

FINAL REPORT

**SINKING OF
SUPPLY VESSEL
OCEAN COOPER 2
IN THE SINGAPORE STRAIT
ON 14 FEBRUARY 2019**

MIB/MAI/CAS.061

**Transport Safety Investigation Bureau
Ministry of Transport
Singapore**

23 March 2020

The Transport Safety Investigation Bureau

The Transport Safety Investigation Bureau (TSIB) is the air and marine accidents and incidents investigation authority in Singapore, responsible to the Ministry of Transport. Its mission is to promote aviation and marine safety through the conduct of independent and objective investigations into air and marine accidents and incidents.

The TSIB conducts marine safety investigations as required by SOLAS Regulation XI-1/6 in accordance with the International Maritime Organisation's (IMO) Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code), as adopted by Res. MSC 255(84).

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SYNOPSIS

In the early hours of 14 February 2019, a supply vessel while enroute to supply stores to a bulk carrier outside port limits, sank in the westbound lane of the Singapore Strait in Singapore territorial waters.

The crew safely abandoned the vessel prior to it sinking with the assistance of an accompanying vessel.

The Transport Safety Investigation Bureau classified the occurrence as Very Serious Marine Casualty and launched a marine safety investigation.

The investigation revealed that steering gear compartment of the vessel had suffered a breach while she was enroute. The breach, which had gone unnoticed, resulted in the steering gear compartment filling up with sea water, which subsequently caused water to enter the engine room compartment and disabled the vessel.

The investigation also revealed that there were no requirements for the installation of bilge alarm for the vessel under the regulations she was certified, and there was no process in place for the crew to check on the condition of the steering gear compartment during the voyage.

Though not contributing to the sinking, the operator of the vessel had not ensured that the vessel was manned by suitably qualified personnel.

DETAILS OF VESSEL

Name	Ocean Cooper 2 (OC2) ¹
Identification/ Licence No.	SC 4576 H
Flag	Dominica ²
Call Sign	J7CP8
Type	Supply vessel (Non-SOLAS) ³
Material	Fibre Glass
Owner/Operator ⁴	Ocean Queen Boat Services Pte. Ltd. ⁵ / HHH Marine Services Pte. Ltd.
Keel laid	2015
Gross tonnage (GT)	49
Length	22.00m
Breadth	4.50m
Depth	2.10m
Designed draught (without cargo)	0.85m
Cargo deck capacity	20 pallets size / 20 tons
Name/ Type of Engines	Two diesel engines Hino F21 C
Cruising speed	20 knots
Remarks	OC2 was proceeding eastbound to rendezvous with a bulk carrier ⁶ outside port limits (OPL), for supplying stores ⁷ while underway

¹ The OC2 is a single deck supply vessel. The vessel is divided into the accommodation (wheelhouse and sleeping quarters) and cargo space area (located abaft the accommodation). Below the main deck are three main compartments, namely steering gear room (compartment), engine room and forward compartment containing a fuel oil tank and fresh water tank, in addition to two void spaces at the foremost part. OC2 was also issued with a Harbour Craft Licence under Maritime and Port Authority of Singapore (Harbour Craft) Regulations for its operations in Singapore.

² The Commonwealth of Dominica Maritime Administration.

³ Non-SOLAS vessel (Non-Convention) – A vessel which is constructed and built in accordance with lesser stringent requirements, as per the SOLAS Convention. According to the flag Administration, OC2 was certified under its Non-Convention regulations. She was fitted with a liferaft (on top of the wheelhouse) with a float-free arrangement that allowed the liferaft to float free (at a depth of no more than 4m) if the vessel were to sink. The liferaft was required to be serviced annually.

⁴ In this context, HHH Marine Services had taken OC2 on a bareboat charter from the Owner, in addition to using its own boat Jolly Rachel for supplying the stores.

⁵ Owned another boat the Ocean Cooper 1 (OC1).

⁶ Panama flagged Polaris Melody.

⁷ 16 pallets - details in paragraph 1.4.3.



OC2

Source: Owner of OC2

1 FACTUAL INFORMATION

All times used in this report are Singapore Time (UTC + 8H).

1.1 Narrative by the Crew of OC2

- 1.1.1 In the late hours of 13 February, 2019, OC2 departed Singapore⁸ with 16 pallets (evenly distributed over the cargo deck), to be delivered to the Polaris Melody (PM). With a tentative estimated time of arrival (ETA) of 0300H on 14 February 2019 to the rendezvous location⁹, OC2 navigated with an approximate speed of 7 knots¹⁰. At this speed, according to the skipper¹¹, the stern of OC2 would be between 0.5m to 0.7m above the waterline (illustrated in **Figure 1**).

