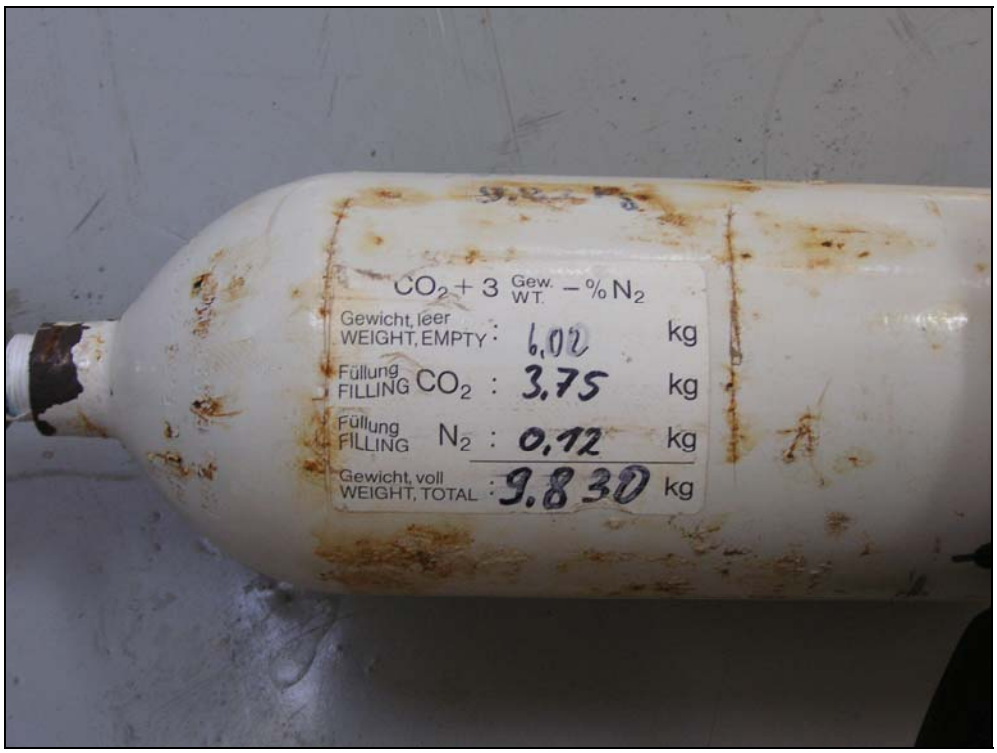
LIFERAFT SERVICING RECORD

Liferaft Manufacturer: | Type: LR-86B | Capacity: 8 | Serial No: 36396

Name of Servicing Station	Servicing Station No.	Gas inflation test (yes/no)	Overload test davit-launched raft (yes/no)	Date of inspection	Signature (certified technician)
	480	YES	NO	09/01	
GÖTEBORGS FLOTTSERVICE	412	NO	NO		
GPS	412	No	No	1.04	KELLY
BORNHOLMS FLÅDESERVICE	358	NO	—	02/2005	
IMS-GRIFFIN	480	YES	NO	01/2006	

Liferaft Service Record attaced to the raft.

Acording to the record shown above, the raft had been reinspected on September 2001, Oktober 2002, January 2004, February 2005 and January 2006. At the last reinspection of the raft in 2006, a gas inflation test had been caried out.



The raft's CO_2 bottle was according to its markings manufactured in 1990 and was pressure tested in October 2002. According to the marking and the re-inspection certificate, the gas mix was 3750, gr. of CO_2 and 120 gr. of N_2.

4 Analyses

4.1 Use of radars – lookout

MARINA-S

The OOW determined by the means of the EBL and the range marker that there was danger of collision. The bearing to the target did not change.

The OOW did not perform any manual form of plotting. There were no automatic plotting facilities.

The information about the CPA was based on what the OOW estimated and not on actual calculations.

The OOW did not obtain any course and speed information of TINTO.

It is the opinion of the investigators that the OOW did not appraise the situation fully after having determined that the risk of collision existed.

When the distance was about 2.5 nm between the vessels, the OOW changed from automatic steering to manual steering.

As the OOW was steering manually he might not have had his full attention to the duties to maintain lookout on the radar and to check the effectiveness of the course alteration.

There was no look-out posted on the bridge despite the darkness and restricted visibility. According to both international and national regulations there should have been a designated look-out.

TINTO

No look-out was posted on the bridge of TINTO despite national and international regulations. This was a normal condition and a known fact by the company.

