Marine Safety Investigation Unit

Transport Malta

MARINE SAFETY INVESTIGATION REPORT

Safety investigation into the allision involving the

Maltese registered bulk carrier

CAPRI

in the Eastern Special Purpose 'A' Anchorage, Singapore

on 09 July 2015

201507/006

MARINE SAFETY INVESTIGATION REPORT NO. 12/2016

FINAL

The MSIU gratefully acknowledges the assistance and cooperation of the Marine Accident Investigation Section, Marine Department, Hong Kong China and the Ship Investigation Department of the Maritime and Port Authority of Singapore, during the safety investigation of this accident.

Investigations into marine casualties are conducted under the provisions of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 and therefore in accordance with Regulation XI-I/6 of the International Convention for the Safety of Life at Sea (SOLAS), and Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009, establishing the fundamental principles governing the investigation of accidents in the maritime transport sector and amending Council Directive 1999/35/EC and Directive 2002/59/EC of the European Parliament and of the Council.

This safety investigation report is not written, in terms of content and style, with litigation in mind and pursuant to Regulation 13(7) of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011, shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame, unless, under prescribed conditions, a Court determines otherwise.

The objective of this safety investigation report is precautionary and seeks to avoid a repeat occurrence through an understanding of the events of 09 July 2015. Its sole purpose is confined to the promulgation of safety lessons and therefore may be misleading if used for other purposes.

The findings of the safety investigation are not binding on any party and the conclusions reached and recommendations made shall in no case create a presumption of liability (criminal and/or civil) or blame. It should be therefore noted that the content of this safety investigation report does not constitute legal advice in any way and should not be construed as such.

MARINE SAFETY INVESTIGATION UNIT
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LIST OF REFERENCES AND SOURCES OF INFORMATION

Crew members MV *Capri*

Marine Accident Investigation Section, Marine Department, Hong Kong, China

Ship Investigation Department of the Maritime and Port Authority of Singapore

VDR data MV *Capri*

GLOSSARY OF TERMS AND ABBREVIATIONS

Aframax	Medium-sized crude tanker with a dead weight tonnage (DWT) ranging between 80,000 and 120,000
AIS	Automatic Identification System
BA	British Admiralty
E	East
gt	Gross Tonnage
ID	Identity
IMO	International Maritime Organization
kW	Kilo Watt
Lat	Latitude
Long	Longitude
LT	Local Time
Ltd.	Limited
m	Metres
MSIU	Marine Safety Investigation Unit
N	North
nm	Nautical miles
No.	Number
OOW	Officer of the Watch
rpm	Revolutions per Minute
Suezmax	The largest ship measurements capable of transiting the Suez Canal. Suezmax vessels are medium to large-sized ships with a deadweight tonnage (DWT) between 120,000 to 200,000
TSS	Traffic Separation Scheme
UTC	Coordinated Universal Time
VDR	Voyage Data Recorder
VHF	Very High Frequency
VTS	Vessel Traffic Service

SUMMARY

On 09 July 2015, the Maltese registered dry-bulk cargo vessel *Capri* was involved in an allision with *Brightoil Legend* within the port limits of Singapore. At the time, *Brightoil Legend*, was on anchor in the Eastern Special Purposes Anchorage. *Capri* was under pilotage and underway.

The allision occurred shortly after *Capri* had dropped her anchor and the vessel took an uncontrollable starboard sheer towards *Brightoil Legend.* Immediate action to hold the vessel by running engines astern only worsened the starboard swing. A second anchor was dropped before *Capri* struck *Brightoil Legend*. Both vessels suffered structural damage but there were no injuries and no pollution.

The Marine Safety Investigation Unit (MSIU) determined that there was ineffective team work between the crew members on the bridge and the pilot. Two recommendations have been made to the Managing Company aimed at improving bridge –pilot interaction and exchange of information.

1 FACTUAL INFORMATION

1.1 Vessel, Voyage and Marine Casualty Particulars

Name	*Capri*	*Brightoil Legend*
Flag	Malta	Hong Kong
Classification Society	Bureau Veritas	Lloyd's Register of Shipping
IMO Number	9248526	9398266
Type	Bulk Carrier	Crude Oil Tanker
Registered Owner	Norwalk Star Owners Inc.	Brightoil Petroleum HK Ltd.
Managers	TMS Bulkers Ltd.	Brightoil Shipping, Singapore
Construction	Steel (Double bottom)	Steel
Length overall	289.80 m	243.80 m
Registered Length	280.20 m	237.76 m
Gross Tonnage	87390	60379
Minimum Safe Manning	15	15
Authorised Cargo	Dry Bulk	Bulk Liquid
Port of Departure	Richards Bay, South Africa	Not available
Port of Arrival	Singapore anchorage	Singapore anchorage
Type of Voyage	International	Not available
Cargo Information	165,906 tonnes of iron ore	Not available
Manning	22	21
Date and Time	09 July 2015 at 1304 (LT)	
Type of Marine Casualty or Incident	Serious Marine Casualty	
	Serious Marine Casualty	Serious Marine Casualty
Location of Occurrence	Eastern Special Purposes 'A' Anchorage	
Place on Board	Forecastle	Overside
Injuries/Fatalities	None	None
Damage/Environmental Impact	None	None
Ship Operation	Anchoring / Manoeuvring	On anchor
Voyage Segment	Arrival	Arrival
External & Internal Environment	Calm weather and clear with visibility up to 12 nautical miles. The air temperature was 28 °C.	
Persons on Board	22	21

1.2 Description of Vessels

1.2.1 MV *Capri*

The Maltese registered *Capri* (Figure 1) is an 87,390 gt, Suezmax-size dry-bulk carrier, owned by Norwalk Star Owners Inc., and managed by TMS Bulkers Ltd. of Greece. The vessel was built by NKK Corp-TSU Works, Japan in 2001, and is classed by Bureau Veritas. *Capri* has a length overall of 289.8 m and a breadth of 45.0 m. The vessel has a summer deadweight of 172,579 tonnes.