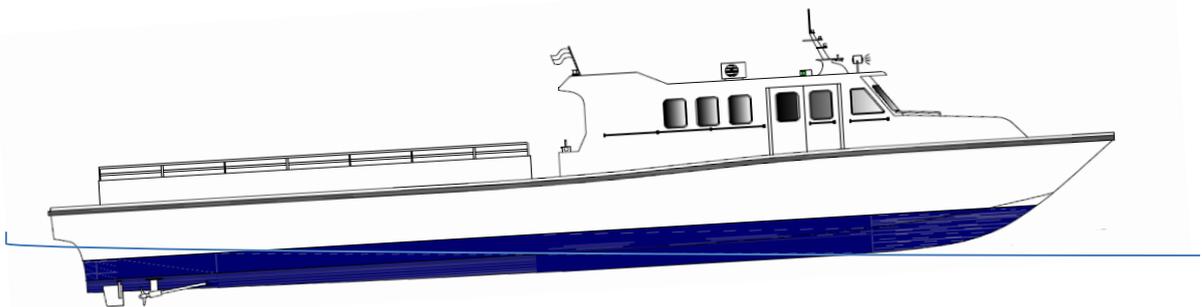


Figure 1: An illustration of OC2's position relative to the waterline (blue) with 16 pallets at the speed of about 7 knots – *not to scale*

⁸ OC2 had completed loading of stores from Penjuru wharf by 1900H on 13 February. OC2 arrived Harbourfront Centre for immigration clearance at about 2030H and departed an hour later, bound for East OPL.

⁹ Outside Singapore Strait

¹⁰ A knot is a unit of speed equivalent to the distance of one nautical mile travelled (1.852km) per hour.

¹¹ Signed-on in the capacity of Master of OC2.

- 1.1.2 The weather according to the crew, which was earlier fair and light wind condition had subsequently deteriorated and developed into moderate to rough seas with sea water shipping on deck from the aft. The engineer reportedly made occasional rounds¹² of the engine room compartment and all machinery was noted to be operating normally.
- 1.1.3 By about 0300H OC2 had arrived near the rendezvous location awaiting the arrival of PM (which was delayed for about an hour). An hour later, when PM made VHF contact with OC2 of its arrival at the rendezvous position, OC2 resumed its passage to head towards PM's location¹³.
- 1.1.4 At some point prior to arriving the rendezvous location, around 0500H while underway towards PM, the skipper of OC2 requested the deck rating and engineer to monitor the passage, so that the skipper could freshen up prior to the storing operations. The skipper (looking aft towards the cargo deck) observed that OC2's stern appeared to be lower than normal and that it was closer to the waterline, despite OC2 heaving and pitching in the weather.
- 1.1.5 The skipper instructed the engineer to check and to also start the bilge pump¹⁴ for the engine room compartment¹⁵. The engineer first went out of the superstructure to open the manhole cover (flushed with the main deck) for the steering gear compartment (see **Figure 2** – annotated in green), and observed that steering gear compartment had a breach, and that sea water had completely filled up the space.

¹² According to the crew, there was no specific process in place for the crew to monitor the spaces below the waterline, other than the engine room compartment, for water ingress at regular intervals. During the round of the engine room compartment, everything was in order.

¹³ Outside the Eastbound lane of Singapore Strait TSS.

¹⁴ OC2 was provided with three bilge pumps – One in steering gear compartment, one in the engine room compartment and one in the forward compartment. Bilge pumps are marked with 7 in Figure 3. All three compartments were separated by watertight bulkheads. Access to these compartments was via manholes on deck. Manholes in the vicinity of the cargo space was flushed with the cargo deck to maximise the cargo loading. The capacity of the pumps was not available with the flag Administration or the Owner of the vessel.

¹⁵ According to the flag Administration, there were no bilge high level alarms required to be fitted in any of the compartments for a vessel of this size as per the regulations under which OC2 was certified. Singapore's Harbour Craft regulations do not require vessels registered under these regulations to be fitted with a bilge high level alarm. Singapore's Harbour Craft regulations too do not have this requirement, vessels under 500GT engaged on international voyages certified under the Singapore's Merchant Shipping (Non-Convention ships) Safety Regulations are required to be fitted with bilge high level alarms for protection against flooding.

