# Report of investigation into the fatal accident on board the Hong Kong registered bulk carrier "*Tokyo Spirit*" at sea on 2 September 2020

**The Hong Kong Special Administrative Region**
**Marine Department**
**Marine Accident Investigation Section**

21 December 2021

## Purpose of Investigation

The purpose of this investigation, conducted by the Marine Accident Investigation Branch (MAIB) of Marine Department, is to determine the circumstances and the causes of the incident with the aim of enhancing the safety of life at sea and avoiding similar incidents in future.

It is not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAIB has no involvement in any prosecution or disciplinary action that may be taken by the Marine Department resulting from this incident.

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**Summary**

At about 1145 hours on 2 September 2020, a fatal accident happened on board the Hong Kong registered bulk carrier "Tokyo Spirit" (*the vessel*) at approximate position 41°36.6'N 175°33.9'W in North Pacific Ocean, during her laden voyage from Vancouver, USA to Nghi Son, Vietnam.

In the morning of 2 September 2020, the Wiper was assigned to assist the 4/E overhauling auxiliary boiler fuel oil pump in the purifier room inside the engine room. When the motor of the pump was detached, the Wiper left the 4/E, who stayed in the purifier room to carry on the work alone, without informing the other crew of his next job.

When the Wiper did not come for lunch, the Master ordered the crew to look for the Wiper. Finally, the Wiper was found lying on the scrap metal cargo beside the vertical ladder inside the No.2 cargo hold. Although the Wiper was taken out from the cargo hold and received treatment immediately, he was declared dead later on the same day.

The investigation revealed that the Wiper did not follow the enclosed space entry procedure when entering the No.2 cargo hold. The main contributory factors causing the accident were the insufficient safety awareness of the Wiper who underestimated the risk of entering cargo hold; the failure to lock the cargo hold access hatch; ineffective communication of the crew to prepare for jobs; the lack of close supervision of the Wiper and ineffective training of enclosed space entry procedure.

## 1. Description of the vessel

| | | |
|---|---|---|
| Ship name | : | *Tokyo Spirit* (Figure 1) |
| Flag | : | Hong Kong, China |
| Port of registry | : | Hong Kong |
| IMO number | : | 9669627 |
| Type | : | Bulk carrier |
| Year built, shipyard | : | Qingshan Shipyard, Wuhan, China |
| Gross tonnage | : | 23,405 |
| Net tonnage | : | 11,922 |
| Summer deadweight | : | 35,550.3 tonnes |
| Length overall | : | 179.9 metres |
| Breadth | : | 30 metres |
| Engine power, type | : | 6,400kW, MAN B&W 5S50ME-B9.2 |
| Classification society | : | Bureau Veritas |
| Registered owner | : | One Star Tokyo Limited |
| Management company | : | Asia Maritime Pacific (Shanghai) Limited |

Figure 1 *The vessel*

## 2. Sources of evidence

2.1 The information provided by the crew and the management company of *the vessel* (the Company).

## 3. Outline of events

(All times were local time UTC +11 hours)

3.1 On 25 August 2020, *the vessel* completed cargo loading of scrap metal and departed Vancouver, USA to Nghi Son, Vietnam for cargo discharging.

3.2 At about 0750 hours on 2 September 2020, when *the vessel* was sailing in the North Pacific Ocean, the Second Engineer (2/E) held a toolbox meeting in the engine room to assign jobs and to brief the engine room crew, including the Third Engineer (3/E), the Fourth Engineer (4/E), the Fitter, the Wiper and an oiler, on safely handling those jobs. In the meeting, the 2/E assigned the Wiper to assist the 4/E in overhauling an auxiliary boiler fuel oil pump (*the pump*).

3.3 At about 0800 hours, the 4/E and the Wiper proceeded to the purifier room after the meeting. They detached the motor from *the pump* and secured the motor locally. At about 0820 hours, the Wiper left the purifier room, and the 4/E kept on overhauling *the pump* alone. However, the Wiper did not inform the 4/E of his next job and the work location.

3.4 At about 0830 hours, two ordinary seamen who were carrying out a maintenance job on deck, noticed the Wiper holding a bucket of tools and proceeding to the forecastle direction.

3.5 At about 1100 hours, the Master went to the mess room for his lunch and noticed that the Wiper, who usually had lunch with him at the same time, did not turn up. He asked the engine room crew members why the Wiper was not coming for lunch, but no one had an idea.

3.6 After the lunch at about 1135 hours, the Master, the 2/E, and the 4/E started looking for the Wiper by searching on the deck of *the vessel*.

