Marine Safety Investigation Unit

Transport Malta

MARINE SAFETY INVESTIGATION REPORT

Safety investigation into the collision

between the VLCC

SEEB

and the container ship

KOTA TENAGA

In the Singapore Strait

on 04 January 2012

201201/002

MARINE SAFETY INVESTIGATION REPORT NO. 19/2012

Final

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 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 04 January 2012. 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
Malta Transport Centre
Marsa MRS 1917
Malta

CONTENTS

GLOSSARY OF TERMS AND ABBREVIATIONS

AB	Able Bodied Seaman
AIS	Automatic Identification System
ARPA	Automatic Radar Plotting Aid
BRM	Bridge Resource Management
CoC	Certificate of Competence
COLREGS	International Regulations for Preventing Collisions at Sea, 1972, as amended
CPA	Closest point of approach
DPA	Designated person Ashore
ECDIS	Electronic Chart Display & Information System
ETA	Estimated Time of Arrival
GM	The distance from the centre of gravity to the metacentre
GMT	Greenwich Mean Time
GPS	Global Positioning System
IMO	International Maritime Organization
ISM	International Safety Management (Code)
LT	Local Time
m	metres
mt	metric tonnes
nm	nautical mile
OOW	Officer of the Watch
MPA	Maritime and Port Authority of Singapore
PSAM	PSA Marine Pte Ltd
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea, 1974 as amended
SoG	Speed over Ground
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended
sVDR	Simplified Voyage Data Recorder
TSS	Traffic Separation Scheme
TCPA	Time to Closest Point of Approach
VHF	Very High Frequency
VLCC	Very Large Crude Carrier
VTIS	Vessel Traffic Information Service
VRM	Variable Range Marker

SUMMARY

On 4 January 2012, at 1800, the VLCC *Seeb* entered the Singapore Strait, following the east-bound traffic lane of deep water route. During her transit in the Strait, *Seeb* was on manoeuvring speed and hand steering. The vessel was constrained by her draft and displayed the required signals in the deep water route.

Kota Tenaga, which was bound for India, had earlier dropped the Singapore PSAM pilot (Jong Fairway). Her master was taking actions to avoid the west-bound LPG carrier *Yosu Gas* on her port side. However, inadvertently, *Kota Tenaga* manoeuvred in such a way that she entered the Deep Water Route into the path of the east-bound *Seeb*. Subsequently, both vessels collided.

Seeb suffered some damages to her forecastle deck fittings, dents and paint scratches on her starboard side shell all the way from stem to the forecastle deck. Her structural integrity, however, was not breached. *Kota Tenaga* sustained damages to fuel tank no. 3 port, resulting in a spill of about 54 metric tonnes of fuel oil, and the loss of two loaded containers of which one was later recovered. The vessel was rendered unfit to proceed with her voyage. There were no reports of any injuries from both ships.

The relevant authorities were informed about this accident. In line with instructions from VTIS, Singapore, *Seeb* then proceeded towards Eastern Boarding Ground for anchoring. Containment and clean-up efforts continued until 07 January 2012. During this period, there was no disruption to traffic movements in the TSS.

The safety investigation, which was carried out with the assistance and cooperation of the Maritime and Port Authority of Singapore, concluded that *Kota Tenaga* had entered the Deep Water Route[1] and was unaware of *Seeb* until moments before the collision.

As a result of the safety investigation, two recommendations have been made to *Kota Tenaga'*s and *Seeb*'s managers, which are intended to improve the standard of look-out and bridge watch keeping. MSIU investigated this accident with the assistance of the Ship Investigation Department, Maritime and Port Authority of Singapore.

[1] The Deep Water Route is established within the east-bound lane. It is a route which has been accurately surveyed so far as possible that is free of dangers and meant for vessels having a draught of 15 metres or more.

1 FACTUAL INFORMATION

1.1 Vessels, Voyage and Marine Casualty Particulars

Name	*Seeb*	*Kota Tenaga*
Flag	Malta	Singapore
Classification Society	Lloyd's Register of Shipping	Lloyd's Register of Shipping
IMO Number	9500716	9251157
Type	VLCC	Container
Registered Owner	Seeb Maritime Transportation Co. Ltd.	Pacific International Lines Pte. Ltd.
Managers	International Tanker Management Holding Ltd.	Pacific International Lines Pte. Ltd.
Construction	Steel (Double hull)	Steel
Length overall	333.0 m	130.4 m
Registered Length	320.0 m	121.6 m
Gross Tonnage	164359	7683
Minimum Safe Manning	18	13
Authorised Cargo	Oil	Containers
Port of Departure	Kharg Island, Iran	Pasir Panjang, Singapore
Port of Arrival	Ningbo, China	Kolkata, India
Type of Voyage	International	International
Cargo Information	Crude oil	Containers
Manning	24	23
Date and Time	04 January 2012 at 2101 (LT)	
Type of Marine Casualty or Incident	Serious Marine Casualty	
	Less Serious Marine Casualty	Serious Marine Casualty
Location of Incident	Singapore Strait in position 01° 10.44'N 103° 48.43'E	
Place on Board	Over side	Over side / bunker tank
Injuries/Fatalities	None	None
Damage/Environmental Impact	Minor damage to hull fittings	Bunker spill and loss of two containers over board
Ship Operation	On passage	On passage
Voyage Segment	Transit	Transit
External & Internal Environment	Gentle breeze, slight seas and low swell with a visibility of about five nautical miles	
Persons on Board	24	23

1.2 Description of Vessels and Key Crew Members

1.2.1 MT *Seeb*

Seeb is a double hull VLCC, built in South Korea, of standard tanker design with the accommodation superstructure located aft. There are five cargo compartments, each divided into five tanks across the vessel's width *i.e.* total of 25 cargo tanks, and two slop tanks.

The vessel is fitted with navigational equipment consistent with SOLAS[2] requirements, including ARPA radars, AIS, and GPS. Propulsive power is provided by a six-cylinder MAN B&W 6S90MC-C, slow speed direct drive diesel engine producing 29,400 kW at 76 rpm. This drives a fixed pitch propeller to reach a service speed of about 15 knots.

At the time of the collision, the vessel's mean draught was about 19.9 m.

The master on board *Seeb* was a Bulgarian national and had joined the vessel on 14 December 2011 at Fujairah. He had completed almost 24 days on board on the day of the collision. He had served as a master on VLCCs since 2010. This was his first contract with International Tanker Management Holding Ltd. During the onset to the collision, the master, who had the con, was assisted by the third mate and one AB as helmsman.

Figure 1: MT Seeb

1.2.2 MV *Kota Tenaga*

Kota Tenaga is a Singapore registered container vessel owned and managed by Pacific International Lines Pte Ltd. The vessel is fitted with navigational equipment consistent with SOLAS requirements, including two (JRC-7 series) radars with ARPA

[2] The International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS).

features. Propulsive power is provided by an eight-cylinder B&W 8S35MC, medium speed direct drive diesel engine producing 5,600 kW at 170 rpm. This drives a fixed pitch propeller to reach a service speed of about 16 knots.

Kota Tenaga was trading on a liner service between the Far East and India – a round trip of about 17 days. *Kota Tenaga* was embarking on the west-bound leg when the vessel left Pasir Panjang Terminal. Her departure draughts were 6.3 m forward and 6.8 m aft.

The master on board *Kota Tenaga* was a Ghanaian national and had joined the vessel on 18 November 2011 at Singapore. The master first went to sea in 1978 and was promoted to a master in 2005. She had worked for the current managers since 1993 as a second mate and was promoted to master in March 2005. The master had been on board *Kota Tenaga* since 18 November 2011. She had been to Singapore on numerous occasions. The third mate was a Chinese national and had joined the vessel on 28 August 2011 at Singapore. He first served at sea in his present rank since August 2011. His first contract with the current managers was signed in 2010.

At the time of the collision, the master on board *Kota Tenaga* had the con (having just dropped the PSAM pilot), assisted by the third mate, one deck cadet and one AB on the wheel.

Figure 2: MV *Kota Tenaga*

1.3 Weather Conditions

A gentle breeze of 7 to 10 knots from south-south east direction was recorded on the day of the accident. The sky was clear and the visibility was over

five nautical miles (nm). There was a 0.6 m to one metre swell and slight seas. The air temperature was 26ºC and sea temperature was 28ºC.

The high / low tide in the area of the collision, off Buffalo Rock isolated danger buoy was at a rate of 1.4 knots / 1.6 knots in the direction 250º / 070º. At 2104, the tide was flooding in the direction of 250° at the rate of 1.4 knots.

