MA2024-10

# MARINE ACCIDENT
# INVESTIGATION REPORT

**October 31, 2024**

Japan Transport Safety Board

The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

TAKEDA Nobuo
Chairperson
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

《Reference》

The terms used to describe the results of the analysis in "3. ANALYSIS" of this report are as follows.

i) In case of being able to determine, the term "certain" or "certainly" is used.

ii) In case of being unable to determine but being almost certain, the term "highly probable" or "most likely" is used.

iii) In case of higher possibility, the term "probable" or "more likely" is used.

iv) In a case that there is a possibility, the term "likely" or "possible" is used.

# MARINE ACCIDENT INVESTIGATION REPORT

October 2, 2024
Adopted by the Japan Transport Safety Board
Chairman TAKEDA Nobuo
Member ITO Hiroyasu
Member UENO Michio
Member SODA Hisako
Member OKAMOTO Makiko

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| **Accident type** | Fatality of a crewmember |
| **Date and time** | Around 21:56 on September 21, 2023 (local time, UTC+9 hours) |
| **Location** | K-1 Wharf, No.2 District and Kudamatsu Area, Tokuyama Kudamatsu Port, Yamaguchi Prefecture<br>On a true bearing of approximately 228° and distance of 70 meters from Tokuyama Kudamatsu ENEOS Sea Berth Light<br>(Approximately 33° 58.7′ N, 131° 53.2′ E) |
| **Summary of the Accident** | Coal Carrier "ENERGIA CENTAURUS" was moored and was loading cargo handling operation at K-1 Wharf, No.2 District and Kudamatsu Area, Tokuyama Kudamatsu Port, a boatswain was performing an inspection work on the upper deck, and then, the boatswain was caught between her structure on the upper deck and the cargo unloading device, which had been running, and then was pronounced dead. |
| **Process and Progress of the Investigation** | (1) Set up of the Investigation:<br>On September 22, 2023, the Japan Transport Safety Board appointed an investigator-in-charge and one other marine accident investigator to investigate this accident.<br>(2) Collection of Evidence:<br>September 23, 2023: On-site investigation, interviews and Collection of questionnaires<br>April 15, 2024: Interview<br>May 7, 13, 15, 17 and 30, 2024: Collection of questionnaires<br>(3) Comments from Parties Relevant to the Cause<br>Comments on the draft report was invited from the parties relevant to the cause of accident. |
| **Factual Information** | |
| Vessel type and name | Coal Carrier ENERGIA CENTAURUS, 73,583 tonnages |
| Gross tonnage<br>Vessel number<br>Owner, Management | 141544, 9233557 (IMO Number), Mitsui O.S.K Lines Co. Ltd. (Owner), MOL Ship Management Co. Ltd. (Ship Management Company, Company A) |

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| company<br>L*B*D, Hull material<br>Engine, Output<br>Date of launch, etc.<br>Port of Registration | 234.93 meters * 43.00 meters * 25.40 meters, Steel<br>Diesel engine, 15,150 kW, March 4, 2001<br>Kudamatsu City, Yamaguchi Prefecture<br>(See Photo 1) |



Photo 1 ENERGIA CENTAURUS

ENERGIA CENTAURUS (hereinafter referred to as "the Vessel") was a coal carrier, which had six cargo holds numbered 1, 2, 3, 4, 5 and 6 in order from the bow. She had 2 devices of the Self Un-Loading System (hereinafter referred to as "SUL") installed by manual operation and automatic operation. The SULs conducted operation as loading and travelling on the travelling rails of both board sides of the upper deck. (See Figure 1, Figure 3)

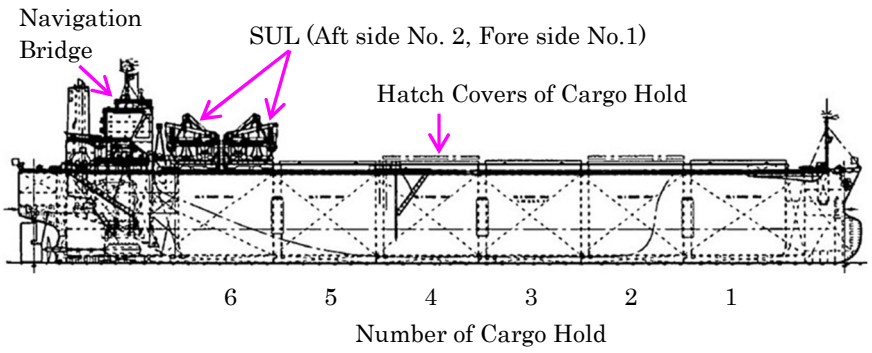
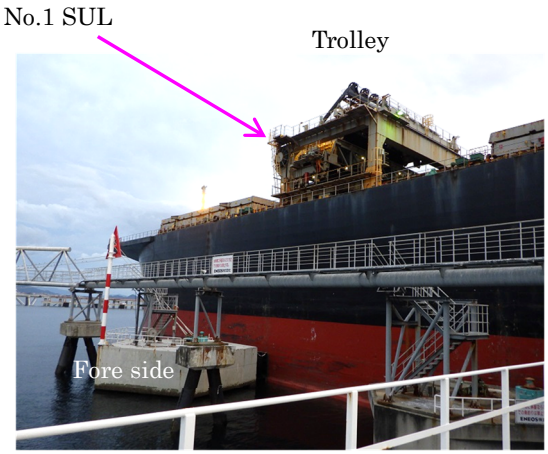
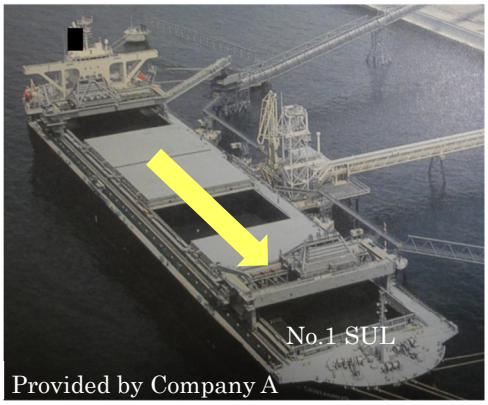