Propulsive power is provided by a 6-cylinder Mitsui-MAN B&W 6S70MC, two-stroke, single acting slow speed diesel engine, producing 14,711 kW at 80 rpm. This drives a fixed pitch propeller to give a service speed of about 15.0 knots.

Figure 1: MV *Capri*

1.2.2 MT *Brightoil Legend*

The Hong Kong registered motor tanker *Brightoil Legend* is a 60,379 gt, Aframax size crude oil tanker, owned by Brightoil Petroleum Holdings and managed by Brightoil Shipping of Singapore. The vessel was built by Tsuneishi Shipbuilding Co. Ltd. in Hiroshima, Japan, in 2009 and is classed with Lloyd's Register of Shipping. *Brightoil Legend* has a length overall of 243.8 m, and a beam of 42.0 m. The vessel has a summer deadweight of 107,518 tonnes.

Propulsive power is provided by a 6-cylinder MAN B&W 6S60MC-C, two-stroke, single acting slow speed engine, producing 13,560 kW at 105 rpm. This drives a fixed pitch propeller to give a service speed of about 15.40 knots.

1.3 Crew on Board *Capri*

There were 22 crew members on board *Capri* of several nationalities. The master was a Greek national, whereas the chief engineer and engine fitter were Romanian. The second mate was Ukrainian and the rest of the officers and crew were from the Philippines. The working language on board was English. The crew compliment was in excess of the minimum number of crew members stipulated in the Minimum Safe Manning Document issued by the flag State Administration.

1.4 Environmental Conditions

In the Eastern Bunkering 'C' Anchorage, Singapore, the weather was fine and clear with visibility up to 12 nautical miles (nm). The Southwesterly wind was light and the sea was calm. The air temperature was 28 °C. Tidal current, if any, was not reported by the master.

1.5 Narrative[1]

1.5.1 Events on *Capri*

Capri sailed from Richards Bay, South Africa, on 20 June 2015 with 165,906 tonnes of manganite. She was bound for a discharge port in China, *en route* Singapore for bunkers. The voyage was uneventful and *Capri* arrived at Singapore on 09 July 2015.

The arrival draft was 17.31 m forward and 17.70 m aft. The navigation bridge was manned by the master, second mate, third mate, helmsman and a lookout. The chief mate, bosun and an ordinary seaman were on anchor station on the forecastle deck. At about 1200, *Capri* crossed the Westbound traffic separation scheme (TSS Singapore Strait) and approached the pilot station - Eastern Boarding Ground C.

[1] Unless otherwise stated, all times are ship's time (UTC +8).

A local marine pilot boarded *Capri* at 1223 and validated the ship's pilot card. At 1227, the Vessel Traffic Service (VTS) Control Centre communicated to the pilot the anchoring position. The coordinates were 01° 16.35´ N 103° 55.90´ E (Figure 2), adjoining Eastern Fairway in the Southwest part of the Eastern Bunkering Area C.

