NATIONAL TRANSPORTATION SAFETY COMMITTEE

REPUBLIC OF INDONESIA

FINAL

KNKT.20.11.10.03

Marine Accident Investigation Report

Grounding of Container Ship *Tina I*

Batu Berhanti, Riau Islands

Republic of Indonesia

22 November 2020

2023

The report is based upon the investigation carried out by the National Transportation Safety Committee (KNKT) in accordance with IMO Resolution MSC. 255 (84) and Indonesian Shipping Act (UU No.17/2008).

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The report is based on:

1. Indonesian Shipping Act No. 17 Year of 2008, articles 256 and 257 as well as the explanatory memorandum;
2. Government Regulation No. 62 Year of 2013 on Transport Accident Investigations;
3. Presidential Regulation of the Republic of Indonesia No. 2 Year of 2012 on the National Transportation Safety Committee; and
4. IMO Resolution MSC.255 (84) on the Casualty Investigation CodeIMO Resolution MSC.255 (84) tentang kode investigasi kecelakaan.

ISBN: -

The report is published by the National Transportation Safety Committee (KNKT), Transportation Building, 3rd Fl., Ministry of Transportation, Jln. Medan Merdeka Timur No. 5, JKT 10110, Indonesia, in 2019.

FOREWORD

Praise to be given to the Almighty God with the completion of the preparation of the Final Report on the Investigation of the grounding vessel Tina I at Batu Berhanti, Riau Island Indonesia on 22nd November 2020.

The completion of this Final Report of Marine Accident Investigation ws mandated by Indonesian Shipping Act No.17 Year of 2008 Articles 256 and 257 as well as Government Regulation of Transport Accident Investigations No. 62 Year of 2013 Article 39 paragraph 2 Letter c which states that " The report of trans[port accident as referred to the verse (1) consist of the final report". The report is the final output of the entire investigation process which covers fact information, analysis of causal factors that most likely contributed the accidents, recommendations for prevention and improvement, and appendix of the supporting documents. The report discussed the marine accidents issues about what, how and why the accident occurred and findings about the cause of the accident along with the recommendations of shipping safety to the parties to minimise or prevent recurrence by the same factors in the future. The final reports is issued or publicly published after requesting responses and/or feedback from regulators, operators, manufacturers of transportation facilities and other related party.

The last but not the least, the Final Report of Marine Accident Investigation was made so that the interested parties could learn and take lesson from accident.

Jakarta, Desember 2023

NATIONAL
TRANSPORTATION SAFETY
COMMITTEE CHAIRMAN

Dr. Ir. SOERJANTO TJAHJONO

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GLOSSARY

AB	ABLE BODY SEAMAN
AIS	AUTOMATIC IDENTIFICATION SYSTEM
ARPA	AUTOMATIC RADAR PLOTTING AIDS
DSC	DIGITAL SELECTIVE CALLING
ECDIS	ELECRONIC CHART DISPLAY AND INFORMATION SYSTEM
GPS	GLOBAL POSITIONING SYSTEM
ICS	INTERNATIONAL CHAMBER OF SHIPPING
IMO	INTERNATIONAL MARITIME ORGANISATION
ISM	INTERNATIONAL SAFETY MANAGEMENT
IWO	IN WAY OF
LOA	LENGTH OVER ALL
MPA	MARITIME AND PORT AUTHORITY OF SINGAPORE
OOW	OFFICER ON WATCH
SOLAS	INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA
STRAITREP	STRAITS REPORTING
SVDR	SIMPLIFIED VOYAGE DATA RECORDER
TSS	TRAFFIC SEPARATION SCHEME
VHF	VERY HIGH FREQUENCY
VTS	VESSEL TRAFFIC SERVICES
VTIS	VESSEL TRAFFIC INFORMATION SYSTEM
WBT	WATER BALLAST TANK

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EXECUTIVE SUMMARY

On 22nd November 2020 at about 16.00 local time[1] (LT), a Cyprus container ship, *Tina I* was departing Pasir Panjang Terminal, Singapore. The Pilot was on board and disembarked at 23.10 LT. Before disembarked, the Pilot had advice the Master to give a way to the west bound vessel and pass from their stern to cross the Traffic Separation Scheme (TSS) to join the east bound lane. At the time there were two vessels at the port beam of *Tina I* on west bound lane names *Bina Marine 61* and *NCC Fajr. Bina Marine 61* was sailing on west bound lane ahead of *NCC Fajr*. OOW communicated with both west bound vessels to pass starboard to starboard as *Tina I* will cross from their stern. The Chief Officer left the bridge for some rest while the third officer take the duty as OOW.

At 23.30 LT, *Tina I* is passing the east bound lane on deep water route (*DW*) and heading 105°. And at the time VTS Central give an information that *Tina I* may to use Deep Water (DW*)* route. And OOW replied that *Tina I* hard to Starboard now to kept clear from Tug and tow. VTIS replied: "if you need you may used deep water route".

OOW again called VTIS Central and asked to repeat the message. And replied by VTIS Central: "*Tina I*, you keep clear from Batu Berhanti buoy and also keep clear from tugboat on the starboard side. If you need, you may used deep water route". The *Tina I* continued crossing the TSS to position the vessel on the track as per passage plan.

At 23h.31m.30s LT VTIS Central was calling *Tina I* and replied by Master that *Tina I* is turning to port now to keep clear from tugboat. VTIS inform *Tina I* to keep clear the gounded vessel and Batu Berhanti buoy on the port side.

At 23h.31m.55s LT VTIS Central again call *Tina I* and give warning: "warning..warning.., on your port bow there is a tug and tow and shallow water Batu Berhanti and one grounded vessel. Take immediate action and keep clear from this area..over..". The OOW replied VTIS: "oke Sir..ok Sir..".

At 23.33 LT Master order the steering hard to port. Heading showing 092°. At that time *Tina I* has entered Eastbound Lane and clear from DW route.

At 23.38 LT, The *Tina I* grounded at Batu Berhanti position 01°11,21 N and 103°52,82 E.

The investigation determined that the weather was not issue in the grounding of *Of Tina I* at Batu Berhanti, Batam. Therefore, the analysis discussed on the passage plan, bridge team mangement amongst crew of *Tina I*, situational awareness and the action in dealing with the situation, regulations as the risk control measures.

The investigation concluded the contributing factors of the occurrence was due to crew did not monitor the passage plan properly, the lack of situational awareness and the wrong mental model amongst the ship crew towards Master, duty officers and their roles lead the vessel to danger and Master was just joined the ship few hours before the derparture and has not been around the area for long time.

Therefore, the KNKT has issued the following safety recommendations to Victoria Oceanway Ltd. (Managing Owner) And Osier Holding S.A. (Registered Owner.

[1] Western Indonesia Time (*Waktu Indonesia Barat*/WIB) is UTC + 07:00.

I. FACTUAL INFORMATION

I.1. THE INCIDENT

On 22nd November 2020, at 15.00 local time[2] (LT), new joining master of *Tina I* (a Cyprus container ship) conducted hand over command with the off-signer master. The new master has conducted a short familiarization before the hand over command done.

At 17.36 LT, cargo operation completed.

About 21.25 LT, Pilot on board *Tina I* from shore side embarkation.

At 21.36 LT, *Tina I* departed from Pasir Panjang Container Terminal bound for Tanjung Priok Jakarta with maximum draft 13,7 meters. At the time, Master, Chief Officer (CO) and helmsman (AB duty) with manual steering were on bridge. The *Tina I* has a smooth departure without any problem and all machineries running well, no issued with the rudder, all in good order.