At approximately 0500 hours, the OOW was in the engine room. When entering the bridge, the OOW had a look at the only radar in operation that morning, and he also made a quick change of scale.

The radar in use worked well. Nothing reveals that there was anything wrong with the present settings or adjustments.

Even though dense fog can have an adverse effect on the prestanda of radars, echoes of buoys and spindle buoys had been seen during the watch and the echo of ASPOE was clearly shown on the screen.

In the opinion of the investigators it is likely that an echo of MARINA-S did appear on the radar screen. It has not, however, been possible to determine why the OOW did not observe the echo. There are several possible explanations to a missed observation:

- The OOW did not maintain a systematic lookout by radar.
- According to the OOW, the look at the radar and the switch of scale from 12 nm to 6 nm and back again was made rather quickly. If the radar is put in “ocean” mode, full picture presentation is delayed by about 12 seconds. This supports that the echo was not presented, or at least not fully presented, before the radar was put back on 12 nm again at which time the OOW might have left the radar.
- The accident occurred at the crack of dawn. The ability to observe the echo may have been affected by the growing light where there is a continuous need for increasing brilliance of the screen.
- The OOW used the AIS display for double-checking the ships’ movements in the area. It is possible that the mental picture based on the AIS information had an influence on what the OOW expected to see, and therefore actually saw on the radar.
- Fatigue is a present factor that on its own can explain the missed observation on the radar. In the opinion of the investigators it is also possible that fatigue had an influence on the OOW’s ability to maintain a proper lookout. According to the OOW, he felt very tired from the beginning of the last hour of the watch and took measures to stay awake. His work/sleep pattern the days before the accident supports the assumption that he was suffering from fatigue in the early morning when the accident occurred.

The International Maritime Organisation (IMO) has recognised fatigue as a problem to maritime safety. The effects of fatigue are described in the appendix.

The use of all available radar equipment is vital in restricted visibility. If the other radar set had been in operation, a continuous double check on that radar would have increased the possibility that the presence of MARINA-S would have been detected.

A designated look-out could also have contributed significantly to the detection of MARINA-S. Furthermore, a watchman could have performed the tasks in the engine room that made the OOW leave the bridge unmanned prior to the collision.

4.2 Actions to avoid the collision

According to information from the two ships, visibility was very poor at the time of the collision and visibility had been restricted for some time prior to the collision.

In the opinion of the investigators COLREG Rule 19 - *Conduct of vessels in restricted visibility*- was applicable. Both ships were therefore in principle both equally obligated to take measures to avoid a close quarter situation and/or the risk of collision.

Section II in COLREG - *Conduct of vessels in sight of one another* did not apply in this case.

Special attention to steering and sailing rules in COLREG should be observed in this case with regard to safe speed, the determination if the risk of collision existed and actions to avoid collision.

As the OOW on board TINTO did not observe MARINA-S and therefore was not aware of the presence of MARINA-S, he was precluded from taken any action in accordance with COLREG.

The OOW observed TINTO on the port bow in a distance of 5.5 nm on the radar 20 – 30° on the port bow.

With a relative groundspeed between 16 and 19 knots, the theoretical TCPA was 17 – 20 minutes.

The OOW determined that there was danger of collision. The bearing to the target did not change. The ascertained CPA was close to own ship.

There was nothing that hindered the OOW in turning to starboard.

The reluctance to alter course at this stage was according to the OOW influenced by the expectation that TINTO would alter course at a later stage.

When TINTO was about 3.5 nm from MARINA-S, the OOW reduced the speed to about 6 knots.

The OOW was expecting that TINTO would alter course to starboard.

The effect of a speed alteration is difficult to check especially when the information about the CPA is based on scanty radar information rather than actual calculations. A speed reduction is furthermore difficult to observe from another vessel. This was, however, not the case in this situation.

It is the opinion of investigators that the conduct of the OOW also at this stage of the events was influenced by the impression that TINTO should give way, and that this in

turn leads to the conclusion that the OOW did not have a proper understanding of the applicable collision prevention regulations.
When the distance was about 2.5 nm between the vessels, the OOW altered gyro course from 204 to 220°.

With a relative groundspeed of 16 knots, the theoretical TCPA was about 9 minutes. By the speed reduction made earlier, the relative track would theoretically change to pass ahead of MARINA-S. The course alteration to starboard was in contradiction to the speed alteration.

According to the OOW, he continued on gyro course 220° until TINTO was observed visually in a distance of approx. 3 cables. The OOW then made “a hard starboard”.

