REPUBLIC OF THE MARSHALL ISLANDS

Maritime Administrator

ASTERIS MARINE SAFETY INVESTIGATION REPORT

Fatal Fall from Height

South China Sea | 17 April 2024

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AUTHORITY

An investigation, under the authority of the Republic of the Marshall Islands laws and regulations, including all international instruments to which the Republic of the Marshall Islands is a Party, was conducted to determine the cause of the casualty.

Maritime Administrator

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LIST OF ABBREVIATIONS AND ACRONYMS

°	Degrees
ASD	Able Seafarer Deck
C/E	Chief Engineer
C/O	Chief Officer
DWT	Deadweight Tonnage
GT	Gross Tonnage
ILO	International Labour Organization
IMO	International Maritime Organization
m	Meters
No.	Number
OS	Ordinary Seafarer
PPE	Personal Protective Equipment
SMS	Safety Management System
UK MCA	United Kingdom Maritime and Coastguard Agency
US OSHA	United States Occupational Safety and Health Administration
UTC	Universal Coordinated Time

DOCUMENTS CITED

29 C.F.R. § 1915.159	Code of Federal Regulations, Title 29, Part 1915.159
Accident Prevention on Board Ship Code	Code of Practice on Accident Prevention on Board Ship at Sea and in Port
COSWP	Code of Safe Working Practices for Merchant Seafarers
IMO Resolution MSC.133(76)	Adoption of Technical Provisions for Means of Access for Inspections
ISM Code	International Management Code for the Safe Operation of Ships and for Pollution Prevention
MLC, 2006	Maritime Labour Convention, 2006
MSA No. 10-24	Marine Safety Advisory No. 10-24, Fatalities Due to Falls from Height
SOLAS	International Convention for the Safety of Life at Sea, 1974
STCW Code	Seafarers' Training, Certification and Watchkeeping Code

PART 1: EXECUTIVE SUMMARY

On 17 April 2024, the Republic of the Marshall Islands-registered ASTERIS, a geared, five-hatch, bulk carrier, managed by Seamax Marine Inc. (the "Company"), was underway in the South China Sea on a ballast voyage. Work being done on board during the day included washing the cargo holds. The hatch covers for all five cargo holds had been partially open since that morning to ventilate the cargo holds.

At approximately 1700,[1] the ASD2 and OS2 were tasked with starting to wash Cargo Hold No. 4 before stopping work for the day at 1800. It was planned for the ASD2, who was wearing a safety belt with a single lifeline, to work inside the cargo hold while the OS2 remained on deck next to the booby hatch to tend the hose and control the flow of water by opening and closing the fire hydrant to which the hose was connected.

The ASD2 directed the OS2 to turn the water on a few minutes after he entered Cargo Hold No. 4. The OS2 heard a loud "bang" from inside the cargo hold as he was returning to the booby hatch after opening the fire hydrant. He climbed down the ladder leading from the booby hatch to the catwalk at the top of the cargo hold. From the catwalk he saw the ASD2 lying motionless on the tank top. The OS2 immediately exited the cargo hold and raised the alarm.

A rescue was conducted per the ship's enclosed space entry rescue plan. Approximately 30 minutes after the OS2 first raised the alarm, the ASD2, whose head was bleeding, was removed without further incident from Cargo Hold No. 4 and transported to the ship's Hospital where he was administered first aid. The ship diverted toward the nearest port so the ASD2 could be disembarked for medical treatment. The ship rendezvoused with a rescue boat just after midnight on 18 April 2024 and the ASD2 was safely disembarked a short time later. The ASD2 was reported to have died while on the rescue boat en route to shore.

The safety belt and lifeline that the ASD2 had been wearing were both intact and the clip on the lifeline was operational when examined after the incident.

1 Unless stated otherwise, all times are ship's local time (UTC +7).

The marine safety investigation conducted by the Republic of the Marshall Islands Maritime Administrator (the "Administrator") determined that the lifeline on the ASD2's safety belt had not been connected to a strong point when he fell. This was due to either the fact the safety harnesses and safety belts on board the ship were fitted with a single lifeline and clip, which required that the lifeline be disconnected when moving it from one strong point to another, or that the ASD2 had not connected the lifeline to a strong point. The Administrator's investigation also determined that the Company's SMS did not address the Company's expectations for securing lifelines when climbing vertical ladders or working on an elevated platform.

The below lessons learned were identified.

- The importance of ensuring lifelines are connected to a strong point when climbing a vertical ladder and while on an elevated platform.
- The use of safety belts to protect against the consequences of a fall from height is contrary to the recommended best practice, which is to use a safety harness.
- To maintain continuous, positive fall prevention, it is necessary to use a safety harness with two lifelines and clips or a safety harness connected to a fall arrester.