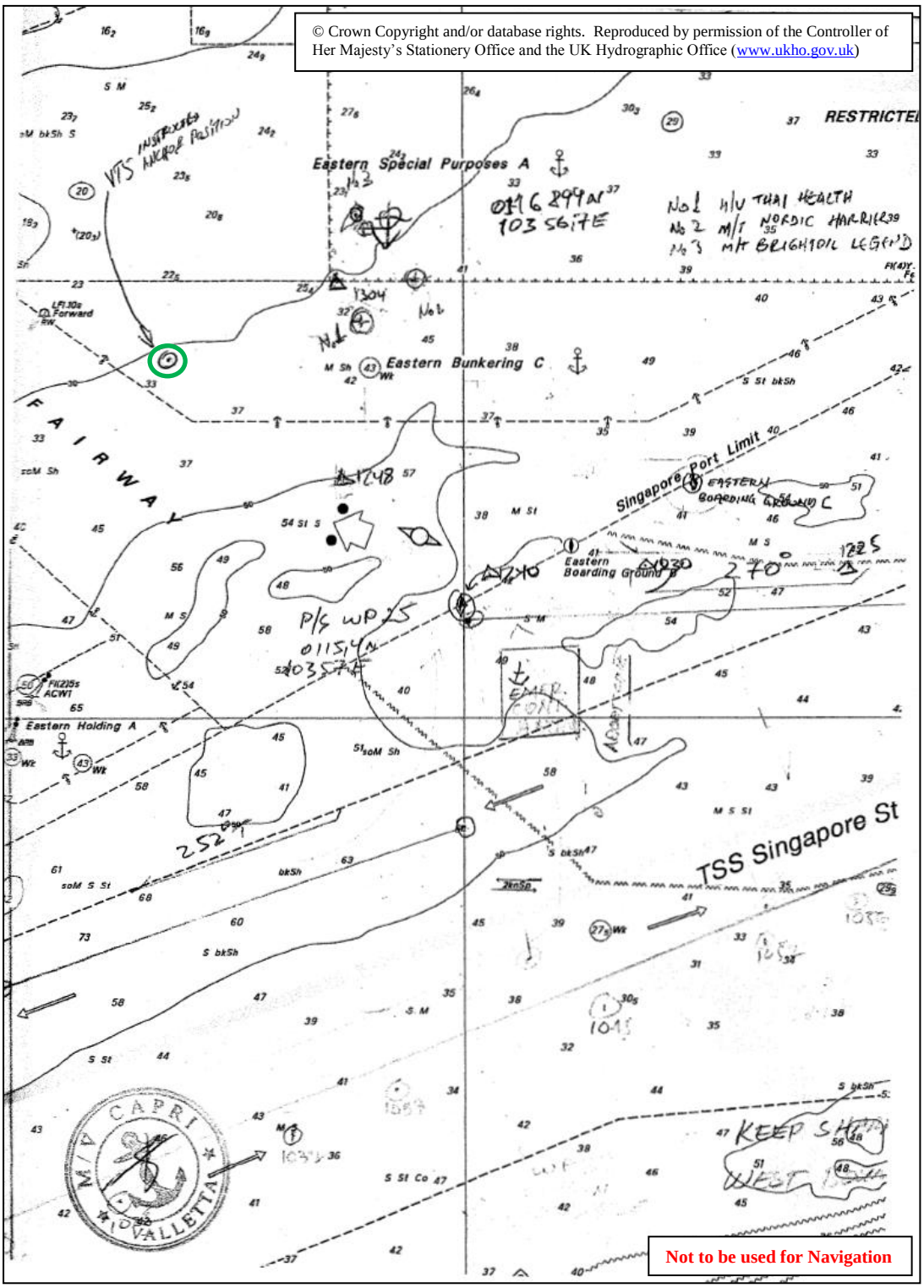

Figure 2: Extract of BA Chart 4041 provided by *Capri*, showing VTS designated anchor position

The pilot had the con and by 1250, *Capri* was 1.75 nm East of the VTS designated anchoring position. The vessel was steady on course 275°, making 6.6 knots. Five minutes later, at 1255, the pilot ordered 20° starboard helm and then hard over to starboard. At the time, *Brightoil Legend*, which was on anchor in the Eastern Special Purposes A and *Tai Health*, also on anchor (AIS ID 12 in the VDR image), were 1.0 nm and 0.5 nm respectively on *Capri's* starboard bow.

The bow of *Capri* on heading 303° cleared *Tai Health.* At 1259, the engines were stopped and the helm was set to midship. Shortly afterwards, the pilot ordered the helm hard over to port. With the engine control set to slow astern and half astern, he directed the crew to let go the port anchor (Figure 3).

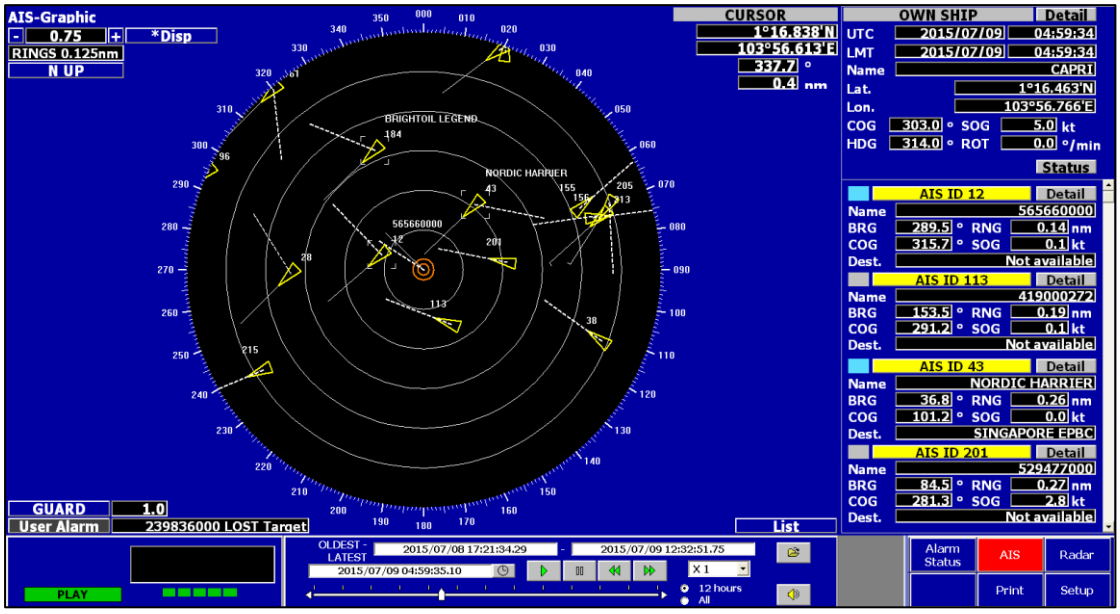

Figure 3: VDR image of *Capri* at 1259/34s

At 1300, *Capri*, which was now on heading 319°, passed *Tai Health*. In spite of the port helm, the engines running astern, and the crew holding on to six shackles in the water, *Capri* continued turning to starboard towards *Brightoil Legend* at 5 knots. As distance between the two vessels decreased, the pilot ordered the engines full astern.

Relative position of *Tai health*, *Nordic Harrier* and *Brightoil Legend* at 1301 is shown Figure 4. At 1303, the starboard anchor was dropped to lessen the impact of the allision, which was now inevitable. Shortly afterwards, the port bow of *Capri* made contact at an angle with *Brightoil Legend* at 2.5 knots in the Eastern Special Purposes Anchorage A, in position 01° 16.842´ N 103° 56.612´ E (Figures 5 and 6).

