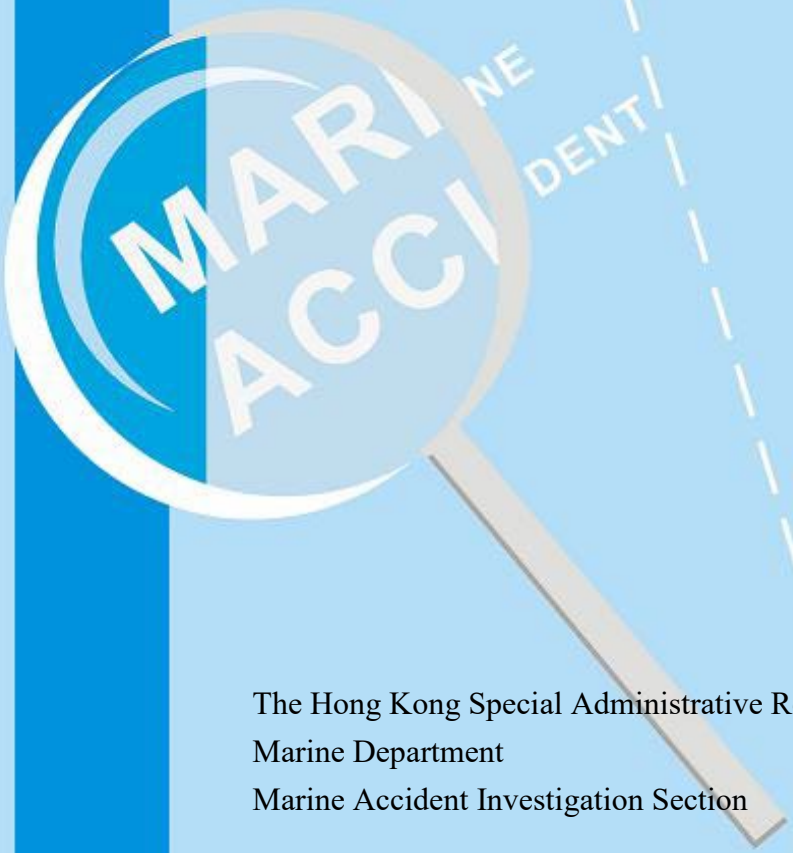
Report of investigation into the sinking of the Hong Kong registered general cargo vessel "*Jin Tian*" near position 32° 03.067' N, 127° 07.888' E south of Jeju Island, Republic of Korea on 25 January 2023



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

15 August 2023

Purpose of Investigation

The purpose of this investigation, conducted by the Marine Accident Investigation Branch (MAIB) of Marine Department, is to understand the causes of the incident by investigating the circumstances leading to its happening with the aim of enhancing the safety of life at sea and preventing similar incidents from occurring 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 1500 hours on 12 January 2023, the Hong Kong registered general cargo vessel "Jin Tian" (*the vessel*) departed the port of Kavieng, Papua New Guinea (*the loading port*), loaded with the cargo of logs (*cargo*), and bound for the destination port of Incheon, South Korea (*the discharging port*) with an estimated time of arrival on 25 January 2023.

In the morning of 23 January 2023, the wind force increased with heavy rain and moderate sea. The bosun found water ingress into the No.1 cargo hold (*the hold*). *The vessel* crew pumped out seawater from *the hold* through the cargo hold bilge system (*the bilge system*), but unsatisfactory due to the clogged suction port of *the bilge system* caused by bark and litter in *the hold*. The weather deteriorated in the early morning of 24 January 2023, and the wind force increased to strong breeze with rough sea. At 0647 hours, to avoid green seas over the forecastle and forward deck, the Master of *the vessel* (*the Master*) reversed *the vessel*'s heading to the southeast. He then instructed the crew to pump the seawater out of *the hold* with two additional portable pumps. As the weather further deteriorated, *the hold* accumulated much seawater due to heavy green seas on the main deck. At about 2200 hours, *the hold* was flooded by seawater, and the deck *cargo* collapsed and fell into the sea, resulting in *the vessel* having a heavy trim by head with rolling to an angle of about 20 degrees. At 2215 hours, Digital Selective Calling (DSC[1]) distress alert was activated on *the vessel,* and *the vessel* sank at about 0200 hours near position 32° 03.067' N, 127° 07.888' E, south of Jeju Island, Republic of Korea on 25 January 2023.

The ship management company of *the vessel* (*the Company*), Hong Kong Maritime Rescue Co-ordination Centre (HKMRCC), Beijing Maritime Rescue Co-ordination Centre (BJMRCC), Korea Coast Guard (KCG), Japan Coast Guard (JCG), the tanker "ZALIV AMURSKIY" (*the tanker*) and the bulker carrier "GUO YUAN 8" (*the bulk carrier*) which were in the vicinity carried out a joint search and rescue (SAR) operation after receiving the distress alert from *the vessel.* The SAR operation was

[1] Digital Selective Calling is a standard call for transmitting predefined digital messages via the medium-frequency (MF), high-frequency (HF) and very-high-frequency (VHF) maritime radio systems. It is a core part of the Global Maritime Distress Safety System (GMDSS).

continued until 30 January 2023. The accident resulted in the death of eight crew members with nine missing and the sinking of *the vessel*. Only five crew members of *the vessel* were survived.

The investigation identified the contributory factors leading to the accident were that *the vessel* crew:

(a) disregarded the approved shipboard Cargo Securing Manual (CSM) requirements to secure the deck cargo properly;

(b) disregarded the International Convention on Load Lines 1966 as modified by the Protocol of 1988 relating thereto (the Load Lines Convention) requirements, and shipboard equipment operation procedures for the hatch cover (*the hatch cover's operation procedures*) to secure the weathertight of the hold hatches with tarpaulins properly;

(c) disregarded the shipboard safety management system (SMS) and CSM requirements to study the meteorological reports carefully, take proper and appropriate measures against severe weather; and

(d) disregarded the "Code of Safe Working Practices for Merchant Seafarers"[2] (*the Code*) requirements to organize *the vessel* crew to abandon ship.

The investigation also revealed that the shipboard training on safety measures against severe weather, abandon ship, and cargo securing was ineffective; *the Company* failed to implement *the Company*'s SMS requirements to identify potential emergency shipboard situations, establish corresponding procedures, and provide *the vessel* with necessary technical assistance. The crew also lacked safety awareness to take appropriate measures to ensure the watertightness of the cargo holds to avoid water ingress into the holds in severe weather.

[2] *The Code* is a publication required to be carried onboard Hong Kong ships pursuant to the Merchant Shipping (Seafarers) (Code of Safe Working Practices) Regulation (Cap. 478M).

1. Description of *the vessel*

Ship name	:	JIN TIAN (Figure 1)
Flag	:	Hong Kong, China
Port of registry	:	Hong Kong
IMO number	:	9578713
Type	:	General Cargo Ship
Year built, shipyard	:	2010, ZHOUSHAN LIGANG SHIPBUILDING CO., LTD.
Gross tonnage	:	6,551
Net tonnage	:	3,949
Length overall	:	126.49 meters
Breadth	:	19.40 meters
Depth	:	9.80 meters
Engine power, type	:	3310 kW, YANMAR 8N330-EN
Classification society	:	Nippon Kaiji Kyokai
Registered owner	:	Long Bright Shipping Limited
Management company	:	Shenzhen Shekou Shipping & Transportation Co., Ltd.



Figure 1: JIN TIAN

2. Sources of evidence

2.1 Information provided by the survived crew and *the Company* of *the vessel*; Maritime Safety Administration of the People's Republic of China (China MSA), KCG, JCG, Department of Marine Administration of the Republic of the Union of Myanmar, the masters of *the tanker* and *the bulk carrier*, and ShipDT[3].

[3] ShipDT obtains global ship's Automatic Identification System data and supports query of real-time ship position, historical track, electronic chart, marine meteorology, etc.

3. Outline of events

(All times were local time UTC + 8 hours)

3.1 On 27 December 2022, *the vessel* arrived at *the loading port* laden with *cargo* inside cargo holds and planned to load deck *cargo*.

3.2 Before loading the deck *cargo*, all three cargo holds were closed by pontoon hatch covers with a layer of color-striped plastic tarpaulin and a layer of nylon net spread over the tarpaulin. The loading operation was carried out at the anchorage of *the loading port* and *cargo* was transferred to *the vessel* by local barges.

3.3 At 0530 hours on 12 January 2023, the loading operation was completed. Totally 8409.324 cubic meters of *cargo* was loaded on board, including 5631.300 cubic meters of *cargo* loaded in cargo holds and 2778.024 cubic meters of *cargo* was stowed on the deck lashed by fixed stanchions, uprights, steel wires and chains (Figure 2). Afterwards, *the vessel* was shifted to the anchoring position 02° 37.80' S, 150° 45.00' E, for port clearance before departure.

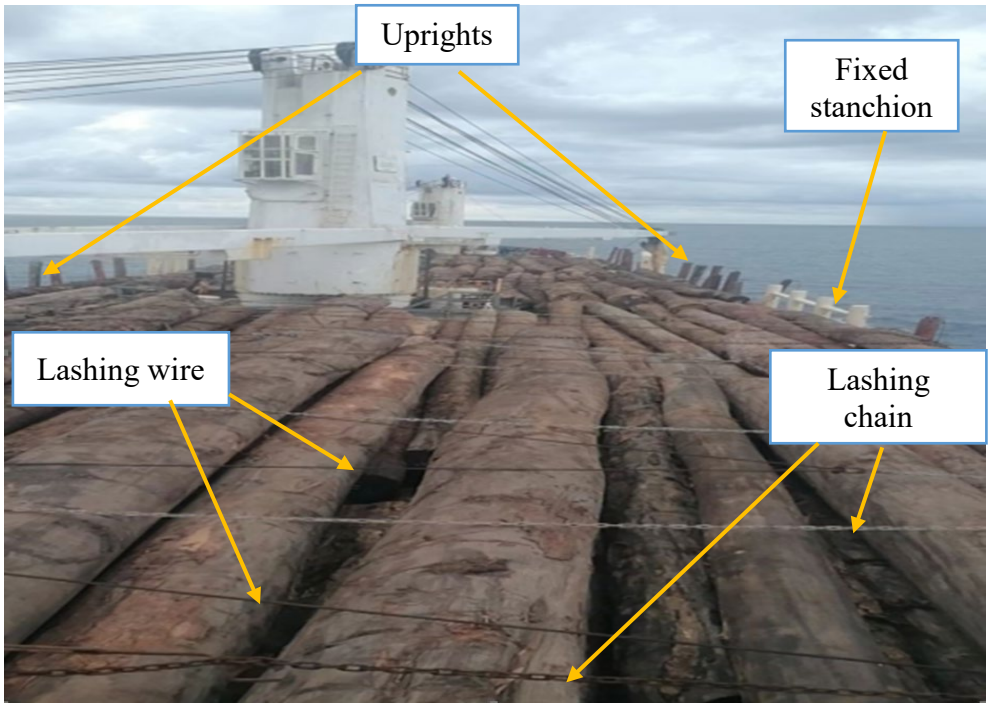


Figure 2: Condition of logs loaded on deck and hatch covers

3.4 At about 1500 hours, *the vessel* departed *the loading port* and was bound for *the discharging port* via the East China Sea with an

estimated arrival time on 25 January 2023.

3.5 During the voyage from 13 to 23 January 2023, *the vessel* was in normal sailing condition, with her main engine running at RPM[4] around 520, and ship's speed ranged between 7.7 and 11.8 knots[5].

3.6 In the morning of 23 January 2023, wind force increased with heavy rain and moderate sea. The bosun checked bilge water by sounding all cargo holds, and seawater was found in *the hold*. Afterwards, the crew started to pump out seawater in *the hold* through *the bilge system,* but unsatisfactory because the suction port was clogged with bark and litter.

3.7 At about 0100 hours on 24 January 2023, the weather further deteriorated with a northwesterly wind of Beaufort Wind Scale Force 6, moderate wave and the speed of *the vessel* was reduced to 1.4 knots at 0616 hours. At 0647 hours, at position 33° 02.889' N, 125° 56.321' E, *the Master* changed *the vessel*'s steering course from 337 degrees to 115 degrees to avoid green seas on the forecastle and forward deck (Figure 3) (Appendix A).

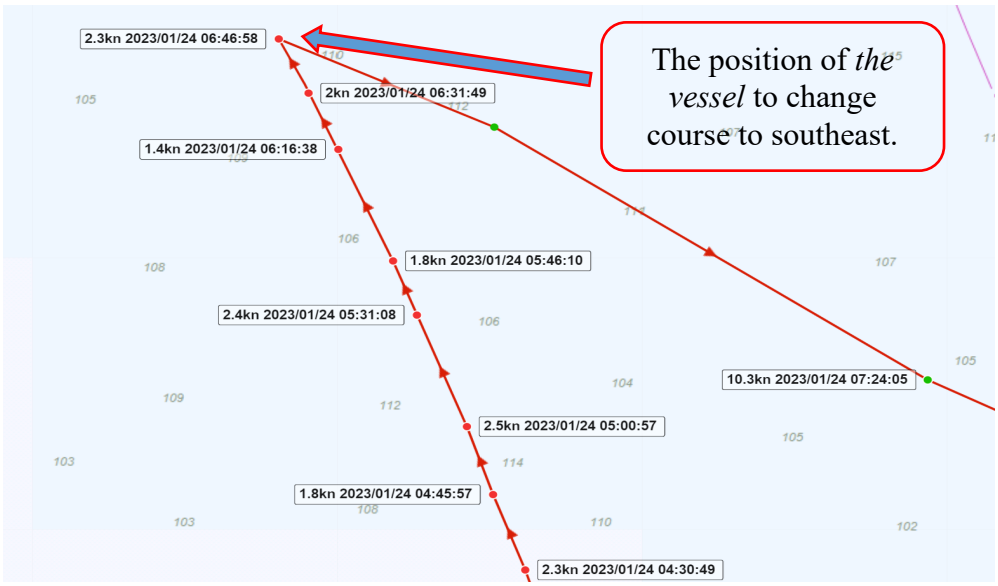


Figure 3: Tracking of *the vessel* from 0430 hours to 0724 hours on 24 January 2023 (https://www.shipdt.com/#/)

[4] Revolutions per minute, a unit of rotational speed or rotational frequency for rotating machines.