Figure 1 Appearance of the Vessel

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| **Crew Information** | Master (Republic of Philippines) 47 years old<br>Endorsement attesting the recognition of certificate under STCW regulation I/10 Master (issued by Japan)<br>Date of Issue: December 8, 2022<br>(Valid Date: December 7, 2027)<br>Boatswain (Republic of Philippines) 49 years old<br>No seamen's competency certificate |
| **Casualties to Persons** | Fatality One person (Boatswain) |
| **Damage to Vessel** | None |
| **Weather and Sea** | Weather: Weather - Cloudy; Wind direction - North-Northwest; |

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| **Conditions** | Wind speed - approximately 0.8 m/sec; Atmospheric temperature - approximately 24 degrees Celsius; Sight - Clear<br>Sea conditions: Sea level height - approximately 245 cm (Tokuyama Port, Tokuyama City, Yamaguchi Prefecture); Tide - End period of Flood tide, Wave height less than 0.5 meters; Sea surface - Rippling wave |
| **Events Leading to the Accident** | The Vessel loaded coal of approximately 103,000 MT[*1] and arrived was moored at K-1 Wharf, No.2 District and Kudamatsu Area, Tokuyama Kudamatsu Port (hereinafter referred to as "K-1 Wharf"), at around 07:25 on September 20, 2023, with the Master, Boatswain and other twenty-two crew members (all members were Filipino) were on board.<br>(Refer to Annex 1 Map of the Location of the Accident)<br>The stevedores of a cargo handling company (hereinafter referred to as "the Stevedores") were assigned the shore side and on board the Vessel, and the hatch covers of No.1, 3 and 5 of the cargo hold (hereinafter referred to as "hatch covers") of six cargo holds on the Vessel were opened at around 10:47, and then, un-loading cargo operation of coal was started. (See Figure 1, Figure 2) |




Moving from the aft side to the fore side at the time of the accident

Figure 2 Appearance of SUL

Boatswain and one crew member (hereinafter referred to as "Crewmember A") were conducting loading patrol on the upper deck and saw the direction of the hatch cover coaming (as a part of cargo hold, hereinafter referred to as "Coaming") of No.4 cargo hold beyond the travelling rail of the SUL from the starboard pedestrian walkway.

[*1] MT (metric tons) was calculated by "bulk specific gravity" as 1.000, where "bulk specific gravity" means the ratio of the weight in air of a given volume of permeable material to the weight in air of an equal volume of distilled water.

They confirmed oil leakage trace at around the hydraulic oil pipe for switching the hatch covers (hereinafter referred to as "HO pipe"), which was laid under the coaming stage (hereinafter referred to as "Stage") near the Coaming. (See Figure 3)




Figure 3 Structure on the Starboard Side of No.4 Cargo Hold

Though Boatswain and Crewmember A were considering approaching the HO pipe to inspect the point of oil leakage, they could not enter around the travelling rail and conduct the inspection work outside the pedestrian walkway (hereinafter referred to as "Working outside SA, (Working outside Safety Area)") due to the SULs in operation. Therefore, Boatswain and Crewmember A decided to confirm this situation again after the next time for switching the hatch covers, etc.

Boatswain and Crewmember A had confirmed oil leakage trace at a similar place on the previous day from the starboard side of the pedestrian walkway between at around 04:00 and at around 05:00 on September 21. However, they could not conduct Working outside SA to confirm oil leakage point, because the SULs were in operation continuously.

After this, Boatswain and Crewmember A returned to the ship office on the aft deck and thought it would be easier to find out the oil leakage point when coming under pressure in HO pipe, because they had discussed entering under the Stage to look for and inspect oil leakage point just after switching hatch covers, and then, they decided to report to a navigation officer in charge of cargo handling operation (hereinafter referred to as "CHO Officer") the result of the inspection work after specifying oil leakage point.

Boatswain could not confirm abnormality point of HO pipe, and therefore did not report anything to CHO Officer about oil leakage trace confirmed near HO pipe and the situation of the inspection concerning its oil leakage that they had done since the previous day.

CHO Officer, a duty navigation officer (hereinafter referred to as "Duty Officer"), Boatswain, Crewmember A and other two crewmembers (hereinafter referred to as "Crewmember B", "Crewmember C") were assigned to conduct un-loading cargo operation. The Vessel stopped un-loading cargo operation temporarily at around 21:09, and then, No.1 SUL (hereinafter referred to as "the SUL") and No.2 SUL were moved to the afterward and the hatch covers of No.1, 3 and 5 cargo holds were closed.