At about 23.10 LT, Singapore Pilot disembarked from the vessel and the Officer on Watch (OOW) back to the brigde after he did to escourt the Pilot disembarked. Before disembarked, the Pilot had advice the Master to give a way to the west bound vessel and pass from their stern to cross the Traffic Separation Scheme (TSS) to join the east bound lane. At the time there were two vessels at the port beam of *Tina I* on west bound lane names *Bina Marine 61* and *NCC Fajr. Bina Marine 61* was sailing on west bound lane ahead of *NCC Fajr*. OOW communicated with both west bound vessels to pass starboard to starboard as *Tina I* will cross from their stern. The Chief Officer left the bridge for some rest while the third officer take the duty as OOW.

At 23.23 LT, *Tina I* enter the TSS and crossing the west bound lane with heading 090° to give way to *Bina Marine 61* and *NCC Fajr* passing before cross the TSS lane.

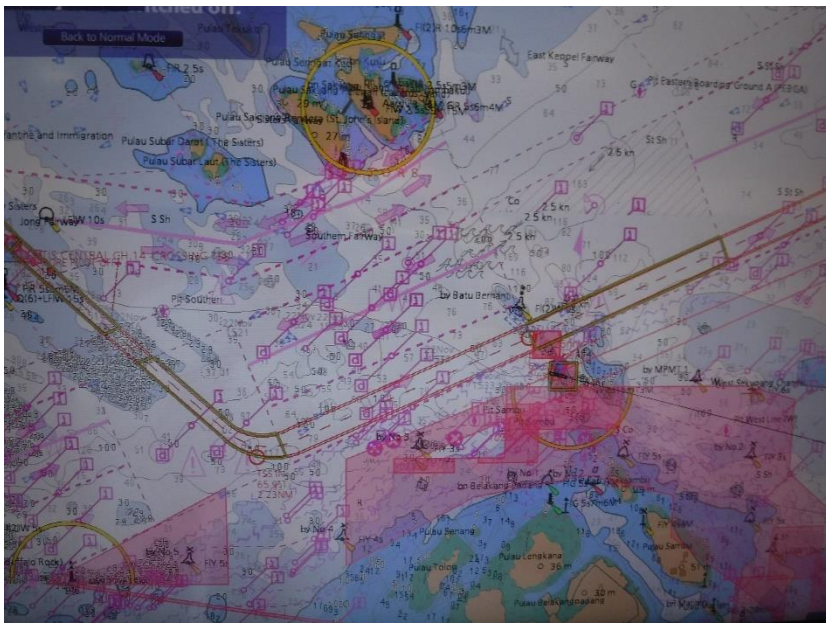

Figure I-1: Tina I route plan on ECDIS as per Passage Plan

[2] Unless stated otherwise, all times shown in this report are local (UTC + 8 hours)

At 23.24 LT Master order the AB duty to change the heading to 120° when west bound vessel clear. The speed of *Tina I* was 10.8 knots.

At 23.26 LT, Master order OOW to inform Bosun finish with his duty standby on anchor deck.

At 23.27 LT Master again order the AB duty to change the heading to 130°. OOW inform Master that on their bow is a shallow water, then Master said oke, we will go to port.

At 23.28 LT Master order the AB duty hard to port and replied by AB hard to port. OOW then informed Master that on their bow there is a tug and tow vessel. Then Master instructs the AB duty hard to starboard and followed by AB hard to starboard. And then Master instruct to midship and followed by AB midship.

At about 23.29 LT, *Tina I* was in the east bound lane heading 105°. And at the time VTIS Central gave an information that *Tina I* may proceed to use the Deep Water (DW*)* route. And OOW replied that *Tina I* hard to Starboard now to kept clear from Tug and tow. VTIS replied: “if you need you may use deep water route”.

OOW again called VTIS Central and asked to repeat the message. And replied by VTIS Central: “*Tina I*, you keep clear from Batu Berhanti buoy and also keep clear from tugboat on the starboard side. If you need, you may used deep water route”. The *Tina I* continued crossing the TSS to position the vessel on the track as per passage plan.

At 23h.31m.30s LT VTIS Central was calling *Tina I* and the Master replied that *Tina I* is turning to port now to keep clear from tugboat. VTIS informed *Tina I* to keep clear of the grounded vessel and the Batu Berhanti buoy on the port side.

At 23.33 LT Master gave the helm order hard to port. Heading showing 092°. At that time *Tina I* has entered Eastbound Lane and clear from DW route.

At 23.35 LT VTIS Central again call *Tina I* and give warning: “warning..warning.., on your port bow there is a tug and tow and shallow water Batu Berhanti and one grounded vessel. Take immediate action and keep clear from this area..over..”. The OOW replied VTIS: “oke Sir..ok Sir..”.

Then the Master of *Tina I* instruct the AB duty to put steering hard to starboard and replied by the AB hard to starboard to avoid the west bound tug. Then mid ship to maintain the heading when the unknown tug clear on the port bow. At that time *Tina I* position has been out of TSS and run toward grounding vessel Shahraz.

At 23.36 LT Master *Tina I* instructed to hard to port and replied by the AB hard to port.

At 23.37 LT third officer gave an announcement to all crew by public addressor to wake up, the vessel will have collision.

At 23.38 LT, The *Tina I* grounded at Batu Berhanti position 01°11,21 N and 103°52,82 E. The Master report to VTIS Central that the vessel has been grounded and has a contacted with grounding vessel Shahraz. VTIS Central response and asked if there is

any injury and oil pollution and replied by master there is no injury and pollution occurred.

At 23.40 LT Master instruct the crew to examine the effects of contact and grounding.

From 23rd to 26th November 2020, salvage team on board conducted diving operation for hull inspection and tanks inspection to check the damage of the vessel.

On 27th November 2020 at 08.50 LT, start salvage operation and pulling *Tina I* by tug *SSA Adira* and *Pacific Wrangler* and vessel succefully clear from grounded.

I.2. THE AFTERMATH

There was no report of fatalities or injuries on the ship's crew in this incident, but there are several damages to the ship occurred. And also, there was one ship suffered damage due to slightly contact made by the *Tina I*. The starboard quarter of *Shahraz* had a slight damage on the hull, railing, and construction. Whereas the *Tina I* had damage on her keel and port side hull and railing.

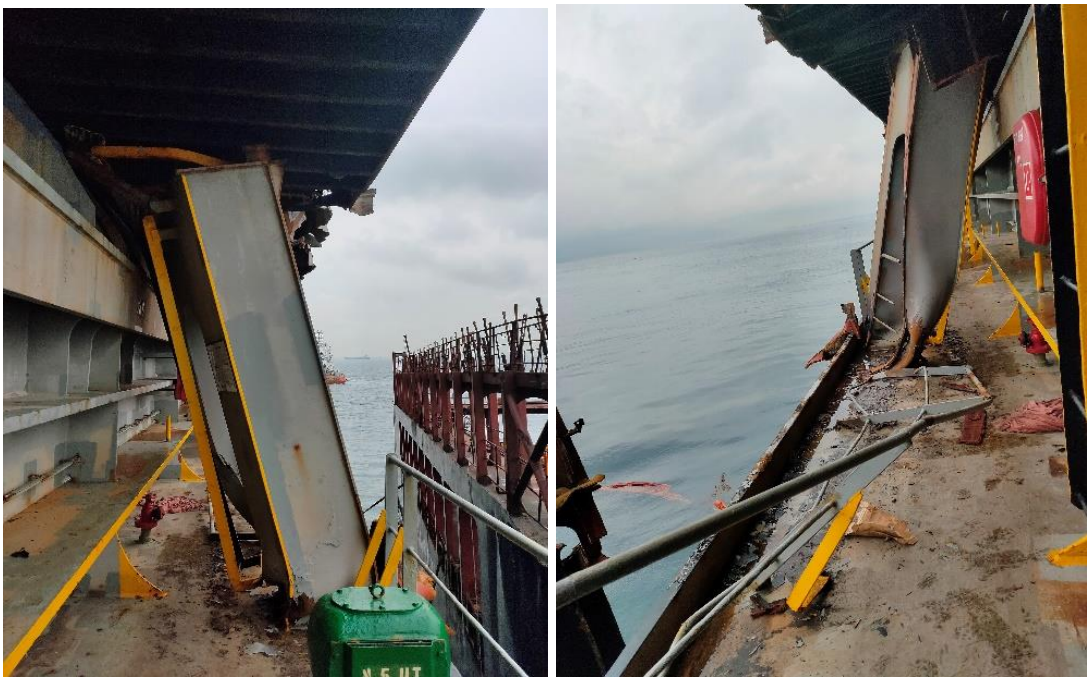

Figure I-2: The damage on the port side of Tina I

As a result of the accident occurred, the following damages have been thorough examination by company internal inspection and diving survey carried out in the damaged area and the following has been ascertained:

a. IWO Forepeak Tank
   - Found indented at stbd bottom plate including internal members in way of Fr.116 – Fr.135, damage area approx.13500 mm (L) x 900 mm (B) with max depth 980 mm.
   - Found indented at stbd bottom plate including internal members in way of Fr.133 – 134, damage area approx.400 mm (L) x 260 mm (B) with max depth 80 mm and 560 mm (L) x 300 MM (B) with maximum depth 50 mm.