3.7 At about 1143 hours, the Master spotted that the hatch of No.2 cargo hold forward access (*the forward access*) was opened and a bucket with tools could be observed inside the access trunk from *the forward access* (Figure 2). The Master believed the Wiper was probably inside the No.2 cargo hold and asked the 2/E to inform the duty officer on the bridge to activate the enclosed space rescue operation.

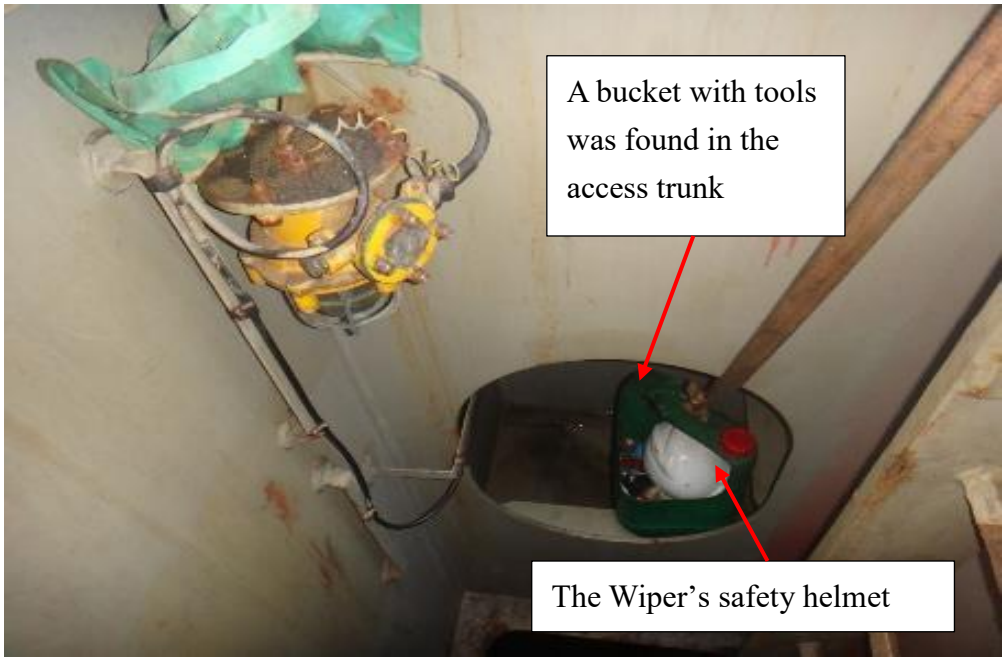


Figure 2 No.2 cargo hold forward access trunk

3.8 At about 1145 hours, when *the vessel* was approximately at position 41°36.6'N 175°33.9'W, the Third Officer (3/O) as the duty officer on the bridge raised an emergency alarm and summoned a search and rescue team through the public address system. Afterwards, the crew mustered on the deck beside *the forward access* to prepare for the enclosed space rescue operation. The Bosun and the Fitter donned the self-contained breathing apparatus to enter No.2 cargo hold through *the forward access* to search for the Wiper. Finally, they found the Wiper lying on the scrap metal cargo beside the vertical ladder of the No.2 cargo hold.

3.9 At about 1152 hours, the Wiper was taken out of *the forward access*. Although the Wiper did not show any vital signs, the Chief Officer still applied first aid treatment immediately, but in vain. The Wiper was declared dead later on the event day.

## 4. Analysis

### *Certification, training and experience*

4.1 The statutory trading certificates of *the vessel* were valid and in order. *The vessel* was manned by 22 crew, including the Master. The manning scale complied with the requirements of the Minimum Safe Manning Certificate of *the vessel*.

4.2 The Master had worked in the Company for about 6 years and joined *the vessel* on 6 November 2019. He had about 5 years of experience as a master. He possessed a Class 1 Certificate of Competency issued by China valid until 17 May 2021.

4.3 The Chief Engineer had worked in the Company for about 6 years and joined *the vessel* on 11 January 2020. He had about 13 years of experience as a chief engineer. He possessed a Class 1 Certificate of Competency issued by China valid until 2 September 2020.

4.4 The 2/E had worked in the Company for about 5 years and joined *the vessel* on 6 November 2019. He had about 2 years of experience as a second engineer. He possessed a Class 2 Certificate of Competency issued by China valid until 4 July 2022.