1.4 Narrative

Seeb loaded 267,660 mt of crude oil (three grades) from Kharg Island, Iran and sailed on 21 December at 1300 for Ningbo, China. Her ETA at Ningbo was 13 January 2012. The vessel had a draft of 19.90 m and was on even keel.

Kota Tenaga departed Pasir Panjang Terminal on the evening of 04 January 2012, and navigated through Jong Fairway, for India to the west. Just off Sebarok beacon (which was on the starboard side), the PSAM pilot left the vessel at about 2040. Before leaving, the pilot briefed the master about the local condition, namely the south-westerly tidal stream. The master was also advised to keep clear of Sebarok beacon when altering course to join the west-bound lane. Once the PSAM pilot disembarked, the master put the main engine full ahead and steered a south-easterly course. The master's intention was to maintain this course and thereby keeping three cables from Sebarok beacon before altering course to join the west-bound lane.

Seeb entered Singapore Strait on 04 January at 1800 and followed the deep water route in the east-bound traffic lane. Throughout the passage, the vessel displayed night and day signals as required for a vessel constrained by her draft. *Seeb* informed VTIS of her status, which was relayed to shipping traffic transiting Singapore Strait so as to navigate with caution.

The vessel's radars, ARPA, ECDIS, AIS, two sets of GPS, gyro and repeaters were operational. *Seeb*'s positions were plotted using the GPS and verified by land mark observations. The AIS display was giving bearings and ranges of target vessels. Both radars were on relative motion, north up display with 1.5 nm, 3.0 nm and 6.0 nm ranges. True/Relative vectors were used as and when required. The guard zone and its alarm were not in use.

Both VHF sets were used to monitor channel 14, 16 and DSC channel 70. The echo sounder was used to monitor under keel clearance. The course recorder printer was out of order and therefore not in use. It has also been reported that the VDR had stopped recording on 30 November 2011[3], whilst the S-band radar was at times loosing target echoes.

Seeb's passage plan from Kharg Island (LT = GMT + 4) to Ningbo (LT = GMT +8) was prepared, signed by the navigational officers and approved by Master. The 6,221 nautical mile passage was to be covered in 23 days and 14 hours at a speed of 11 knots. Passage charts were corrected up to the weekly Admiralty Notice No. 49 of 2011. Courses were drawn after consulting relevant nautical publications. Under keel clearance was taken into consideration, with due regard to the speed of the vessel, available depth of water, and potential effects of squat.

On 4 January, during her transit from Malacca Strait to Singapore Strait, *Seeb* reduced speed to manoeuvring speed. Before the evening watch and prior to entering Singapore Strait, the main engine was also tested astern and found satisfactory. During the transit, *Seeb* was on hand steering and one AB was designated as the helmsman.

At 2000, in position 01º 04.98'N 103º 42.5'E, the chief mate on board *Seeb* handed over the navigational watch to the third mate[4]. At about 2020, the second mate and the cadet, who was also on the bridge, left to take a rest, leaving the master, the third mate and the duty AB on the bridge.

Whilst *Seeb* was transiting the Singapore Strait, her main engine was put on *Dead Slow* ahead at 2024. At 2038, in position 01º 08.8´N 103º 45.8´E, *Seeb* altered course to 056º(T). The vessel's speed was now reduced to about eight knots. At 2048, *Seeb* was in position 01º 09.5'N 103º 46.9'E on a charted course of 056º(T) and was 1.3 nm from the next waypoint.

---

[3] See Footnote 8 for a comment on this issue.

[4] During this period of time, the engine-room was manned by the fourth engineer, assisted by the engine-room watch rating and supervised by the chief engineer.

At 2053, *Seeb*'s main engine was again put on *Slow Ahead* and at 2057, she commenced altering course[5] (Figure 3).

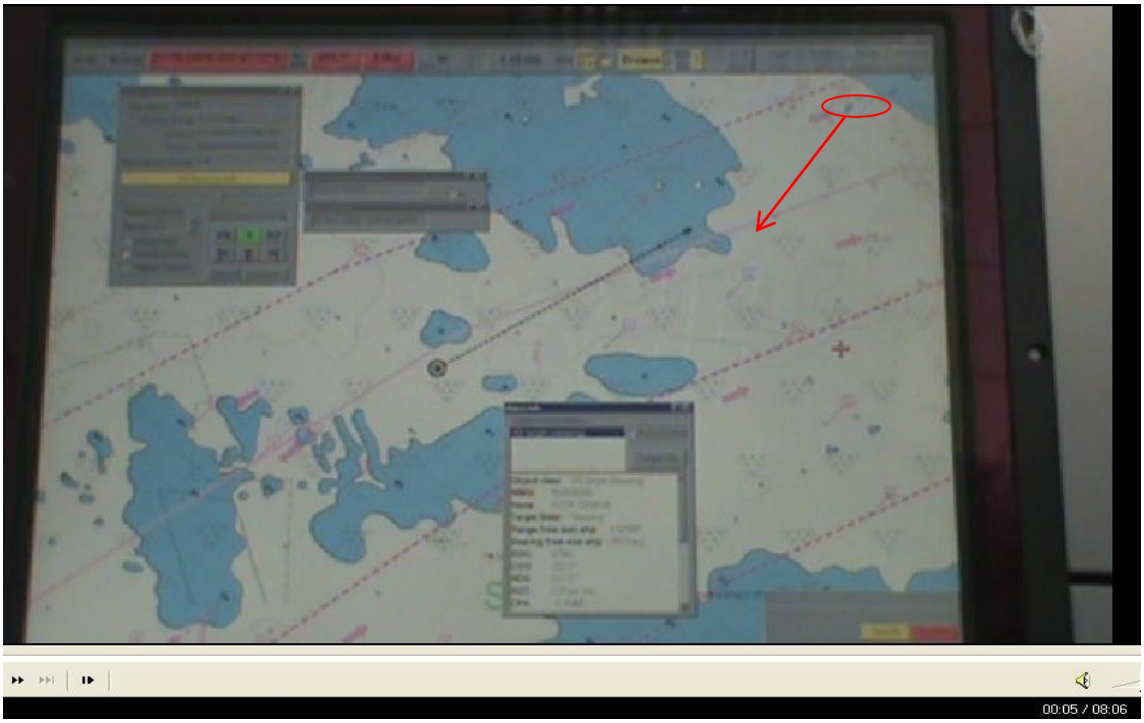


Figure 3: ECDIS screen shot at 2057

In the meantime, as *Kota Tenaga* reached the sea speed of about 8.5 knots, the Master noticed a west-bound vessel, later identified as *Yosu Gas*, broad on the port side. The Master checked the radar and noted that *Yosu Gas* was making about 12 knots with a CPA of about one cable. At about the same time, that is at 2047, Singapore VTIS called the Master to watch out for *Yosu Gas*.

The Master decided to slow down and let *Yosu Gas* proceed ahead. However, after putting the engines on slow ahead, the radar showed *Yosu Gas* also slowing down to about nine knots. The Master immediately ordered hard starboard helm (to the west) and engines full ahead to avoid a close-quarters situation with *Yosu Gas*.

As *Kota Tenaga* started swinging to the west, the Master saw *Yosu Gas* altering course towards *Kota Tenaga*'s stern. Fearing a collision between the vessels' sterns, the Master ordered a 10^{o} port helm to stop the vessel's swing and instructed the third mate to plot the vessel's position. Subsequently, the Master went into the chartroom to check the vessel's position.

[5] By 2059, she was steady on her next course of 070^{o}(T).

At about 2057, Singapore VTIS called the vessel again and warned that:

> *...you have a deep draft tanker in the deep water route…advise you do not go into the deep water route…*

At this time, the look-out reported the sighting of three red lights in a vertical line[6] and the port (red) sidelight of a vessel, later identified as *Seeb*, on the starboard bow.

Seeb was now doing 7.7 knots and on a course of 070º(T) since it was required to transit the east-bound traffic lane, with a speed of eight knots. Her vector length was shown for six minutes. The target vessel (marked in red circle in Figure 3) was one point on her port bow at a distance of one nautical mile, heading on 223º(T) with speed of 9.9 knots and crossing Seeb's bow from port to starboard. The target vessels were acquired by AIS and shown as sleeping targets.

At this time, the master queried in surprise the intentions of the other ship. The third mate also observed that the container vessel was on *Seeb*'s port bow, showing green side light and both mast head lights. He also observed that the vessel was crossing from port to starboard.

The master assessed the movement of the target vessel visually. Observations were not made on Radar or AIS. ECDIS display showed the target vessel (marked in red circle in Figure 4) one point on the port bow at a distance of 0.8 nm, heading 203º(T) and attempting to cross *Seeb*'s bow from port to starboard.