- Found indented at port bottom plate including internal members in way of Fr.129 – 133, damage area approx.2500 mm (L) x 1300 mm (B) with max depth 800 mm;

b. IWO Bow Thruster Area

- Found indented at bottom port side plate including internal members in way of Fr.108 - 109, damage area approx. 590 mm (L) x 600 mm (B) with max depth 180 mm;

c. No.1 WBT (C)

- Found indented at stbd bottom plate in way of Fr.101 - 103, damage area approx. 500 mm (L) x 500 mm (B) with max depth 100 mm.
- -Found indented at stbd bottom plate in way of Fr.104 - 105, damage area approx. 250 mm (L) x 400 mm (B) with max depth 100 mm, followed with crack on the bottom plate approx.300 mm (L) x 70 mm (B)
- Found indented at stbd bottom plate in way of Fr.104 - 105, damage area approx. 500 mm (L) x 350 mm (B) with max depth 150 mm, followed with crack on the bottom plate approx.100 mm (L) x 20 mm (B);

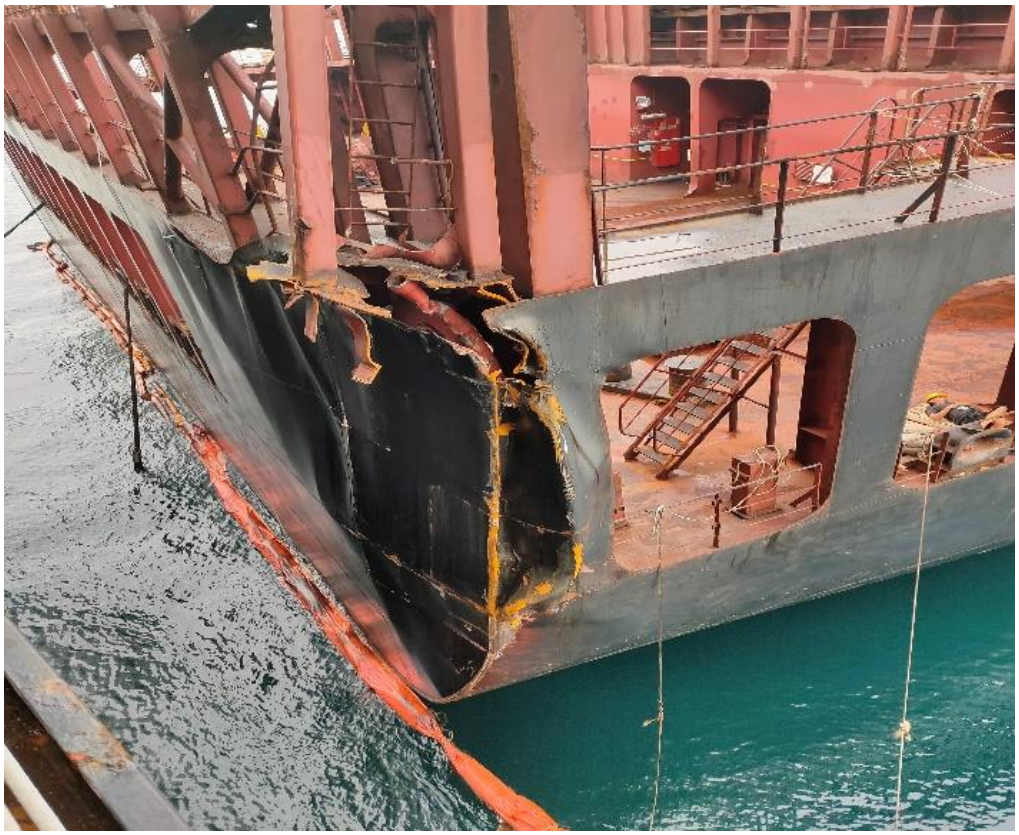

Figure I-3: The Damage of Shahraz at the stern starboard side hull

d. IWO Passageway (Port)

- Stringer no.1 Fr.60 – Fr.62 found dented 1500 mm (L) x 1000 mm (B) max depth approx.50 mm. Several detached detected on fillet joint welding between deck stringer to side shell iwo Fr.61 approx. 100 mm;

e. IWO Healing Tank No.5 (Port)

- Found indented Side shell and long. side shell stiffener no.1 & no.2 counting from main deck Fr.60 – Fr.62 approx. size 1500 mm x 2000 mm, max. depth 50 mm approx, and no crack detected;

f. IWO Upper Deck (Port)
- Port railing approx. 8000 mm in length and 1(one) pc H beam with adjacent structure found damage and detached iwo Bay 36 (P);

h. Bilge Keel Plate (Port)
- Found damage at portside bilge keel plate (P) between Fr.61 – Fr.64, damage area approx. 4500 mm (L);

There is no pollution occurred affected by this incident as *Tina I* has not experienced any leaks and oil spill.

I.3. SHIP INFORMATION

I.3.1. Ship Detail

TINA I (IMO 9267156) is a Container ship built in 2004 by KOYO DOCKYARD CO. LTD. - MIHARA, JAPAN. Currently sailing under the flag of Cyprus owned by AQ Maritime Co. Limited and manage by Technomar Shipping Inc. Formerly also known as *CHANGHONGJI7, TINA ORN, TINA NA SEVILLA, RBBA I, GREAT, GREAT 0, GBE, YM GREAT, MING GREAT*.

Figure I-4: Tina I (image: MarineTraffic)

Her dimensions of length overall of 278.94 m, length perpendicular of 262 m, depth of 24.00 m and breadth of 40.00 m. The *Tina I* had a total capacity of 6,030 TEUs with the maximum summer draft of 14.021 m and her gross tonnage of 66,332 and deadweight of 67,720 tons.

The bridge of *Tina I* was equipped with navigational equipment which complied with the SOLAS requirements. These are included a gyro autopilot, ARPA equipped radars, AIS, GPS plotter, ECDIS, echo sounder, DSC VHF radios, satellite telephone and a SVDR JRC JCY-1850 type.