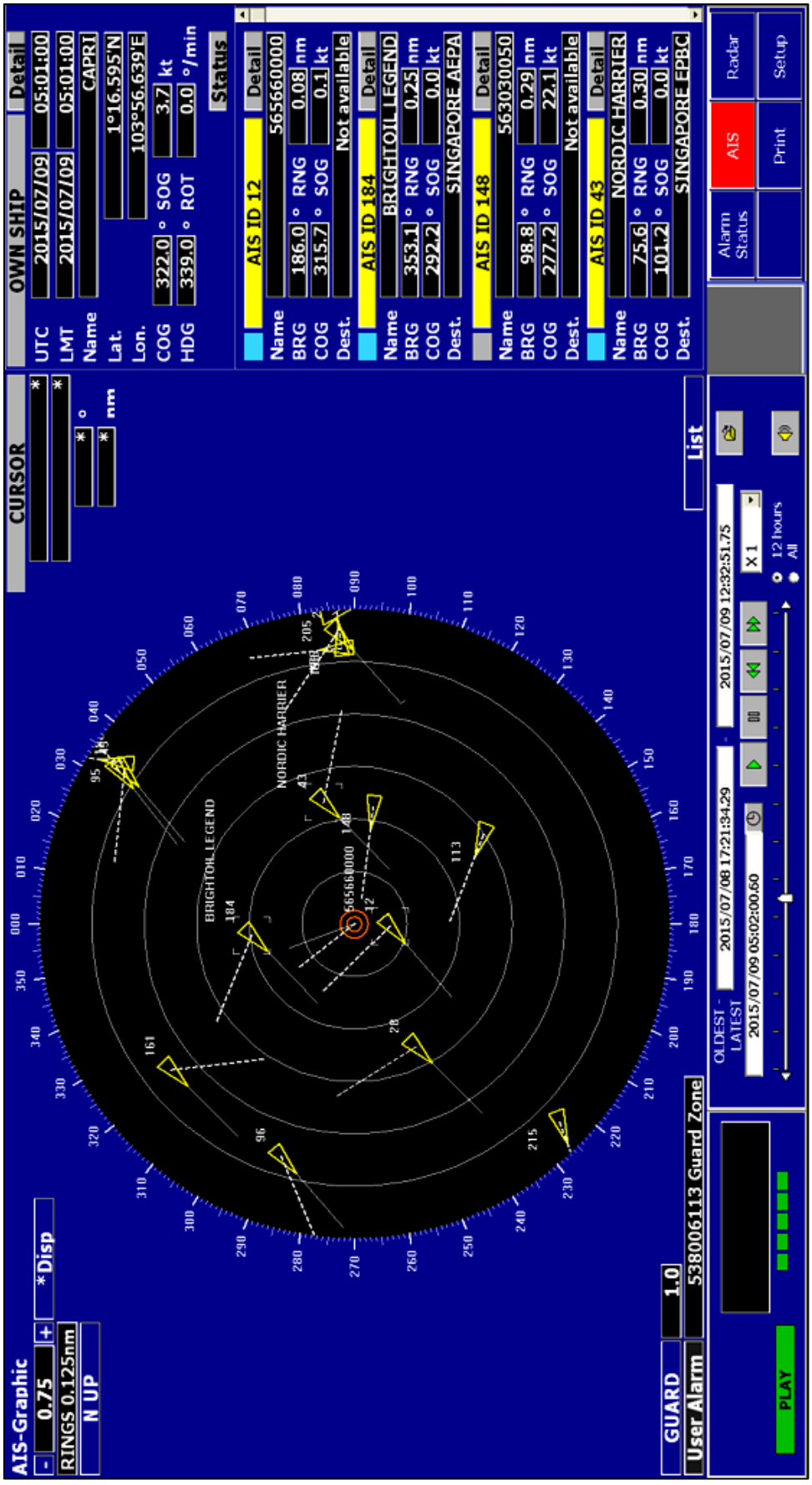

Figure 4: VDR image of *Capri* at 1301/00 s

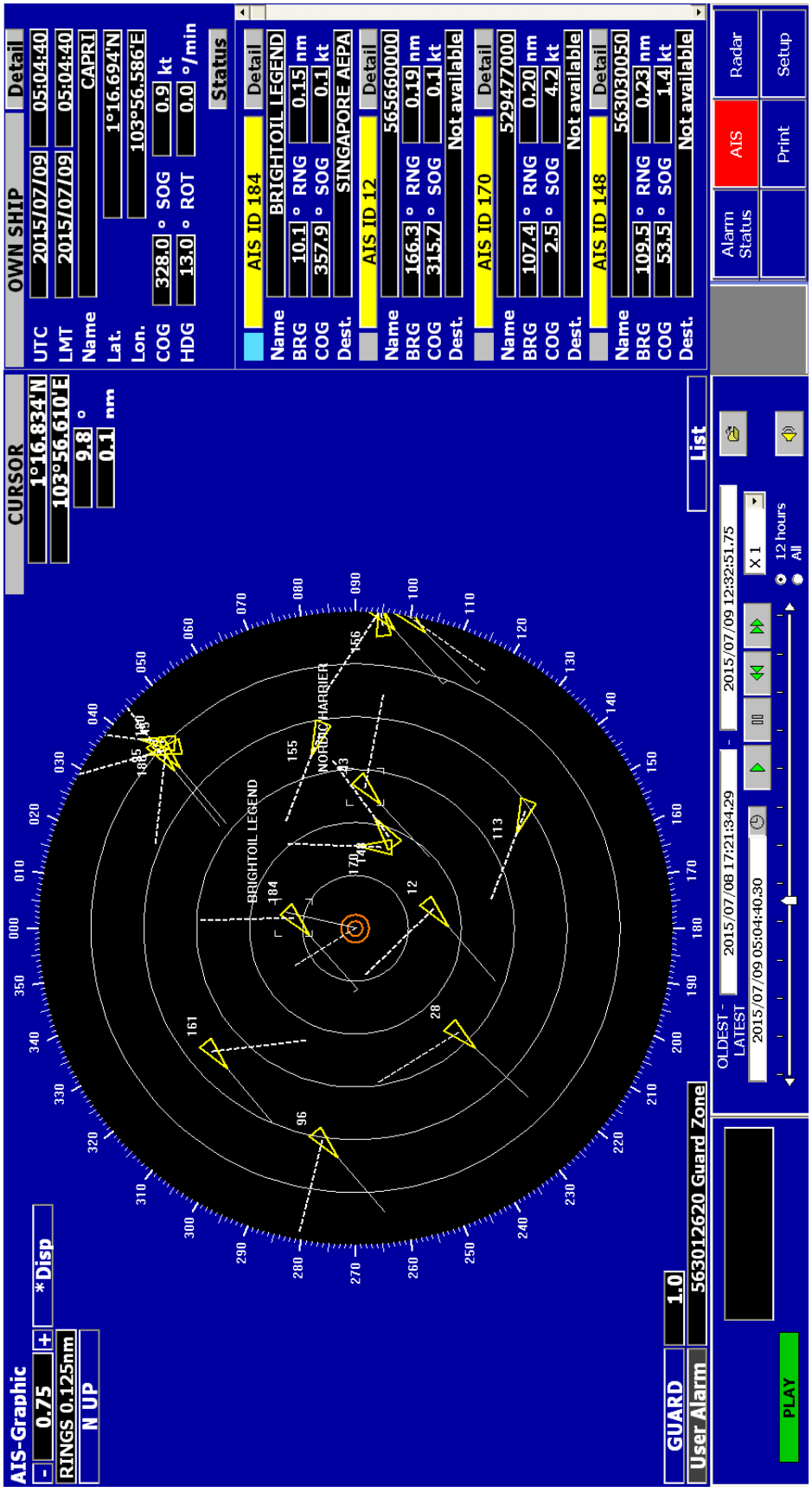

Figure 5: VDR image of *Capri* at 1304/40 s

Figure 6: *Capri* and *Brightoil Legend* several minutes after the allision

Capri's positions and track as captured by the AIS are shown in Figure 7. A hand-drawn copy of track submitted by *Capri* is reproduced as Figure 8.

Both vessels reported structural damage above the waterline, although there were neither injuries nor pollution.