The third mate gave five short blasts. There was no VHF communication between the vessels.

[6] Three all-round red lights in a vertical line are exhibited by a 'vessel constrained by her draught'.

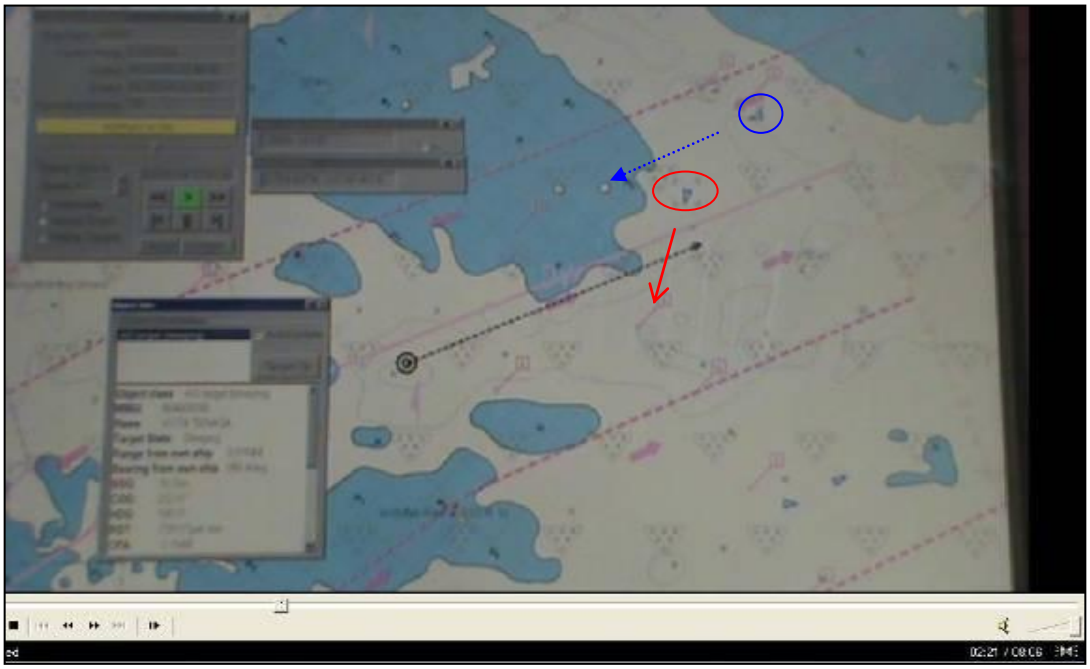


Figure 4: *Kota Tenaga* about to cross *Seeb*'s bow from port to starboard

At 2100, *Seeb* was still on a course of 070º(T) at 7.6 knots. The target vessel (marked in red circle in Figure 5) was right ahead at a distance of 0.5 nm, on a course of about 203º(T) and crossing *Seeb*'s bow from port to starboard.

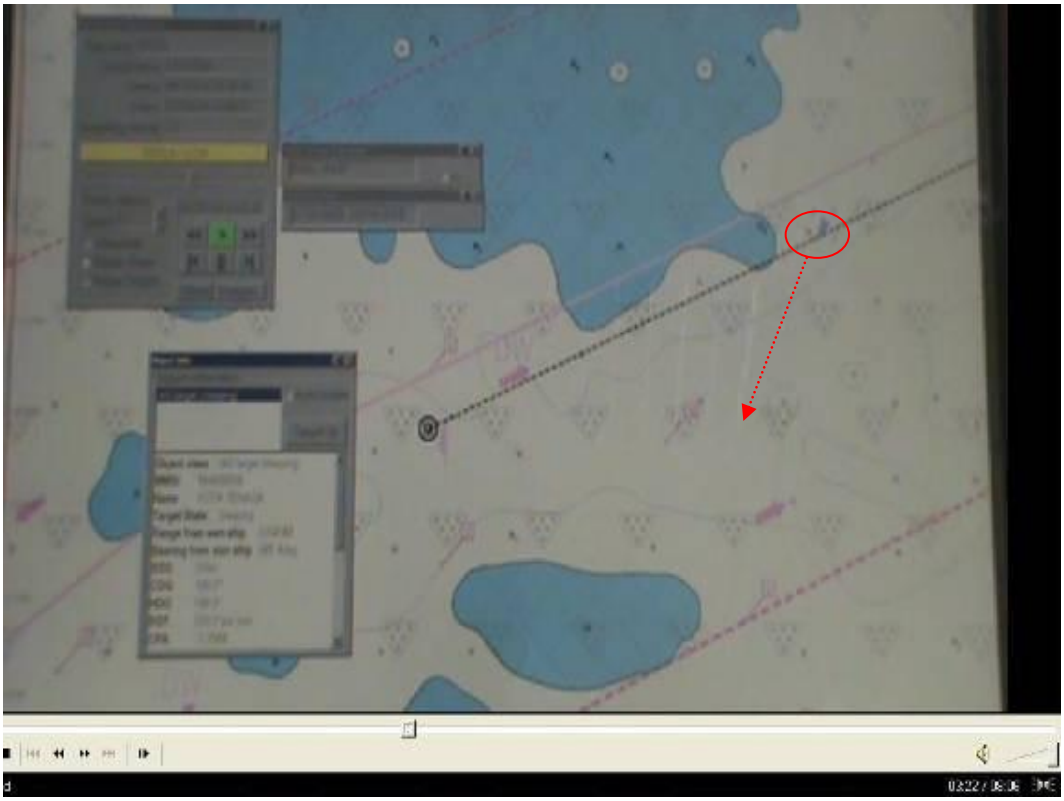


Figure 5: *Kota Tenaga* right ahead of *Seeb* at a distance of 0.5 nm (course 203º) and crossing *Seeb*'s bow from port to starboard

Eventually, the target vessel entered the east-bound lane (Figure 6). Upon coming out from the chartroom, the master of *Kota Tenaga* ordered a hard over helm to starboard. As *Kota Tenaga* started swinging to starboard (to the west), the master saw *Seeb* slowly displaying the starboard (green) sidelight *i.e.* appeared to be altering towards *Kota Tenaga*. The Master ordered the helmsmen to hold onto the hard starboard helm.

Figure 6: The target vessel showed starboard side light and both mast head lights and was about to start turning to her starboard

At 2101, the target vessel (marked in red circle in Figure 7) was one point on *Seeb*'s starboard bow at a distance of 3.5 cables, heading about 260º(T) with a speed of 5.2 knots. The target vessel was still not identified on AIS or by VHF communication and she remained in the east-bound lane, heading against the general direction of the traffic flow but swinging to her starboard. Seeing this, the master on *Seeb* ordered a hard to port helm and continued on '*Slow Ahead'*.

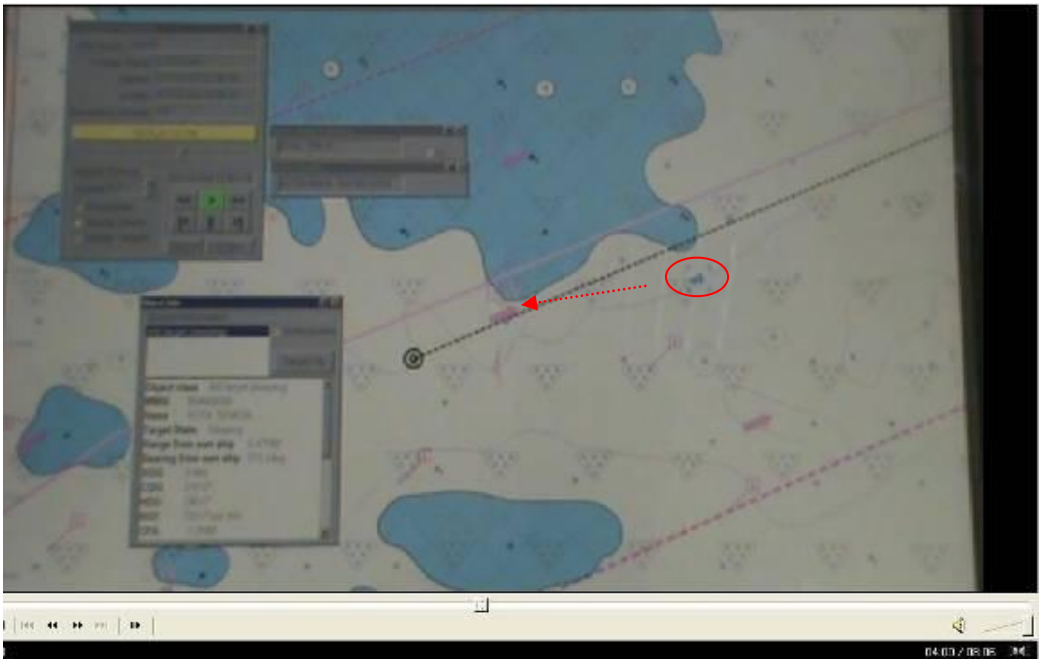


Figure 7: The target vessel now one point on *Seeb*'s starboard bow at a distance of 3.5 cables

At 2102, *Seeb* was on a course of 055º(T) making 7.5 knots. At this time, the target vessel, which was identified from the AIS as *Kota Tenaga* (marked in red circle in Figures 8 and 9), was two points on *Seeb*'s starboard bow at a distance of 1.3 cables, heading almost north westerly. *Kota Tenaga* was still in the east-bound lane and continued swinging to her starboard in a likely attempt to pass ahead of *Seeb* and come back in the west-bound lane of the TSS.