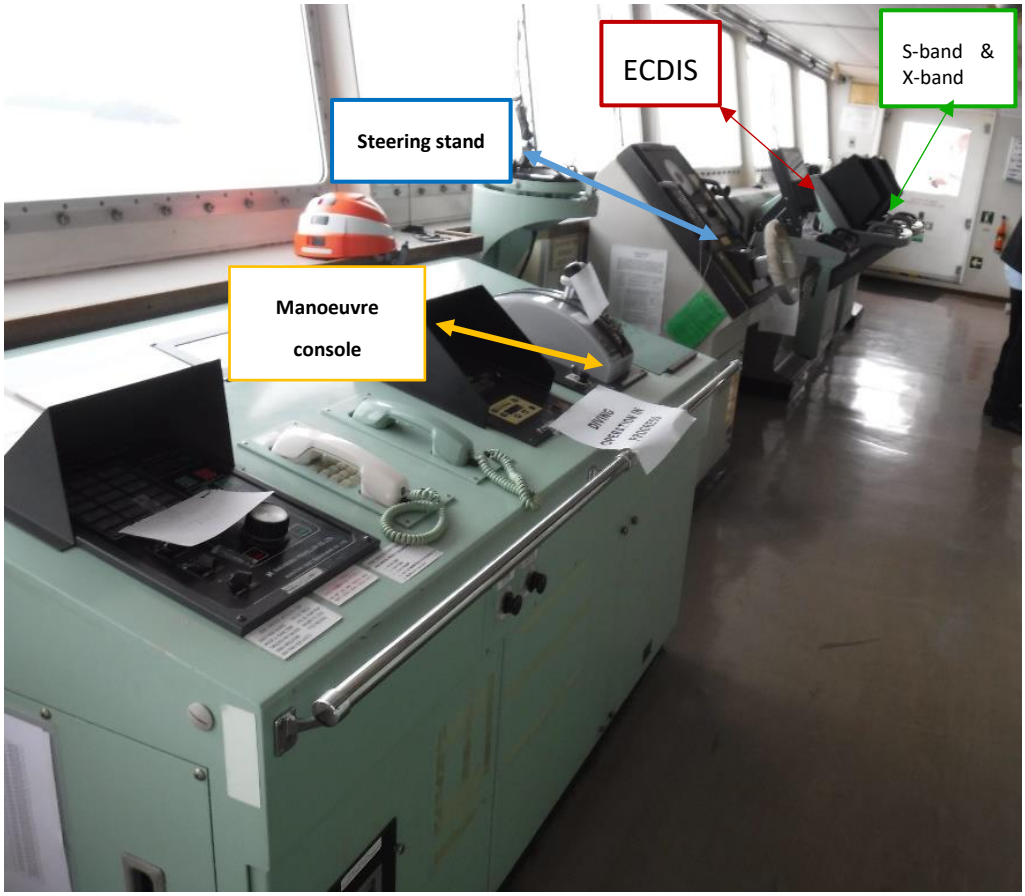

Figure I-5: The bridge of Tina I

I.3.2. Engine System

Her main engine was a B&W 10K98MC (6) built by Mitsui Engineering & Shipping Co.Ltd Tamano Works, which could produce a total power of 57.200 HP[3] at 94 rpm[4] to drive a fixed pitch propeller (4 right-handed blades). This would provide a service speed of 18.5 knots. She was equipped with 4 auxiliary engines Yanmar 6N330L-EV in which each engine generated electric power of 2,354 kW at 720 rpm. Her bowthruster Nakashima TCT-260 was able to deliver a maximum power of 2000 kW.

The engine of *Tina I* was controlled from bridge by telegraph to give an order to the engine control room. The pneumatic system was used in the engine system.

[3] Horse power is a unit of measurement of power, or the rate at which work is done, usually in reference to the output of engines or motors.

[4] Revolutions per minute is the number of turns in one minute. It is a unit of rotational speed or the frequency of rotation around a fixed axis.

At the time of incident, there was no maintenance on going in engine room and all engine's equipment were reported in good coodition and operating well.

I.3.3. Crew of *Tina I*

There were 20 crew members multinational who worked onboard the *Tina I*. They were Polish, Russians, Ukranians and Filipinos. Most of them worked less than one year onboard the *Tina I*. The ship regularly called Singapore Port and transited through TSS and Singapore Strait.

The Master, who is Polish nationality held the master mariner certificate on ships of 3000 GT and more. He just joined the ship one day prior to the incident. He has been promoted as Master in the year 2012 and sailed all over the world but mostly in Europe area. Master has experience in navigating through the TSS and Singapore Strait, but it was his first time to navigated again in the area since his last experience in 2016. Master hold ECDIS certificates including other certificates as per STCW requirement.

The Chief Engineer (CE) is Russian nationality also just joined at the same time with the master 1 day prior to the incident.

Third Officer was an OOW at the time is Philipino nationality had been working more than 1 month onboard the ship prior to the incident. His duty was 0800 to 1200 Hrs and 2000 to 2400 Hrs as 3rd Officer. He has been working for the company since 2015. OOW hold ECDIS certificates including other certificates as per STCW requirement.

Helmsman (AB Duty) is Philipino nationality held watckeeping certificate issued in 2016. He joined *Tina I* one day before the incident. He has been working for the company since September 2019 as an AB. He has an experience as an AB since 2012 until the incident.

At the first time Master and CE onboard, they had undertaken a familiarisation about the ship and surrounding. Prior to work onboard the *Tina I*, the Master, CE and OOW worked on the other container ships for a long time.

I.3.4. Standard Operational Procedure

The *Tina I* Safety Management System manage under Technomar Shipping Inc. The company issued the Standard Operational Procedure (SOP) for the crew as a part of the International Safety Management (ISM[5]) Code requirement. The documents which authorised by the Designated Person Ashore (DPA) and approved by the general manager demonstrated how respective crew should do work based on the authority and tasks. In terms of the ship's operation, the Master and Chief Engineer had more authority to manage the crew.

As per Technomar Management System QP09 regarding Navigation Procedures, Section 5.7 as follow:

5.7 Passage Plan

The passage plan concept

Before each voyage begins, the navigation officer should develop a detailed mental model of how the entire voyage is to proceed sequentially, from berth to berth. This mental model will include charting courses, forecasting the weather and tides, checking Sailing Directions and Coast Pilots and projecting the various future events-landfalls, narrow passages, and course

[5] International Safety Management Code (IMO Res. A 741 (18))

changes-that will transpire during the voyage. This mental model becomes the standard by which he will measure the progress toward the goal of a safe and efficient voyage, and it is manifested in a passage plan.

The passage plan is a comprehensive, step by step description of how the voyage is to proceed from berth to berth, including undocking, departure, enroute, approach and mooring at the destination. The passage plan should be communicated to the navigation team in pre-voyage conference in order to ensure that all members of the team share the same mental model of the entire trip and all signed passage plan.

Differences of opinion must be addressed. For example, one watch officer might consider a one-mile minimum passing distance appropriate, while the Master prefers to pass no closer than two miles. These kinds of differences must be reconciled before the voyage begins and the passage plan is the appropriate forum in which to do so. Thus, each member of the navigation team will be able to assess the vessel's situation at any time and make a judgement as to wether or not additional bridge rsources are necessary.

As the voyage proceeds, the navigator must maintain situational awareness to continually aasses the progress of the vessel as measured against the passage plan and the mental model the voyage. Situational awareness consists of perceiving, comprehending and comparing what is known at any given time with the mental model and passage plan. Both individual and team situational awareness are necessary for a safe voyage and the former must be established by all members of the bridge team before the latter is possible. The enemies of situational awareness are complacency, ignorance, personal bias, fatigue, stress, illness and any other condition which prevents the Master and his team members from clearly seeing and assessing the situation.

6. Navigation Equipment

The Master must ensure that all deck officers are fully conversant with the operation of all navigation equipment on board, particularly with regard to the setting up controls and the steps to be followed in the event of a fault. All deck officers when joining the ship must be familiarized prior taking over the first watch in operation of all Navigational Equipment according to form "Familiarization with the Bridge Equipment" copy which must be signed by the familiarized officer and the Master.

6.1 Navigation Processes

All deck officers must follow the company's Safety Management System, the COLREGS and the International Rules and Regulation as well as the regulations of the sovereign sates the Territorial waters or the EEZ of which the vessel is transitting in order to ensure the safe navigation of the vessel.

6.1.1 Arrival/Departure preparation

The 2nd officer, assisted by the 3rd officer must prepare all forms of the latest revision of passage plan for the intended voyage from the departure berth to arrival berth nothing relevant tides, currents, waypoitns, danger areas and other relevant information and will lay off appropriate courses on the passage. Essential details of navigation from pilot station pilot ot berth and from berth to pilot station shall be discussed between Master and Pilot. The passage plan must be approved by the Master and signed by the Master all watch keeping Deck Officers prior sailing from each port.