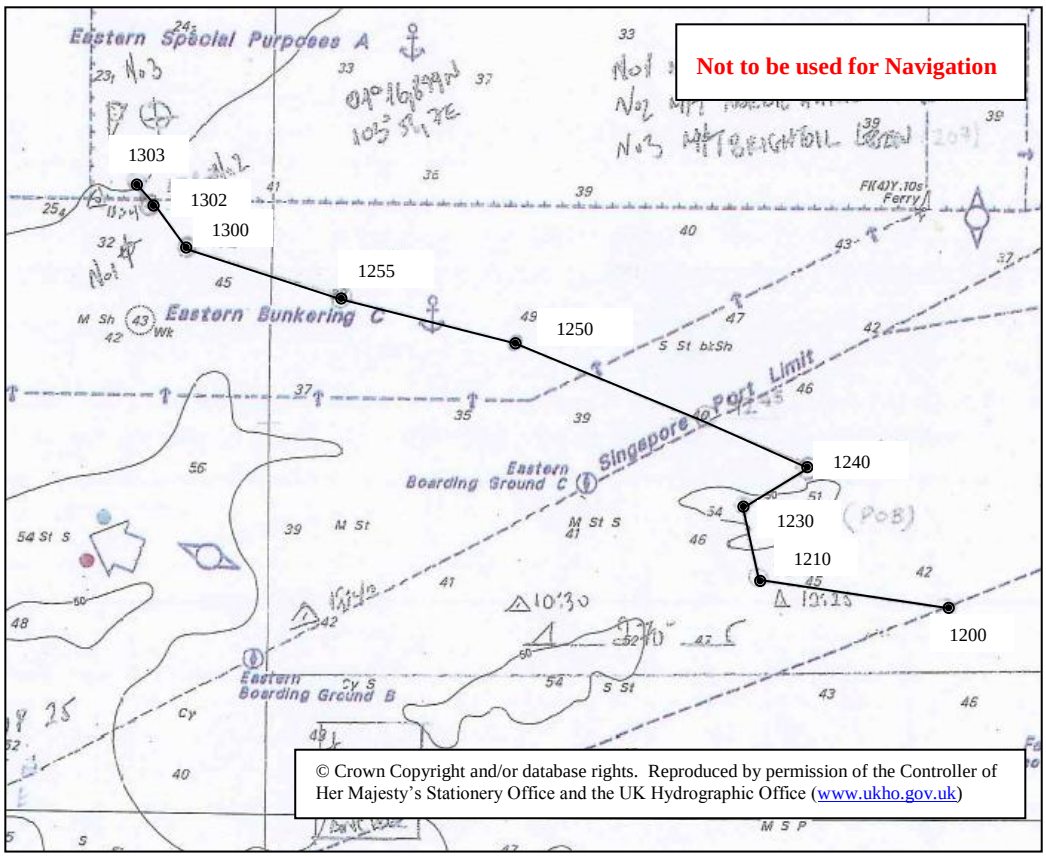

Figure 7: Capri's track compiled from the positions captured from the AIS

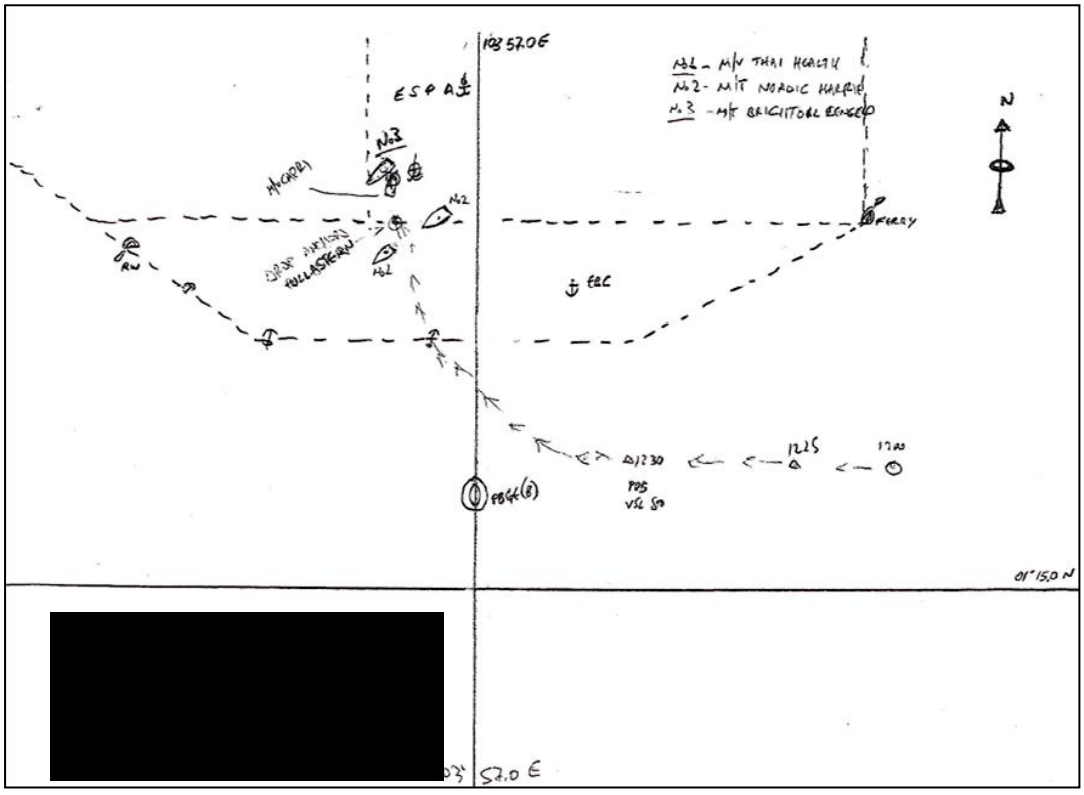

Figure 8: Allision sketch as obtained from *Capri*

1.5.2 Events on *Brightoil Legend*

The second mate was on anchor watch before the accident happened.

He reported seeing *Capri* about two points on *Brightoil Legend*'s port bow. The second mate observed that after passing ahead of *Nordic Harrier, Capri* altered course towards *Brightoil Legend.* Seeing this, he called *Capri* on the VHF radio, however, there was no response. In the meantime, the master had arrived on the bridge and using the ship's whistle and VHF radio, he made several attempts to warn *Capri* of the developing situation. The second mate reported that he had observed that *Capri* had dropped port and starboard anchors but continued advancing forward and eventually collided with *Brightoil Legend,* in way of no. 5 ballast tank.

1.6 Voyage Recorder Data Recovery

VDR data from *Capri* was saved by the crew. A copy of the data was made available to the MSIU for analysis. The data provided valuable information as to the accident dynamics and events following the allision. The most relevant part of the data is tabulated below (Table 1).

Table 1: Extract of events and actions recorded on VDR (time is UTC)

Time hh mm ss	*Latitude N ° ´*	*Longitude E ° ´*	*Heading °*	*COG °*	*SOG (Speed) Knots*	*Audio*	*Observations*
04 20 00	*1 15.837*	*103 58.261*	*326*	*122*	*0.9*		*Embarking pilot*
04 24 37 to 04 25 37						*Bridge: VTS Central VTS Capri/VTS Capri VTS Capri* *VTS Central: Capri pilot on board over?* *Bridge: Pilot on board* *VTS Central: Thank you* *Bridge: 1223*	
04 26 37 to 04 27 37						*Pilot: East Control, Capri* *East Control: Capri, East Control* *East Control: …Bunkering Charlie/position somewhere 1635 1635 5590/1635 5590* *Pilot: Thank you over*	*Anchoring position given to pilot: Lat 01° 16.35´ N Long 103° 55.90´ E.*