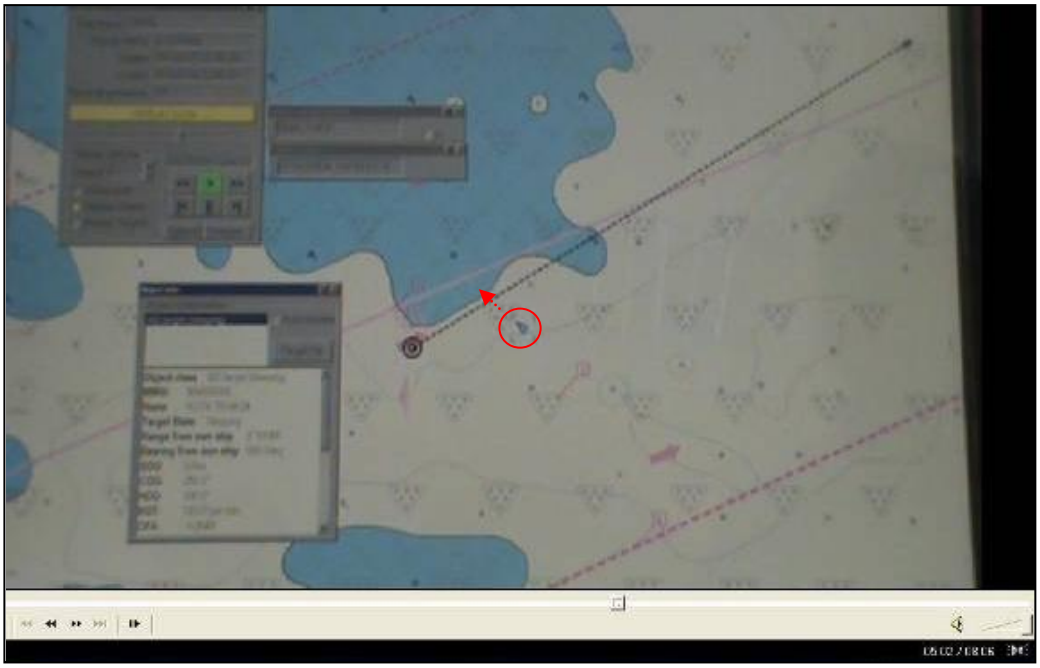


Figure 8: *Kota Tenaga* at about 1.3 cables from *Seeb*

Kota Tenaga showed her port side light and both mast head lights and continued swinging to starboard and started crossing Seeb's bow.

Figure 9: *Kota Tenaga* showing her port side light and both mast head lights

At 2102, *Seeb* was still altering course to port and was now on a course of 050º(T) doing 6.7 knots. The target vessel (marked in red circle in Figure 10) was fine on the starboard bow at a distance of 1.0 cable and was by now heading north in the east-bound lane.

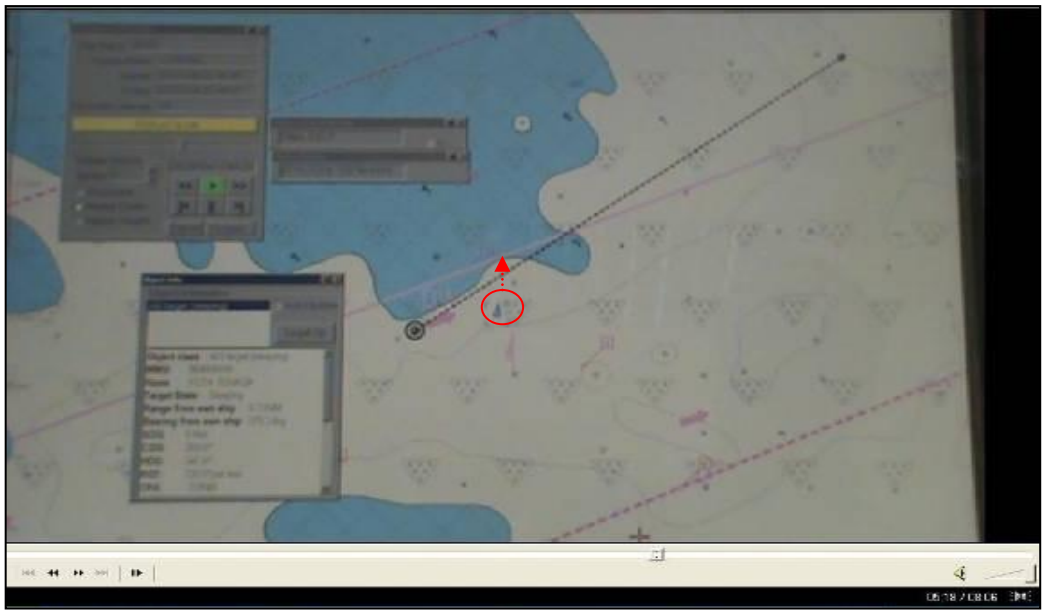


Figure 10: *Kota Tenaga* about 1.0 cable from *Seeb*

Kota Tenaga showed her port side light and both mast head lights (marked in red circle) and continued swinging to starboard. In Figure 11, *Kota Tenaga* is seen right ahead of *Seeb* at a distance of 1.0 cable and attempting to cross the latter's bow. The forward mast head light of *Kota Tenaga* is seen forward of *Seeb*'s stem.

Figure 11: Accommodation of *Kota Tenaga* is seen on starboard side of *Seeb* whilst attempting to cross *Seeb*'s bow

At 2103, *Seeb* continued altering her course to port and was on a course 040º(T) at 5.2 knots. *Kota Tenaga* (marked in red circle in Figure 12) was one and half points on starboard bow at close distance, heading 033º(T) and still attempting to cross *Seeb*'s bow.

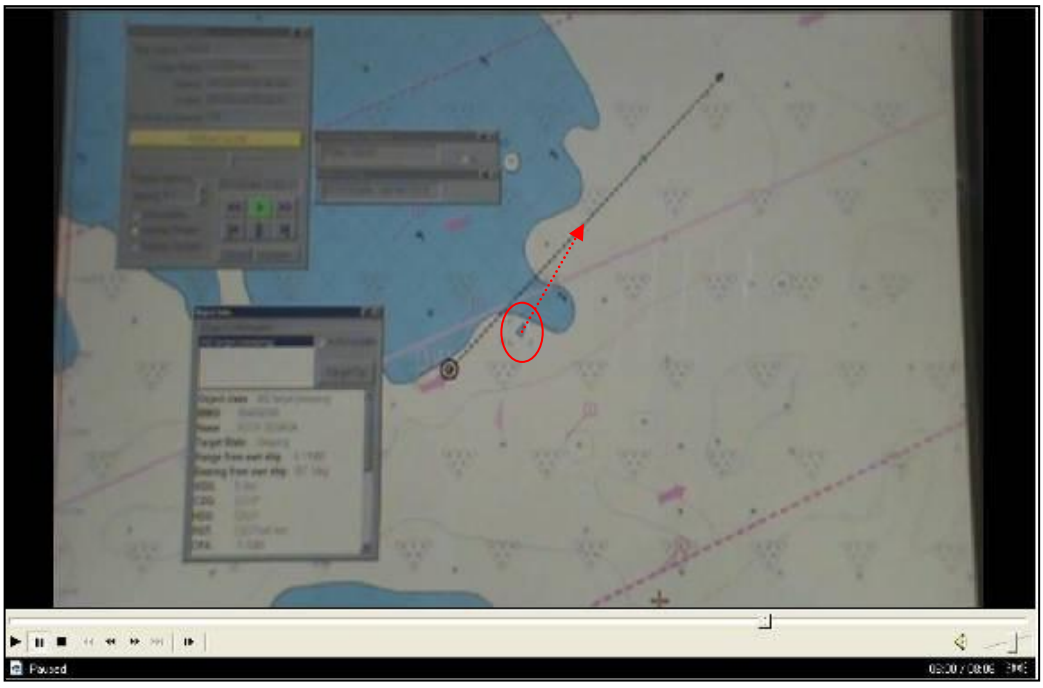


Figure 12: *Kota Tenaga* now at a very close distance to *Seeb*

At 2103, *Seeb* was on a course of 038º(T) and doing 5.0 knots. Engine speed was increased to *Half Ahead* a few seconds later. *Kota Tenaga* (marked in red circle in Figure 13) was now on a course of 030º(T), at a very close distance, and still attempting to cross *Seeb*'s bow.