After this, she began to conduct opening of the hatch covers of No.2, 4 and 6 cargo holds. (See Figure 4)

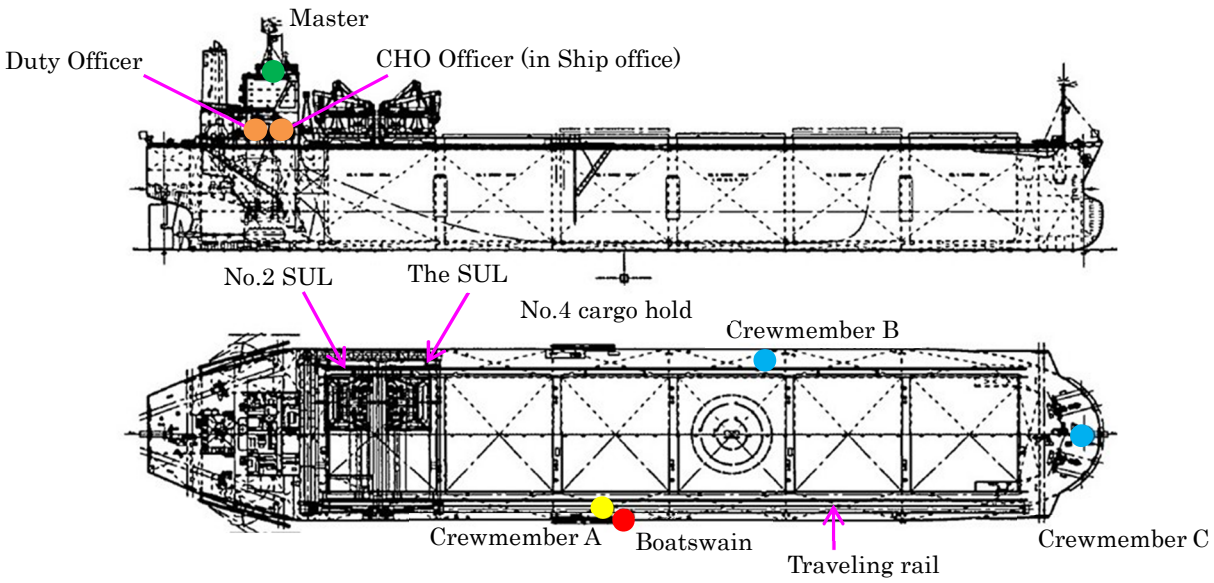



Figure 4 Crewmember's Assignment for Cargo Handling Operation, etc.

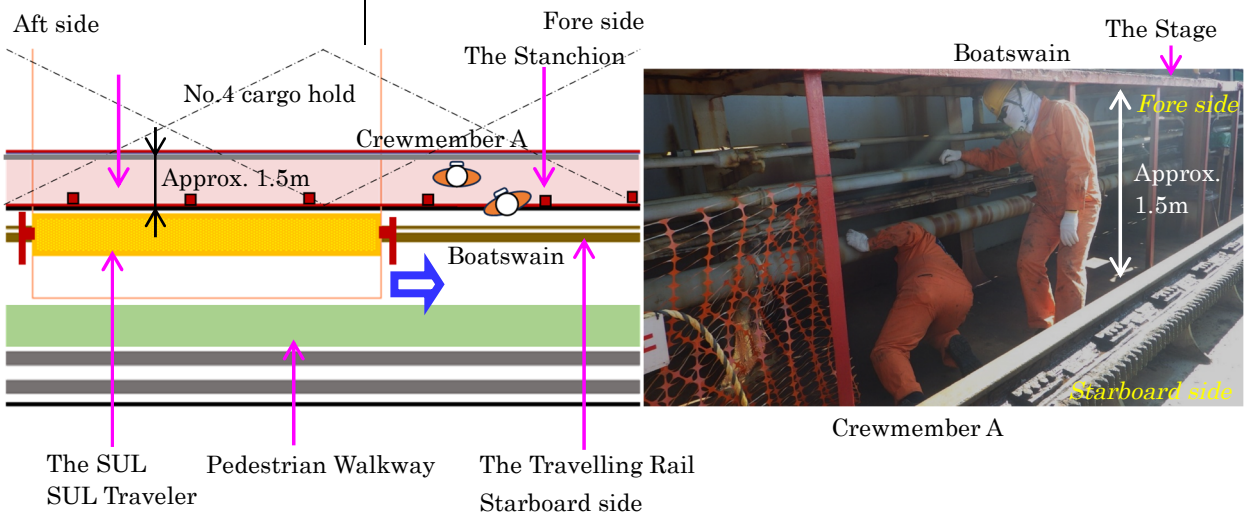
Boatswain completed conducting opening operation of the hatch covers of No.2 cargo hold, etc. at around 21:46, and then, he reported to CHO Officer in the ship office this completed operation by his transceiver. After receiving this report, CHO Officer conveyed the condition of the hatch covers of No.2 cargo hold, etc. by the transceiver to the Stevedores on shore side and on board.

Boatswain and Crewmember A thought that it was easy for them to find out oil leakage point due to coming under pressure in HO pipe after switching the hatch covers. Therefore, they confirmed the SULs were not in operation, and then, entered around the travelling

rail and under the Stage (hereinafter referred to as "the Travelling Rail") according to the advanced discussion, and then, they began to conduct an inspection of oil leakage point of HO Pipe as Working outside SA (hereinafter referred to as "HO Pipe Inspection").

CHO Officer knew that Boatswain, Crewmember A and other Crewmembers conducted the switching operation of the hatch covers on the upper deck, however, he did not know that Boatswain and Crewmember A entered around the Travelling Rail and conducted HO Pipe Inspection as Working outside SA.