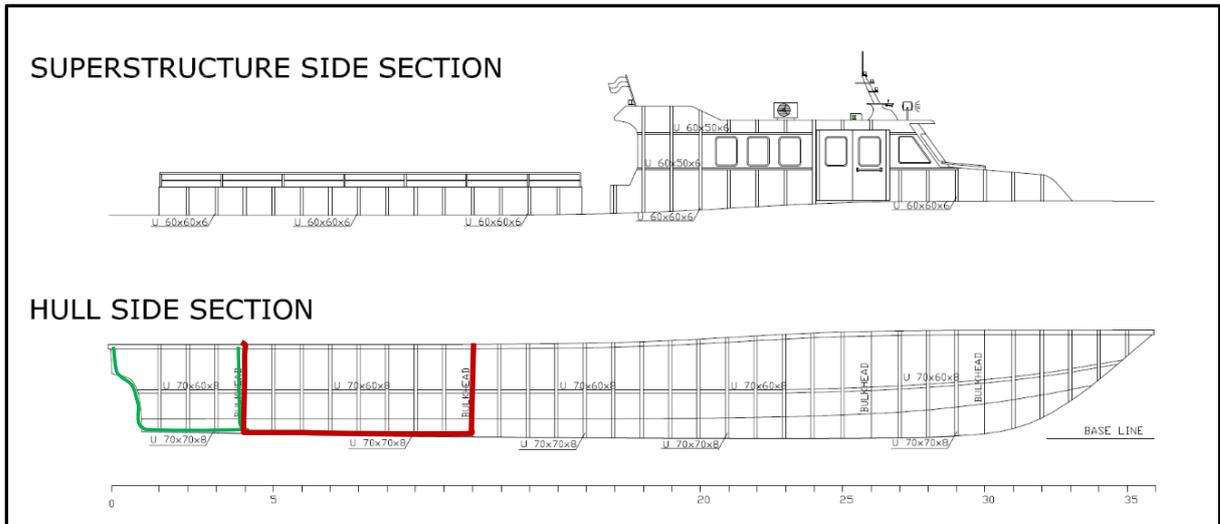


Figure 2: OC2's layout with Fr. numbers marked on the scale at the bottom

- 1.1.6 On inspecting the engine room compartment (annotated in red in **Figure 2**) which was separated by a watertight bulkhead from the steering gear compartment, the engineer observed that sea water was entering the space from the starboard corner through the exhaust fan¹⁶ (see **Figure 3**). OC2 had 36 frames (Fr.). The steering gear compartment¹⁷ was from Fr. 0 to Fr. 4 and the engine room compartment was from Fr. 4 to Fr. 12

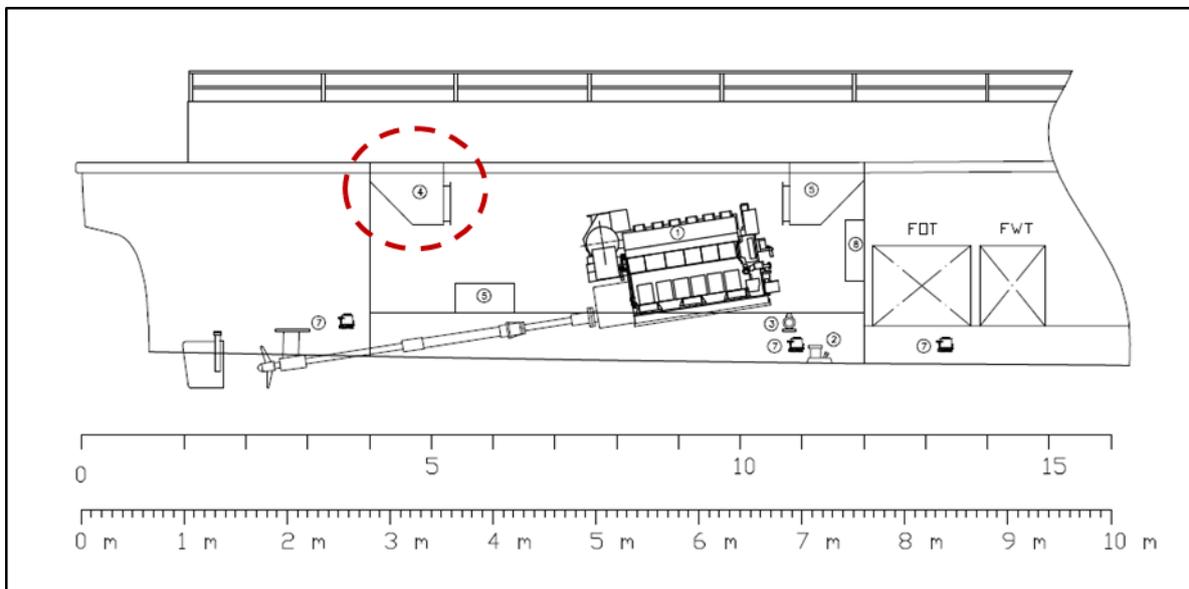


Figure 3: Starboard side view of engine room layout. Exhaust fan is circled in red.