Figure 13: *Kota Tenaga* on a course of 030º(T) and still crossing *Seeb*'s bow

At 2103, *Seeb* further altered to port, eventually coming to a course of 035º(T) at 5.0 knots. *Kota Tenaga* (marked in red circle in Figure 14) was on a course of 030º(T). While attempting to cross bow of *Seeb*, her port shoulder made contact with the stem of *Seeb* in position 01º 10.4'N 103º 48.4'E (Figure 15).

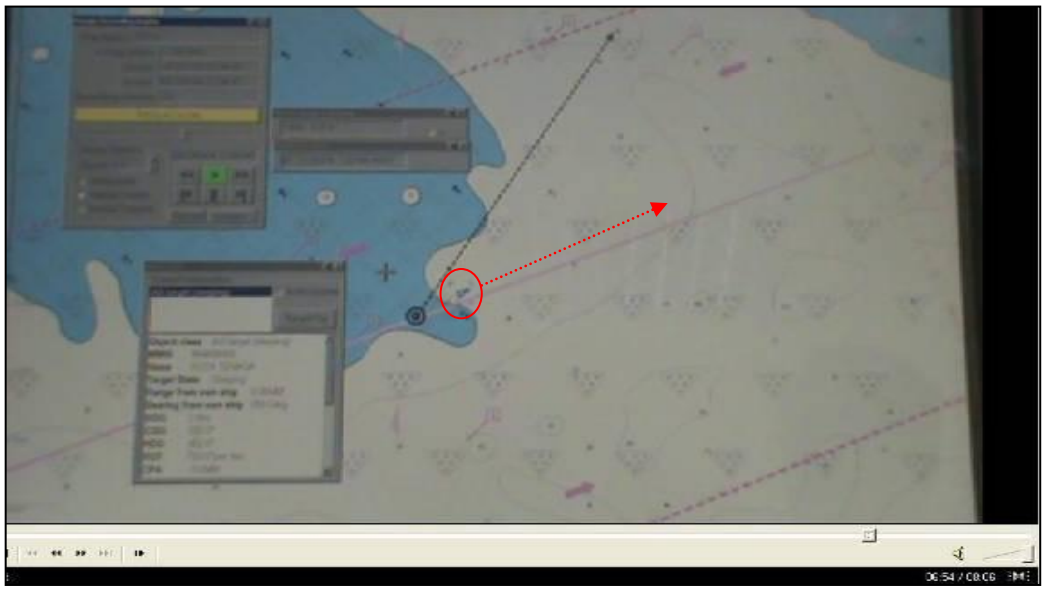


Figure 14: *Kota Tenaga* just before the collision

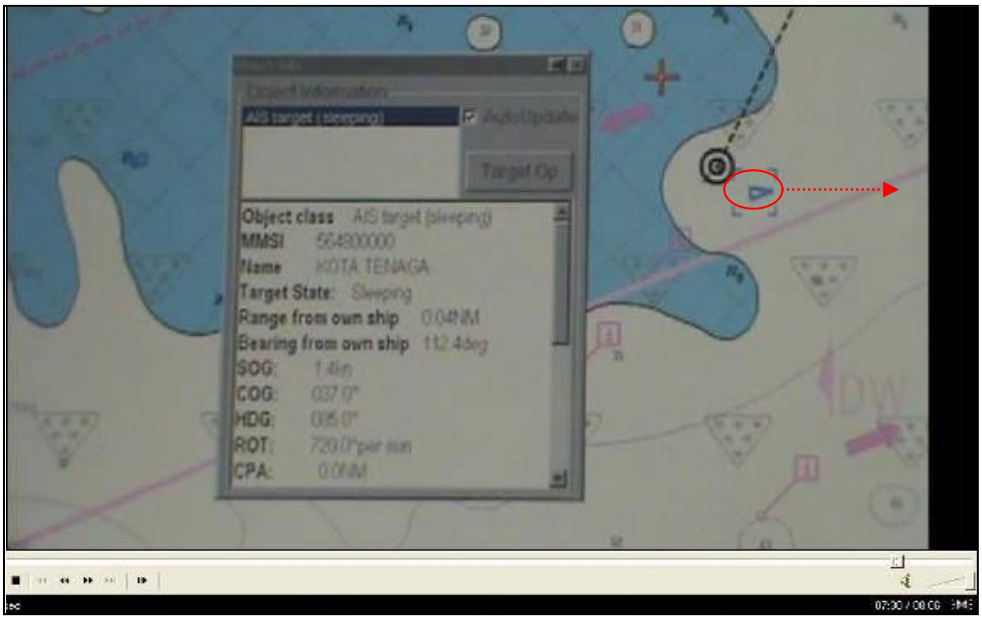
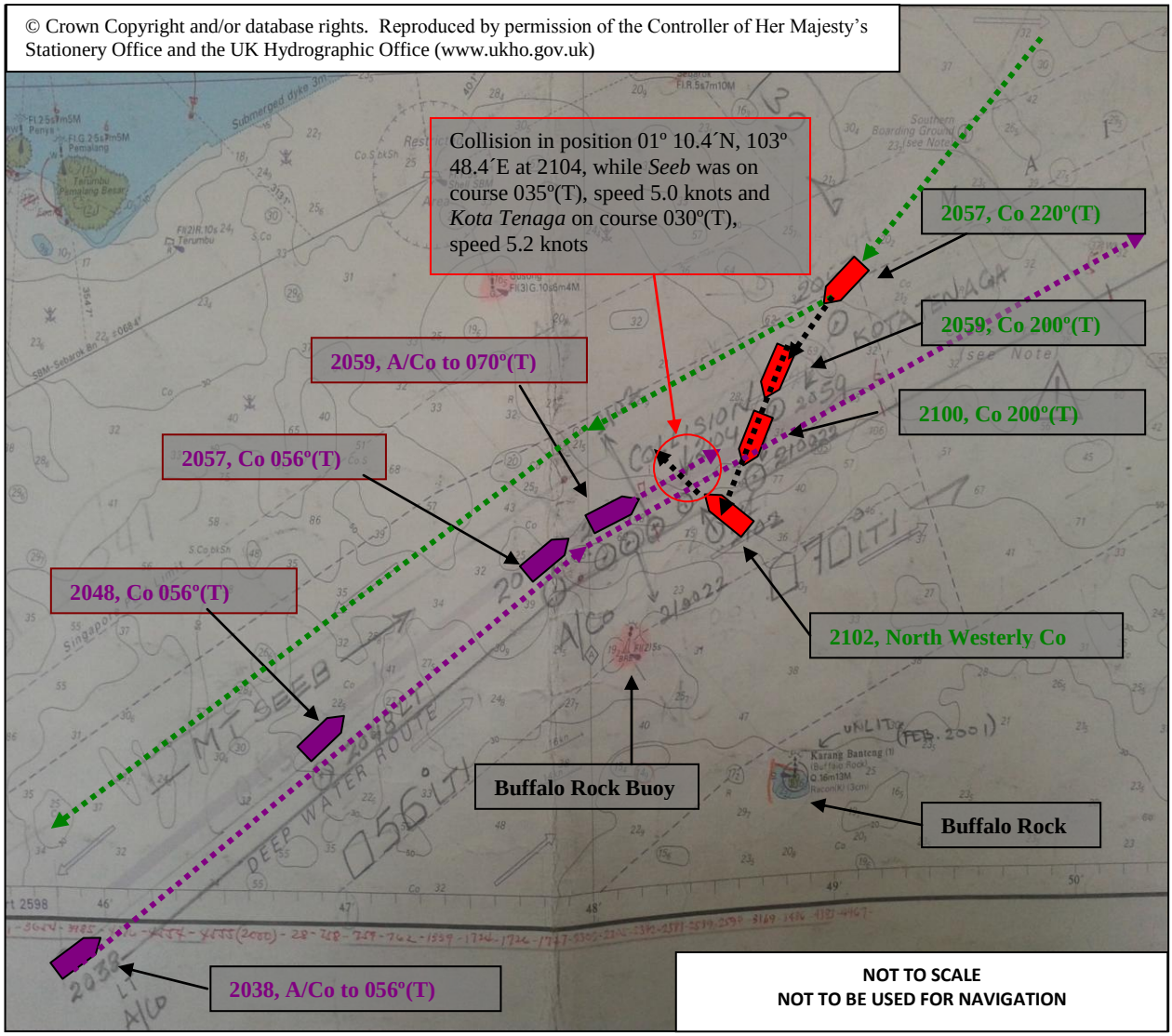