Crewmember A was looking for oil leakage point while lighting HO pipe with a flashlight, and then, Boatswain was standing in a slouched position back right of Crewmember A and leaning against a stanchion (hereinafter referred to as "the Stanchion") around the Travelling Rail, and was looking into it with his bent-forward posture. They continued to conduct HO Pipe Inspection.
(See Figure 5)




Space under of the Coaming: Wide approx. 1.5 m * Height approx. 1.5 m

: Travelling Direction of SUL when the accident occurred

Figure 5 Image Figure of HO Pipe Inspection

The Stevedores received information from CHO Officer that the hatch covers of No.2 cargo hold, etc. had been opened, and then, the Stevedores restarted un-loading cargo operation after conveying to CHO Officer, Boatswain, etc. and all the Stevedores that the un-loading work was going to restart. The SUL operator received the radio communication and was travelling the SUL to the fore side with maximum travelling speed in manual operation.

Crewmember A heard Boatswain's scream from behind at around

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| | 21:56 and looked out in the scream direction. Crewmember A found that Boatswain laying around the Travelling Rail on the upper deck. And then, Crewmember A thought the SUL was coming closer to the fore side, and subsequently, the body of Boatswain would be caught between the travelling device of SUL (hereinafter referred to as "the SUL Traveler", Refer to Figure 6) and the Stanchion of the Stage, and was injured.<br>Crewmember A confirmed the SUL was passing by them and was travelling to the direction of No.2 cargo hold, and then, he grabbed Boatswain's arm and moved Boatswain's body from the Travelling Rail. Crewmember A called for help to other crewmembers by transceiver.<br>The leader of Stevedores, who was at the aft side of No.4 cargo hold, noticed something strange due to hearing a scream from No.4 cargo hold. The leader of Stevedores gave CHO officer, etc. and other Stevedores the direction of stopping SULs and un-loading cargo operation completely.<br>Master, Crewmembers and Stevedores gathered at the starboard side of No.4 cargo hold on the upper deck, and then, they were checking Boatswain's condition and confirmed that Boatswain's conscious level was decreasing and breathing becoming difficult. A director of Company A onboard requested ambulances through the cargo handling company at around 22:12.<br>After that, Boatswain was moved to the aft deck on the upper deck, and then, though he took the treatments of cardiopulmonary resuscitation, AED, etc., he decreased in pulse and respiration and his condition got worse gradually.<br>The fire department receiving request for emergency help dispatched ambulances and arrived at K-1 Wharf where the Vessel moored at around 22:36. The ambulance crew came to the upper deck of the Vessel and conducted first-aid treatment and life-saving measures for Boatswain.<br>After that, Boatswain was transferred to a hospital located at Syunan City, Yamaguchi Prefecture, and then, he was pronounced dead by a doctor at around 23:32. |
| **Other Matters** | (1) Information of Boatswain<br>1 According to the post mortem certificate, Boatswain's ribs were fractured, and died from suffocation by hemopneumothorax.<br>2 He had experience of approximately 10 years as boatswain onboard and had no past onboard experience of vessels with |

SUL installed. He had had 3 times working experience, including taking over the present work from his predecessor, of cargo handling operation using SUL since he embarked on the Vessel on March, 2023.

3 There were no problems with his health condition on the day of the accident.

(2) Information of SUL

1 SUL traveled on the travelling rails driven by 4 couples' wheels in manual operation and automatic operation. The maximum travelling speed of SUL in manual operation was approximately 30 m/min (approximately 50 cm/sec) and was able to adjust continuously by the controller in the operation room.

SUL was conducted with position control on the travelling rail by the Encoder (Moving amount and Direction, etc. of SUL was converted into electric signal.).

The distance from the stopping position of the SUL at the time of the accident to the location of the accident was approximately 45 meters, and the SUL based on the above-mentioned travelling speed arrived at the location of the accident in approximately 90 seconds with the travelling speed of approximately 30 m/min since the SUL began to travel.

The SUL's operation room was at the port side on the upper floor. The operator in the operation room could not see the place where Boatswain and Crewmember A were around the Travelling Rail on the starboard side of No.4 cargo hold due to blind spot.

(See Figure 6)

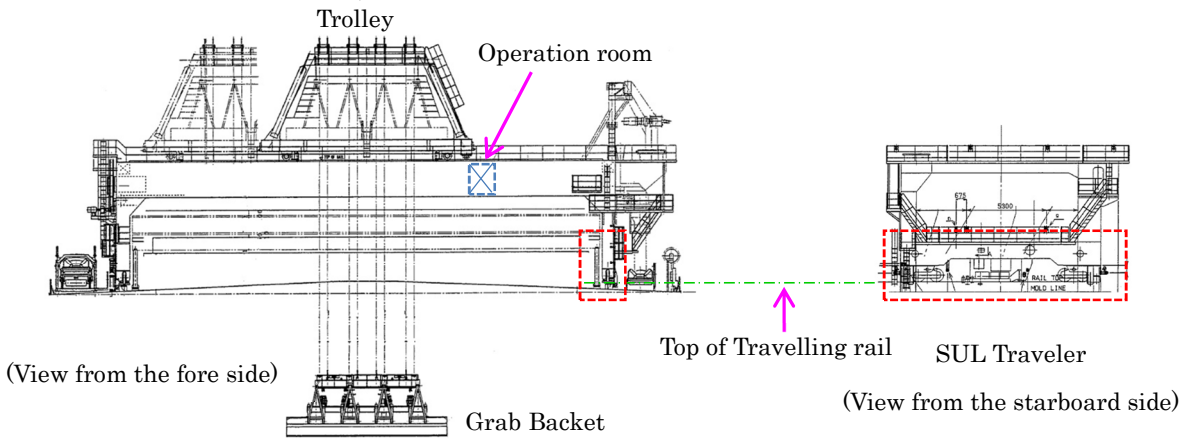



Figure 6 Cargo Handling Apparatus and SUL Traveler

The SUL was equipped with rotating lights and alarm horns for warning when operating during SUL's travelling.