[5] The difference in ship speed was caused by ocean currents and weather conditions (wind, wave, etc.)

3.8 At 0648 hours, *the Master* reported to *the Company* that seawater was accumulated in *the hold,* resulting in *the vessel* being listed to starboard about five (5) degrees, and *the vessel* would deviate to south of Jeju Island to shelter severe weather and pump out the seawater in *the hold*.

3.9 At about 0700 hours, *the vessel* was trimmed by the head heavily. The crew pumped out the seawater in *the hold* using *the bilge system* and two additional portable pumps as instructed by *the Master* when the depth of the seawater in *the hold* was about 2 meters forward and 1.3 meters aft.

3.10 At 0910 hours, *the Master* reported to *the Company* that the forward electric cable pipe connected to the forward port store room was broken, which led to seawater flooding the rigging storeroom (Figure 4) (Appendix B). At 0940 hours, he also reported to *the Company* that *the vessel* crew had been assigned to pump out seawater from *the hold* by using *the bilge system* and two additional portable pumps.

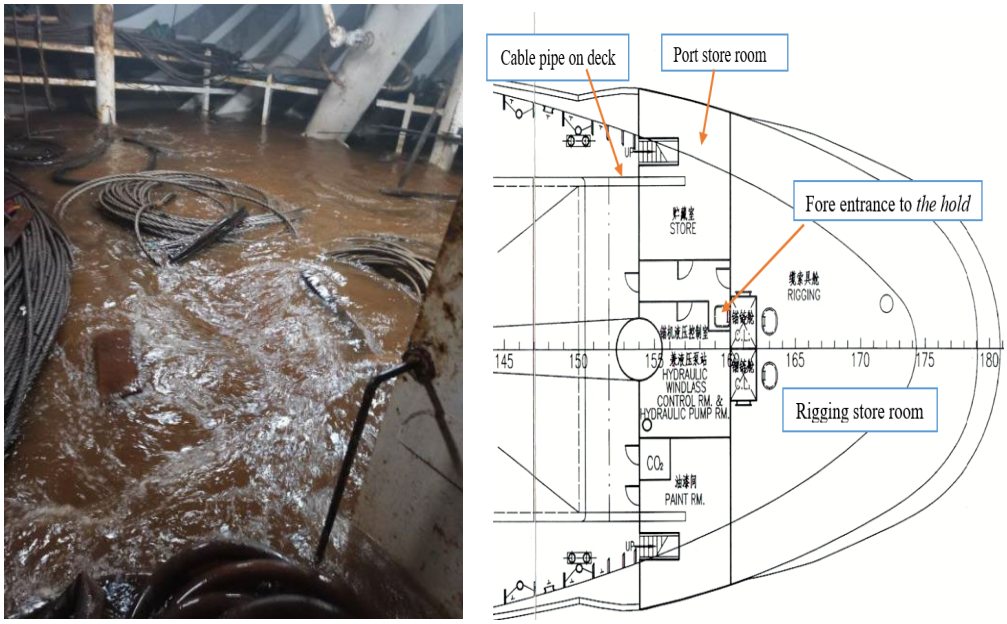


Figure 4: Water ingress in the rigging storeroom

3.11 At 1648 hours, *the Master* reported to *the Company* that seawater was being pumped out, and *the vessel* listing was improved. *The Company* reminded *the Master* to manoeuvre *the vessel* carefully, tighten deck *cargo* lashing, continue to follow the wind and sea, and

decide on further action when weather permits on 25 January 2023.

3.12 At 2117 hours, *the Master* emailed *the Company* that the wind of Beaufort Wind Scale Force increased to 9 (gust force about 10), and the seawater accumulated in *the hold* had been pumped out from a depth of about 3 meters to a depth of 1.8 meters.

3.13 At about 2200 hours, the bosun and one engine oiler at the forward deck of *the vessel* reported that the seawater flooded *the hold*. After they returned to *the vessel*'s accommodation, the deck cargo lashing was broken and collapsed, followed by cargo falling into the sea (Figure 5). After losing the deck *cargo*, *the vessel* became listed seriously to the port side.



Figure 5: Photo taken by *the tanker* on scene after the loss of *vessel's* deck cargo

3.14 At 2215 hours, HKMRCC received a DSC distress alert at position 31° 56.500' N, 127°17.7'00 E. *The tanker* and *the bulk carrier* also received the distress alert, about 4 nautical miles (NMs) and 8 NMs off *the vessel*, respectively.

3.15 At about 2230 hours, the master of *the bulk carrier* received information from *the vessel* that the *cargo* lashing was broken and

water ingress was in *the hold.* As No.2 and No.3 holds might also have water ingress, *the Master* was trying to contact JCG stations. According to voyage data recorded by ShipDT, the course of *the vessel* was changed to 304 degrees at 2231 hours with a speed of 4.1 knots.

3.16 At 2232 hours, *the Master* reported to *the Company* that all deck cargo fell into the sea, *the vessel* listed to port about ten (10) to fifteen (15) degrees, and *the vessel* was under control, but tug assistance was required. *The Master* also contacted Japan SAR Center to request tug assistance. At that time, the weather was snowy with northwesterly wind of Beaufort Wind Scale Force 8 to 9, and the sea wave was about 4 to 6 meters in height.

3.17 Upon receiving the distress alert, the masters of *the tanker* and *bulk carrier* took command of their vessels and organized ship crew to standby for SAR operation. After confirming with *the tanker* that the distress message was sent by *the vessel,* HKMRCC then relayed the distress message to BJMRCC, JCG and KCG.

3.18 At 2348 hours, the master of *the bulk carrier* reported the distress situation of *the vessel* to the Moji Coast Guard. He also relayed information from JCG to *the Master* that rescue boat could not arrive in time for rescue due to severe weather.

3.19 *The tanker* escorted *the vessel* by maintaining 0.4 NM off, and *the bulk carrier* escorted *the vessel* from 1 to 2 NMs on the upwind side at the request of *the Master*. *The Master* informed both masters that he tried to control *the vessel* by steering to windward.

3.20 At about 0000 hours on 25 January 2023, all crew of *the vessel* mustered on the bridge. Afterwards, the Chief Engineer (C/E) and the duty oiler returned to the engine room to continue pumping out seawater in *the hold* and adjusting ballast water distribution as instructed by *the Master*. At 0124 hours, *the Master* notified the master of *the tanker* that No.1 and No.2 holds were flooded.

3.21 At about 0130 hours, the bow of *the vessel* was submerged in water. Most of the crew wearing immersion suits on the bridge rushed to the starboard bridge wing attempting to release the life raft but failed

due to *the vessel* severely listed to port.

3.22 At 0138 hours, the Chief Officer (C/O) reported to *the Company* by telephone that *the vessel* was out of control and would be abandoned. At 0140 hours, *the Master* informed *the tanker* via VHF radio that *the vessel* would be abandoned in fifteen minutes.

3.23 At about 0147 hours, *the vessel* capsized suddenly. At about 0200 hours, the vessel sank at approximately 32° 03.067' N, 127° 07.888' E (Figure 6 refers), and her crew fell into the sea.

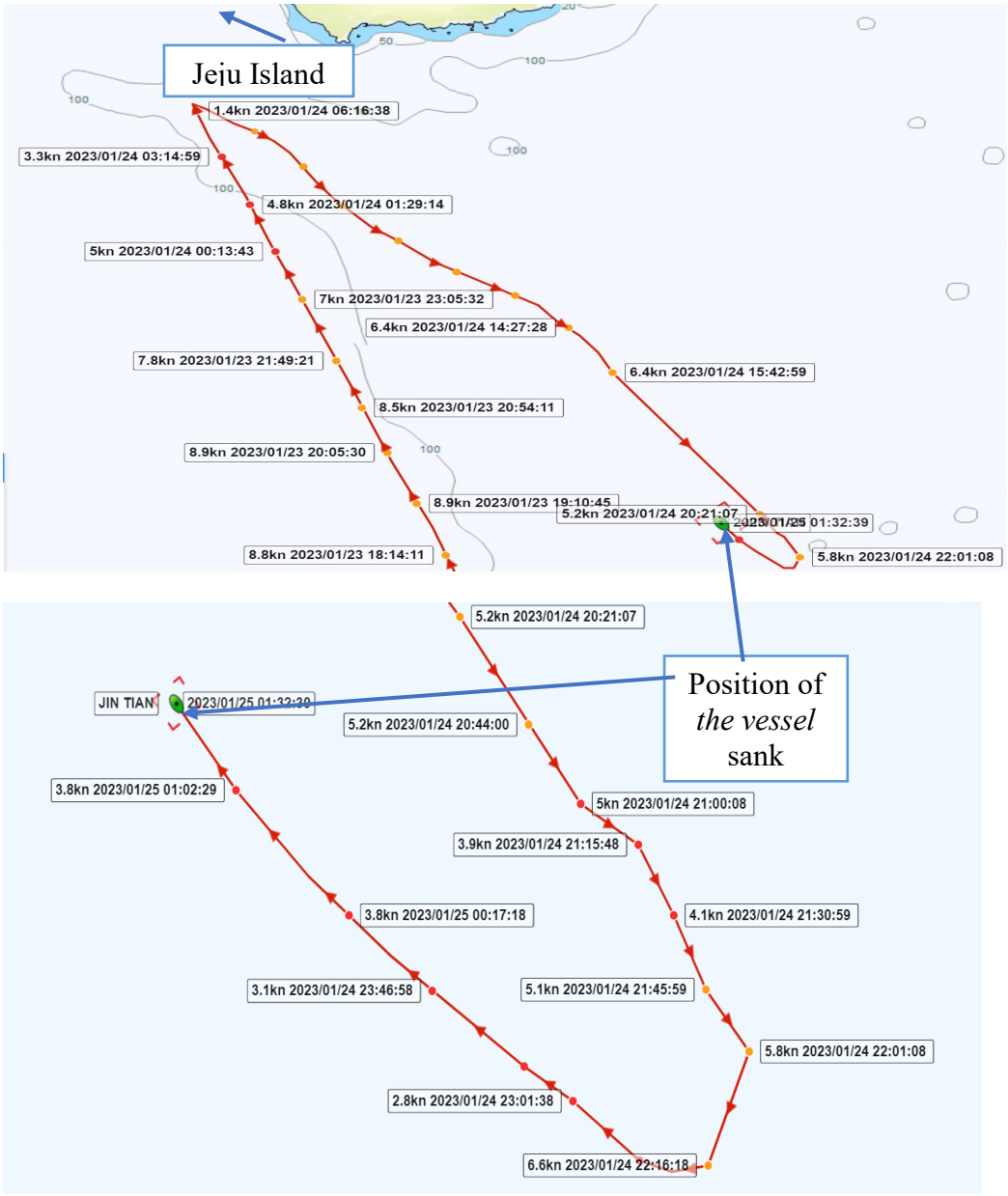


Figure 6: Tracking from 1841 hours 23.01.2023 to final moment of sinking (https://www.shipdt.com/#/).

3.24 At 0207 hours, the Emergency Position Indicating Radio Beacon[6] (EPIRB) of *the vessel* activated and KCG received the distress signal. After *the vessel* sank, *the tanker* and *the bulk carrier* conducted an initial SAR operation onsite (Figure 7). Due to windy and snowy weather, and poor visibility, only some life jackets with flashing lights and an empty lifeboat were found in the sea.

3.25 At 0320 hours, Japan rescue vessel "MIRAI" arrived to carry out the SAR operation with the assistance of aircraft.

3.26 By 1001 hours on 25 January 2023, 13 crew members were rescued. Five of them were rescued by *the bulk carrier*, six by KCG and two by JCG. Among them, five crew members rescued by *the bulk carrier* were survived.



Figure 7: rescue operation on site by the crew of *the bulk carrier*

3.27 KCG and JCG suspended the SAR operation at 0718 hours and 1420 hours on 27 January 2023, respectively. BJMRCC terminated the SAR operation at 0800 hours on 30 January 2023.

3.28 In this SAR operation, five Chinese government vessels, three Korean government vessels, 13 Japanese government vessels, five merchant vessels and 14 Japanese rescue aircrafts, including

[6] EPIRB is a device to alert SAR in case of an emergency out at sea. Tracking equipment transmits a signal on a specified band to locate a lifeboat, life raft, ship or people in distress.

helicopters, were engaged.

3.29 Unfortunately, nine crew members of *the vessel* were still missing when the SAR operation was terminated.

4. Analysis

Certificates and manning

4.1 The statutory trading certificates of *the vessel* were valid at the time of the accident. *The vessel* was manned by 22 crew members and fulfilled the requirements stipulated in the Minimum Safe Manning Certificate of *the vessel* issued by the Hong Kong Marine Department (HKMD).