Figure 15: The port shoulder of *Kota Tenaga* collided with stem of *Seeb*. The bow of *Kota Tenaga*, after the collision, swung to starboard and away from *Seeb*

Soon after colliding, *Kota Tenaga*'s bow swung to starboard to a heading of 060º(T). Her master stopped the engines and raised the general alarm. All the crew were accounted for with no reported injuries. Almost immediately, the vessel developed a 10º port list. Fuel oil was seen in the vicinity and the crew reported that two loaded containers went overboard. The master reported the collision to VTIS.

At 2104, *Seeb* was on a course of 022º(T) doing 5.2 knots. *Kota Tenaga* (Figure 16) further swung to starboard to a heading 085º(T) and away from *Seeb*, two points abaft her beam. *Seeb* now altered course to starboard so as to return on the charted course of 070º(T) and in the appropriate east-bound traffic lane. The dynamics of the collision are represented in Figure 17.

Figure 16: The situation for both vessels soon after the collision.



Denotes charted courses of MT *Seeb*

Denotes positions of MT *Seeb*

Denotes positions of *Kota Tenaga*

Denotes appropriate courses to be followed by *Kota Tenaga* in west bound lane.

Denotes actual courses followed by *Kota Tenaga*

Figure 17: Collision dynamics

Seeb called *Kota Tenaga* for an exchange of information. In view of the situation on board *Kota Tenaga*, the latter agreed to provide the information at some later stage but made no contacts thereafter.

All tanks on *Seeb* were sounded to assess damages or flooding of any of the compartments. There was no reported water ingress in any of the tanks (Figures 18 to 20). The vessel remained afloat with a positive GM. After obtaining the necessary

permissions from the Singapore authorities, the vessel dropped her anchors at 0112 on 05 January 2012 at the Eastern Boarding Ground 'B' Anchorage in position 01º 16.6'N 103º 59.4'E.

Figure 18: Forecastle deck railing

Figure 19: Starboard side railing

Figure 20: Stiffeners buckled and side shell indented

Kota Tenaga was assisted by a tug escort, and with a PSAM pilot on board. The vessel eventually dropped anchor in the Raffles Reserve Anchorage.

1.5 Oil Spill Response

MPA worked with partners from various agencies to contain and clean up the spill. Containment and clean-up efforts proceeded until 07 January 2012, when there were

no more reports of any sighting of oil slick in the region. There was no disruption to traffic movements in the TSS during the clean-up period.

1.6 The Accident Site – Singapore Strait TSS

The collision occurred in the Singapore Strait TSS, inside the east-bound Deep Water Route, which is separated from the west-bound lane (to the north) by a traffic separation line, which is 0.2 cables wide. The Deep Water Route is about four cables wide and there is a 19 m shallow patch (Buffalo Rock) to the south of the collision site.

In this location, the Singapore shore could be seen clearly *i.e.* well lit but not so for the Indonesian shore. As such, it would have been easier for a look-out on board *Kota Tenaga* (initially located to the north of *Seeb*) to sight *Seeb* rather than the other way around.

The area provides sufficient navigational aids in the vicinity for position taking and for parallel indexing *e.g.* Raffles Lighthouse (about four nautical miles to the west) and Buffalo Rock beacon (about 1.5 nm to the south).

1.7 Singapore VTIS

At approximately 2047, Singapore VTIS provided *Kota Tenaga* with the following traffic information about *Yosu Gas:*

> *For your information on your port bow 1.5 miles you have LNG tanker Yosu Gas heading west bound…*

At about 2050 and 2057 respectively, VTIS issued the following precautionary messages to *Kota Tenaga:*

> *Exercise caution you are seem to be cutting across the bow of the LNG tanker Yosu Gas (sic)*

and

> *…you have a deep draught tanker in the deep water route…advise you do not go into the deep water route…*

All these messages were acknowledged by *Kota Tenaga*.

Similarly at 2057, VTIS provided *Seeb* with the following information:

> *...you have an LNG tanker and a container ship in the west bound lane now.*

Soon after the collision was reported to VTIS, navigational warnings were promulgated regularly to warn ships to keep a look-out for the two missing containers[7].

1.8 Conflicting Evidence – Final Events before the Collision

According to *Kota Tenaga*, just before the collision, *Seeb's* starboard (green) sidelight was seen, suggesting that *Seeb* altered towards *Kota Tenaga* and caused the collision whereas *Seeb* claimed that it was *Kota Tenaga's* re-crossing of *Seeb's* bow at close range that caused the collision.

Based on available evidence, *Kota Tenaga* (initially to the north-east of *Seeb)* crossed the path of *Seeb*, followed by a starboard turn to a reciprocal course towards *Seeb to* re-cross *Seeb's* bow. Thereafter, *Seeb* commenced on a 'slow' port turn (away from *Kota Tenaga)* when the collision occurred.

It appeared that *Seeb's* version is more accurate *i.e.* it was *Kota Tenaga* that made the starboard turn to re-cross *Seeb's* bow and presented her port hull to *Seeb*.

With reference to *Kota Tenaga's* sighting of *Seeb's* starboard sidelight, in all probability, this was due to *Kota Tenaga* re-crossing *Seeb's* bow *i.e.* due to the relative positions of both vessels and not due to any (abrupt) alteration of course by *Seeb.*

[7] One of the missing containers was subsequently recovered.

2 ANALYSIS

2.1 Aim

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

2.2 Fatigue

Analysis of the documents made available for the purpose of the safety investigation did not reveal any evidence that the bridge teams on board either vessels were suffering from fatigue. Although the master on board *Seeb* had remained almost a whole day on the bridge whilst the vessel transited the Singapore Strait, there was no evidence to suggest that fatigue should be considered to be a contributing factor to this collision.

2.3 Statutory Requirements for the Two Vessels

The dates of the Statutory certificates of both vessels[8], and the Certificates of Competence of the respective officers serving on board were valid and in order. All officers held the necessary recognition endorsements issued by the two flag State administrations.

[8] As indicated in sub-section 1.4, *Seeb*'s VDR had a fault and was not recording and saving data at the time of the accident. The matter has been queried with the managers although it was very clear to the safety investigation that the technical problem with the VDR did not contribute to the accident in any way. It was explained that the operational indicator on the VDR panel was showing that the unit was operational. The crew members therefore had no indication that the VDR unit was not saving data and only became aware of a potential fault soon after the collision. As a result of this, the flag State Administration was never informed of the malfunction.

The managers of the vessel have raised a guarantee claim with the manufacturers. Technicians have installed a laptop computer to the system, which now gives a clear and accurate status indication of the VDR unit. An attending Company superintendent has also provided familiarisation training to the relevant crew members on board, whilst instructions on how to retrieve VDR data have been posted in close proximity to the VDR unit. Monitoring of the VDR unit has also been added as a task for all navigational OOWs. The implementation of this procedure is being verified during internal audits, which are regularly performed by the Company's Technical Superintendents. The Company has also ensured that all the ships under its management that are equipped with the same make and model of VDR, are also fitted with a laptop computer, similar to the one installed on *Seeb*.

2.4 Situation Awareness on Board *Seeb*

There were several factors which suggested that the bridge team on board *Seeb* had detected anomalies, although the team had not necessarily understood the intentions of *Kota Tenaga*[9]. These factors are further elaborated below.

The master and OOW on *Seeb* observed *Kota Tenaga* visually in the west-bound lane but did not take any action, presuming she would alter her course to starboard for transiting in the appropriate west-bound lane.

At 2100, *Kota Tenaga* entered the east-bound lane on course of 200º(T) and crossed the bow of *Seeb* at a distance of five cables. At this juncture, the navigational officer on *Seeb* sounded five short and rapid blasts on the ship's whistle indicating doubts on the intentions of *Kota Tenaga*.