Also the 2nd officer must carry out in good time prior sailing all applicable tests and checks stated "Preparation for Departure Form from Port" and relevant entry to be made in the deck

log book. The Master must ensure that all items in the relevant "Prevaration for Sailing" checklist have been actually checked by 2nd officer.

The 2nd Officer must carry out in good time prior arrival to Pilot station all applicable tests and checks stated "Preparation for Arrival to Port Form" and the relevant entry to be made in the deck log book.

The Master must ensure that all items in the relevant "Preparation for Arrival" checklist have been actually checked by the 2nd officer.

6.1.2 During Navigation (Voyage)

When a change over of watch is about to take place, the Officer who will take over the watch (OOW) must ensure that members of his watch are fully capable of performing their duties and furthermore personally satisfy himself regarding the navigational situation and all other aspects related to the safe navigation of the vessel, such as:

- The passage plan is followed, and the Master immediately informed in case of major deviation
- Watch keeping arrangements are always complied with
- Frequent testing to ensure the operational situation of navigation equipment
- Bridge order book instructions are followed (including clear instruction issued by the Master) to be followed during his absence of special circumstances (night orders and standing order)
- Hazards likely to be encountered during the watch

Also, he must satisfy himself that he received all requirement information from OOW to be relieved regarding vessel's position, traffic of other ships, weather etc)

6.1.3 Critical Condition

For navigation under critical condition such as:

- Navigation in restricted visibility
- Navigation in coastal waters / traffic separation schemes
- Navigation in heavy weather / tropical storm areas
- Navigation in ice
- Navigation in areas of excessive tidal effects

I.3.5. Cargoes

At the time of incident, total of cargoes on board were 2,165 unit of containers with total weight 57,163.9 MT.

I.4. SAFE NAVIGATION

The Bridge Procedures Guide[6] states that safe navigation of a ship requires that it not be exposed to unnecessary danger and that at all times it can be controlled within acceptable margins. This requires effective command, control, communication and management of the ship.

A key accepted and practised principle of safely navigating a ship is bridge resource management (BRM). Passage planning is central to BRM. Regulation, training,

[6] International Chamber of Shipping (ICS) 2007, *Bridge Procedures Guide*, 4th edition, Marisec Publications, London.

guidelines, and multiple procedures apply to these concepts and enshrine them and their usage in the maritime industry.

I.4.1. Bridge Resource Management

Bridge Team (or Resource) Management (BRM) is defined as the use and coordination of all the skills and resources (people, procedures and equipment) available to the entire bridge team to achieve the established goal of optimum safety and efficiency[7]. All individuals make errors, and BRM aims to minimise the occurrence and outcome of errors through the best possible use of resources.

All ship's navigators must have training, and demonstrate competence, in BRM techniques[8].

Bridge resource management is a broad topic which covers many inter-related subjects, including but not limited to:

- Share mental model
- Situational awareness
- error management
- contingency planning
- challenge and response
- distractions and interruptions.

BRM is a process to use all of available resources during critical operation. BRM techniques will emphasize decision making based upon conditions related to workload and potential threat to the vessel.

The objective of the BRM is to reduces the risk of marine casualties by helping ship's bridge crew to anticipate and correctly respond to their ship's changing situation. The fundamental principal in BRM is that vessel navigation and operation is not "one-man show".

BRM training normally consists of intensive bridge simulator exercises conducted over a period of 5 days, and includes modules of exercise planning, execution and a debrief session at the end of each exercise.

I.4.2. Passage Plan

Passage planning is necessary to allow the entire bridge team to arrive at a shared understanding of what 'should' happen during the passage and thus ensure the ship can be safely navigated between ports from berth to berth. The margins of safety in restricted coastal waters can be critical, limiting the time available to take corrective action when required. Careful passage planning is used to make a pilotage passage safer, for example, by setting limits that make unsafe deviations from the plan readily apparent.

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[7] Nijjer, R 2000 *Bridge Resource Management: The Missing Link*, Sea Australia 2000, Sydney.

[8] International Maritime Organisation (IMO) 1978, *International Convention on Standards of Training Certification and Watchkeeping for Seafarers, 1978, as amended (STCW Code), Section A-II/1, Standards regarding the master and deck department*, IMO, London.

The ship's master is required to develop a plan for its safe and efficient passage between ports. Detailed plans are needed to ensure appropriate margins of safety are maintained at all times.
The International Maritime Organization (IMO) provides guidelines for voyage planning, which comprises four distinct stages:

- appraisal during which all information relevant to the passage is considered.
- planning when a detailed plan for the voyage is prepared.
- execution of the plan, including suitable alterations to the passage plan as required by circumstances.
- monitoring the execution of the plan including ensuring all navigators know and understand it.

Passage planning or voyage planning is a procedure to develop a complete description of a vessel's voyage from start to finish. The plan includes leaving the dock and harbor area, the *en route* portion of a voyage, approaching the destination, and mooring. The industry term for this is 'berth to berth'. According to international law, a vessel's captain is legally responsible for passage planning, The duty of passage planning is usually delegated to the ship's navigation officer, typically the second officer on merchant ships.

These stages are specified in *International Maritime Organization Resolution A.893(21), Guidelines For Voyage Planning,* which are, in turn, reflected in the local laws of IMO signatory countries. The *Guidelines* specify fifty elements of passage planning, some of which are only applicable in certain situations.

The *Guidelines* specify three key items to consider in the practice of voyage planning:

- having and using a voyage plan is "of essential importance for safety of life at sea, safety and efficiency of navigation and protection of the marine environment,"
- voyage planning is necessary for all types of vessels on all types of voyages, and
- the plan's scope should be based on all information available, should be "berth to berth," including when under pilotage, and the plan includes the execution and the monitoring of progress.

Voyage planning starts with the appraisal stage. Before each voyage begins, the navigator should develop a detailed mental model of how the entire voyage will proceed. The appraisal stage consists of gathering and contemplating all information relevant to the voyage. Much of this appraisal is done by consulting nautical charts, nautical publications and performing a number of technical tasks such as weather forecasting, prediction of tides and currents, and checks of local regulations and warnings.

Nautical publications are a valuable guide to local conditions and regulations, but they must be updated and actually read to be of any use. These publications could

include Sailing Directions and Coast Pilots or similar texts produced by other authorities.

The next stage of the process is known as the planning stage. Once information is gathered and considered, the navigator can begin the process of actually laying out the voyage. The process involves projecting various future events including landfalls, narrow passages, and course changes expected during the voyage. This mental model becomes the standard by which the navigator measures progress toward the goal of a safe and efficient voyage, and it is manifested in a passage plan.

A good passage plan will include a track line laid out upon the best-scale charts available. This track is judged with respect to at least nine separate criteria given in the *Guidelines* including under-keel clearance, safe speed, air draft, the use of routing and reporting services (TSS and VTS), and the availability of contingencies in case of emergency.

Nowadays, the modern navigators enter passage plans on electronic systems. The navigator will draw and redraw the track line until it is safe, efficient, and in line with all applicable laws and regulations. When the track is finished, it is becoming common practice to also enter it into electronic navigation tools such as an Electronic Chart Display and Information System, a chartplotter, an ARPA system, or a GPS unit.

When working in a team environment, the passage plan should be communicated to the navigation team in a pre-voyage conference in order to ensure that all members of the team share the same mental model of the entire trip.

The third stage of passage planning is the execution stage. The IMO was careful to include execution as part of the process of passage planning. This underscores the fact that the *Guidelines* list a number of tasks that are to executed during the course of the voyage. It also reiterates the captain's responsibility to treat the plan as a "living document" and to review or change it in case of any special circumstances that should arise.