4.2 *The Master* joined *the vessel* on 10 August 2022. He had about fourteen years of experience as a master. *The Master* possessed a master Certificate of Competency issued by China, valid until 20 August 2023.

4.3 The C/O joined *the vessel* on 4 April 2022. He had about five years of experience as a chief officer. The C/O possessed a chief officer Certificate of Competency issued by China, valid until 30 August 2026.

4.4 The Second Officer (2/O) joined *the vessel* on 10 August 2022. He had about four years of experience as a second officer. The 2/O possessed a second officer Certificate of Competency issued by China, valid until 24 January 2024.

4.5 The Third Officer (3/O) joined *the vessel* on 4 April 2022. He had about three years of experience as a third officer. The 3/O possessed a deck officer class III Certificate of Competency issued by Myanmar, valid until 30 September 2024.

4.6 The C/E joined *the vessel* on 4 April 2022. He had about four and half years of experience as a chief engineer. The C/E possessed a chief engineer Certificate of Competency issued by China, valid until 5 September 2023.

4.7 The Second Engineer (2/E) joined *the vessel* on 4 April 2022. He had about ten years of experience as a second engineer. The 2/E possessed a second engineer Certificate of Competency issued by China, valid until 12 November 2025.

4.8 The Third Engineer (3/E) joined *the vessel* on 4 April 2022. He had about five years of experience as a third engineer. The 3/E possessed a marine engineer officer class III Certificate of Competency issued by Myanmar, valid until 9 February 2027.

4.9 The fourth engineer (4/E) joined *the vessel* on 4 April 2022. He had about three years of experience as a fourth engineer. The 4/E possessed a marine engineer officer class III Certificate of Competency issued by Myanmar, valid until 28 February 2025.

4.10 The Electrician joined *the vessel* on 4 April 2022. He had about fifteen years of experience as an electrician.

4.11 There was no abnormality with regard to the certification and qualification of the crew concerned.

Freeboard requirement of Load Lines Convention

4.12 The international load line certificate of *the vessel* was issued under the provisions of the Load Lines Convention. The tropical freeboard of timber for *the vessel* was 1.96 meters as assigned, i.e., the maximum draft for timber loading in the tropical zone was 7.86[7] meters, and an allowance shall be made proportional to the difference between 1.025 x 10^3 kg per cubic meter and the actual density of seawater.

4.13 According to *the loading port* information and the departure report of *the vessel*, the mean departure draft as from the average of the forward and aft drafts at *the loading port* was 8.01 meters in the seawater of density was 1.025 x 10^3 kg per cubic meter[8]. The actual draft readings observed onboard ship at anchorage might not be reliable as the readings were not obtained at sea level. Information obtained from *the Company* that the calculated draft at

[7] Molded depth 9.80 meters – assigned freeboard 1.96 meters plus the thickness of flat keel 0.015 meters. (Molded depth is the vertical distance measured from the top of the keel to the top of the freeboard deck beam at side. The max. draft for timber in tropical zone for *the vessel* is calculated as: 9.80m +0.015m – 1.96m = 7.855m (or 7.86m)).

[8] https://www.5688.com.cn/ports/pg/kavieng.html

departure was 7.86 meters[9] which was based on the loaded *cargo*, the quantities of fuel oil, diesel oil, fresh water, ballast water, the constant of *the vessel*, and the lightship weight. It was deduced that *the vessel* was at the maximum draft for timber loading in the tropical zone at departure.

Insufficient lashing for deck cargo

4.14 Section 1.2.2 of the Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011[10], requires that cargo securing of timber deck cargoes should follow the requirements of the shipboard CSM.

4.15 Sections 3 and 5.3.2.2 of the approved shipboard CSM state that the uprights used for cargo securing should be made of steel or other suitable material of adequate strength and takes into account the breadth of the deck cargo, such as using the approved wood stanchions with a size of 0.3 meter x 0.3 meter x 5.5meters (*the approved wood stanchions*).

4.16 The investigation revealed that the uprights on board *the vessel* were selected from the *cargo* (Figure 2 refers), and *the approved wood stanchions* were not used for securing of the deck *cargo*. There was no evidence showing that the uprights used onboard *the vessel* could meet the requirements of the shipboard CSM.

4.17 Sections 5.3.4.2 of the shipboard CSM states that the timber deck cargo stowed over the hatches should be secured by a system of athwartship lashings joining each port and starboard pair of uprights near the top of the stow and at other appropriate levels as appropriate for the height of the stow (*the hog lashing*); and a lashing system to tighten the stow whereby a dual continuous wire

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[9] According to the quantities of the loaded *cargo* (8409 cubic meters with its inferred density 1.16 tons/cubic meter, i.e. 9754.8 tons), fuel oil (195.8 tons), diesel oil (58.0 tons), fresh water (90 tons), ballast water (400 tons), the constant of *the vessel* (231 tons), and lightship weight (3208 tons), the displacement of *the vessel* was 13937.6 tons, and its corresponding draft before departure was 7.86 meters according to *the vessel's* loading manual.

[10] The Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011 is mandated pursuant to Regulation 16 of Merchant Shipping (Safety) (Load Lines) (Deck Cargo) Regulations (Cap. 369AE).

rope (wiggle wire) is passed from side to side over the cargo and held continuously through a series of snatch blocks or another suitable device, held in place by foot wires (*the top lashing*).

4.18 The investigation found that the *cargo* on deck was stowed over the hatches with a height of about five meters on the Nos. 2 and 3 hatch covers. They were secured by *the top lashing* only but without *the hog lashing* (Figure 8 refers). It was concluded that the crew did not follow the requirements of the shipboard CSM to secure the deck *cargo* properly.

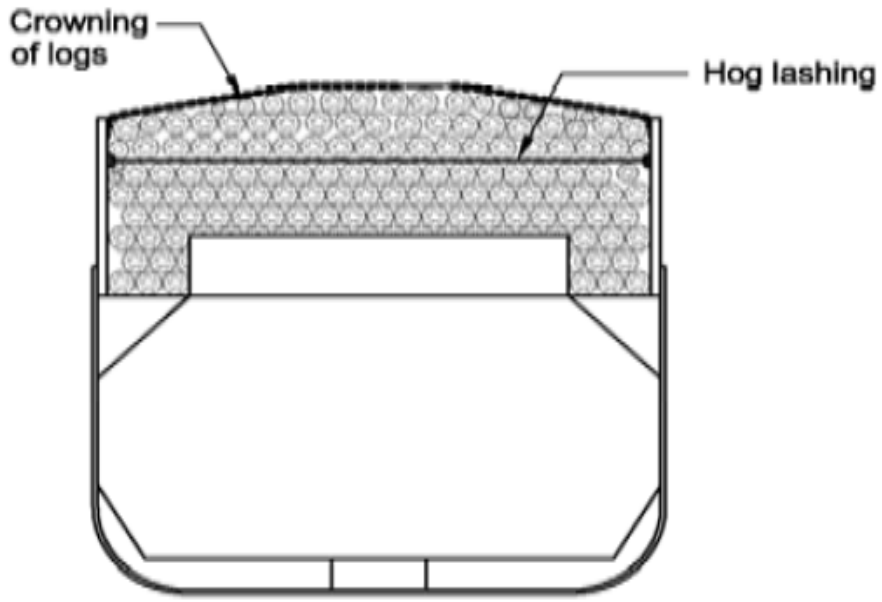


Figure 8: Hog lashing.

Weathertightness of the hatch cover

4.19 Regulations 15 (11) and (12), Chapter II of Annex I of the Load Lines Convention state the requirements that the hatchways closed by portable covers should be secured weathertight by at least two layers of tarpaulins[11], and steel bars or other equivalent means shall be provided in order efficiently and independently to secure each section of hatchway covers after the tarpaulins are battened down.

[11] The tarpaulins shall be waterproof and of ample strength. They shall be of a material of at least an approved standard weight and quality.

Hatchway covers of more than 1.5 meters in length shall be secured by at least two such securing appliances.

4.20 The shipboard equipment operation procedures for the hatch cover (*the hatch cover's operation procedures*) state that the water-tightness of hatch covers was achieved by covering two layers of canvas and pressing steel bars and wooden wedges around hatches to tight and secure the covering.

4.21 The hatch covers of *the vessel* consisted of portable pontoons (Figure 9 refers). The crew statements stated that only one layer of colour-striped cloth with nylon net was used for securing the weathertightness of each hatch cover on board *the vessel*, and the colour-striped cloth was torn seriously in various locations during the movement of deck *cargo*. The investigation identified that the crew did not follow the requirements of the Load Lines Convention and *the hatch cover's operation procedures* to secure the weathertightness of the hold hatches with tarpaulins properly.



Figure 9: Pontoons of the hatch cover of *the vessel*

Weather and sea conditions

4.22 According to the surface analysis charts issued by the JMA (Figures 10, 11, 12, and 13 refer), a cold high pressure located at about 65°

N, 095° E with pressure 1060 hPa[12] on 21 January 2023, moving southeasterly with a speed of 10 knots and strengthened to 1066 hPa on 22 January 2023. The gale warning covered the Yellow Sea area on 22 January 2023. In the early morning of 23 January 2023, the cold high further strengthened to 1068 hPa and the gale warning area was enlarged to cover the East China Sea and South China Sea. At 1400 hours on 24 January 2023, the gale warning area fully covered the routing of the vessel.

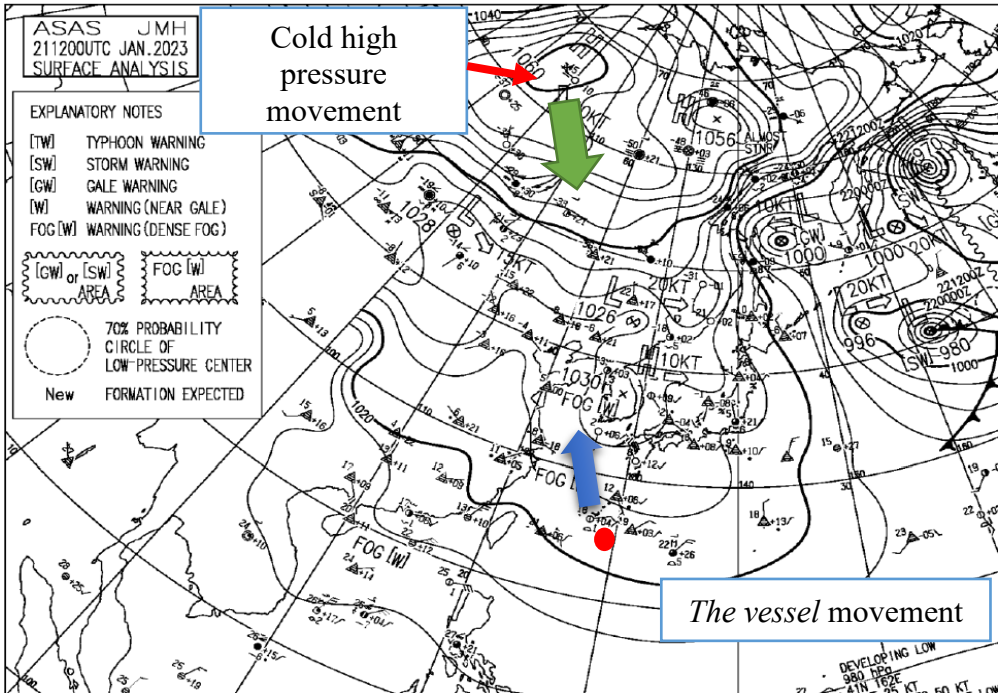


Figure 10: Surface analysis chart issued at 2000 hours on 21 January 2023

[12] Hectopascal is the international unit for measuring atmospheric or barometric pressure.

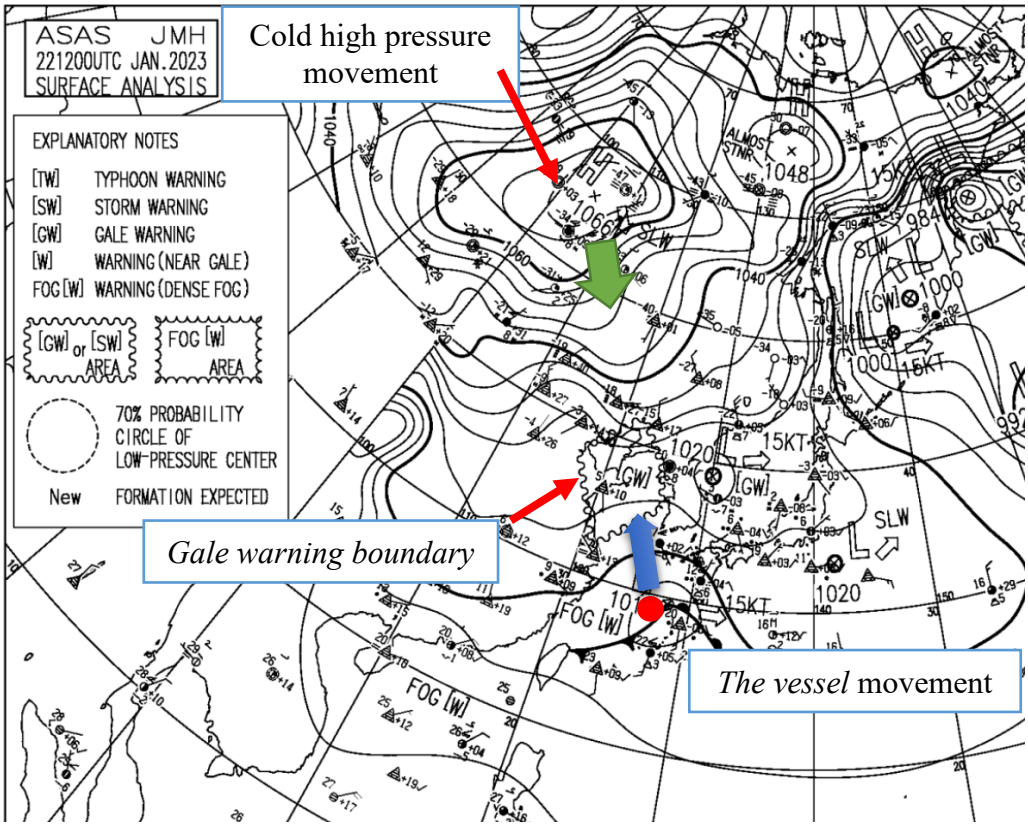


Figure 11: Surface analysis chart issued at 2000 hours on 22 January 2023.