4.5 The 4/E had worked in the Company for about 4 years and joined *the vessel* 16 December 2019. He had about 2 years of experience as a fourth engineer. He possessed a Class 3 Certificate of Competency issued by China valid until 30 May 2022.

4.6 The Wiper had worked in the Company for about 5 years and joined *the vessel* on 26 December 2019. He had about 5 years of experience as a wiper.

4.7 There was no abnormality noted with regard to the certification and experience of the crew concerned.

### *Weather and sea conditions*

4.8 The weather was cloudy with a north-north-easterly wind of Beaufort force 5. The sea was moderate and the visibility was about 8 nautical miles. The weather should not be a contributory factor to the accident.

### *Fatigue, alcohol and drug abuse*

4.9 There was no evidence to show that any crew members on board suffered from fatigue at work, alcohol or drug abuse.

### *Duties of the Wiper*

4.10 The Safety Management System (SMS) manual of *the vessel* explicitly stated in document number SR-10 that the Wiper was in charge of the management and maintenance for the electrical equipment on board under the leadership of the Chief Engineer. *The vessel* did not have the post of electrician, and the Wiper did electric work under the supervision of the Chief Engineer.

### *Properties of scrap metal in bulk*

4.11 In accordance with the IMSBC Code[1], scrap metal in bulk is categorized as Group C, which is neither liable to liquefy nor possesses chemical hazards. The cargo safety information on board provided by the shipper did not mention any particular precaution.

4.12 However, when reference is being made to the "Revised recommendations for entering enclosed spaces aboard ships" as a supplement in the IMSBC Code, scrap metal stowed inside an enclosed cargo hold would oxidize to absorb oxygen in the cargo hold resulting in oxygen depletion.

### *Probable cause of the accident*

4.13 The No.2 cargo hold was loaded with scrap metal of approximately 7100 metric tons. All the cargo holds were closed since *the vessel* departed on 25 August 2020. On the day of the accident, all the cargo holds were closed for more than a week. Therefore, apart from the specific oxygen depletion warning from IMSBC Code for carrying

[1] IMSBC Code: the International Maritime Solid Bulk Cargoes Code, entered into force on 1 January 2011 under the SOLAS Convention. The IMSBC Code facilitates the safe stowage and shipment of solid bulk cargoes by providing information on the dangers associated and instructions on the procedures to be adopted when the shipment of solid bulk cargoes is contemplated.

scrap metal, the general oxygen depletion safety warning in paragraph 15.4.2 of the Code of Safe Working Practices for Merchant Seafarers (the Code)[2] is also applicable to the condition of the *vessel* at the time of the accident. The Code provides a safety warning with broader coverage of advice that if an empty tank or other confined space has been closed for a period of time, the oxygen content may have been reduced for a number of reasons, e.g., corrosion and oxygen absorbing reactions with the cargoes carried including scrap metal, etc.

4.14 The minimum oxygen level in the air required for human breathing is 19.5%. The occupational exposure limit of carbon monoxide is 35 parts per million (ppm). The concentration of carbon monoxide over 100 ppm can cause slight headaches after 1-2 hours of exposure, and over 350 ppm can cause fainting on exertion and collapse in 3 hours.

4.15 After the accident, atmosphere test of all the cargo holds had been carried out. It was found that the oxygen level in the No.2 cargo hold was at an extreme low alarm level far below the safe level of 19.5% and the concentration of carbon monoxide was 108 ppm which was sufficient to cause headache to humans after exposure for some time. Hence, it was reasonable to believe that when the accident happened, the oxygen level in the No.2 cargo hold would be much lower than the minimum oxygen level and the carbon monoxide level would be higher than the occupational exposure limit, both would cause faint and death of humans after exposure for some time.

4.16 The Wiper did not follow the shipboard enclosed space entry procedure and entered the No.2 cargo hold without informing any crew members on board. Eventually, the Wiper was defeated by the oxygen depletion and the high carbon monoxide concentration resulting in his fatality inside the cargo hold. It was probable that the Wiper had inadequate safety awareness and underestimated the risks of working inside the No.2 cargo hold.

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[2] In accordance with Section 4 of Cap.478M "Merchant Shipping (Seafarers) (Code of Safe Working Practices) Regulation", all Hong Kong registered vessels are required to carry the "Code of Safe Working Practices for Merchant Seafarers" onboard.

***Control measures against enclosed space entry***

4.17 Paragraph 15.1.8 of the Code requires that all entrances to unattended dangerous spaces on a ship should be kept locked or secured against entry.