¹⁶ OC2 was fitted with two exhaust fans and two supply fans located one set on each side. The exhaust fan(s) were fitted from Fr. 4 to Fr. 5.

¹⁷ Estimated volume of space to be at least 17 cu.m.

1.1.7 The exhaust fan outlet was flushed with the cargo deck as per the general arrangement plan. Photographs provided by the flag Administration indicated that the outlet(s) were covered by wooden dunnage (typically used to protect cargo). See **Figures 4a and 4b**.

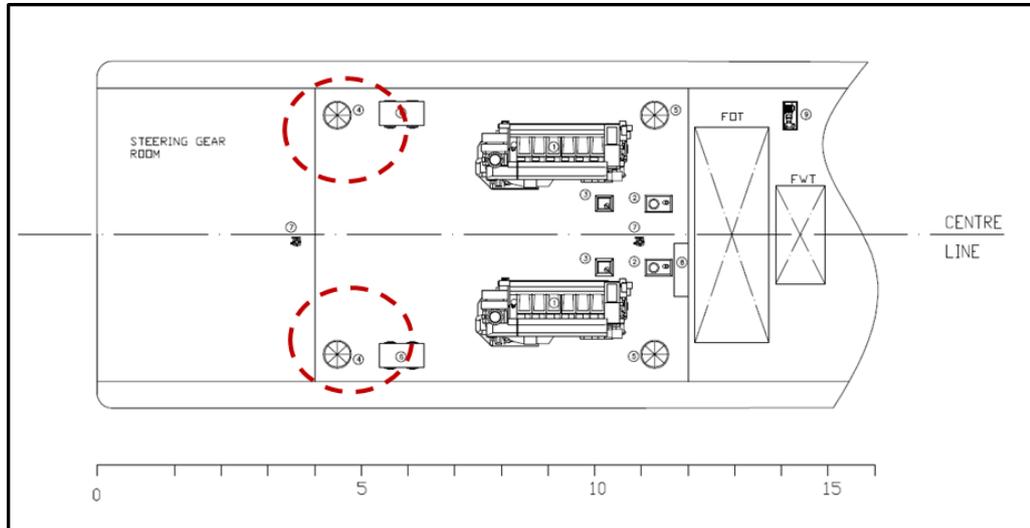


Figure 4a: Plan view of engine room compartment layout. Exhaust fans are circled in red.

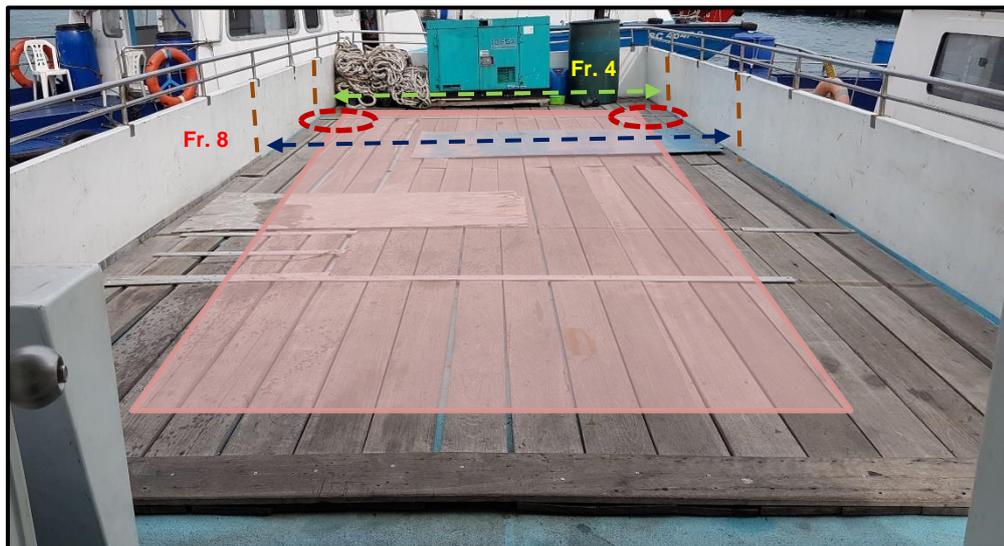


Figure 4b: Photograph taken looking aft towards the cargo deck (annotated by TSIB with approximate cargo which extended across the cargo deck till the aft– *not to scale*). Location of exhaust fans are circled in red. Cargo was evenly distributed till Fr. 4