At 2101, when *Kota Tenaga* was one point on *Seeb'*s starboard bow and almost reciprocal course of 260º(T), *Seeb* altered course to port, having wheel "hard a port" so as to move away from *Kota Tenaga*.

2.5 Deep Water Route and Vessel Constrained by Her Draught

According to the IMO Ships' Routeing 'Rules for Vessels Navigating through the Straits of Malacca and Singapore', a vessel having a draught of 15 m or more shall be deemed to be a deep draught vessel and is required to use the designated Deep Water Route. *Seeb* was drawing 19.9 m and was thus required to navigate inside the Deep Water Route.

Being a deep draught vessel, *Seeb* was severely restricted in her ability to deviate from the course she had been following because of the (lack of) available depth and width of navigable water. In such a scenario, the only viable avoiding actions are the change in speed or reciprocal courses (if at all possible). Inside the Singapore Strait, *Seeb* was constrained by her draft and restricted in her ability to deviate from the course because of her deep draft in relation to available depth of water[10].

---

[9] Further to the fact that the bridge team on board *Seeb* observed a ship navigating in the wrong traffic lane, the 'erratic' manoeuvres of *Kota Tenaga* made it difficult for them to understand the intentions, limiting even further the possibility of making a full appraisal of the situation.

[10] She displayed three all round red lights in vertical line during night and black cylinders during day, in compliance with COLREGs. A green flashing light was also displayed to indicate a large vessel.

2.6 *Seeb*'s Speed[11]

Seeb had her main engine on bridge control while transiting through the Singapore Strait so as to adjust the speed as necessary in the prevailing conditions of dense traffic and coastal navigation. She was on 'slow ahead' since 20:53:23 and was steaming at about 5.2 knots.

Three minutes before the collision, both vessels were almost on reciprocal courses. However, *Kota Tenaga* continued the starboard swing, attempting again to cross *Seeb* ahead of the bow. This manoeuvre developed a risk of collision (Figure 19). The situation was such that one minute later, the collision was inevitable and it was only a matter of reducing the impact to minimise damages. *Seeb's* master claimed that the main engine was put to full astern when he observed *Kota Tenaga* crossing *Seeb's* bow. This action would have been appropriate.

However, there seemed to be controversial statements and records about reduction of *Seeb*'s speed prior to the collision. The telegraph logger record indicated that the engine speed was increased from '*Slow Ahead'* to '*Half Ahead'*, 30 seconds before the collision, while the master and crew statements stated that the main engine was put on *'Full Astern'* at 2101, *i.e.* three minutes before the collision.

Irrespective of whether or not the main engine was reversed, the minimum under keel clearance would have aggravated the inherently slow and sluggish dynamics of a fully laden VLCC like *Seeb*. In other words, it would have taken considerable time before any significant changes in *Seeb's* vector would become apparent.

2.7 Collision Avoidance

At 2100, when *Kota Tenaga* was right ahead in east-bound lane at 0.5 nm, *Seeb* sounded five short rapid blasts. However, *Seeb* did not make use of signalling light to draw *Kota Tenaga*'s direct attention and alert her that she was in the wrong lane.

At 2101, *Kota Tenaga* was one point on *Seeb*'s starboard bow and almost on a reciprocal course of 260º(T) at 3.5 cables.

[11] There was no evidence to suggest that there was anything amiss with the vessel's propulsion system before the collision.

Seeb was now on a course of 070º(T), and the master ordered hard to port, possibly for two main reasons:

1. navigate away from *Kota Tenaga*; or
2. as a result of the fact that the vessel had just passed a 19 m shallow patch on the starboard quarter (Buffalo Rock) to the south.

The alteration of course to port, however, made *Seeb* enter the west bound-lane, and prolonged the suddenly developed close quarter situation. Since the close quarter situation developed at the very last moment, *Seeb* could not make effective collision avoidance actions in ample time, albeit in restricted waters.

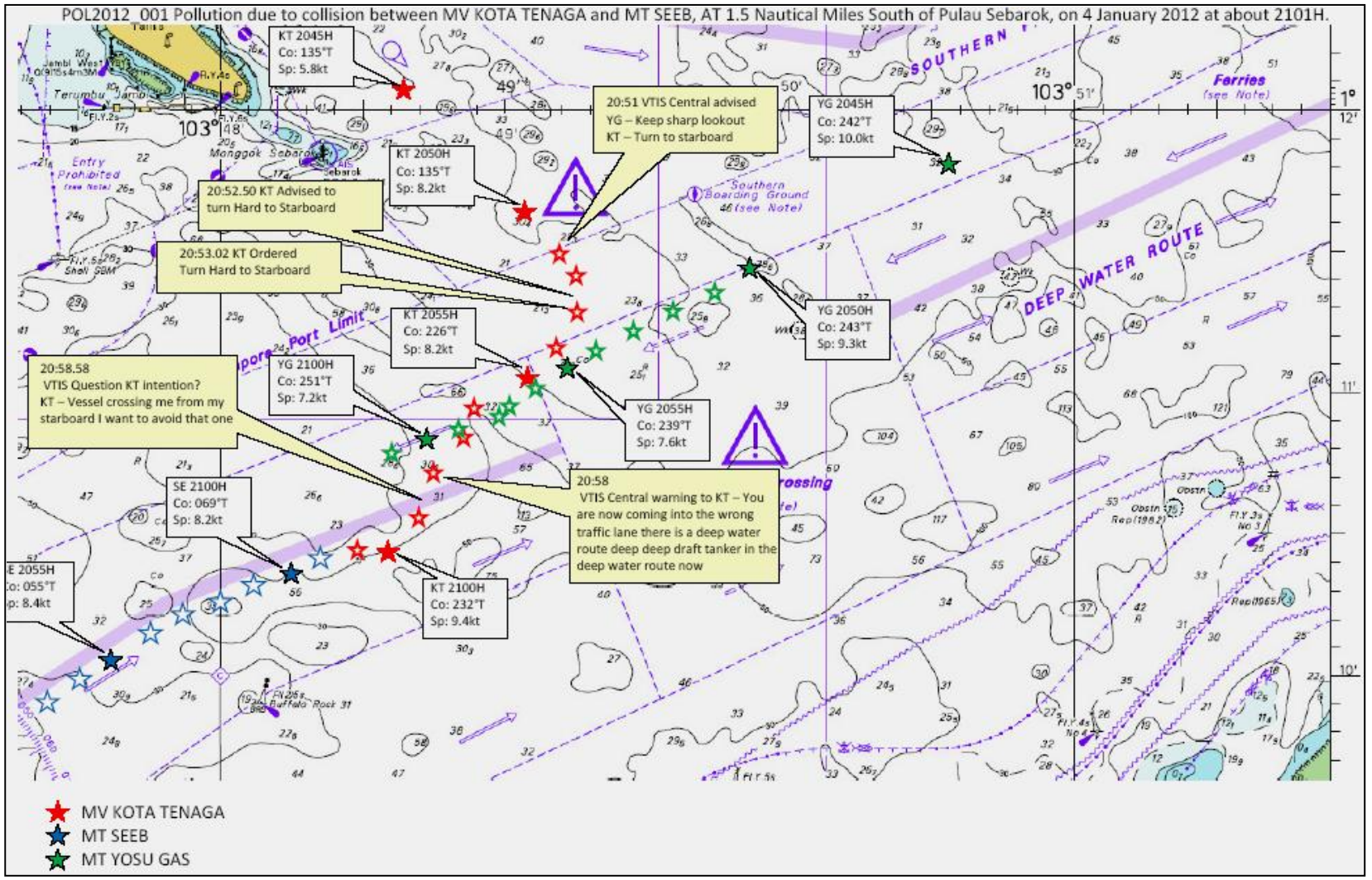


Figure 19: Manoeuvres, collision and subsequent pollution

2.8 VHF Communication between the Two Vessels

Both vessels were fitted with VHF sets but there was no attempt to use them to seek clarifications or to raise any alert – notwithstanding the quick succession of events and the available navigational equipment, which helped both ships identify one another at a very early stage.

It appeared that the masters on both vessels were not recognising the advantages of using VHF communication.

2.9 *Kota Tenaga*'s Actions to Avoid the Collision

The Master's initial action of slackening her speed to allow *Yosu Gas* to cross ahead was considered to be appropriate. However, although it was done in ample time, it was not positive enough *i.e.* the vessel did not significantly slow down, say, by stopping the main engine or reversing her means of propulsion to take all way off.