According to the AIS information, TINTO did not change course or speed prior to the collision.

It is the opinion of the investigators that the OOW on MARINA-S misjudged the situation after having altered the course to starboard approximately 9 minutes earlier because his evaluation of the situation was based on scanty radar information rather than systematic observations.

According to the AIS information the collision occurred at approximately 0530 hours. MARINA-S was hit in the port side at an angle of 90˚ between the vessels.

When looking into the event as a whole, the situation developed from a simple two-ship-situation into a close-ship-situation. It is the opinion of the investigators that close-ship-situation can be prevented effectively in open sea by making a large course alteration at an early stage. The effectiveness of a large course alteration made in amble time is furthermore easier to check.

Extract of COLREG, Rule 8

COLREG Rule 8 prescribes among other things the following:

Any action to avoid collision shall, if the circumstances of the case admit, be positive, made in amble time and with due regard to the observation of good seamanship.

…. a succession of small alterations of course and /or speed should be avoided.

If there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close quarter situation provided that it is made in good time, and *is substantial ….*

Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.

4.3 Information about attempts to attract attention

According to the OOW on board MARINA-S, he tried to make contact by VHF.

The OOW on TINTO left the bridge area at approximately 0500. While on the bridge, he did not hear any call from MARINA-S prior to the collision.

According to the OOW on MARINA-S, he sounded the fog signal several times by the ship's whistle.

According to the chief officer on TINTO, he did not hear signals from other ships prior to the collision.

It is the opinion of the investigators that the fact that no communication was established neither verbally by means of the VHF nor by means of sound signals had a vital influence on the sequence of events.

The reasons as to why the attempts to attract attention from MARINA-S did not succeed are not known to the investigators. According to recordings of VHF channel 16, however, there was no verbal communication between the vessels prior to the collision.

The OOW on TINTO did not sound the fog signal prior to the collision, a contradiction to COLREG Rule 35 regarding sound signals in restricted visibility. It is the opinion of the investigators that a signal should have been sounded. In this case, however, the OOW on MARINA-S was aware of the presence of TINTO.

4.4 Accident data

The capsizing and foundering of MARINA-S

Immediately after the collision the chief officer of TINTO put the handle for the pitch propeller in zero position.

The two vessels were drifting apart the very moment the captain on board TINTO arrived on the bridge.

MARINA-S was starting to list to the port side. The port side list increased very rapidly and the ship capsized and sank within approximately 3 minutes.

It is the opinion of the investigators that by going ahead on the propulsion on TINTO instead of stopping after the collision, the water filling of the cargo hold of MARINA-S would have been delayed which could have given the crew of MARINA-S more time to evacuate.

4.5 Life-Saving Appliances on board MARINA-S

Accessibility of personal life-saving appliances

Lifejackets and immersion suits were placed in each of the crewmembers' cabins.

None of the crewmembers were wearing lifejackets or immersion suits when they abandoned the ship.

The ship capsized and sank within few minutes.

The water was very cold and they were all perished with cold, when they were taken on board TINTO after more than 20 minutes in the water.

Relevant national legislation which is based on SOLAS

Danish Maritime Authority Notice B III B of 1. January 2006 - *Life-Saving Appliances and Arrangements* – Reg. 32.3.4 prescribes:

Immersion suits shall be placed, so as to be readily accessible ….

Reg. 7.2.2 prescribes: *Lifejackets shall be so placed as to be readily accessible … Where, due to the particular arrangement of the ship, the lifejackets provided … may become inaccessible, alternative provisions shall be made to the satisfaction of the Administration which may include an increase in the number of lifejackets to be carried.*

In the Danish Maritime Authority's Technical Regulation No 5 of 11 May 2004 1); *Technical Regulation on life rafts and immersion suits on board fishing vessels* – Section 8 it is prescribed: *Immersion suits shall be placed in the vicinity of the life-saving appliances and, as far as possible, so as to be accessible from the open deck.*

It is the opinion of the investigators that the personal life-saving appliances became inaccessible in this situation, because the crew after the collision had to go inside the accommodation in order to get their lifejacket or immersion suit.

The life raft

The roof of the life raft did not inflate. The raft had been serviced regularly, most recently in January 2006.

The test performed after the accident did not show any damage or defects in the inflation system. It has, however, not been possible to rule out that the malfunction could have been caused by defects in the CO^2 supply system at the time of the bottle was activated.