The fourth and final stage of voyage planning is the monitoring stage. Once the voyage has begun the progress of the vessel along its planned route must be monitored. This requires that the ship's position be determined, using standard methods including dead reckoning, celestial navigation, pilotage, and electronic navigation.

According to the *Guidelines,* the passage plan should always be available to the officer on watch on the bridge. The *Guidelines* also specify that deviations from the plan should be clearly recorded and be consistent with other provisions of the *Guidelines.*

I.5. WEATHER INFORMATION

The Investigation Team acquired the weather information from the Headquarters of Meteorological, Climatological, and Geophysical Agency (BMKG). The information comprised of the wind, wave and current. There was neither rain nor fog at the accident time. The visibility was good about 5-6 NM.

From the weather information, it was known that the wind blew from northeast the strength of between 4-12 knots with current speed about 2 knots toward northeast.

I.6. SINGAPORE STRAIT

The Singapore Strait and approaches to port of Singapore is one of the busiest waters in the world. An advanced VTS (Vessel Traffic Service) is essential for the safe and efficient navigation of the ships in these waters. Ships navigating within the STRAITREP Sector 7, 8 and 9 report to Singapore's VTIS, operated by MPA. Ships of the following categories need to participate in the STRAITREP:

1. vessel of 300 GT and above;
2. vessel of LOA 50 m or more in length;
3. vessel engaged towing or pushing with a combined GT of 300 and above, or with a combined LOA of 50 meter or more;
4. vessel of any tonnage carrying hazardous cargo;
5. all passenger vessels that are fitted with VHF, regardless of LOA or GT;
6. any category of vessels fitted with VHF that uses the appropriate traffic lane or separation zone in an emergency situation to avoid immediate danger.

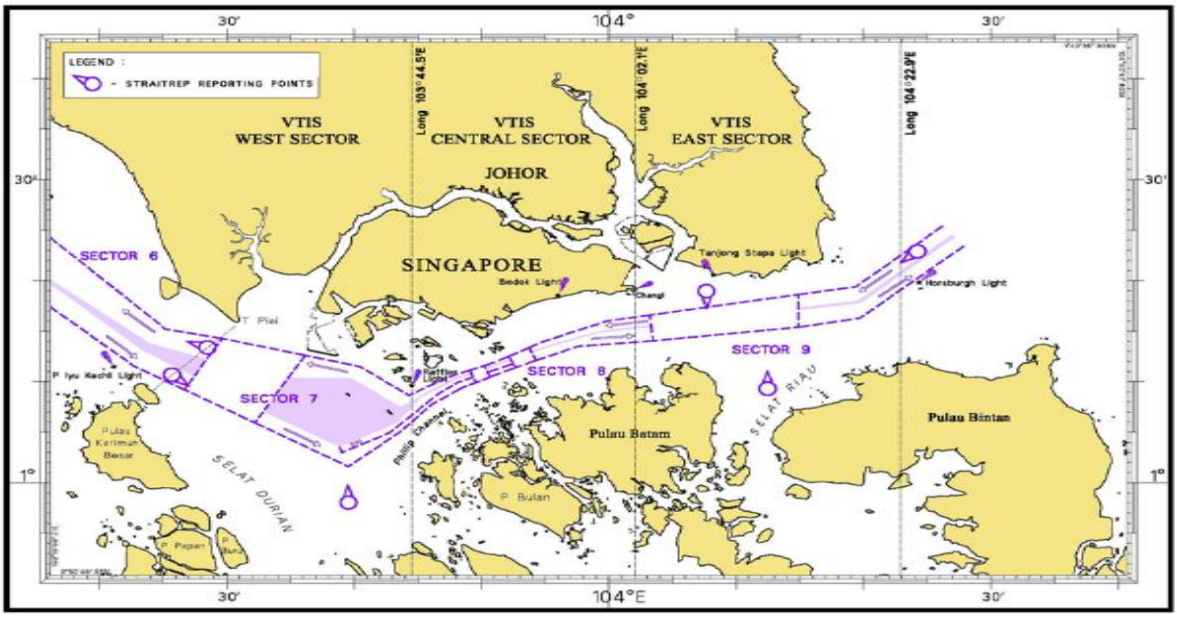

Figure I-6: Area cover by STRAITREP

The operational area of STRAITREP covers the Straits of Malacca and Singapore between longitudes 100° 40'E and 104° 23E. The area includes the routeing system in the Straits of Malacca and Singapore. There are nine sectors in the area with an assigned VHF channel.

Ships entering the operational area must report when leaving port or anchorages in the area before joining the traffic lane of the Traffic Separation Scheme.

Singapore VTIS was established by MPA as the competent authority to monitor vessel traffic in the TSS of the Singapore Strait. STRAITREP reporting made by vessels while

navigating in Sectors 7, 8 and 9 are managed by Singapore VTIS. Singapore VTIS also provide critical traffic advisories to vessels pertaining to safety of navigation.

The IMO adopted the mandatory ship reporting system STRAITREP in 1998 for vessels transiting the Malacca and Singapore Straits.

I.7. MENTAL MODELS

A mental model is described as "*the mechanisms whereby humans are able to generate descriptions of system purpose and form, explanations of system functioning and observed system states, and predictions of future system states*" (Rouse & Morris, 1986). In a simple definition, it is a perception of someone towards the objects, activities or conditions based on the knowledge, observation and experience (Langan-Fox, Anglim, & Wilson, 2004). This term was first used in 1943 by Kenneth Craik. Someone's assumption is built based on the knowledge and experience of all five senses. Therefore, the way of thinking about an object or situation of each person is most likely different each other. Further, a mental model of the two people would be different due to the differences in culture.

The mental model defines how someone carries out a deed based on their knowledge and experience (Gentner, 2014). The deed, as derived from the mental model, would be different for each individual. Further, the decision taken by someone would be based on what is in the mind, particularly when there was no guidance or when the guide has been ignored in particular situations.

Mental model also covers how someone expects other people to react (Castellan, Cannon-Bowers, & Salas, 2013). This behaviour becomes critical when the expectation or action involves more people, e.g. in a team. In terms of the seamanship, this cooperation is called the Bridge Resource Management (BRM). To eliminate an incorrect perception, a briefing and debriefing are prominent need to ensure that the plan is running on the track. Through the briefing sessions, the expectation and information would be conveyed by the members and later become a shared mental model (Imset & ØvergÁrd, 2017) otherwise known as consensus. This has been pointed out by a study which found that human interaction is a dominant factor in shaping a unified understanding (Lynam et al., 2012). Without the team mental model (TMM), there will be inconsistent perspectives about how to solve a problem.

The highest advantage of the briefing is eliminating incorrect mental models in preventing an accident. An accident might be a result of a dyad partnership coincidentally with similar improper mental models (Badke-Schaub, Neumann, Lauche, & Mohammed, 2007). The TMM amongst a team comprised of more people, is likely to allow the member to make a correction of a wrong-doing act. Moreover, when all members have the same familiar tasks and basic knowledge, it is supposed to enable an improvement of discipline of works or appropriate responses.

In a research, the incorrect mental models can occur in all level of intellects, even the well-educated people (Fischhoff, Bostrom, & Quadrel, 1993). In more complex situations, the mental models would deterioriate the situation when it is followed by the inaccurate assessment.

II. ANALYSIS

The analysis carried out in this report is based on the evidence taken by the Investigation Team from the witness interview, *Tina I*'s Simplified Voyage Data Recorder (SVDR), Batam VTS Station, ship's documents as well as pilotage related documents. Some government regulations were also amalgamated in this chapter. Apart from the direct causal factors, this chapter will also discuss about the importance of the other safety issues which are considered as substantial matters. The KNKT's analysis is solely made to enhance the safety of marine transport by issuing safety recommendations refer to the analysis chapter.

Scrutinising the causes of the accident, there were three essential problems brought to the grounding. First is the passage plan of the *Tina I*. Second is the communications and third is team's work, situational awareness and mental model.