04 40 00	*1 15.952*	*103 58.431*	*290*	*311*	*3.0*		
04 50 00	*1 16.273*	*103 57.638*	*280*	*284*	*6.6*		*Anchoring position 1.75 nm west of Capri.*

Time hh mm ss	Latitude N	Longitude E	Heading	COG	SOG (Speed) Knots	Audio	Observations
04 54 01			275	279	6.1	Pilot: Dead slow ahead	
04 55 00	1 16.376	103 57.183	275	279	6.1		Anchoring position about 1.55 nm west of Capri
04 55 37 to 04 56 37						Pilot: Starboard 20°/ I have to go in there after I have… Bridge: Starboard 20° sir Pilot: Hard starboard Bridge: Engine Dead slow ahead sir Bridge: Hard starboard now	
04 56 08			275	279	6.0		
04 57 00	1 16.397	103 57.059	275	278	6.0		Capri turning to starboard
04 57 15			281	275	5.8		
04 58 11	1 16.418	103 56.881	293	278	5.6		Bearing/Distance from Capri Tai Health 290°/0.3´ Nordic Harrier 009°/0.3´ Brightoil Legend 327°/0.5´
04 58 30			299	281	5.5		
04 58 37 to 04 59 37						Pilot: Midship Bridge: Midship Pilot: Hard to port Bridge: Hard to port Pilot: Slow ahead Pilot: Midship Bridge: Midship Pilot: Stop engine/ let go /let go	(See Figure 3) Tai Health (AIS ID 12) bearing/distance 289.5°/0.14´
04 59 04			309	290	5.3		
05 59 34			314	303	5.0		
04 59 37 to 05 00 37						Pilot: Slow astern Bridge: Slow astern Pilot: Half astern Bridge: Half astern Bridge: We stay here. Drop here Pilot: Stop her Pilot:…now/slow astern Bridge: Let go chief Pilot: Six shackles in the water Bridge: Six shackles in the water	Port anchor released.
05 00 00			318	309	4.9		
05 00 21	1 16.506	103 56.760	321	312	4.8		Passing close astern of Tai Health. Brightoil Legend 343°/0.3´ from Capri.
05 00 31			322	313	4.7		
05 00 37 to 05 01 37						Bridge: Six shackles in the water Pilot: Full astern eh. / Okay hold on	(See Figure 4) Brightoil Legend 353°/0.25´
05 01 00			339	322		Bridge: Hold on	