PART 2: FACTUAL INFORMATION

The following Factual Information is based on the information obtained during the Administrator's marine safety investigation.

Ship particulars at the time of the incident: *see* chart to right.

Narrative

On the night of 16 April 2024, the geared, five-hatch, bulk carrier ASTERIS *(see Figure 1)* departed Campha, Socialist Republic of Vietnam (hereinafter "Vietnam") on a ballast voyage to Muara Berau, Republic of Indonesia, where the ship was scheduled to arrive on 23 April 2024.

SHIP PARTICULARS

Vessel Name
ASTERIS

Registered Owner
Spiliani Marine S.A.

ISM Ship Management
Seamax Marine Inc.

Flag State
Republic of the Marshall Islands

IMO No.	Official No.	Call Sign
9384796	2772	V7LN3

Year of Build	Gross Tonnage
2007	31,261

Net Tonnage	Deadweight Tonnage
18,291	53,629

Length x Breadth x Depth
183.1 x 32.3 x 17.2 m

Ship Type
Bulk Carrier

Document of Compliance Recognized Organization
DNV

Safety Management Certificate Recognized Organization
Nippon Kaiji Kyokai

Classification Society
Nippon Kaiji Kyokai

Persons on Board
21

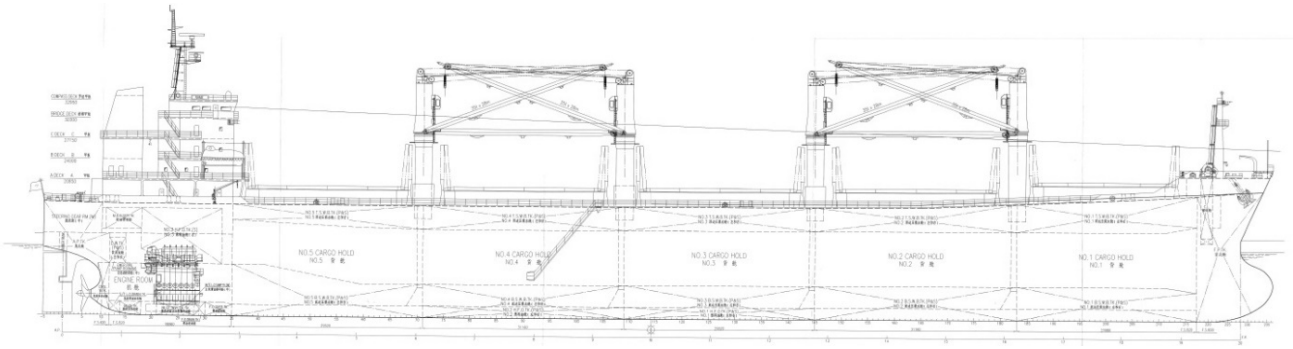

Figure 1: ASTERIS General Arrangement.

In preparation for cleaning the ship's cargo holds prior to arrival at Muara Berau, the C/O completed, and the Master approved, a risk assessment and a Working Aloft or Overside Permit on the morning of 17 April 2024. Hazards commonly associated with working aloft, include not using PPE, inadequate supervision, inadequate work planning, and failure to follow procedures that were identified on the risk assessment. The identified control measures for these hazards included designation of a supervisor for the planned work, completion of the Company-required familiarization training, and clear, consistent job instructions. Required PPE identified on the permit for working aloft included lifelines and harnesses.

The permit identified the Bosun as the person in charge of the work (i.e., the supervisor). It also identified the Bosun and the three ASDs as the persons who would be working aloft. Required PPE included lifelines, harnesses, and safety netting.[2] The PPE listed on the permit was in addition to the required primary PPE which included coveralls, safety boots, safety helmet, goggles, and gloves.

At 0800, the C/O conducted a Toolbox Talk with the Bosun and deck ratings to review the plan for cleaning the cargo holds. It was planned to first wash the bottom of the hatch covers and underdeck, working from forward to aft, before washing the bulkheads and tank tops. The Bosun and ASDs would work inside the cargo holds and the OSs would remain on deck to tend the hoses and control the supply of water. It was expected that cleaning the cargo holds would take three to four days to complete. The C/O also reviewed the hazards and associated controls that were identified on the risk assessment and the required PPE with the Bosun and deck ratings.

After the Toolbox Talk was completed, the hatch covers for all five cargo holds were partially opened to ventilate the cargo holds.[3] There is no record that the atmosphere inside the cargo holds was tested before crewmembers entered them on 17 April 2024.