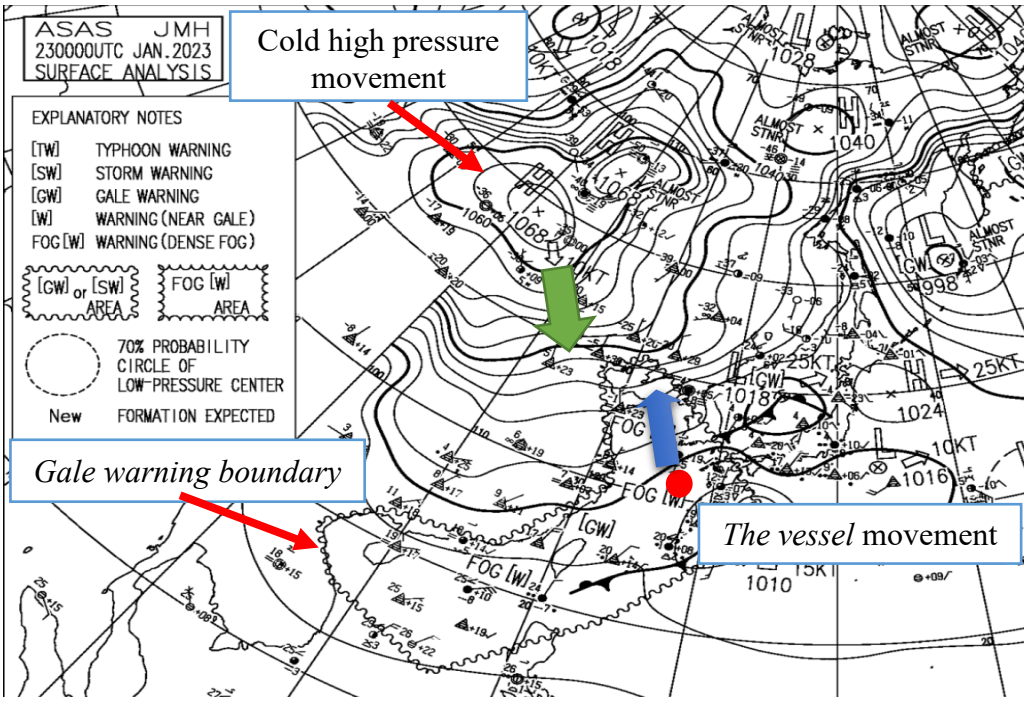


Figure 12: Surface analysis chart issued at 0800 hours on 23 January 2023.

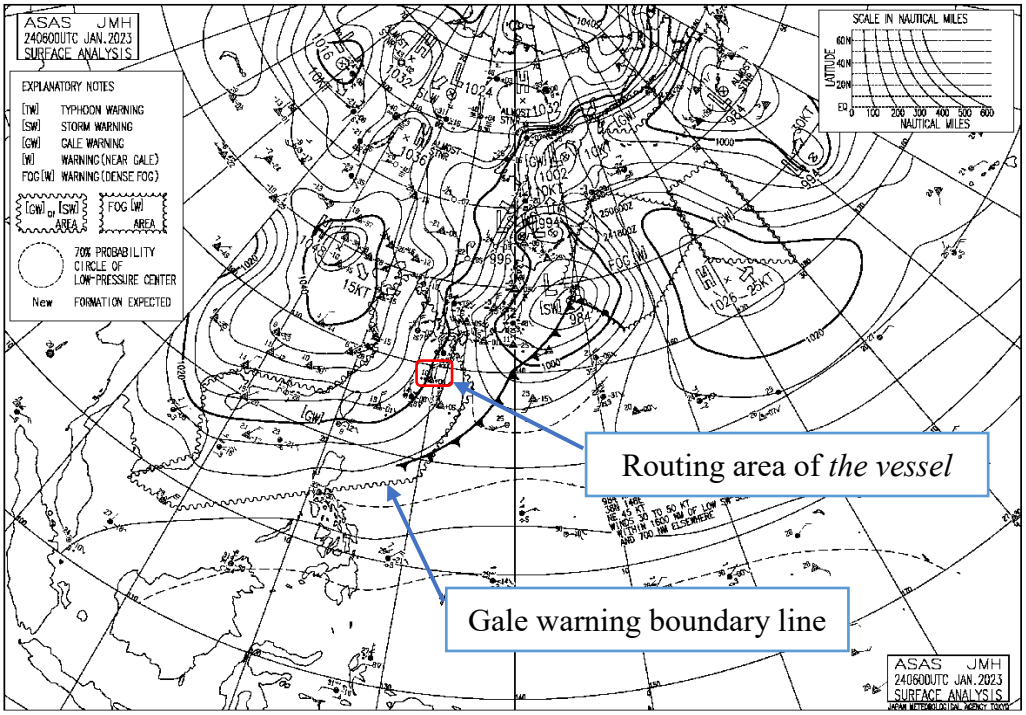


Figure 13: Surface analysis chart issued at 1400 hours on 24 January 2023

4.23 At 1626 hours on 24 January 2023, the Enhanced Group Call[13] (EGC) message was issued by Japan Land Earth Station showed that the warning of gale wind with the high sea about six to eight meters and swell of three to four meters was over the East China Sea

4.24 The deck logbooks of *the tanker* and *the bulk carrier* recorded that the sea was moderately high to high with a northwesterly wind of Beaufort Wind Scale Force 8 to 10 on 24 January 2023 and in the early morning of 25 January 2023 on the accident site.

4.25 The adverse weather and sea conditions caused *the vessel* to take green seas on the deck. The forecastle of *the vessel* submerged into the sea frequently from 23 January 2023, which led to seawater ingress to the rigging storeroom and cargo holds, resulting in the accident. The adverse weather and the sea conditions were

[13] Enhanced group call service is a part of the GMDSS system for transmitting maritime safety information in areas. These messages could be navigational warnings, Meteorological warnings, and Search and Rescue messages.

considered to be the contribution factors to the accident.

Assessment of severe weather[14]

4.26 Section 5.4.2 of the shipboard CSM states that voyage should be planned properly to avoid the potential severe weather and sea conditions, and that master should reduce speed or alter the ship's course at an early stage to minimize the forces imposed on the ship's structure, the loaded cargo, and its lashings in the severe weather condition.

4.27 Section 5 of "Instructions for navigation in the severe weather" of the shipboard SMS states that the master should carefully study the meteorological reports and make a safe navigation plan to ensure the safety of the vessel, cargo and crew.

4.28 In winter, cold waves[15]frequently occur in Northeast Asia, which could bring rapid fall in temperature, rough sea and gale wind on the sea. The waters of the East China Sea could be affected by cold waves. According to paragraph 3.4, *the vessel* would pass the waters of the East China Sea to *the discharging port*.

4.29 Despite seawater was found in *the hold* and was difficult to be pumped out (paragraph 3.6 refers), *the vessel* continued the voyage to *the discharging port* (Figure 12 refers) on 23 January 2023 when she was sailing in the gale warning area until the weather further deteriorated in the early morning of 24 January 2023. *The vessel* then changed course and headed southeast to avoid green seas on the forecastle and the forward deck (paragraph 3.7 refers).

4.30 According to paragraph 4.22, the weather continued deteriorating from 22 January 2023 as affected by the cold wave. However, *the Master* failed to follow the shipboard CSM and SMS requirements to study the meteorological reports carefully and re-assess the voyage plan proactively to avoid *the vessel* proceeding to a dangerous area affected by the cold wave. If *the Master* had studied the weather information, including the effects of the severe

[14] Appendix C refers.

[15] Cold wave (known in some regions as a cold snap, cold spell or Arctic Snap) is a weather phenomenon distinguished by a cooling of the air.

weather caused by the cold wave and taken appropriate measures, such as adjusting the steering course to shelter earlier, the casualty might have been avoided.

Causes of sinking

4.31 As mentioned in paragraphs 3.6 and 3.10, it was deduced that water ingress in the rigging storeroom and *the hold* through the broken electric pipe and the opened manholes or access hatchways of *the hold*, causing a heavy trim by head with an increment of green seas on the forecastle and forward deck, leading to more water ingress into *the hold* and the rigging storeroom under the inclement weather.

4.32 According to paragraphs 4.16 to 4.18 and 4.21, the deck *cargo* was not lashed properly, leading to the cargo collapse eventually with *the vessel* heavily listed thus causing seawater further flooding the cargo holds due to the hatch covers not being covered by proper tarpaulins as required.

4.33 The seawater accumulated in the rigging storeroom and cargo holds not only reduced the reserve buoyance of *the vessel* but also had an adverse effect on the stability of *the vessel* due to the free surface effect[16] of seawater onboard. As mentioned in paragraphs 3.20, 3.21 and 3.23, the No.1 and No.2 holds were flooded, the bow of *the vessel* was submerged in water, and *the vessel* finally capsized and sank. It was deduced that *the vessel* lost her stability due to flooding of cargo holds and the rigging storeroom.

Abandon the ship in a distress situation

4.34 Section 4.5 of *the Code* states that in the event of abandoning ship, the order to abandon ship can only be given verbally by master; all crew should assemble at muster point wearing warm clothing and lifejackets; any additional provisions, water or equipment, including Search and Rescue Radar Transponders (SART[17]) and EPIRB should be brought and placed in the lifeboat.

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[16] The free surfaces of liquids lead to the reduction of the GM of the ship.

[17] SART is a self-contained, waterproof transponder intended for emergency use at sea. The radar-SART is used to locate a survival craft or distressed vessel by creating a series of dots on a rescuing ship's radar display.

4.35 As paragraph 3.22 mentioned, *the vessel* was out of control at about 0138 hours on 25 January 2023, and *the Master* intended to abandon *the vessel*. However, according to the statements of survived crew, *the Master* did not give the order to abandon *the vessel*. As such, the lifeboats or life rafts were not prepared for abandoning *the vessel*, nor were *the vessel* crew assembled at the muster point with any additional provisions and SART or EPIRB. At the final moment of *the vessel* before her sinking, *the Master* sat on the bridge floor. All crew members, except the C/E and the duty oiler in the engine room, were scattered at different positions outside the accommodation.

4.36 The investigation concluded that *the Master* failed to follow the requirements of *the Code* in organizing the crew orderly to abandon *the vessel* in an appropriate time well before the capsizing of *the vessel*. If *the Master* instructed *the vessel* crew to prepare the lifeboats at an early stage and ordered to abandon *the vessel* at an appropriate time, the opportunity for the crew to survive could have been increased.

Shipboard training and safety awareness

4.37 There was a shipboard 2022 annual training plan (*the training plan*) which followed the requirements of the "Training procedure" of the shipboard SMS. *The training plan* covered the topics of cargo securing manual, navigation in severe weather, ballast water management plan, safety awareness, etc.

4.38 According to the shipboard's monthly safety reports, the training of the cargo securing manual was carried out monthly on board, the procedure of the “Navigation in severe weather” was conducted in July 2022, and the emergency drills, including abandon ship drill, were carried out monthly. However, the performance of *the vessel* crew on cargo lashing operation, navigation in severe weather, and abandoning ship, as mentioned in paragraphs 4.18, 4.21, 4.30 and 4.36, showed that the shipboard training was ineffective.

4.39 As paragraphs 3.9 to 3.15 mentioned, it was found that the crew might pump out the accumulated seawater from *the hold* by using two additional portable pumps through its opened manholes or

access hatchways. However, without ensuring that no water can ingress through these manholes or access hatchways, *the vessel*'s course was changed to the northwest against the wind and waves resulting in seawater ingress into *the hold* through these openings. It was deduced that the crew lacked safety awareness to the risk of water ingress into *the hold* through the opened manholes or access hatchways when heavy seas were coming on board in severe weather.

Support from the Company

4.40 Sections 1.2 and 1.3 of the "Procedures for emergency response ashore and personnel deployment" of *the Company*'s SMS state that *the Company* should study the situation of the ship to make effective measures and formulate a rescue plan; maintain communication with ships; instruct ships to take effective measures in time; and to provide ships with necessary technical assistance if an emergency happened onboard.