1) [This Regulation has been notified in draft form in accordance with European Parliament and Council Directive 98/34/EC (the Information Procedure Directive), most recently amended by Directive 98/48/EC.]

5 Conclusion

Due to restricted visibility COLREG Rule 19 was applicable. Both vessels were obliged to take action to avoid a close quarter situation and/ or the risk of collision.

The two vessels collided mainly because:

- The actions taken on board MARINA-S to avoid the collision were inefficient.

- The OOW on board TINTO was alone on the bridge and did not maintain a proper look-out by radar at all times appropriate to the conditions with restricted visibility. Therefore, he was not aware of the presence of MARINA-S and was precluded from taking any action in accordance with COLREG.

The following conditions and circumstances contributed to the collision:

MARINA-S

The OOW did not appraise the situation fully.

Actions taken by the OOW to avoid the close quarter situation was belated.

Actions taken were counteractive to each other.

The OOW failed to check the effectiveness of the course alteration.

TINTO

The OOW had only one radar as source of information to reveal the presence of MARINA-S.

Human - machine interface problems or attention failure due to fatigue might have contributed to the missing observation the echo of MARINA-S.

Other contributing causes

None of the vessels had a designated look-out on the bridge.

There was no communication between the vessels. There is discrepancy as to whether MARINA-S attempted to make contact by VHF and by signal prior to the collision

The high relative speed under conditions with poor visibility.

6 Recommendation and actions taken

6.1 Accessibility of personal life-saving appliances

In accordance with the previously mentioned Technical Regulation for fishing vessels, *Immersion suits shall be placed in the vicinity of the life-saving appliances and, as far as possible, so as to be accessible from the open deck.*

In accordance with the Danish Maritime Authority Notice B, alternative provisions shall be made to the satisfaction of the Danish Maritime Authority where the lifejackets, due to the particular arrangement of the ship, becomes inaccessible …*Immersion suits shall be placed, so as to be readily accessible.*

The Investigation Division recommends the Danish Maritime Authority to consider in general whether personal life-saving appliances are *readily accessible* when placed in the crew's cabins, and also to consider the placement of immersion suits in cargo ships without means for dryshod evacuation.

6.2 Actions taken

According to the Danish Maritime Authority (DMA) it is a requirement and usual practice, and it has been so for several years, that life vests and emersion suits on board Danish registered cargo ships must be placed in the immediate vicinity of the embarkation area or on the ship's bridge.

The DMA has since March 5, 2007 taken steps to ensure that the above mentioned requirement will be communicated individually to Danish registered non-SOLAS cargo ships in the future.

The DMA will further more clarify what should be regarded as *readily accessible.* This clarification will be issued in the first coming number of *Notices from the Danish Maritime Authority (Meddelelser fra Søfartsstyrelsen).*

7 Appendix

GUIDANCE ON FATIGUE MITIGATION AND MANAGEMENT MSC/Circ.1014

The International Maritime Organisation (IMO) has recognised fatigue as a problem to maritime safety. The effects of fatigue are described as follows;

6. EFFECTS OF FATIGUE

Alertness is the optimum state of the brain that enables us to make conscious decisions. Fatigue has a proven detrimental effect on alertness– this can be readily seen when a person is required to maintain a period of concentrated and sustained attention, such as looking out for the unexpected (e.g. night watch).

When a person's alertness is affected by fatigue, his or her performance on the job can be significantly impaired. Impairment will occur in every aspect of human performance (physically, emotionally, and mentally) such as in decision-making, response time, judgement, hand-eye coordination, and countless other skills.

Fatigue is dangerous in that people are poor judges of their level of fatigue. The following is a sample of fatigue's known effect on performance. Modules 2 - 9 contain a more extensive list for use by each individual industry group.

- Fatigued individuals become more susceptible to errors of attention and memory (for example, it is not uncommon for fatigued individuals to omit steps in a sequence).
- Chronically fatigued individuals will often select strategies that have a high degree of risk on the basis that they require less effort to execute.
- Fatigue can affect an individual's ability to respond to stimuli, perceive stimuli, interpret or understand stimuli, and it can take longer to react to them once they have been identified.
- Fatigue also affects problem solving which is an integral part of handling new or novel tasks.

Fatigue is known to detrimentally affect a person's performance and may reduce individual and crew effectiveness and efficiency; decrease productivity; lower standards of work and may lead to errors being made. Unless steps are taken to alleviate the fatigue, it will remain long after the period of sustained attention, posing a hazard to ship safety.