In case of trouble of the Encoder, the pillars, which were called "Mechanical Stopper" (hereinafter referred to as "Mechanical Stopper"), were installed on the end of the fore side and the aft side of the travelling rails for purpose of the SUL's wheel stopper device. The SUL was stopped physically such that the contact part for the Mechanical Stopper of the SUL Traveler run bumps into the Mechanical Stopper. Furthermore, the pushbutton switch for emergency stop was installed on the pedestrian walkway side of the SUL Traveler.

(See Figure 7)

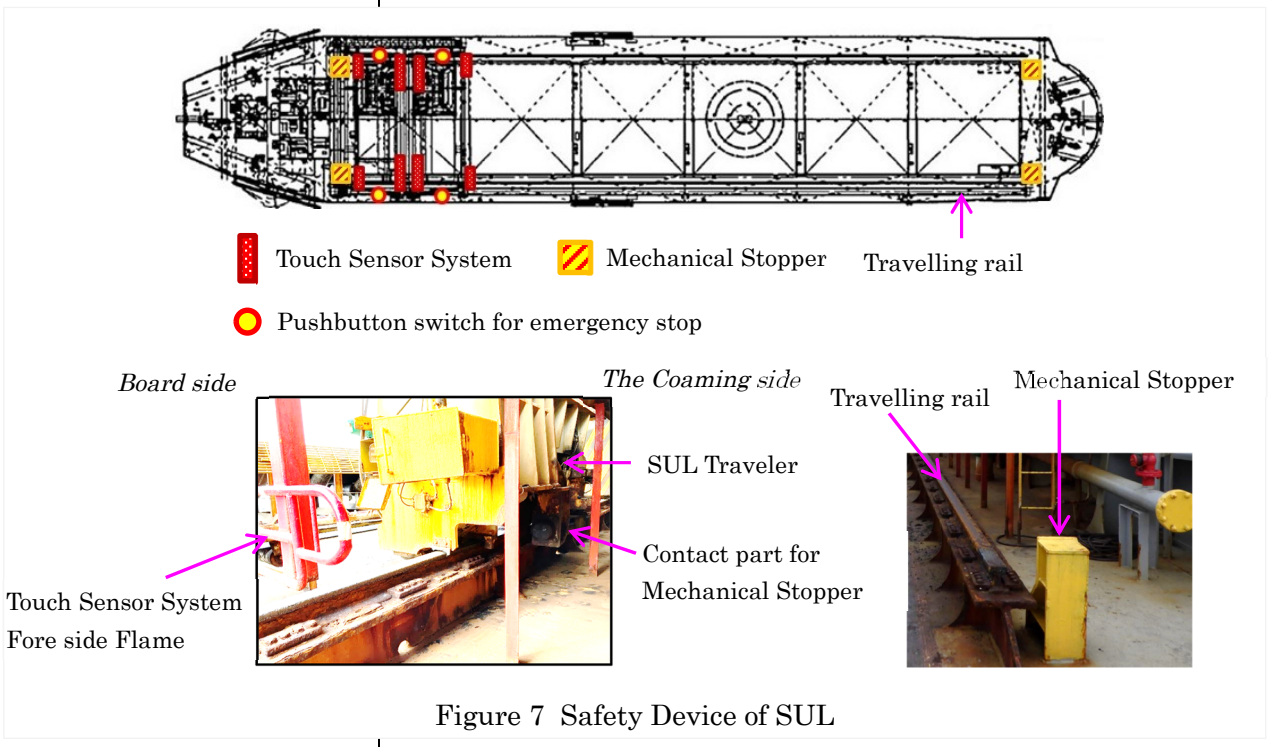



Figure 7 Safety Device of SUL

The touch sensor system (hereinafter referred to as "the TSS") was constructed with arms and flames, called palisade layer, made of steel on both each the fore side and the aft side of the starboard side and the port side of the SUL Traveler. The SULs had an emergency stop system installed, when the arm of the touch sensor system contacted some obstacles and tilted approximately 15 degrees as the upper fulcrum part.

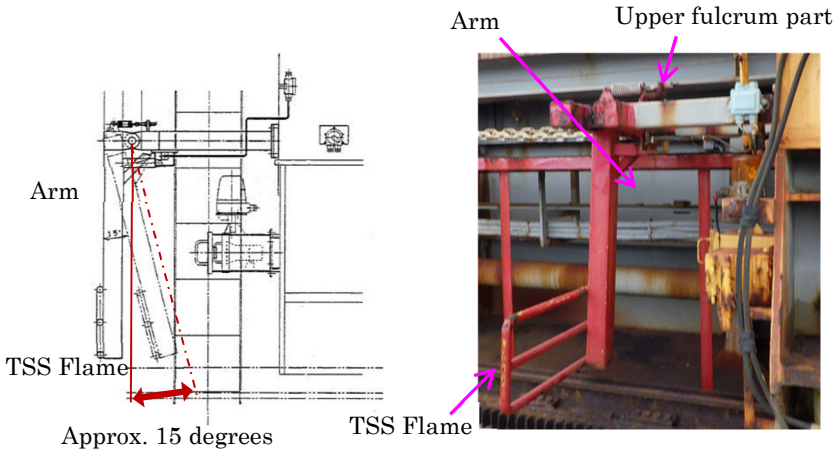



Figure 8 Structure of the TSS

3 As for the TSS flame of the SUL, the length from the center line of the arm in the Coaming direction was approximately 167 mm on the fore side and approximately 447 mm. The fore side length was shorter than the aft side length, and also described as such length in the drawing.