4.41 As mentioned in paragraphs 3.8, 3.10 to 3.12, *the Master* had reported to the Company by telephone or email at 0648 hours, 0910 hours, 1648 hours, and 2117 hours on 24 January 2023 on the harsh conditions faced by *the vessel*, i.e. seawater ingress was found in *the hold* and *the vessel* listed to starboard, the seawater flooded the rigging storeroom due to the forward electric cable pipe broken, the wind of Beaufort Wind Scale Force increased to 9 (gust force about 10), and the poor *bilge system*. According to the relevant records provided by *the Company*, however, there was no evidence to show that *the Company* took appropriate actions except a reminder to *the Master* to maneuver *the vessel* carefully, tighten the deck *cargo* lashing and decide on further action when weather permitted on 25 January 2023. It could be concluded that the *Company* failed to implement the requirements of the *Company*'s SMS to identify potential emergency shipboard situations, establish corresponding procedures, and provide the vessel with necessary technical assistance.

5. Conclusions

5.1 At about 1500 hours on 12 January 2023, *the vessel* departed *the loading port*, loaded with *cargo*, and was bound for *the discharging port* with an estimated time of arrival on 25 January 2023.

5.2 In the morning of 23 January 2023, the wind force increased with heavy rain and moderate sea. The bosun found water ingress in *the hold*. *The vessel* crew pumped out seawater in *the hold* through *the bilge system*, but unsatisfactory due to poor suction of *the bilge system* caused by the clogging of the suction port with bark and litter in *the hold*. The weather deteriorated in the early morning of 24 January 2023, and the wind force increased to strong breeze with rough sea. At 0647 hours, to avoid green seas over the forecastle and forward deck, *the Master* reversed *the vessel*'s heading to the southeast. He then instructed the crew to pump the seawater out of *the hold* with two additional portable pumps. As the weather further deteriorated, *the hold* accumulated much seawater due to heavy green seas on the main deck. At about 2200 hours, *the hold* was flooded by seawater, and the deck *cargo* collapsed and fell into the sea, resulting in *the vessel* having a heavy trim by head with rolling to an angle of about 20 degrees. At 2215 hours, DSC distress alert was activated on *the vessel,* and *the vessel* sank at about 0200 hours near position 32° 03.067' N, 127° 07.888' E, south of Jeju Island, Republic of Korea on 25 January 2023.

5.3 *The Company*, HKMRCC, BJMRCC, KCG, JCG, *the tanker* and *the bulk carrier* which were in the vicinity carried out a joint SAR operation after receiving the distress alert from *the vessel.* The SAR operation was continued until 30 January 2023. The accident resulted in the death of eight crew members, nine were missing, and the sinking of *the vessel*. There were only five crew members survived.

5.4 The investigation identified that the contributory factors leading to the accident were that *the vessel* crew:

(a) disregarded the approved shipboard CSM requirements to secure the deck cargo properly;

(b) disregarded the Load Lines Convention requirements and *the hatch cover's operation procedures* to secure the weathertight of the hold hatches with tarpaulins properly;

(c) disregarded the shipboard SMS and CSM requirements to study the meteorological reports carefully, take proper and appropriate measures against severe weather; and

(d) disregarded *the Code* requirements to organize *the vessel* crew to abandon ship.

5.5 The investigation also revealed that the shipboard training on measures against severe weather, abandon ship, and cargo securing was ineffective; *the Company* failed to implement *the Company*'s SMS requirements to identify potential emergency shipboard situations, establish corresponding procedures, and provide *the vessel* with necessary technical assistance. The crew also lacked safety awareness to take appropriate measures to ensure the watertightness of the cargo holds to avoid water ingress into the holds in severe weather.

6. Recommendations

6.1 The management company should issue a circular informing all masters, officers and crew members of its fleet of the investigation findings and lessons learnt from this accident to:

(a) strictly comply with the requirements of approved shipboard CSM to carry out deck cargo stowing and securing;

(b) strictly follow the requirements of the Load Lines Convention and shipboard *the hatch cover's operation procedures* to ensure the weathertight of hold hatches;

(c) strictly follow the shipboard SMS and CSM to study the meteorological information carefully and take proper and appropriate measures against severe weather;

(d) strictly follow the requirements of *the Code* in case of abandon ship;

(e) enhance shipboard training for abandonment of ship, cargo securing and the measures against severe weather; and

(f) enhance the crew safety awareness to take appropriate measures to ensure the watertightness of the cargo holds to avoid water ingress into the hold when heavy seas were on board in severe weather.

6.2 *The Company* should implement the requirements of *the Company*'s SMS to identify potential emergency shipboard situations, establish corresponding procedures, and provide necessary technical assistance to vessel in necessity.

6.3 The Administration should conduct an additional audit on *the Company* to ensure *the Company* itself and its fleet to strictly follow the requirements of the Load Lines Convention, *the Code*, *the Company* SMS and shipboard SMS and CSM.

6.4 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 Company*, China MSA, JCG, KCG, Department of Marine Administration of the Republic of the Union of Myanmar, Quality Assurance Section of Ship Registration and Quality Branch, Hong Kong Marine Department, and the masters of *the tanker* and *the bulk carrier* for comments.

7.2 By the end of consultation, comments from *the Company*, China MSA, Department of Marine Administration of the Republic of the Union of Myanmar and the master of *the tanker* were received and the report had been amended as appropriate.

8. Appendices

Appendix A: Abstracted voyage data and tracking of *the vessel* recorded by "ship DT" (https://www.shipdt.com/#/).

Appendix B: General arrangement plan of *the vessel*.

Appendix C: Surface analysis charts and wave forecast charts issued by JMA, Tokyo on 21, 22, 23, and 24 January 2023.

Appendix A:

(1) Abstracted voyage data and tracking of *the vessel* recorded by "ship DT"

Ship Name:	JIN TIAN	MMSI:	477852500	IMO:	9578713	
Registry：	Hong Kong, China		Length:	127.0m	Breadth：	19.0m
From	2023-01-23 06:18		To	2023-01-25 01:32	(UTC+8)	
Time	Long	Lat	Course over ground (°)	Heading course(°)	Speed (kn)	Status
2023-01-23 06:18	127°21.77'E	30°21.69'N	332.5	343	8.8	Underway
2023-01-23 06:33	127°20.67'E	30°23.67'N	336.5	343	8.6	Underway
2023-01-23 09:25	127°8.70'E	30°46.40'N	332		8	Underway
2023-01-23 09:28	127°8.50'E	30°46.80'N	337		9	Underway
2023-01-23 17:06	126°35.55'E	31°49.12'N	334.5	335	8.8	Underway
2023-01-23 17:21	126°34.38'E	31°51.14'N	334.3	337	9.2	Underway
2023-01-23 17:44	126°32.66'E	31°54.26'N	337.2	338	9	Underway
2023-01-23 17:59	126°31.64'E	31°56.28'N	337.3	338	8.8	Underway
2023-01-23 18:14	126°30.64'E	31°58.37'N	338.4	338	8.8	Underway
2023-01-23 18:29	126°29.72'E	32°0.42'N	342	341	8.3	Underway
2023-01-23 18:44	126°28.76'E	32°2.46'N	336.4	332	8.5	Underway
2023-01-23 19:10	126°26.70'E	32°5.84'N	331.9	333	8.9	Underway
2023-01-23 19:27	126°25.40'E	32°8.05'N	333.4	335	8.7	Underway
2023-01-23 19:50	126°23.77'E	32°11.12'N	337.6	339	8.6	Underway
2023-01-23 19:55	126°23.40'E	32°11.70'N	336		8	Underway
2023-01-23 20:05	126°22.72'E	32°13.13'N	336.2	339	8.9	Underway
2023-01-23 20:20	126°21.67'E	32°15.16'N	337.5	339	8.9	Underway
2023-01-23 20:35	126°20.60'E	32°17.20'N	337	339	8.8	Underway
2023-01-23 20:54	126°19.32'E	32°19.61'N	338.2	340	8.5	Underway
2023-01-23 21:09	126°18.29'E	32°21.55'N	335.5	339	8.5	Underway
2023-01-23 21:19	126°17.69'E	32°22.74'N	337.9	340	7.9	Underway
2023-01-23 21:24	126°17.36'E	32°23.39'N	336.2	341	8.3	Underway
2023-01-23 21:34	126°16.74'E	32°24.58'N	335.2	339	6.9	Underway
2023-01-23 21:49	126°15.83'E	32°26.31'N	335.2	338	7.8	Underway
2023-01-23 22:20	126°13.91'E	32°29.93'N	335.5	337	7.6	Underway
2023-01-23 22:43	126°12.47'E	32°32.58'N	334.7	338	7.1	Underway
2023-01-23 23:05	126°11.13'E	32°35.04'N	333.5	337	7	Underway
2023-01-23 23:20	126°10.28'E	32°36.67'N	336.2	339	6.5	Underway
2023-01-23 23:28	126°9.88'E	32°37.44'N	335.7	340	5.7	Underway
2023-01-23 23:35	126°9.53'E	32°38.13'N	335.3	338	6.6	Underway
2023-01-23 23:50	126°8.73'E	32°39.62'N	336	336	6.4	Underway
2023-01-24 00:13	126°7.58'E	32°41.85'N	336.3	337	5	Underway
2023-01-24 00:29	126°6.76'E	32°43.30'N	336.5	336	6.3	Underway
2023-01-24 00:44	126°6.03'E	32°44.66'N	341.1	336	5.9	Underway
2023-01-24 00:59	126°5.36'E	32°45.98'N	334.1	337	4.7	Underway
2023-01-24 01:14	126°4.73'E	32°47.27'N	337.6	336	5.3	Underway
2023-01-24 01:29	126°4.10'E	32°48.54'N	343.1	334	4.8	Underway
2023-01-24 01:44	126°3.51'E	32°49.69'N	331.2	330	4.9	Underway

Ship Name:	JIN TIAN	MMSI:	477852500	IMO:	9578713	
Registry：	Hong Kong, China		Length:	127.0m	Breadth：	19.0m
From	2023-01-23 06:18		To	2023-01-25 01:32	(UTC+8)	

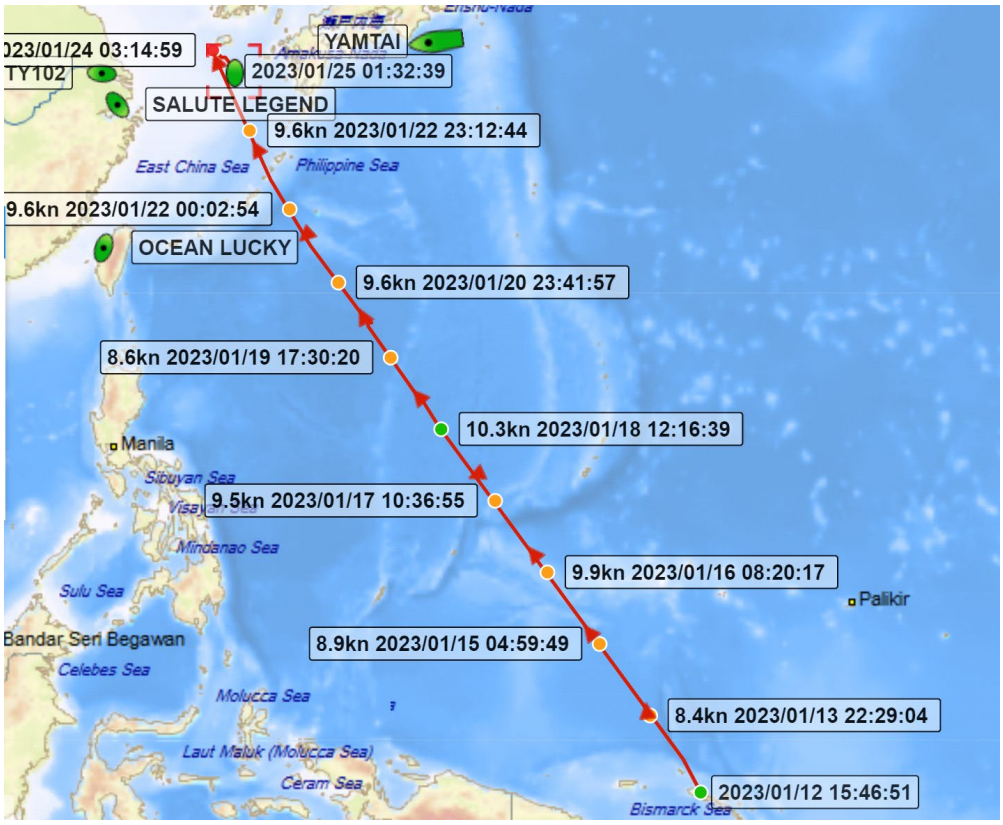
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2023-01-24 02:17	126°2.20'E	32°51.80'N	335		4	Underway
2023-01-24 02:29	126°1.72'E	32°52.75'N	338.5	332	5.1	Underway
2023-01-24 02:44	126°1.17'E	32°53.72'N	343.2	332	4.3	Underway
2023-01-24 03:14	126°0.25'E	32°55.41'N	336.3	330	3.3	Underway
2023-01-24 03:30	125°59.85'E	32°56.17'N	343.1	334	2.6	Underway
2023-01-24 04:00	125°59.14'E	32°57.52'N	316.4	322	1.7	Underway
2023-01-24 04:15	125°58.68'E	32°57.98'N	342.3	330	2.6	Underway
2023-01-24 04:30	125°58.47'E	32°58.54'N	336.3	330	2.3	Underway
2023-01-24 04:45	125°58.18'E	32°59.16'N	340.3	327	1.8	Underway
2023-01-24 05:00	125°57.96'E	32°59.71'N	358.2	331	2.5	Underway
2023-01-24 05:31	125°57.53'E	33°0.62'N	337.6	330	2.4	Underway
2023-01-24 05:46	125°57.32'E	33°1.07'N	316.3	336	1.8	Underway
2023-01-24 06:16	125°56.85'E	33°1.98'N	359.7	329	1.4	Underway
2023-01-24 06:31	125°56.58'E	33°2.44'N	349.4	337	2	Underway
2023-01-24 06:34	125°56.55'E	33°2.51'N	340.2	330	1.8	Underway
2023-01-24 06:46	125°56.33'E	33°2.88'N	4.7	353	2.3	Underway
2023-01-24 07:01	125°58.19'E	33°2.16'N	117.7	115	10.1	Underway
2023-01-24 07:24	126°1.94'E	33°0.09'N	118	111	10.3	Underway
2023-01-24 07:39	126°4.69'E	32°58.95'N	119.7	105	9.7	Underway
2023-01-24 07:55	126°7.34'E	32°57.62'N	121.4	112	10.3	Underway
2023-01-24 08:10	126°9.55'E	32°55.98'N	136.9	139	10.2	Underway
2023-01-24 08:25	126°11.26'E	32°53.97'N	147.2	140	9.5	Underway
2023-01-24 08:40	126°12.91'E	32°51.95'N	139.8	134	9.2	Underway
2023-01-24 08:55	126°14.70'E	32°50.20'N	138	130	9.1	Underway
2023-01-24 09:02	126°15.60'E	32°49.30'N	137		9	Underway
2023-01-24 09:10	126°16.56'E	32°48.47'N	138.4	130	9.7	Underway
2023-01-24 09:11	126°16.64'E	32°48.40'N	141.4	128	8.9	Underway
2023-01-24 09:25	126°18.48'E	32°46.97'N	129.8	126	8.5	Underway
2023-01-24 09:44	126°20.62'E	32°45.41'N	130.7	121	7.5	Underway
2023-01-24 09:59	126°22.13'E	32°44.44'N	129.9	113	5.8	Underway
2023-01-24 10:20	126°24.17'E	32°43.38'N	128.8	116	6.2	Underway
2023-01-24 10:41	126°26.25'E	32°42.22'N	118.7	118	5	Underway
2023-01-24 11:05	126°28.21'E	32°41.01'N	131.3	120	5.1	Underway
2023-01-24 11:17	126°29.18'E	32°40.41'N	116.4	107	5.1	Underway
2023-01-24 11:20	126°29.47'E	32°40.25'N	127.6	111	5.2	Underway
2023-01-24 11:50	126°32.03'E	32°39.03'N	126.9	115	5.6	Underway
2023-01-24 12:21	126°34.94'E	32°37.78'N	104.4	110	5	Underway