1.1.8 Green dashed line in **Figure 4b** indicates the approximate location of the watertight bulkhead separating the steering gear compartment and engine room compartment (at Fr. 4) below the cargo deck.

1.1.9 The engineer informed the skipper of the situation and also requested the skipper to ask the other supply boat (Jolly Rachel) which was accompanying

OC2 to supply stores to PM, to come alongside and provide an additional¹⁸ portable pump. The skipper called Jolly Rachel, and reported the matter to the operator's office indicating the intention to return to Singapore and turned the vessel around towards Singapore.

- 1.1.10 By about 0650H Jolly Rachel was alongside¹⁹ OC2 (which turned around and was proceeding at about 6 knots on a nearly westerly course to meet up with Jolly Rachel) and one portable pump (capacity not known) had been transferred. Though the pump had been started, within approximately 20 minutes of doing so, OC2's generators stopped. The engineer with the assistance of the deck rating manually commenced bailing water out from the engine room.
- 1.1.11 With no sign of reduction of the water ingress in the engine room compartment, the engineer and rating evacuated the space and informed the skipper.
- 1.1.12 The skipper eventually decided to abandon OC2²⁰. After donning lifejackets, the three transferred to Jolly Rachel and noted OC2 to start to sink at about 0715H. OC2's liferaft floated up when OC2 sank and was recovered by Jolly Rachel.

1.2 Location of the accident

- 1.2.1 The OC2 sank about 3nm west of Horsburgh Lighthouse within the westbound lane of the Singapore Strait Traffic Separation Scheme (TSS) in Singapore territorial waters (see **Figure 5**) in approximate position 01°20.20'N, 104°21.38'E at water depth of about 40 metres. The sinking did not pose a danger to surface navigation and the wreck²¹ was not removed.
- 1.2.2 Navigation safety broadcast on the location and least depth over the sunken vessel, via NAVTEX was promulgated by the Maritime and Port Authority of Singapore (MPA) in addition to the issuance of relevant Singapore Notices To Mariners.

¹⁸ It was noted by the engineer that the rate of sea water filling-up the engine room compartment was very high.

¹⁹ Traffic separation line in between the eastbound and westbound lane.

²⁰ By this time OC2 was in the westbound lane of the Singapore Strait TSS.

²¹ The wreck was located in Lat: 1°20.030'N Long: 104°21.409'E – *Source* – MPA Press Release dated 7 June 2019.