II.1. PASSAGE PLAN

During the course of a voyage, a vessel may need to leave her planned route temporarily at short notice. The marking of critical areas on the chart is a good practice that will assist the bridge team when they have to decide quickly, to what extent the vessel can deviate without jeopardising safety. No-go areas, parallel index lines and specific hazards had not been marked on the paper chart in use at the time, even though the passage plan checklist indicated that this had been done. Although the bridge team were aware of the reef, a complete passage plan would have reinforced to the Master and Duty Officer - the dangers of entering no-go areas had he continued to plot or monitoring positions on the chart.

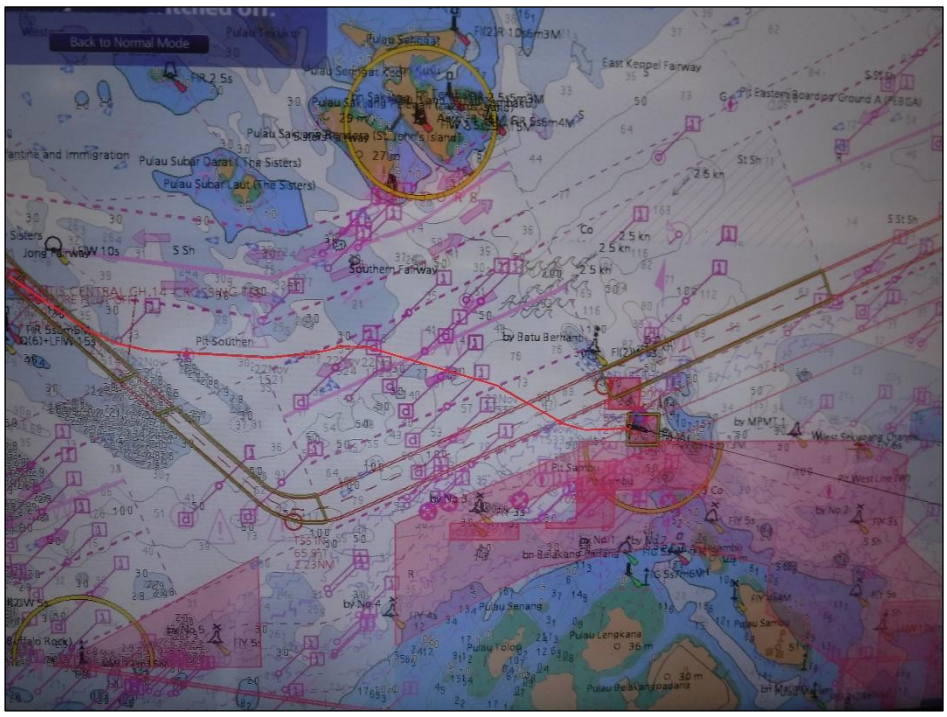

Figure II-1: The Tina I's real track on ECDIS (red)

The ECDIS was meant to be used as a secondary aid to navigation. However, the passage plan entered in it was incomplete (Figure II-1) and did not utilise in-built safety features such as danger areas, safety depths, look ahead and predicted vessel movement. Both the master and third officer had attended an ECDIS course and should have been aware of the advantage of using these features; they should have checked to see that the equipment was correctly set up.

The passage plans referred to the maximum speed the vessel was required to transit each leg, but it failed to take into account confined water transits and contingency planning such as areas of expected increased traffic volume where speed may have to be reduced and other precautionary measures taken. For the passage through the Singapore Strait consideration should have been given to:

- The engine on a higher state of readiness anytime during the passage in TSS.
- Clearing the anchors for standby immediate deployment
- Put additional generator running in accordance with the company's instructions
- Having both steering gear pump motors running for easier maneuver, and
- Posting additional personnel on the bridge.

The passage plan through the Singapore Strait was incomplete and not in accordance with the best practices of seamanship, the ICS Bridge Procedures Guide and the company's own requirements. The master and third officer were complacent in not valuing the benefits of comprehensive passage planning.

II.2. COMMUNICATION WITH VTIS

Singapore VTIS, in accordance with its role, provided *Tina I* with advice and information during the period leading up to the grounding. On three particular occasions, had the master or third officer sought clarification from VTIS, they would have had an opportunity to reassess the situation and change their planned actions.

The first occasion occurred at 23.29H when VTIS advised *Tina I* while entering east bound lane and may used deep water route and to keep clear from Batu Berhanti buoy and west bound tug and tow.

The second occasion was when VTIS again advised *Tina I,* at 23h:31m:30s, to keep clear the grounded vessel and Batu Berhanti buoy on the port side. In fact, VTIS was so concerned by *Tina I*'s actions that it requested all ships to stand-by while it warned *Tina I* again that she appeared to be heading towards the other grounding vessel M.V. *Shahraz* at Batu Berhanti*.* The third, when the master had personally responded to VTIS at 23h:33m:35s, and it is apparent that he and the third officer had just acknowledge the VTIS advice. Most likely they have intention to clear of tug and barge on her port bow.

Should the *Tina I* follow the first VTIS advice to used deep water route, she would not encounter closed quarter situation. At the time the deep water route was not occupied by traffic.

II.3. TEAMWORK, SITUATIONAL AWARENESS AND MENTAL MODEL

The cornerstone of effective bridge team management is enshrined in the following extract from the ICS Bridge Procedures Guide:

> *"A bridge team which has a plan that is understood and is well briefed, with all members supporting each other, will have good situational awareness. Its members will then be able to anticipate dangerous situations arising and recognise the development of a chain of errors, thus enabling them to take action to break the sequence."*

The breakdown in bridge team management contributed to the *Tina I* run aground. The master and third officer, although aware that *Tina I* was heading towards the reef, did not effectively monitor the vessel's speed nor her position was out of TSS, and did not appreciate the significance of the communications from VTIS at 2330. There were some actions was taken by the Master before *Tina I* leaving the TSS. The master maneuver the vessel to avoid the towing tug until the ship left the TSS and by that time all the actions taken were too late to prevent the ship from running aground. The action taken then was too late to help them get out of the danger of running aground.

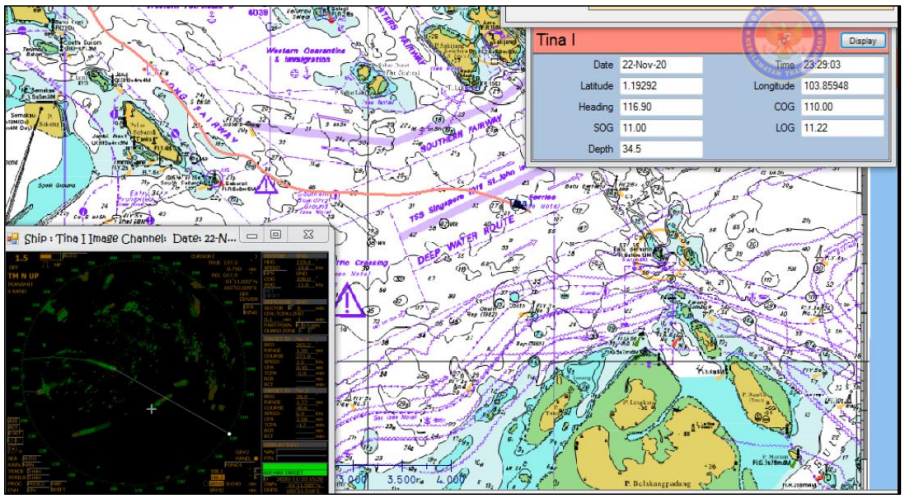

Figure II-2: Range of radar used on 1.5 NM (source:VDR)

Since *Tina I* commenced crossing TSS to the time of grounding, the bridge team monitored the vessel's progress on ECDIS and Radar. However, the Radar was inappropriately set up. The master used a range 3 NM when crossing the westbound lane before changed to 1.5 NM **(Figure II-2)**. While there are good reasons for using a large scale, in this case it probably contributed to the master losing positional awareness as the tug and tow would not have appeared on the display until shortly before the vessel grounded. In addition, ECDIS feature has no danger areas were

marked and the look ahead feature, which would have alerted the master and third officer of the impending danger, was not set up.