4.18 The enclosed space entry procedure in the SMS manual of *the vessel* requires that entrance doors or hatches leading to enclosed spaces should at all times be secured against unauthorized entry.

4.19 No.2 cargo hold loaded with scrap metal was an unattended dangerous space. Hence, all entrance accesses should be properly locked or secured against unauthorized entry. The investigation indicated that the hatch of *the forward access* was closed by the cleat but was not secured against unauthorized entry, e.g., to be fitted with a locking device against unauthorized entry. Therefore, the control measures against unauthorized enclosed space entry were insufficient, resulting in the fatal accident.

***Pre-work safety meeting***

4.20 Before the accident, a toolbox meeting was held by the 2/E to assign the jobs to the engine room crew members. The Wiper was assigned to assist the 4/E in overhauling *the pump*, but the Wiper did not inform the 2/E of his further work plan on the day as the Wiper was directly responsible to the Chief Engineer.

4.21 Hence, a meaningful work plan and risk assessment for the Wiper's other work were not addressed in the toolbox meeting to ensure job safety. This indicated that *the vessel* had ineffective communication among the crew members onboard in executing their duties.

***Supervision of the Wiper***

4.22 The Wiper did not inform other crew members, including the 2/E, before going for other duty in the cargo hold. The fatal accident of the Wiper was only discovered after a thorough search on board which indicated the lack of close supervision of the daily work of the Wiper by the Chief Engineer who was his direct supervisor as stated in the SMS.

***Enclosed space entry training***

4.23 The Company had established enclosed space entry procedure in the SMS of *the vessel*. The procedure explicitly requires that all crew shall strictly comply with this operating procedure. The Master therefore had the duty to promote enclosed space safe working practices such that all crew members onboard were in well awareness of the practices including the precautions to be taken before entering enclosed spaces.

4.24 On 7 July 2020, about two months before the accident, the Wiper had attended the enclosed space entry training, including the definition of enclosed space, atmospheric hazards, gas detector operation, ventilation procedure, entry procedure and rescue operation, conducted by the Chief Officer onboard. The training had demonstrated the use of portable gas detectors to measure the atmosphere before entering enclosed space.

4.25 The accident indicated that the shipboard training on 7 July 2020 was ineffective as it failed to impress the crew about the potentially fatal hazards in enclosed space entry, and the importance of strictly complying with this SMS operation procedure including wearing required personal protective equipment and measuring the atmosphere to confirm safe entry before entering enclosed space.

## 5. Conclusions

5.1 On 2 September 2020, a fatal accident happened on board *the vessel* while sailing in the North Pacific Ocean. The Wiper was assigned to assist the 4/E in overhauling *the pump* in the purifier room of the engine room. When the motor from *the pump* was detached, the Wiper left the 4/E and proceeded to somewhere without informing other crew on board. Later, the Wiper was found lying on the scrap metal cargo beside the vertical ladder of the No.2 cargo hold. Although the Wiper was taken out from the cargo hold and received treatment immediately, he was declared dead on the same day.

5.2 The investigation revealed that the Wiper did not follow the enclosed space entry procedure when entering the No.2 cargo hold, resulting in his death inside. The main contributory factors causing the accident were as follows:

(a) inadequate safety awareness of the Wiper who underestimated the risks of working inside enclosed cargo space;

(b) failure to lock the access hatch against unauthorized enclosed space entry;

(c) ineffective communication in the toolbox meeting failing to develop a meaningful work plan and risk assessment for the crew in executing their duties;

(d) the lack of close supervision of the Wiper in his daily work by the Chief Engineer who was his direct supervisor; and

(e) ineffective training of enclosed space entry procedure.

## 6. Recommendations

6.1 The management company of *the vessel* should issue circulars informing all Masters, officers and all crew members of its fleet of the findings of the investigation and lessons learnt from this accident, and instruct them to:

(a) enhance training on enclosed space entry, including the awareness of the risks involved and precaution measures;

(b) lock all entrances of all unattended dangerous spaces against unauthorized entry; and

(c) consider revising the SMS to provide close supervision of the work of a wiper by his supervisor.

6.2 The management company should conduct internal audit on *the vessel* to ensure that the crew follow the safety requirements strictly when entering enclosed space.

6.3 A Hong Kong Merchant Shipping Information Note is to be issued to promulgate the lessons learnt from this accident.

## 7. Submission

7.1 The draft investigation report, in its entirety, was sent to the management company and the Master of *the vessel*.

7.2 By the end of the consultation, there was no comment received from the above-mentioned parties.