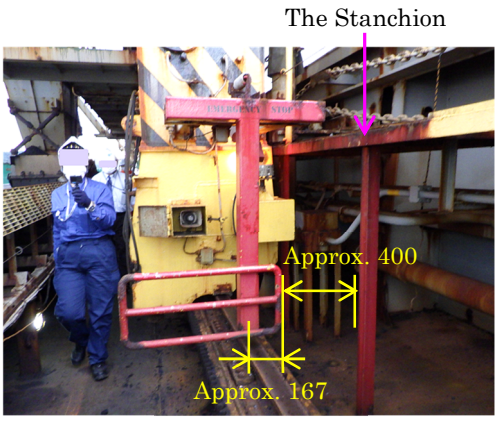
The reason why the fore side length was shorter than the aft side length was that the SUL was stopped by the fore side TSS flame contacting the Mechanical Stopper when the SUL traveled to the end of the fore side on the travelling rails, and subsequently, the situation of not being able to un-load cargo at a part of the fore side in No.1 cargo hold inside during cargo handling operation was avoided.

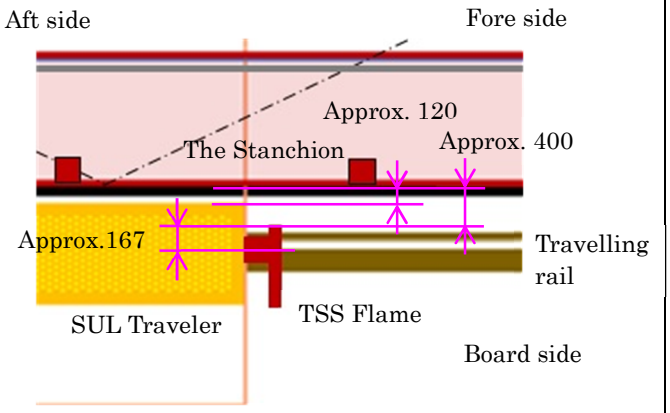
There was a clearance of approximately 400 mm between the end of the fore side TSS flame and the Stanchion, and also, there was a clearance of approximately 120 mm between the SUL Traveler and the Stanchion.

The SUL did not do emergency stop at around the time of the accident because the touch sensor system did not detect Boatswain who was at around the Travelling Rail on the starboard side of No.4 cargo hold.

(Refer to Figure 9 and Figure 10)

In addition, an inspection was conducted on the safety devices including the TSS, etc. to verify condition of operation after the accident. As a result, it was confirmed that there was no abnormality and normal operation on the devices.




Clearance Dimension of Each Part around the Stanchion

Figure9 TSS of the Fore Side (Unit: mm)

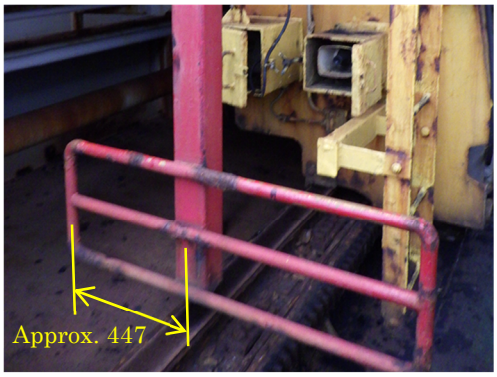



Figure 10 TSS of the Aft Side (Unit: mm)

(3) Information of Approaching Status of the SUL

1 Crewmember A did not contact the SUL because his whole body entered under the Stage and was closer to the Coaming side than the Stanchion.

2 Crewmember A did not think that the SUL operation had started in a short time while conducting HO Pipe Inspection and traveled to the fore side due to the SULs not being operated before beginning to conduct HO Pipe Inspection, and subsequently, they began to do HO Pipe Inspection with Boatswain.

In addition, Crewmember A's visibility was restricted due to entering under the Stage and HO Pipe, and furthermore, he did not hear the warning sound during the SUL travelling due to peripheral noise and did not notice the SUL approaching.

(4) Information of Safety Management

1 CHO Officer was designated as personnel in charge of safety in the Vessel under Regulations for labour safety and health of seafarers (Ordinances No.53 of the Ministry of Transport,

1964), and also, the safety supervisor must conduct inspection and maintenance of safety devices, etc., prevention measures in case of a potentially hazardous situation occurring, education and training for working safety, etc.

2 Company A had produced a SMS[*2] Manual (hereinafter referred to as "the Manual") based on "the International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention" (ISM Code). The Vessel conducted onboard work including cargo handling operation, deck arounds, apparatus inspections, etc. provided in procedures and measures.

The following decisions were specified in the Manual.

a Boatswain shall report to CHO Officer for all deck maintenance including ship's hull.

b Duty Officer and Duty Crewmembers during cargo handling operation shall take arounds of cargo compartments to inspect cargo, facilities, all equipment, etc. at regular interval. The Inspection of cargo, facilities, all equipment, etc. for cargo handling operation shall be carried out at times when there is no cargo handling operation in progress.

3 The unloading cargo operation of the Vessel at K-1 Wharf was noticed during the cargo handling operation procedure by the stevedores on land side, and then was conducted under the arrangements between the stevedores and the Crewmembers of the Vessel.

Company A specified "The Vessel - Safe Regulation during Cargo Work at K-1 Wharf (in Tokuyama Kudamatsu Port)" (hereinafter referred to as "the Safe Regulation") besides the Manual. The Safe Regulation defined that the area of the upper deck was divided in the SULs surrounding area was 'Dangerous Area', the area being around the travelling rails except the SULs surrounding area was 'Warning Area', and the pedestrian walkway was 'Safety Area'.