Both officers had attended a generic course in the use of ECDIS and had signed the bridge equipment familiarisation sheet to confirm that they were familiar with the equipment. While they relied on the ECDIS as the primary means of navigation, they did not utilise it to its full potential in monitoring the vessel's position in relation to the planned track and surrounding hazards.

Neither the master nor the third officer monitored the vessel's position as required by Technomar Management System QP09 regarding Navigation Procedures and ICS Bridge Procedures Guide.

The master was confident in his planned manoeuvre to return to the original track after clearing tug and tow, right up to the point at which *Tina I* was about to run aground. To make his plan succeed, he inadvertently channelled all of his attention on collision avoidance. Even though OOW has informed about the reef and Shahraz, the captain is more focused on avoiding tugs/barges. With no navigational alerts from the third officer, the master lost situational awareness in terms of the vessel's increasingly close proximity to the reef.

An effective bridge team will work to eliminate the risk of an error by one person developing into a dangerous situation. The master and third officer just sailed together on *Tina I* on first occasions and started established a mutual respect and rapport with each other. The third officer was comfortable and confident in the master's decisions and navigational capabilities. Although the master was approachable, he liked to get involved and to do things himself. This type of leadership carries the risk of working in isolation and, when not properly supported by the bridge team, can result in an error going undetected and unchallenged.

Although the master, through his standing orders, had made it clear that the OOW should question the master's actions when in doubt, this did not infer that the master would first discuss his intentions with the OOW. Master should clarify and reiterate his requirements, and it is evident that the officers considered it unnecessary to question the master's intentions or actions on this occasion.

Different societies vary in the way inequalities in status and power are handled. In societies organised on relatively authoritarian or paternalistic lines, consultation between superiors and subordinates is not expected (by either party). The probability of a subordinate challenging or contradicting a superior's decision is low. A respected superior is treated as more or less infallible. In a less authoritarian society, the emotional distance between leaders and those led is smaller and thus the barriers to consultation and co-operative decision making are less formidable.

Hofstede and Hofstede (2005) have measured the strength of these attitudes and expectations in many countries in the form of a Power Distance Index. Countries in the Indian sub-continent tend to have a higher Power Distance Index than countries in northern Europe. In a worldwide study of 74 countries, Philippines scored 94, while the Polish scored 68 on the Index, which suggests markedly different approaches to power and status.

The third officer did not challenge the master's intentions or actions because:

- His previous experience with the master gave him no reason to do so
- He did not appreciate the impending danger
- The master did not engage the third officer in terms of the navigational support he required
- The master appeared to be in control and comfortable with the situation
- The third officer was culturally reluctant to challenge the master

In light of the number of similar incidents where the main contributing factors are related to deficiencies in bridge resources management, this accident provides an object lesson and identifies a need for:

1. Increased competence in leadership and management skills
2. Knowledge and understanding of bridge resource management
3. Training in bridge team management.

While 1 and 2 have been addressed in the amendments to the STCW Code, there is still a need for companies to consider providing refreshment training in bridge team management. The revised convention has introduced bridge resource management and engine resource management requirements for senior officers and leadership and management skills within their certificate. Companies should be responsible for providing training in these areas where seafarers do not have appropriate training. The 2010-amended STCW has increased refresher requirements on certificates of proficiency which can be facilitated onboard, but where evidence of training is not available five yearly retraining ashore is required.

The shipping industry, now require their officers to have undertaken training in either bridge resource or bridge team management, or both. It is also considered good practice to provide officers with refresher training every 5 years to reiterate the principles of bridge management and eliminate bad practices that might have developed in the interim. As navigational bridges become increasingly sophisticated and expensive, it seems logical that ship owners should increasingly invest in officers' training with the aim of protecting their assets.

Situational awareness means having an accurate understanding of what is happening around the ship (the existing condition) and what is likely to happen (hard situation). The situational awareness also covers how to cope the unwanted situation based on the existing information (Sandhåland, Oltedal, & Eid, 2015).

In consideration of limited waters in the Singapore Strait, the situational awareness was exteremely important to ensure the passage process could run safely. There were some risks existed surrounding the *Tina I*, such as the other ships –especially for both tug and tow and grounding vessel *Shahraz*– as well as the other passing vessel. The absence of ensuring the vessel on safe passage reflected the lack of situational awareness since required by the STCW, particularly after the Manila amendments in 2010 (Oltedal & Lützhöft, 2018).

Another factor which was strongly believed contributed the lack of situational awareness was the incorrect mental model amongst the ship crew towards Master, duty officers and their roles. The interview of Master and crew of *Tina I* revealed that each of them had a different point of view. The duty officer believed that the Master had more experience because the Master was a highest command on board. At the other side, the master as in command need a continuously information from duty officer as a navigational officer at the time. Where this information is very crucial for the master in taking action in navigating.

III. SUMMARY

III.1. FINDINGS

Findings are statements of all important conditions, events or circumstances in the accident sequence. The findings represent significant steps in the accident sequence, but are not necessarily causal, or indicate deficiencies. Some findings indicate conditions that existed before the accident sequence, but are usually important to understand the occurrence, usually in chronological order. In this incident, the NTSC identified the following findings:

1. Crew familiarizations were given in a short time periode to the new joining crew and familiarization check list was completed.
2. Master has an experience sailing in Singapore port and Singapore Strait, last call to Singapore port was in 2016.
3. VTIS Central has warned *Tina I* regarding the traffic and danger of shallow water and grounding vessel.
4. The ECDIS was inappropriately set up where used a scale of 1:5000. While the Radar also set up on range 3 NM when crossing the west bound lane before changed to 1.5 NM.
5. Before the incident OOW has informed the Master about the shallow water on their bow.
6. Master joined the vessel a day before the accident.
7. At the time of accident, there was a west bound tug and tow using the eastbound traffic lane, in the vicinity of Batu Berhanti rock.

III.2. CONTRIBUTING FACTORS[9]

1. The bridge team members did not effectively monitor the ship's passage.
2. The lack of situational awareness and the wrong mental model amongst the ship crew towards Master, duty officers and their roles lead the vessel to danger.
3. Master was just joined the ship few hours before the derparture and has not been around the area for long time.

[9] Contributing factors are anything which might be the source of an accident. In terms of any act, negligence, condition or situation in which avoided or diminished would prevent an accident or reduce the impacts.

IV. RECOMMENDATIONS

Based on the grounding of container ship *Tina I*, the National Transportation Safety Committee (KNKT) recommends following matters to the interested parties to prevent the recurrence of a similar accident in the future.

Referring to the Government Regulation of Transport Accident Investigations No. 62 Year of 2013, Article 47 suggested that the interested parties should follow up on the safety recommendations from this report and report the progress of those recommendations to the chairman of the KNKT.

IV.1. VICTORIA OCEANWAY LTD. (MANAGING OWNER) AND OSIER HOLDING S.A. (REGISTERED OWNER)

1. To ensure that the passage plan to be completed and in accordance with the best practices of seamanship, the Rules for vessels Navigating through the Straits of Malacca and Singapore, the ICS Bridge Procedures Guide and the company's own requirements.
2. To avoid changing the master who is close to the ship's departure time, especially the captain who has not been around for a long time / has never entered the voyage area.

SOURCES OF INFORMATION

Tanjung Balai Karimun Harbour Master CLASS I.

Batam Vessel Traffic Service CLASS I.

Class Association

Crew members of *Tina I*.

Simplified Voyage Data Recorder of *Tina I*.

REGULATIONS

Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) 1972.

Convention Standards of Training, Certification & Watchkeeping for Seafarers (STCW)

International Safety Management (ISM) Code

Safety Of Life at Sea (SOLAS) 1974.

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ISBN
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