Time hh mm ss	*Latitude N*	*Longitude E*	*Heading*	*COG*	*SOG (Speed) Knots*	*Audio*	*Observations*
05 01 26			*345*	*324*	*3.4*		*Brightoil Legend 357°/0.2´ from Capri.*
05 02 30			*346*	*325*	*3.4*		
05 01 37 to 05 02 37						*Pilot: What he say now* *Bridge: We cannot stop*	
05 03 00			*353*	*330*	*3.0*		*Starboard anchor released.*
05 03 35 to 05 04 37	*1 16.667*	*103 56.598*	*358*	*000*	*2.5*	*Bridge: We touch* *Pilot: Ask forward if we touch. We touch* *Pilot: Yes we touch [Brightoil Legend]*	*(SeeFigure 5) Brightoil Legend 010.1°/0.15´*
05 04 40			*013*	*328*	*0.9*		
05 04 37 to 05 05 37						*Pilot: East Control, Capri East Control. I just collided with Brightoil Legend* *Bridge: Half astern/Slow astern/Heave up heave up stop engine* *Pilot: East Control, East Control, Capri* *East Control: Yes Capri* *Pilot: I just collided with Brightoil Legend*	
05 05 37 to 05 06 37						*Bridge: Port Marne Safety (PMS), Capri* *PMS: Come in over* *Bridge: Motor vessel Capri calling for Marne Safety* *PMS: Yes Capri* *Bridge: I just collided with Brightoil Legend ...position 01 16 decimal...*	

During the course of the investigation, the MSIU did not have a copy of any statements released by the pilot.

1.7 Damages

As a result of the allision, *Brightoil Legend* sustained damages above the waterline (Figures 9, 10 and 11). A hole in her side shell plating between frame 56 and 57 and shell longitudinal 40 to 42 measured 4.9 m * 0.37 m. The internal members were also found to be buckled. The main deck plating between frame 56 and 57 and deck longitudinal 21 and 22 were deformed. Damages was also visible on the port side

railing, fish plate, accommodation ladder and its control station/panel. One fairlead was torn off its seat.

Figure 9: Damages to the *Brightoil Legend* side shell plating

Figure 10: Damages to *Brightoil Legend* railing and fish plate

Figure 11: Damages to *Brightoil Legend* accommodation ladder, control station/panel damage and fairlead, which was torn off

Figure 12: *Capri's p*ort and starboard anchors fouled

Figure 13: Damages to *Capri*'s port bow shell plating

Capri had a fracture on her side shell plating at the bow, measuring 7.5 m * 0.5 m, in way of bosun store between frames 295 and 300. Adjacent stiffeners also sustained structural damages, whilst the port and starboard anchors were fouled (Figures 12 and 13).

2 ANALYSIS

2.1 Purpose

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, to prevent further marine casualties or incidents from occurring in the future.

2.2 Master/Pilot Information Exchange

Upon boarding, the pilot was given the pilot card with the vessel's manoeuvring characteristics. The VTS had provided the coordinates and the pilot was conning the vessel.

A step to lessen the risk of accident during pilotage is to have a clear understanding of planned passage/manoeuvres and practical knowledge of ship handling. These issues are addressed by the provision of master/pilot exchange of information or pilot card. In fact, Annex 2 of the IMO Assembly Resolution A.960 (23) recommend this exchange of information. Section 5.1 states that:

> The master and the pilot should exchange information regarding navigational procedures, local conditions and the ship's characteristics. This information exchange should be a continuous process that generally continues for the duration of the pilotage.

Thus, such formal exchange and subsequent communication assist the master and crew as pilot operations progress. The MSIU is aware that a pilot card with the vessel's information was prepared and exchanged with the pilot. It contained information on navigational instruments, engine power and manoeuvring characteristics of the vessel. However, essential information on pilot's intended passage or anchoring operations were overlooked, other than a note in the pilot card *'as per passage plan'*. The safety investigation, however, found no compelling evidence to support any formal exchange of information on pilotage or anchoring position.

2.3 Anchoring Operation and Accident Dynamics

Capri is fitted with a right handed propeller which pushes the bow to starboard when going astern. In shallow waters, the helm and engine response is weak and she carries her way farthest when fully laden.

At 1250, *Capri* was steady on a course of 275° and making 6.6 knots. The anchoring position was 1.75 nm fine on her port bow. Taking into consideration the gradual reduction of engine speed, it would take the vessel about 20 minutes to reach the anchoring position. However, at 1255 the pilot said, *'I have to go there'* and ordered the helm 20° to starboard and then hard over starboard. A number of helm and engine movements '*midship/hard to port/slow ahead/stop engines/midship'* were ordered by the pilot between 1258/37 s and 1300/37 s and executed by the bridge team.

Analysis of the pilot's actions recorded on the VDR indicated that the vessel was being readied for anchoring. The relative positions of *Tai Health* (AIS ID 12), *Nordic Harrier* and *Brightoil Legend* at 1259/34 s are shown in Figure 3. With the engines running on slow astern and half astern, she dropped port anchor in 25 m of water at 5 knots. *Capri* passed *Tai Health* and entered Eastern Special Purposes Anchorage where *Brightoil Legend* was anchored. The sluggish engine response caused by the shallows and a strong transverse thrust pushed the bow to starboard. Subsequent running of the engines full astern to take all way off the ship exacerbated the starboard cant towards *Brightoil Legend*.

It is evident from the analysis of the VDR data that the manner in which the ship handling manoeuvres were conducted reflected an intention to anchor between *Tai Health* and *Nordic Harrier*, a position which is at a significant distance from the one communicated by the VTS. The fact that the master did not query what seemed to be a deviation from the original anchoring decision may be suggestive of a situation where actually there was either no awareness or no safety concerns on the new position which had just been indicated by the pilot.