Per the Safe Regulation, deciding to enter a Warning Area was always conducted after Crewmembers contacted a Duty Officer when it was necessary. The Crewmembers had already known

*2 "SMS (Safety Management System)" means, in this accident report, a safety management system that was obligated under the International Safety Management Code, and also, was constructed such that staff of the ship management company was able to conduct the policy for ship's safety operation and environmental protection effectively. The Code is mandatory for passenger ships, including high-speed passenger ships engaged on international voyages, all cargo ships of 500 gross tonnages or more, and mobile offshore drilling units and companies that operate and manage the units.

about that.

4 According to the Safe Regulation, the Crewmembers of deck department (hereinafter referred to as "Deck Crewmember") including Boatswain, walked all the time, even during cargo handling operation, on the pedestrian walkway indicated by green color in Safety Area on the upper deck, and then they conducted usual inspections of condition of piping and apparatus, etc. as regular deck arounds. The Crewmembers did not report some trifling information to each other because the inspection work in regular intervals were included in cargo handling operation. At that time, they did not report some trifling information among themselves.

5 CHO Officer mentioned the following working directions concerning deck arounds during regular cargo handling operation to Deck Crewmembers including Boatswain in the Meeting of the deck department in the morning time on the accident day, and then, noticed that in the Meeting Note of daily work schedule.

a *Regular deck arounds for any hydraulic leakings, not good condition conveyor rollers and any abnormalities during discharging operation*

b *Monitor SUL condition before and during discharging*

(5) Opinions of Those Involved regarding the Background of the Accident

1 CHO Officer took a guess in keeping with the situation of the accident and the explanation of Crewmember A, and then, even though Boatswain and Crewmember A recognized that the place where they conducted HO Pipe Inspection was in Warning Area and it was prohibited to enter around the travelling rails, they decided to report after specifying oil leakage trace, and subsequently, would prioritize HO Pipe Inspection over contact for entering in Warning Area.

2 Company A expressed its view in keeping with the result of the internal investigation regarding the accident that Boatswain should not have conducted HO Pipe Inspection without the permission of CHO Officer on the responsibility of the boatswain's official duties. Also, Company A took a guess that Boatswain thought HO Pipe Inspection had been completed in a short time, and then did not think that the SUL operation had begun and the SUL traveled to the fore side.

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| **Analysis**<br>Involvement of crew members<br>Involvement of vessel, engine, etc.<br>Involvement of weather and sea conditions<br>Analysis of the findings | Applicable<br><br>Applicable<br><br>Not Applicable<br><br>(1) Situation for Casualties and Injuries to Boatswain<br>The cause of death for Boatswain was ribs' fracture and suffocation from hemopneumothorax.<br>(2) Analysis of the Accident Occurrence<br>1 The Vessel was moored at K-1 Wharf and was conducting un-loading cargo operation of coal.<br>It is probable that Boatswain and Crewmember A tried to specify oil leakage point of HO Pipe, however, they could not enter around the Travelling Rail in Warning Area during the inspection work, which had continued until the accident day.<br>It is probable that Boatswain and Crewmember A considered that it was easier for them to find out oil leakage point when coming under pressure in HO pipe, because they discussed entering under the Stage for specifying oil leakage point just after switching the hatch covers.<br>According to the Manual, it is prescribed that Boatswain shall report to CHO Officer for all deck maintenance. However, he thought it was enough to report the inspection work after specifying oil leakage point, and therefore, he did not report anything to CHO Officer concerning the situation of the inspection work that they had done since the previous day.<br>2 It is probable that Boatswain reported to CHO Officer the completion of the opening operation of the hatch covers after the operation. Then he entered under the Stage and started to conduct HO Pipe Inspection.<br>On the Safe Regulation, entering in Warning Area was decided to be conducted after Crewmembers contacted Duty Officer. It is probable that Boatswain and Crewmember A had already recognized the decision. Nevertheless, it is likely that they entered around the Travelling Rail in Warning Area without contacting CHO Officer before beginning to conduct HO Pipe Inspection around that area, because they thought HO Pipe Inspection would be completed immediately in a short time. |

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| | 3 It is probable that CHO Officer did not know that Boatswain and Crewmember A entered in Warning Area and conducted HO Pipe Inspection, because CHO Officer contacted the Stevedores that the opening operation of the hatch covers were completed. It is probable that the Stevedores conveyed to CHO Officer, Boatswain, etc. and all the Stevedores by transceiver that the un-loading work was going to restart, and then the SUL operator conducted operation of the SUL travelling the SUL to the fore side via the radio communication.<br>Taking those working procedures into consideration, even if Boatswain and Crewmember A contacted CHO Officer that they entered Warning Area before beginning to conduct HO Pipe Inspection, the SUL operation had not been restarted.<br>4 It is highly probable that the SUL arrived at the location of the accident in approximately 90 seconds from when the SUL was restarted.<br>It is probable that, even though the SUL was equipped with rotating lights and alarm horns for warning during SUL's travelling, Crewmember A entered under the Stage and HO Pipe, and Boatswain was standing and leaning against the Stanchion for observing Crewmember A's state and was looking into it with his bent-forward posture, and subsequently, their visibility was restricted, and furthermore, they did not hear the warning sound during the SUL travelling due to peripheral noise and did not notice the SUL approaching.<br>5 It is highly probable that Crewmember A did not contact the SUL due to entering under the Stage, however, Boatswain was standing and leaning against the Stanchion around the Travelling Rail and continued to conduct HO Pipe Inspection, because Boatswain was caught between the SUL Traveler of the SUL which was travelling to the fore side and the Stanchion, and subsequently was injured and died.<br>6 It is certain that the SUL was equipped with the TSS on the SUL Traveler, and also, the fore side TSS flame was narrowed at left and right width due to avoiding to contact with the Mechanical Stopper, and there was a clearance of approximately 400 mm between the end of the TSS flame and the Stanchion, because the TSS did not detect Boatswain who was at around the Travelling Rail and did not operate emergency stop of the SUL. |