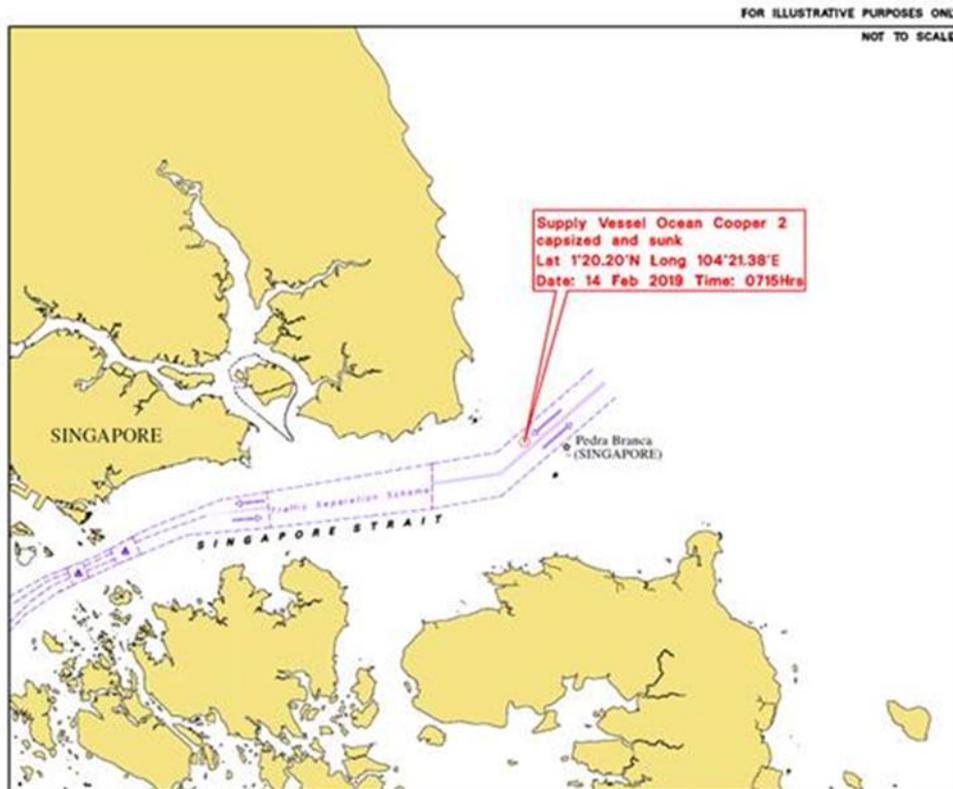


Figure 5 – Location of occurrence

Source: Maritime and Port Authority of Singapore, Press Release

1.3 OC2's manning²²

- 1.3.1 The Minimum Safe Manning Certificate (MSMC) issued by the flag Administration for OC2 required it to be manned by three persons, one in the capacity of Master (pursuant to STCW II/3.5), a Rating forming a part of the Navigational watch (pursuant to STCW II/4) and a Chief Engineer (pursuant to STCW III/3). The rating and engineer were required to assist in the storing operations, while the latter was also responsible for the upkeep of machinery and engines.
- 1.3.2 The skipper of OC2 designated by the operator as the Master was the holder of Certificate of Competency - Deck Officer Class V - issued by the Directorate General of Sea Transportation of Indonesia (DGST), under the provision of STCW II/4, 1978, as amended, to serve in the capacity of a Watchkeeping Officer on vessels below 500GT engaged on near-coastal voyages. The skipper also held a license to serve as a Master as per Indonesia's national requirement, within Indonesian waters in that capacity. The skipper joined the vessel on 10 October 2018.

²² The Administration had a requirement (in the form of a circular CD-MSM 13-04 Rev01) for being notified when there was a crew change with supporting evidence of crew qualifications to be submitted within one month of the crew being engaged, in addition to a monthly report.

- 1.3.3 OC2 also had a deck rating forming a part of a navigational watch, who held a Certificate of Competency - Deck Officer Class V - issued by the DGST, under the provision of STCW II/4, 1978, as amended, to serve in the capacity of a Watchkeeping Officer on vessels below 500GT engaged on near-coastal voyages. The rating joined the vessel on 18 August 2018 and had about three years of in-rank experience on board supply vessels.
- 1.3.4 The person designated by the operator as the Chief Engineer held a Certificate of Competency – Engineer Officer Class III - issued by the DGST, under the provision of STCW III/1, 1978, as amended to serve in the capacity of an engine room Watchkeeping Engineer on vessels below 500GT engaged on near-coastal voyages. The engineer also held a license to serve as a Chief Engineer as per Indonesia’s national requirement, within Indonesian waters in that capacity. The engineer joined the vessel on 26 September 2018 and had about three years of in-rank experience on board supply vessels.
- 1.3.5 The flag Administration confirmed that if a vessel was issued with a MSMC, a crew list with supporting evidence was required to be submitted to the flag Administration, so that the flag Administration could undertake a verification exercise for ensuring the vessels are manned by appropriately qualified personnel. A monthly crew list report was also to be submitted to indicate the movement of the crew.
- 1.3.6 According to the operator, vessels below 100GT had been exempted²³ from submitting a crew list (with supporting evidence) to the flag Administration. Despite this understanding, a crew list was submitted by the operator to the flag Administration on 13 September 2018. At the time of the occurrence the flag Administration had not been provided with supporting evidence of the crew qualifications. A monthly report had also not been submitted to the flag Administration.

1.4 Additional information

- 1.4.1 The principal activity of the operator of OC2, was to operate non-convention (non-SOLAS) boats and launches. The operator had chartered²⁴ OC2 from the Owner. According to the agreement, the operator was responsible for ensuring the vessel was manned by appropriately qualified personnel.

²³ Evidence provided by the Owner was an email from the flag Administration for another vessel (operated by a different operator) dated in Aug 2012. This email was being used as a “generic exemption” by operators according to the Owner.