Ship Name:	JIN TIAN	MMSI:	477852500	IMO:	9578713	
Registry：	Hong Kong, China		Length:	127.0m	Breadth：	19.0m
From	2023-01-23 06:18		To	2023-01-25 01:32	(UTC+8)	

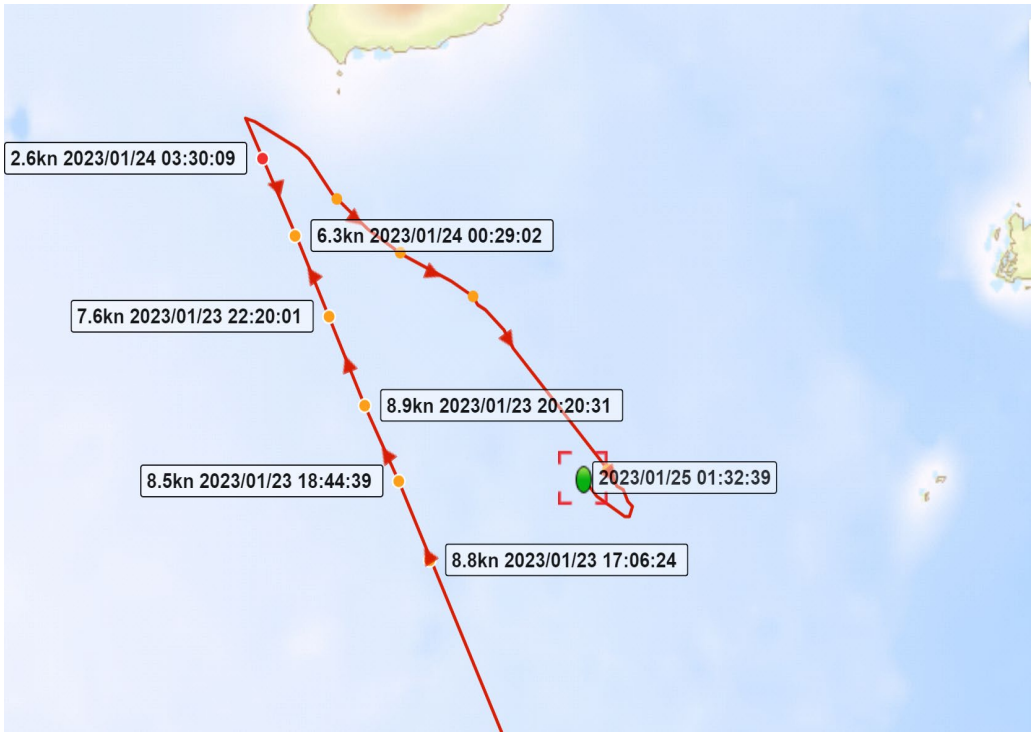
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2023-01-24 13:11	126°40.01'E	32°35.66'N	107.2	105	5.7	Underway
2023-01-24 13:26	126°41.49'E	32°34.97'N	119.4	114	6.4	Underway
2023-01-24 13:41	126°43.12'E	32°34.22'N	116.3	115	7	Underway
2023-01-24 13:56	126°44.49'E	32°33.16'N	153.1	146	6.7	Underway
2023-01-24 14:11	126°45.67'E	32°31.96'N	116.7	123	6.4	Underway
2023-01-24 14:27	126°47.24'E	32°30.99'N	127.9	127	6.4	Underway
2023-01-24 14:42	126°48.69'E	32°29.94'N	138.6	144	6.3	Underway
2023-01-24 15:12	126°51.29'E	32°27.56'N	143.4	140	6.6	Underway
2023-01-24 15:42	126°53.21'E	32°24.61'N	167.8	170	6.4	Underway
2023-01-24 20:21	127°13.16'E	32°4.31'N	130.1	126	5.2	Underway
2023-01-24 20:44	127°14.43'E	32°2.78'N	153.5	143	5.2	Underway
2023-01-24 21:00	127°15.40'E	32°1.66'N	124.8	112	5	Underway
2023-01-24 21:15	127°16.48'E	32°1.08'N	133.6	127	3.9	Underway
2023-01-24 21:30	127°17.13'E	32°0.08'N	151.1	140	4.1	Underway
2023-01-24 21:45	127°17.73'E	31°59.02'N	151.9	139	5.1	Underway
2023-01-24 22:01	127°18.53'E	31°58.13'N	179.2	167	5.8	Underway
2023-01-24 22:16	127°17.78'E	31°56.53'N	196.6	179	6.6	Underway
2023-01-24 22:31	127°17.09'E	31°56.43'N	295	304	4.1	Underway
2023-01-24 22:38	127°16.50'E	31°56.60'N	309		4	Underway
2023-01-24 23:01	127°15.25'E	31°57.44'N	299.9	309	2.8	Underway
2023-01-24 23:16	127°14.36'E	31°57.93'N	305.6	310	3.7	Underway
2023-01-24 23:46	127°12.64'E	31°59.00'N	308.6	317	3.1	Underway
2023-01-25 00:02	127°11.88'E	31°59.50'N	299.7	316	3.7	Underway
2023-01-25 00:17	127°11.09'E	32°0.07'N	313.4	314	3.8	Underway
2023-01-25 00:32	127°10.34'E	32°0.64'N	309.8	315	3	Underway
2023-01-25 01:02	127°9.00'E	32°1.85'N	319.3	323	3.8	Underway
2023-01-25 01:17	127°8.43'E	32°2.46'N	322.5	324	2.6	Underway
2023-01-25 01:32	127°7.89'E	32°3.07'N	318.5	323	2.6	Underway

(2) Tracking of *the vessel* recorded by "shipDT"

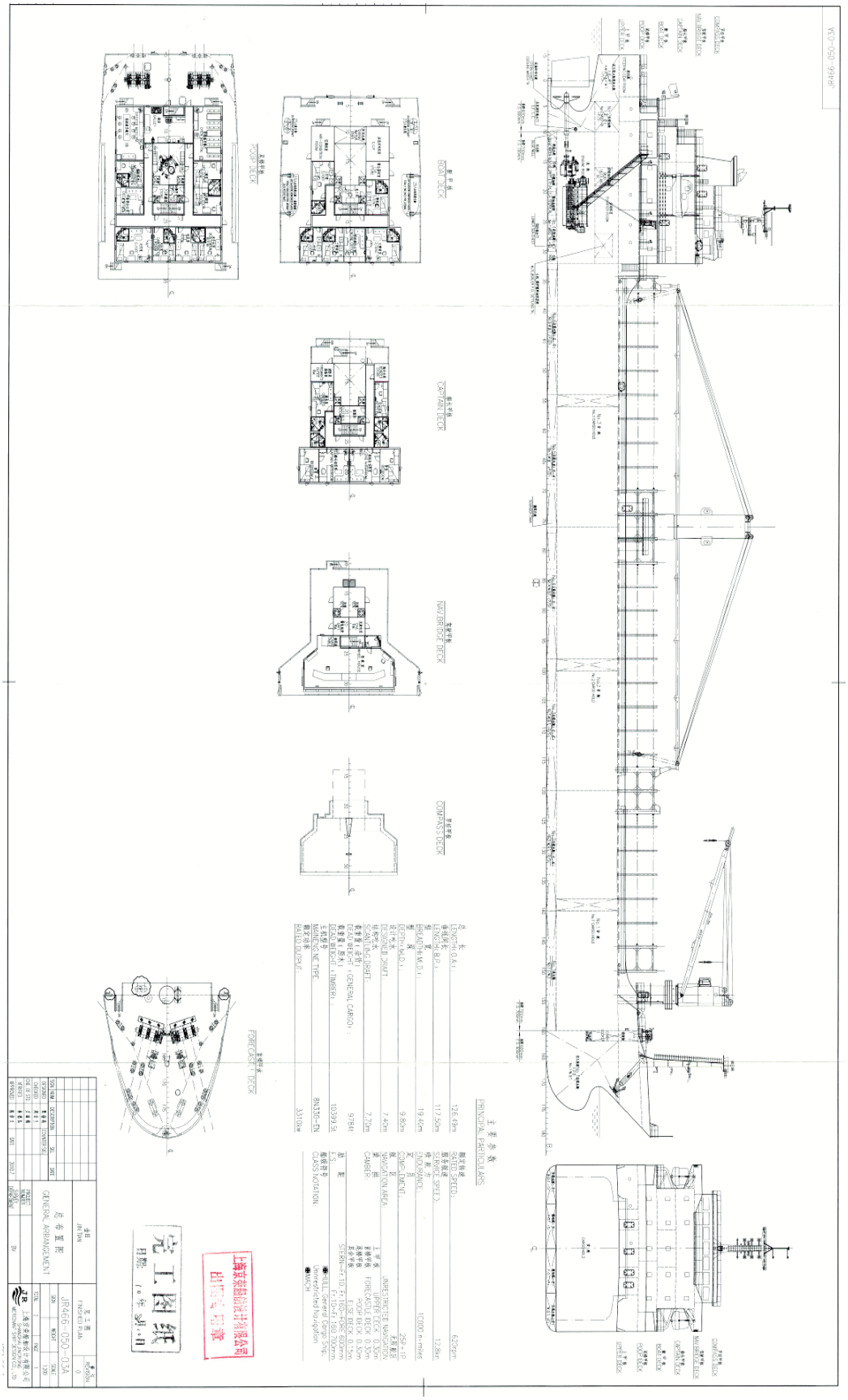
(a) Tracking of the whole voyage:

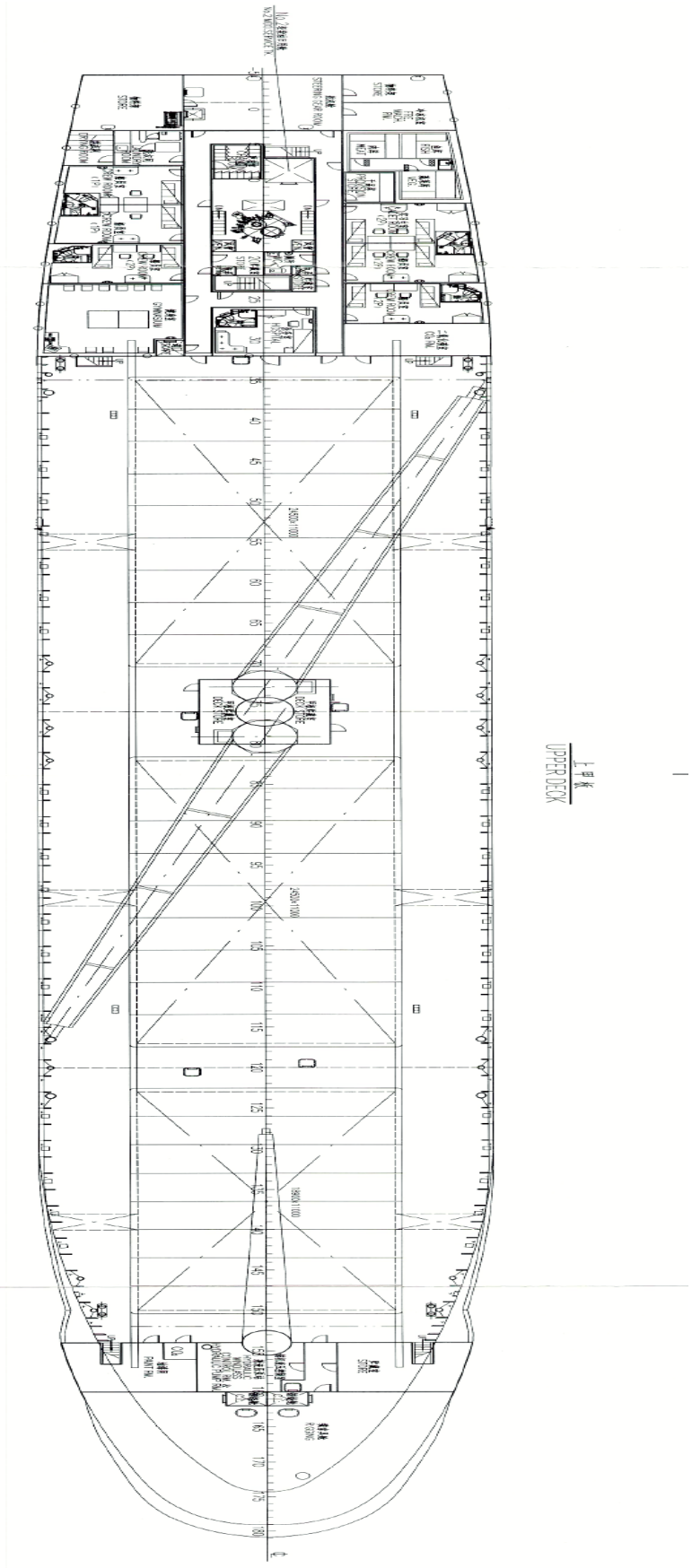


(b) Tracking from 1706 hours on 23 January 2023 to the time of accident :



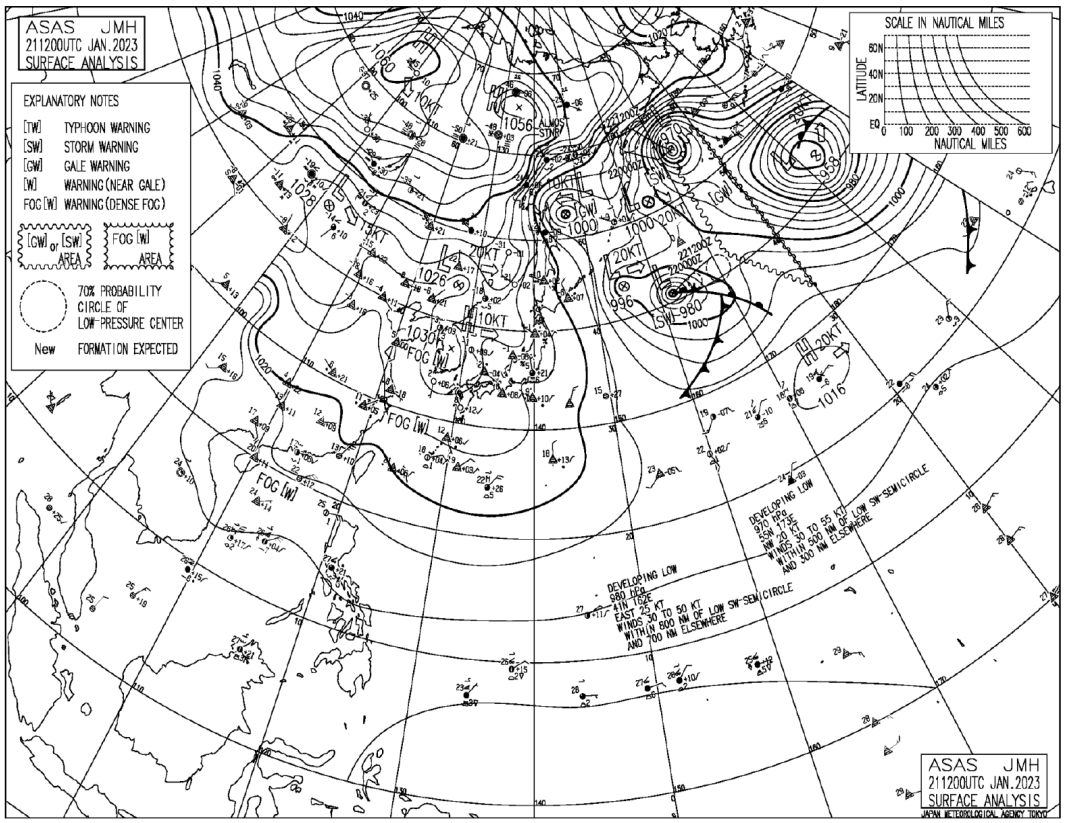
Appendix B: General arrangement plan of *the vessel*

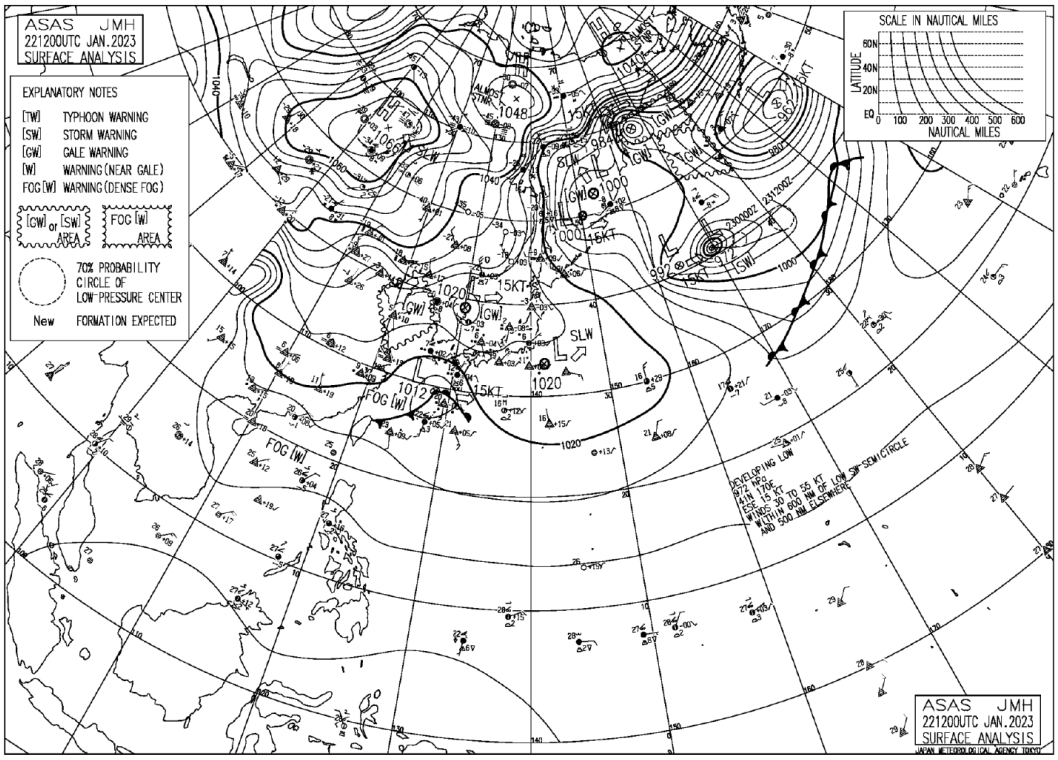


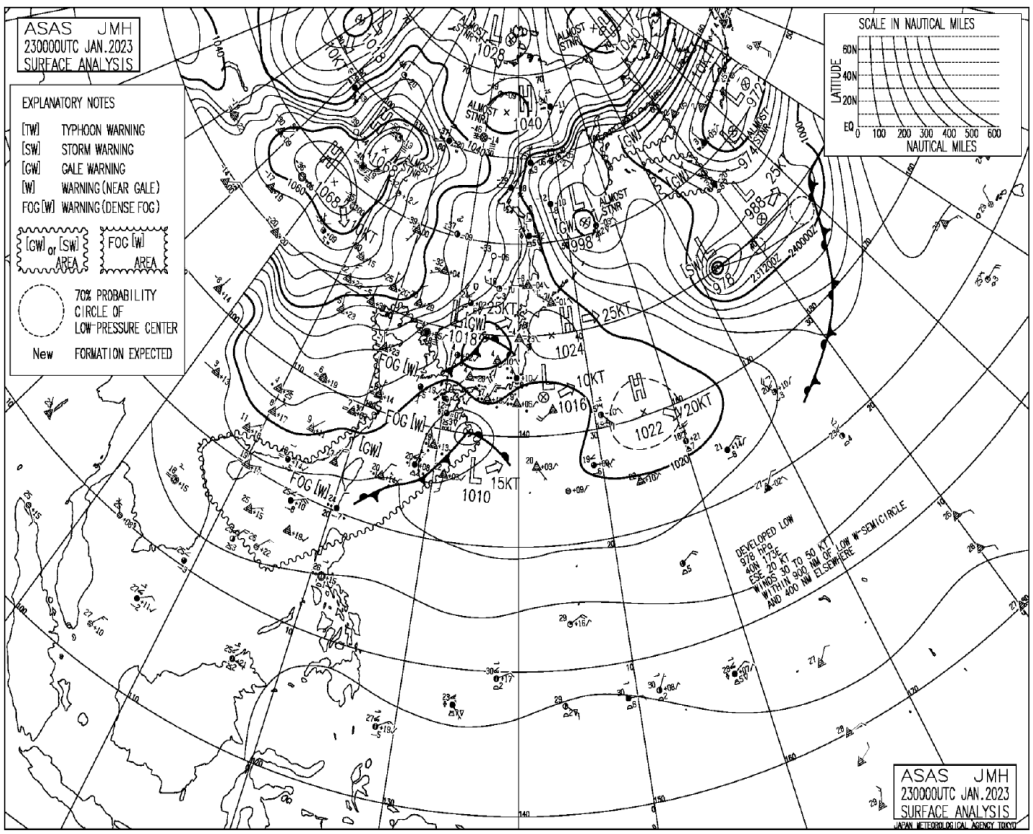

UPPER DECK

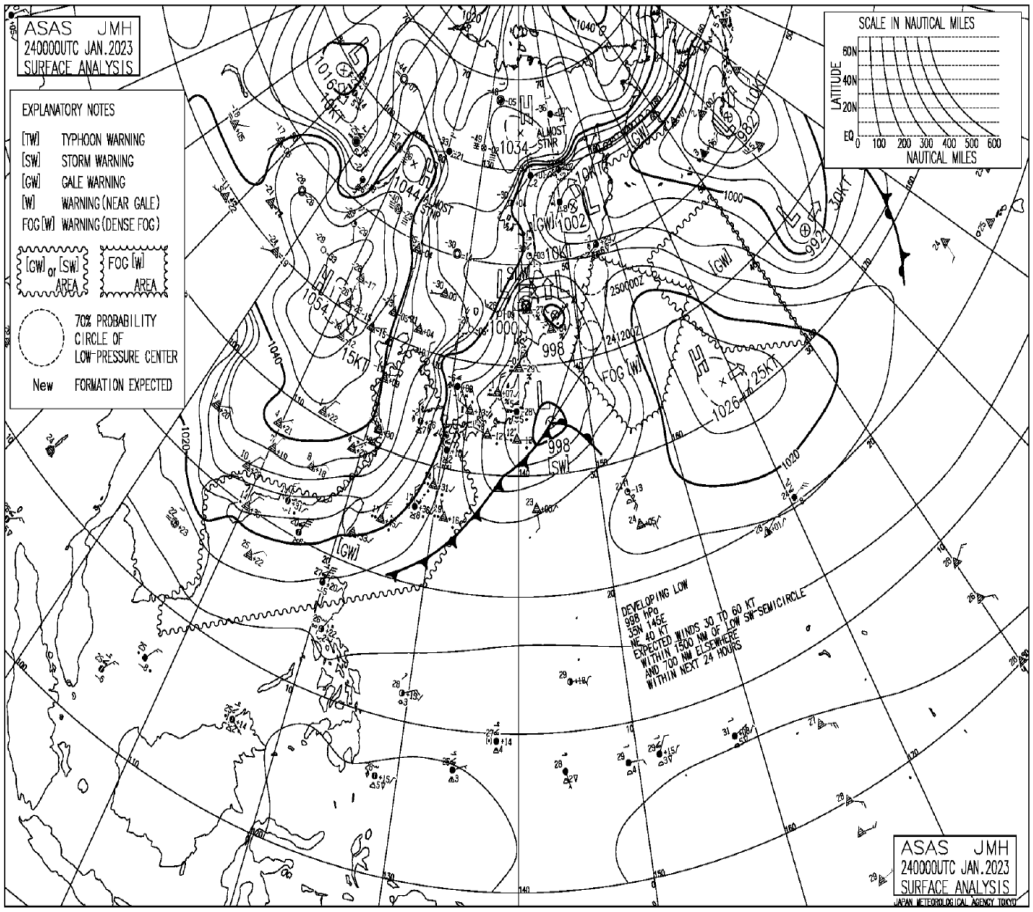
Appendix C:

(1) Surface Analysis Chart issued by JMA, Tokyo on 21, 22, 23, and 24 January 2023.