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| **Probable Causes** | The JTSB concludes that the probable cause of this accident was more likely that Boatswain entered around the Travelling Rail in Warning Area for the purpose of HO Pipe Inspection after completing the switching operation of the hatch covers, and subsequently, his body was caught between the SUL Traveler which was travelling to the fore side and the Stanchion, and was injured while the Vessel was moored and was loading cargo handling operation at K-1 Wharf during the night.<br>It is probable that Boatswain entered around the Travelling Rail in Warning Area for the purpose of HO Pipe Inspection because it is more likely he thought HO pipe Inspection would be completed immediately in a short time before beginning to conduct HO Pipe Inspection, and furthermore, he thought it was enough to report the situation after specifying oil leakage point.<br>It is probable that the SUL was travelling to the fore side because the hatch covers of No.2 cargo hold, etc. had been opened and the Stevedores conveyed to CHO Officer, etc. that the un-loading work was going to restart. In addition, Boatswain and Crewmember A did not contact CHO Officer before beginning to conduct HO Pipe Inspection.<br>It is probable that Boatswain continued to conduct HO Pipe Inspection around the Travelling Rail because he was standing and leaning against the Stanchion for observing Crewmember A's state entered under the Stage, etc., and then his visibility was restricted and he did not hear the warning sound during the SUL travelling, and subsequently, he did not notice the SUL approaching.<br>It is certain that the TSS did not detect Boatswain who was at around the Travelling Rail and did not operate emergency stop of the SUL because the SUL was equipped with the TSS on the SUL Traveler, and also the fore side TSS flame of the TSS was narrowed at left and right width and there was a clearance of approximately 400 mm between the end of the TSS flame and the Stanchion. |
| **Safety Actions** | 1. The following measures are possible to prevent recurrence of and mitigate the damaged caused by similar accidents:<br>(1) Master should instruct crewmembers to reconfirm the arrangements and the procedures, and then repeatedly instruct them not to enter risk areas for conducting inspection work and maintenance work during cargo handling operation. In addition, when crewmembers have necessity for similar inspection work, etc., crewmembers must report the work to responsible persons in charge of cargo handling operation on board and accept permission, and then they must confirm via contact with responsible persons that stevedores are not operating the SULs, and then must conduct the inspection work, etc. by securing safety measures, e.g. assignment of watchmen. |

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| | (2) Master and personnel in charge of safety in each department should reinstruct crewmembers to make planning and conduct inspection work and maintenance work and for cargo handling apparatus in appropriate period when they could secure safety.<br>(3) Master and ship management company, etc. should conduct inspection of safety devices for cargo handling apparatus on a daily basis, and also collect near-miss reports concerning operation of cargo handling apparatus and conduct risk assessment*3 based on the result of the near-miss report, and subsequently take risk mitigation measures, e.g. improvement and modification safety devices.<br>2. The following measures were conducted to prevent recurrence caused by similar accidents after the accident by Company A and the Vessel:<br>(1) Company A disseminated the correspondence of the accident "Requirement for Safe Operation against fatal accident" to the Vessel, and then, noticed Master and Crewmembers of the Vessel about that. (Implemented by October 11, 2023)<br>The primary requirements were as follows.<br>・ Crewmember Education for safety cargo handling operation utilized by "Requirement for Safe Operation at Tokuyama Kudamatsu Port" as described below.<br>・ Inspection work on deck is prohibited when entering in Dangerous Area and Warning Area without permission.<br>・ Direction of request for stopping cargo handling apparatus for securing safety work and in emergency situations.<br>・ Reconfirmation of the hazard points for the structure of the machinery/equipment, and Safety and Health Inspection.<br>(2) In addition, safety devices related to SUL apparatus, etc. were as follows.<br>1 Extending the TSS flame length to the direction of the Coaming.<br>2 Extension for the warning flashing lamps and the SUL sirens on the SUL Traveler during the SUL travelling.<br>3 Installed safety ropes (e.g., tiger rope) and nets for the purpose of indicating entry prohibition in hazardous areas such as around the travelling rails.<br>(3) Education by Master and Chief Officer, including On-Job-Training for all crewmembers not to enter hazardous areas |

*3 "Risk assessment" means an overall process of risk specification, risk analysis and risk evaluation in some work. Business operator and company were required to decide risk mitigation measures and to take appropriate safety measures based on the result.

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| | without permission, including raising their risk prediction.<br>(4) Add the item of 'Collision between SUL and Crewmembers' in the risk assessment sheet of 'Routine Risk Assessment of SUL Operation (Cargo Operation, Test and Checks) for Self-Unloader Vessels' and review risk evaluation in that sheet.<br>Reconfirm the hazards along with the structure of the machinery/equipment/facility and the working/reporting procedures though toolbox meeting and onboard guidance.<br>(5) Add the item of 'Requirement for Safe Operation at Tokuyama Kudamatsu Port' in the Manual.<br>1 Definition of risk area on the upper deck.<br>2 Procedure for entering any risk areas for safe cargo operation.<br>3 Communication/Meeting with stevedores.<br>(6) Master, Officers and Engineers must regularly monitor that Crewmembers are working safely and safe measures are being taken.<br>(7) Establish open communication on board to report even minor matters. |

ANNEX 1　Map of the Location of the Accident