Yosu Gas' slowing down at about the same time had effectively negated the effects of *Kota Tenaga* slowing down. As such, the Master could have communicated with *Yosu Gas* to establish the vessel's intentions before making any abrupt movements – in this case, the subsequent engines full ahead and hard to starboard helm, eventually taking all way off, if circumstances had to turn for the worse and no response received from *Yosu Gas*.

2.10 Bridge Resource Management (BRM) on *Kota Tenaga*

It appeared that the master did not make full use of the third mate's skills to continuously monitor the vessel's position – particularly so when the vessel had yet to align itself to join the west-bound lane. Instead, the master requested the third mate to only plot the occasional positions. As such, this raised doubt on the BRM and how it was being implemented on board the ship, especially the effective organisation of the duties on the bridge – and the consequent incomplete appraisal of the situation and the risk of collision.

Prior to the collision, *Kota Tenaga* was taking actions to avoid *Yosu Gas*. However, when taking these actions, *Kota Tenaga* inadvertently entered the Deep Water Route and into the path of *Seeb*. There was no evidence which indicated that, for instance,

parallel indexing[12] was used although there were sufficient navigational aids in the area. Parallel indexing would have provided a constant radar image of *Kota Tenaga's* position *vis-à-vis* 'no-go' areas such as the Deep Water Route.

2.11 Situation Awareness on *Kota Tenaga*

The analysis of the alterations made by *Kota Tenaga*, indicated that no one on the bridge noticed *Seeb;* not until the very last moments before the collision. The issue of a proper look-out warrants some considerations.

Moreover, it also appeared that the Master was unaware that her vessel was leaving the west-bound lane and entering the Deep Water Route. In fact, the master only had an inaccurate indication when the third mate plotted the vessel's position and the ship received a call from Singapore VTIS.

The situation evolving on the bridge of *Kota Tenaga* was a situation of a simultaneous tasks and distraction; during the period leading to the collision, the Master was pre-occupied with avoiding *Yosu Gas* without continuously monitoring *Kota Tenaga's* position. This is so because evidence suggested that distraction occurred with the focus on the *Yosu Gas* (triggering event), which then induced an attentional shift away from *Seeb*.

Although advised earlier by the PSAM pilot, of the westerly tidal stream *i.e.* setting the vessel towards the Deep Water Route, it appeared that the master had a poor assessment of the situation as it evolved (and hence leading to an inaccurate situation awareness)[13] - when it was incorrectly assumed that all was in accordance with the navigation plan, when in fact the vessel was entering the Deep Water Route and

---

[12] Parallel indexing technique is a method on radar for monitoring that the ship is maintaining the planned track, and safe distances in coastal or restricted waters. The technique requires an index line to be drawn parallel to the ships planned track, tangential to a VRM (variable range marker) set to a range equal to the desired passing distance, and passing through the radar echo of a fixed, conspicuous object. The technique does not replace the need to fix the ship's position on the chart at regular intervals. With a relative motion display, the echo of the fixed object will move in a direction and at a speed which is the reciprocal of the ship's ground track, and it should move along the index line. On a ground stabilised true motion display, the echo will remain stationary and the edge of the VRM should move along the index line as the ship passes the echo.

[13] Inaccurate situational awareness - an incorrect understanding of the current situation which can lead to a faulty awareness: hypothesis regarding a future situation, or an understanding which is based upon incorrect beliefs, leading to compounded errors that can substantially increase the risk to the ship *e.g.* lack of knowledge of current location, traffic in vicinity, *etc.*

creating a close-quarters situation with *Seeb*. The inaccurate situational awareness is considered to be the main contributory factor in this accident.

2.12 *Kota Tenaga's* Bridge Team Members

According to the master, the SMS Manual stipulated a five-crew bridge team when the vessel arrives or departs from pilot stations. It also requires that there must be at least three deck officers (including the master). It was understood that this requirement was based on the particular needs and equipment fitted on board the ship. However, evidence indicated that at the time of the accident, there were two deck officers on the bridge.

The master claimed that the chief mate and second mate were finishing their work on deck (departure stations) and were supposedly on the way to the bridge when the collision happened. The master claimed that the number of team members on the bridge just before, and at the time of the collision was inadequate to manage the situation and this had caused some tension when the situation started to unfold.

Notwithstanding the master's claim and the fact that the SMS Manual stipulated a five-crew bridge team with three deck officers, the safety investigation determined that the bridge was still safely manned with a four-crew bridge team *i.e.* the master[14], the third mate as a qualified look-out, one AB on hand steering, and one deck cadet.

Rather, it did seem that although the most senior deck officers were not on the bridge at the time, the master did not make best use of the available resources on the bridge. Time management was crucial and problem solving under time constraints was a cognitive problem. In order to maintain an adequate awareness of the system status[15], the master had to track the development of the events as they gradually unfolded.

[14] The master had the con at the time.

[15] For the purpose of this safety investigation, the term 'system status' was not limited to the situation on board the ship. The system was therefore interpreted as such to capture the wider external environment within the Singapore Strait.

The important function of tracking was not delegated and therefore the workload was not shared[16]. It was therefore a situation where the problems in the Strait were exacerbated by the lack of understanding and application of mitigating factors. The situation eventually cascaded into a close quarter situation where the safe passage of a vessel constrained by her draft was impeded. The matter was therefore more of a situation where effective BRM was not implemented. This led to a situation where single person errors went undetected for various factors, such as ineffective internal communication.

2.13 Actions by Singapore VTIS

VTIS is defined as "*A service implemented by a competent Authority, designed to improve safety and efficiency of vessel traffic…*". Singapore VTIS is the competent Authority in these waters and besides providing information service, it also provides navigational assistance service to assist the navigational decision making on board. The VTIS role was therefore to ensure safe and efficient transit of the Straits by, *inter alia*, disseminating the relevant information in a timely and accurate manner.

Prior to the collision, Singapore VTIS provided advice and information to assist both bridge teams to decide on how best to navigate their respective ships. It did not transpire that there were doubts on the services provided by Singapore VTIS, given that no clarifications were sought by either ship.

It was therefore concluded that the actions taken by Singapore VTIS were appropriate in the period leading to and during the accident.

[16] The look-out only remarked seeing the three red lights in a vertical line and the port side navigational light after Singapore VTIS called the master and warned him of the hazards ahead of him.

THE FOLLOWING CONCLUSIONS, SAFETY ACTIONS AND RECOMMENDATIONS SHALL IN NO CASE CREATE A PRESUMPTION OF BLAME OR LIABILITY. NEITHER ARE THEY BINDING OR 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

3.1.1 The collision was the result of *Kota Tenaga*'s course alteration towards *Seeb* when both vessels were closing in.

3.2 Latent Conditions and other Safety Factors

3.2.1 The alteration of course to port by *Seeb* prolonged the close quarter situation;

3.2.2 *Seeb*'s speed was not reduced. Her main engine was not reversed. This could have allowed more time to assess the situation;

3.2.3 It was possible that *Seeb* had sufficient depth of water available to consider a starboard alteration of course by a few degrees to pass clear of *Kota Tenaga*'s stern;

3.2.4 Communication was not established by either vessel until after the collision;

3.2.5 *Kota Tenaga* did not monitor the developing situation until VTIS communicated with the ship and *Seeb*'s whistle was heard;

3.2.6 *Kota Tenaga* overshot the alteration point from where she should have been in the west-bound TSS lane on a course of about 245° – 250°;

3.2.7 *Kota Tenaga* did not have accurate situation awareness.

3.3 Other Findings

3.3.1 There were no indications to suggest that either vessel had sustained failure of any of her machinery and / or navigational equipment;

3.3.2 *Seeb'*s speed was increased from '*Slow Ahead*' to '*Half Ahead*' about 30 seconds before the collision, in all probability to make helm order more effective to manoeuvre away from the other vessel and minimise the impact of the contact;

3.3.3 Singapore VTIS had warned *Kota Tenaga* that she was heading against the general direction of west-bound traffic in the TSS;

3.3.4 There were no VDR recordings from *Seeb* since it was reported that it had stopped recording on 30 November 2011. The course recorder printer was also not operational. The S-band radar was reported loosing target echoes at times[17].

4 RECOMMENDATIONS

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

International Tanker Management Holding Ltd. and Pacific International Lines Pte. Ltd.:

19/2012_R1 promulgate lessons learnt from this accident to other ships under its management.

Pacific International Lines Pte. Ltd. is recommended to:

19/2012_R2 ensure that the ship's watchkeepers maintain an effective radar and visual look-out at all times commensurate with the prevailing conditions and circumstances.

[17] The status of this navigational equipment had no direct bearing on the dynamics of the events leading to the collision.