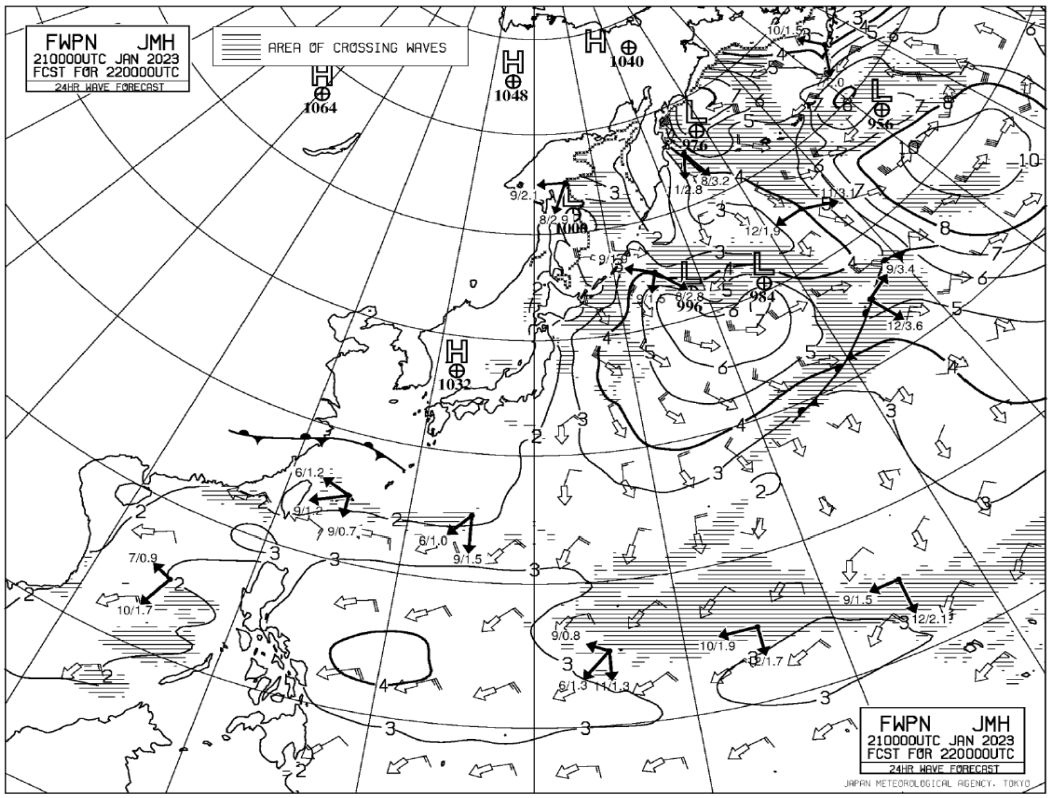


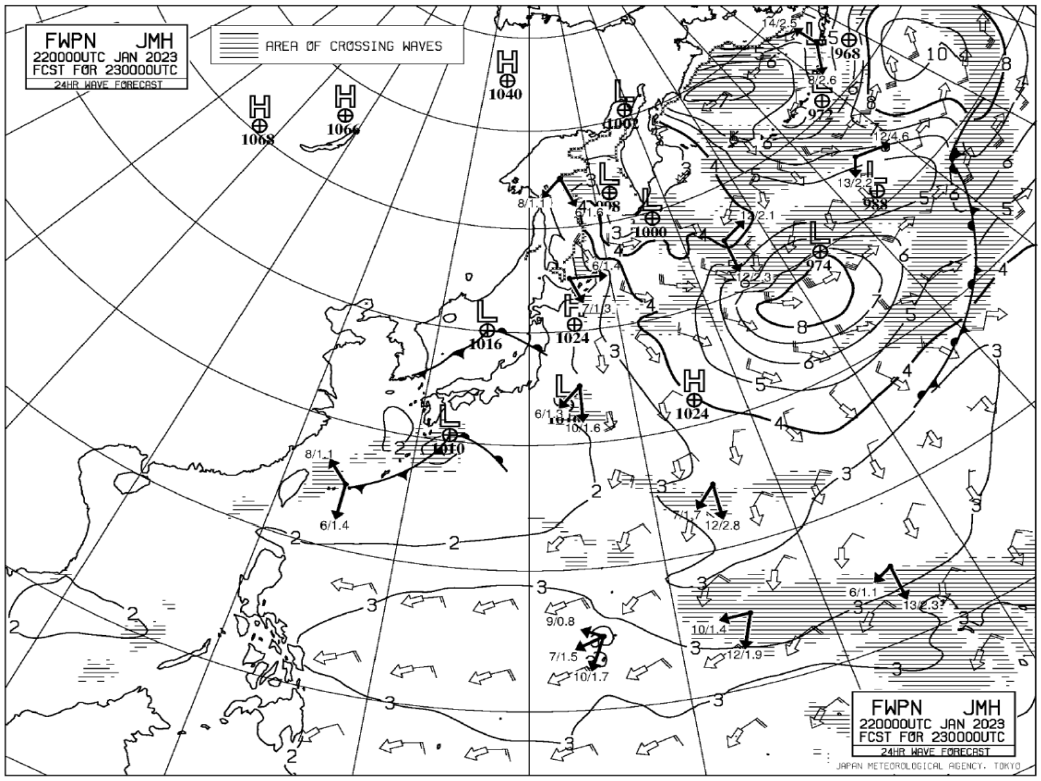


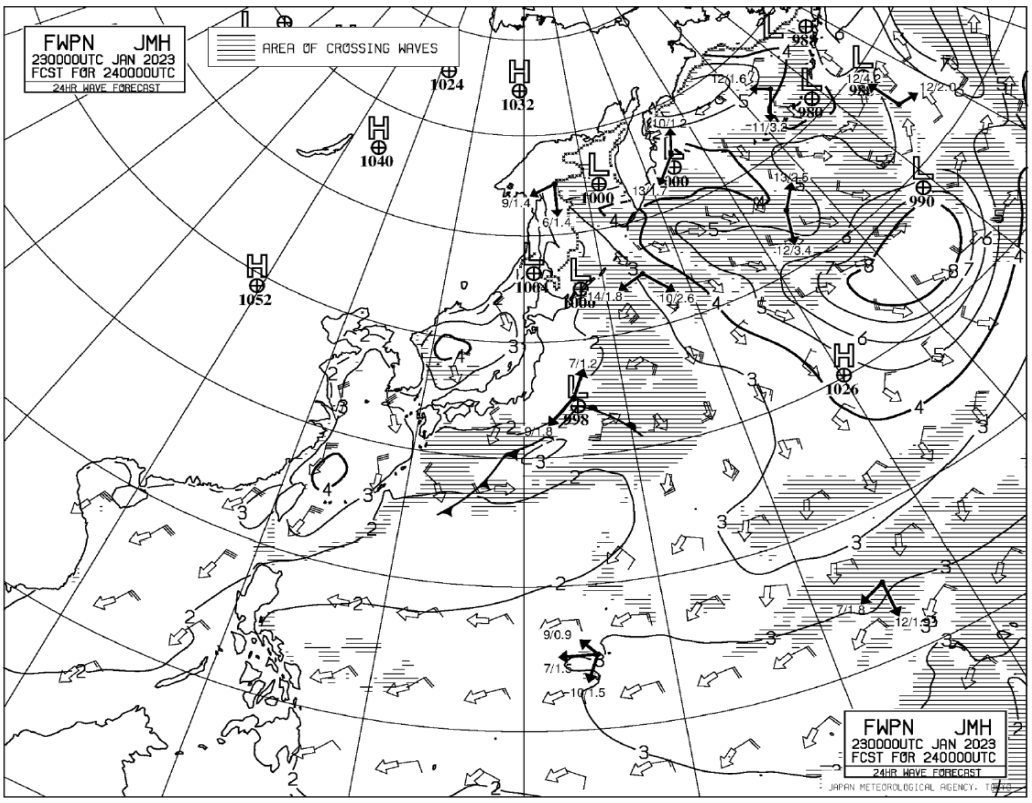

ASAS JMH
230000UTC JAN.2023
SURFACE ANALYSIS
EXPLANATORY NOTES
[TW] TYPHOON WARNING
[SW] STORM WARNING
[GW] GALE WARNING
[W] WARNING(NEAR GALE)
FOG[W] WARNING(DENSE FOG)
[GW] or [SW] AREA
FOG [W] AREA
70% PROBABILITY CIRCLE OF LOW-PRESSURE CENTER
New FORMATION EXPECTED
SCALE IN NAUTICAL MILES
LATITUDE
NAUTICAL MILES
DEVELOPED LOW
978 hPa
45N 173E
MOVE E 20 KT
WINDS 30 TO 50 KT TO SW-SEMICIRCLE WITHIN 300 NM AND 400 NM ELSEWHERE
ASAS JMH
230000UTC JAN.2023
SURFACE ANALYSIS
JAPAN METEOROLOGICAL AGENCY TOKYO

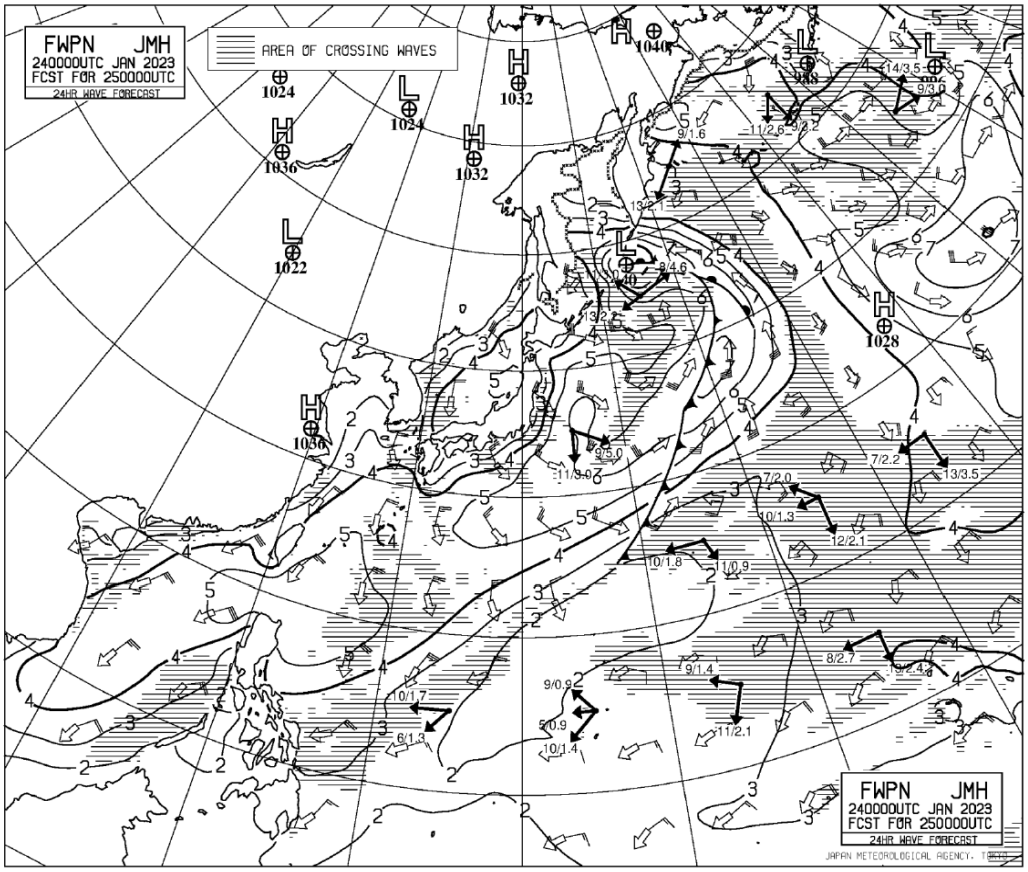

ASAS JMH
240000UTC JAN.2023
SURFACE ANALYSIS
EXPLANATORY NOTES
[TW] TYPHOON WARNING
[SW] STORM WARNING
[GW] GALE WARNING
[W] WARNING(NEAR GALE)
FOG[W] WARNING(DENSE FOG)
[GW] or [SW] AREA
FOG [W] AREA
70% PROBABILITY CIRCLE OF LOW-PRESSURE CENTER
New FORMATION EXPECTED
SCALE IN NAUTICAL MILES
LATITUDE
NAUTICAL MILES
DEVELOPING LOW
968 hPa
35N 145E
NE 40 KT
EXPECTED WINDS 30 TO 60 KT WITHIN 1500 NM OF LOW SW-SEMICIRCLE AND 700 NM ELSEWHERE WITHIN NEXT 24 HOURS
ASAS JMH
240000UTC JAN.2023
SURFACE ANALYSIS
JAPAN METEOROLOGICAL AGENCY TOKYO

(2) Wave forecast charts issued by JMA, Tokyo on 21, 22, 23, and 24 January 2023






FWPN JMH
230000UTC JAN 2023
FCST FOR 240000UTC
24HR WAVE FORECAST
AREA OF CROSSING WAVES
FWPN JMH
230000UTC JAN 2023
FCST FOR 240000UTC
24HR WAVE FORECAST
JAPAN METEOROLOGICAL AGENCY.


FWPN JMH
240000UTC JAN 2023
FCST FOR 250000UTC
24HR WAVE FORECAST
AREA OF CROSSING WAVES
FWPN JMH
240000UTC JAN 2023
FCST FOR 250000UTC
24HR WAVE FORECAST
JAPAN METEOROLOGICAL AGENCY.