²⁴ Bareboat charter commencing from 16 Aug 2018. The charter included operations and crewing matters. This was the first time the Owner had chartered out their boat(s) to the operator.

- 1.4.2 The operator had 18 outside port limits (OPL) boats, 22 supply boats for within port and seven passenger launches.
- 1.4.3 OC2 was carrying 16 pallets comprising various items ranging from paint drums, oil drums, to compressor parts, totalling in weight to about 7 tonnes (7000kgs). A portable generator reportedly belonging to OC2 (weighing about 2 tonnes) was placed at the aft of the cargo deck (see Figure 3b).
- 1.4.4 OC2's first annual survey after delivery was on 12 December 2016 and the second annual survey was on 12 December 2017. She underwent a docking²⁵ in January 2018 and the anniversary date for the third annual survey was from 17 September 2018 for a period of three months. By the time of the incident, the third annual survey (window ending on 17 December 2018) had not been carried out by the Owner.

²⁵ General hull cleaning and re-painting. During the survey in January 2018, the liferaft was noted to be in satisfactory condition including the float free arrangement.

2 ANALYSIS

2.1 Ingress of water

- 2.1.1 Receiving stores and spares is an integral part of any vessel's normal operation. While most stores and spares are received when the vessel is alongside at berth or at anchor, it is however, not uncommon for the transfer operation to be carried out when the vessel is underway.
- 2.1.2 OC2 was engaged to provide stores both outside port limits and inside port. OC2's designed draught meant that her freeboard²⁶ would be approximately 1.25m without cargo. It is normal for small vessels to trim by the stern which increases the draught and thus reducing the freeboard, with an increase in speed.
- 2.1.3 With an added weight of almost 10T (weight of cargo and generator), this freeboard, would be expected to be further reduced. When the skipper noticed that the stern of OC2 was closer to the waterline, it was likely that the estimated waterline was as illustrated in **Figure 6**.

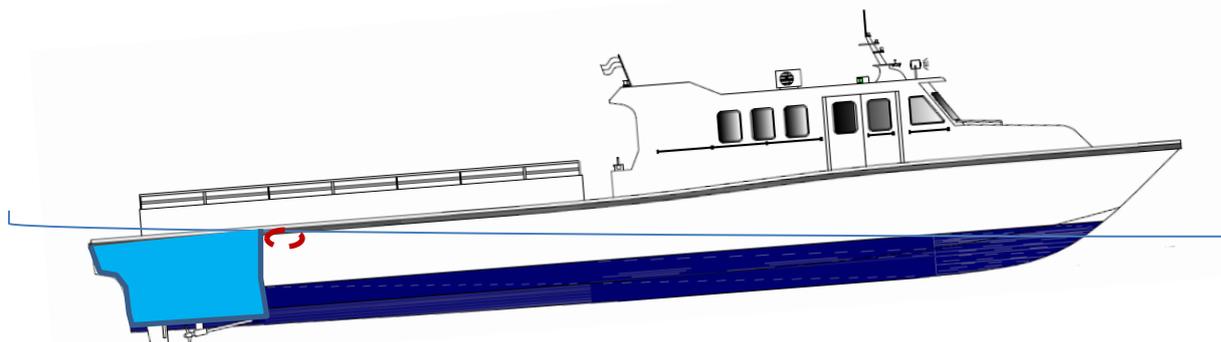


Figure 6 – Illustration of the stern's position according to the skipper – *not to scale*

- 2.1.4 The reasons for the breach of the steering gear compartment of OC2 (indicated by blue in the figure above) could not be established during the period of OC2's departure from Harbourfront Centre and its location while waiting for PM to arrive.
- 2.1.5 With an estimated volume of 17 cu.m, the steering gear compartment would possibly contain an added weight of at least 15T²⁷ which would have further reduced the freeboard²⁸. It is likely that by this time, sea water would have likely made its way nearer to the location where the exhaust fans were situated (under the dunnage) and entered the engine room compartment, eventually disabling the vessel and causing it to sink.

²⁶ Freeboard is the distance between the waterline and the upper edge of the side of a small boat.

²⁷ The density of sea water ranges from about 1020 to 1029 kg/m³

²⁸ It is to be noted that OC2 was certified to carry 20T of cargo.

- 2.1.6 The filling up of the steering gear compartment had gone unnoticed due to the lack of statutory requirements for bilge high level alarms for this vessel and in the absence of a process to check the spaces under the waterline at regular intervals, enroute to the rendezvous location.
- 2.1.7 If there was a statutory requirement for a bilge high level alarm, it could have provided an early warning of water ingress in the steering gear compartment. It would be desirable for such a requirement to be provided for under the flag Administration's Non-Convention regulations.