While there had been no change in the original anchoring position provided by the VTS, the safety investigation was unable to establish the reason for the deviation to anchor between *Tai Health* and *Nordic Harrier*. It does seem, however, that the

probability of poor engine/helm response, strong starboard cant and the risk of allision with *Brightoil Legend* were not recognised for the reasons explained in the sub-sections below.

2.4 Monitoring a Dynamic Environment

The recommended exchange of information is only but an integral part of the master's and the navigational officer of the watch (OOW)'s role on the bridge during the course of the navigation. It is actually an integral part in the role of managing any navigational risks involved to carry out the necessary manoeuvres. In assessing the risks, monitoring of the ship's navigation and progress in order to mitigate any unplanned or unexplained deviations in good time remains crucial. Available evidence does not indicate that there were any discussions on pilotage, anchoring position or operations.

During the course of the investigation, the master explained that since the manoeuvre was a simple anchoring operation and which did not involve mooring the vessel, no essential information was exchanged. The perception of the actual risk was also indicative in the limited number of positions which were plotted on the chart. A copy of vessel's track (Figure 8) submitted as documentary evidence of navigational progress was found unreliable when compared with the actual positions extracted from the VDR data. The fact that both the track and plotted positions sharply vary with *Capri's* true AIS positions and VTS recorded track (Figure 7) was indicative of inadequate monitoring and inaccurate situational awareness.

This factor is further addressed in more detail in the following sub-section.

2.5 Situation Awareness in a Dynamic Environment

An issue which seemed evident to the safety investigation was the absence of horizontal and vertical communication lines within the bridge team members and the pilot, as an extended member of the team.

Effective communication is not only crucial for the transfer of clear and accurate information but also a means to express concern on particular situation, if any. The

master may be seen as the pivotal point person but all persons on the bridge are actually crucial team members. It would seem that the lack of communication led to different mental models on the bridge because the crew members were unclear as to what the intentions of the pilot were.

The MSIU believes that the problem was exactly there. Referring to studies in the model of perceptual cycle, during the course of events, the environment is normally sampled and information is gathered in order to update and even modify internal, cognitive schema of the world. The process is almost cyclic as long as the environment is dynamic.

Thus, assuming that the master and the bridge team had full knowledge of the vessel's characteristics and the prevailing context, their mental model would have enabled them to anticipate events as the ship navigated through the anchorage, direct a course of action and check whether the outcome was as expected. With an updated mental model and thorough knowledge of the vessel's characteristics, they would have been in a better position to seek further data, consider possible explanations and new approaches as necessary.

The main issue in this case was that although the master and his crew members had thorough knowledge of the vessel, they did not have an updated model. This was manifested in a way that the there was no discussion on the new anchoring position and the none of the crew members would have been able to quote an exact new geographical position had they been asked at the time.

The situation with the pilot was different but the outcome would have been possibly the same. Knowing what he wanted to achieve, the pilot had the most updated mental model of all the persons on the bridge. In actual fact, he may have been the only one at the time prior to the allision. However, contrary to the crew members, his knowledge of the ship's characteristics would have been limited to what had been exchanged initially when he boarded and experience on similar ships operating in similar conditions.

From a human physiological point of view, cognitive function would depend on a perceptual system which requires the persons on the bridge to, *inter alia*, detect signals, organise them and understand them. It would appear that for the reasons

explained above, both the pilot and the bridge team missed on perceptual information which was vital for their respective role in ensuring that the vessel's anchors safely.

THE FOLLOWING CONCLUSIONS AND RECOMMENDATIONS SHALL IN NO CASE CREATE A PRESUMPTION OF BLAME OR LIABILITY. NEITHER ARE THEY BINDING NOR LISTED IN ANY ORDER OF PRIORITY.

3 CONCLUSIONS

Findings and safety factors are not listed in any order of priority.

3.1 Immediate Safety Factor

.1 The immediate cause of the accident was ineffective team work between the crew members on the bridge and the pilot.

3.2 Latent Conditions and other Safety Factors

.1 Essential information on pilot's intended passage or anchoring operations were overlooked, other than a note in the pilot card *'as per passage plan'*;

.2 The safety investigation found no compelling evidence to support any formal exchange of information on pilotage or anchoring position;

.3 The fact that the master did not query what seemed to be a deviation from the original anchoring decision may be suggestive of a situation where actually there was either no monitoring or no safety concerns on the new position which had just been indicated by the pilot;

.4 The probability of poor engine/helm response, strong starboard cant and the risk of allision with *Brightoil Legend* were not recognised;

.5 A copy of vessel's track submitted as documentary evidence of navigational progress was found unreliable when compared with the actual positions extracted from the VDR data;

.6 Horizontal and vertical communication lines within the bridge team members and the pilot, as an extended member of the team were missing;

.7 Although the master and his crew members had thorough knowledge of the vessel, they did not have an updated mental model;

.8 Both the pilot and the bridge team missed on perceptual information which was vital for their respective role in ensuring that the vessel's anchors safely.

3.3 Other Findings

.1 The shore authorities did not change the anchoring position originally communicated to the pilot by the VTS;

4 RECOMMENDATIONS

In view of the conclusions reached and taking into consideration the safety actions taken during the course of the safety investigation,

TMS Bulkers Ltd. is recommended to:

12/2016_R1 encourage the formal use of master/pilot exchange of information with particular emphasis on pilot passage plans, anchoring/berthing operations, VTS service and other important details for safe navigation;

12/2016_R2 bring to the attention of crew members serving on board Company vessels the importance of:

- frequent and regular plotting of the vessel's positions; and
- ensuring that the pilot becomes an integral part of the bridge so that sharing of relevant information is done effectively.