2.2 OC2's manning

- 2.2.1 Though not contributing to the sinking, the investigation team noted that the skipper and the engineer were not qualified for the position that was required as per the MSMC, in accordance with the flag Administration's requirement. Both persons held licenses to be as a Master and Chief Engineer of a non-SOLAS vessel as per Indonesia's national requirement, which meant they could not operate a vessel outside Indonesian waters in that capacity.
- 2.2.2 Though a crew list was submitted to the flag Administration, there was no supporting evidence of their qualifications provided to the flag Administration. Had it be done, timely intervention by the flag Administration could have ensured that the vessel was manned by appropriately qualified persons.
- 2.2.3 Recognising that Singapore Strait is used by vessels of varying sizes and types, it is of utmost importance that vessels are manned by appropriately qualified persons in accordance with international requirements.

2.3 OC2's design and survey matters

- 2.3.1 OC2 was due for its annual survey on 17 December 2018, which had not been completed by the time the incident had occurred. Although there is no evidence that there were some structural problems with OC2's steering gear compartment, had she been surveyed timely, defects in the steering gear compartment could have been identified and rectified timely.
- 2.3.2 It is extremely important to ensure that vessels are surveyed and inspected as per the regulations to ensure that potential defects are uncovered in a timely manner.

2.3.3 Though the exhaust fans were flushed with the main deck and situated under the wooden dunnage to maximise cargo space, considering the possibility of a flooded compartment causing the stern to sink closer to the waterline, additional risk mitigating measures should be considered for such vessels, to prevent an ingress of water into the engine room compartment.

3 CONCLUSIONS

From the information gathered, the following findings are made. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- 3.1 In all probability, OC2's steering gear compartment had suffered a breach while she was enroute to supply stores to PM. The breach, which had gone unnoticed, resulted in the steering gear compartment filling up with sea water, which subsequently caused an increase in OC2's aft draught.
- 3.2 The consequent increase in OC2's aft draught caused sea water to enter the engine room compartment from the two exhaust fan openings which were flushed with the main deck. By the time the crew noticed the problem, the water ingress was much more than the bilge pumps could have handled, despite the crew of OC2 using a portable pump from Jolly Rachel, and eventually resulted in the crew abandoning the vessel.
- 3.3 There was no requirement for the installation of bilge alarm for vessel of the class of OC2 and there was no process in place for the crew to check on the condition of the steering gear compartment during the voyage.
- 3.4 Though not contributing to the sinking, the operator of OC2 had not ensured that the vessel was manned by suitably qualified personnel in accordance with the MSMC.
- 3.5 OC2 was overdue for its annual survey and if done timely, could have alerted the operator and Owner of any defects in the steering gear compartment.

4 SAFETY ACTIONS

Arising from discussions with the investigation team, the following safety actions were taken by the supply vessel operator / Owner.

- 4.1 The investigation team was not made aware of any safety actions initiated by the operator or Owner after the incident.

5 SAFETY RECOMMENDATIONS

A safety recommendation is for the purpose of preventive action and shall in no case create a presumption of blame or liability.

5.1 Owner of OC2

5.1.1 To implement a process of checking the compartments below the waterline at a regular basis for early detection and intervention on vessels under its operation. **[TSIB-RM-2020-006]**

5.1.2 To ensure the vessel under its ownership or operation is manned by suitably qualified personnel. **[TSIB-RM-2020-007]**

5.1.3 To ensure vessel under its ownership are surveyed and inspected timely in accordance with regulations under which they are certified. **[TSIB-RM-2020-008]**

5.2 Operator of OC2

5.2.1 To implement a process of checking the compartments below the waterline at a regular basis for early detection and intervention. **[TSIB-RM-2020-009]**

5.2.2 To ensure the vessel under its operation is manned by suitably qualified personnel. **[TSIB-RM-2020-010]**

5.3 Flag Administration of OC2

5.3.1 To review the requirements of the Non-Convention regulations for the fitting of bilge high level alarms. **[TSIB-RM-2020-011]**

5.3.2 To enhance its oversight on vessel for ensuring they are surveyed and inspected timely in accordance with regulations under which they are certified. **[TSIB-RM-2020-012]**

5.3.3 To enhance its oversight for ensuring vessels are manned by suitable qualified personnel. **[TSIB-RM-2020-013]**

-End of Report-