The hoses used for washing the cargo holds were fitted with nozzles and a fitting so they could be connected to fire hydrants. Each of the hoses was approximately 25–30 m long. The nozzles were pieces of pipe connected to the hose by a hose clamp *(see Figure 2)*. The flow of water was controlled by opening or closing the fire hydrant. Crewmembers needed to stand on either the platforms that were part of the vertical ladder or on the Australia ladder while cleaning

2 Safety netting was available but not used when the cargo holds were being cleaned on 17 April 2024.

3 ASTERIS was fitted with folding hatch covers. It was estimated that the hatch cover panels were approximately 20–30° above horizontal after being partially opened.

the bottom of the hatch covers and underdeck since the hoses could not be effectively handled with one hand when the water was flowing.[4]

Figure 2: Hoses and nozzles that were used for cleaning the cargo holds.

The weather during the day on 17 April 2024 was good with Beaufort Force 5 winds from the south southeast and seas of 1.5–2.5 m. Crewmembers reported that the ship was not pitching or rolling more than 1–2°.

The Bosun, ASD1, ASD3, and the ship's two OSs cleaned Cargo Holds Nos. 1 and 2 before stopping for lunch.[5] The Bosun and ASDs worked inside the cargo holds while the OSs remained on deck to assist tending the hoses and turning the water on and off as instructed. After lunch, the Bosun, with assistance from the two OSs, both of whom remained on deck, started cleaning Cargo Hold No. 3.[6] At 1400, the ASD2 joined the Bosun and assisted with cleaning Cargo Hold No. 3.

By approximately 1700, the Bosun, ASD2, and two OSs had finished cleaning Cargo Hold No. 3. The Bosun directed the ASD2 and OS2 to start cleaning Cargo Hold No. 4 while he and the OS1 removed the hose they had been using from Cargo Hold No. 3. The Bosun also reminded the ASD2 and OS2 to stop work at 1800.

The Bosun and the three ASDs were reported to have been connecting their lifelines to strong points or fall arresters when they were cleaning Cargo Holds Nos. 1–3 during the day on 17 April 2024.

The ASD2 and OS2 removed the hose they had been using from Cargo Hold No. 3 and moved it aft to the forward booby hatch for Cargo Hold No. 4.[7] The OS2 connected the hose to the fire hydrant closest to the forward booby hatch. They then lowered the hose through the booby hatch into the cargo hold. The ASD2, who was wearing a safety belt with lifeline, then entered Cargo Hold No. 4 by climbing down the vertical ladder leading from the booby hatch to the catwalk at the top of the hold.[8] The OS2 observed that the ASD2 was connecting the lifeline to the ladder rungs

4 The actual water pressure in the hoses as the cargo holds were being cleaned on 17 April 2024 is not known. The typical discharge pressure of the ship's Fire and General Service pump was 5–6 bar.

5 ASD2 was on watch on the Bridge from 0800–1200. He attended the Toolbox Talk before reporting to the Bridge.

6 ASD3 was assigned to the 1200–1600 watch on the Bridge and ASD1 was resting during the afternoon before going on watch at 1600.

7 This booby hatch led to the vertical ladder in Cargo Hold No. 4.

8 This ladder was 2.4 m high.

as he climbed down the ladder. The OS2 lost sight of the ASD2 when he stepped through the manhole at the bottom of the ladder on to the catwalk at the top of the cargo hold *(see Figure 3)*. The OS2 remained on deck next to the booby hatch.

Figure 3: Vertical ladder and manhole leading to the catwalk at the top of Cargo Hold No. 4.

The ASD2 directed the OS2 to turn the water on a few minutes after he entered Cargo Hold No. 4. The OS2 went to the fire hydrant, which was about 15 m from the booby hatch, and turned on the water. Immediately after turning the water on, he started back to the booby hatch.

The OS2 heard what he described as a loud "bang" from inside the cargo hold when he was about 5 m from the booby hatch. The OS2, who was not wearing either a safety harness or safety belt and lifeline, ran to the booby hatch and climbed down the vertical ladder to the catwalk while calling for the ASD2. From the catwalk he saw the ASD2 lying motionless on the tank top about 1.5 m from the bottom of the vertical ladder. The hose was swinging inside the cargo hold with water coming from the nozzle.

The OS2 immediately went back up on deck and called for help using a handheld radio. Based on statements from the Master and other crewmembers, the call from the OS2 was at approximately 1730. The OS2 turned the water off and stood by the booby hatch to assist.

The Master and C/O, both of whom heard the OS2's call for help, and other crewmembers went out on deck to the forward booby hatch for Cargo Hold No. 4. The C/O instructed crewmembers to get a stretcher, cargo net, and lines. The C/O and Bosun entered the cargo hold and climbed down to the tank top. They found the ASD2 lying unconscious with his head bleeding. No water was reported dripping from the hatch covers or underdeck.

The C/O and Bosun put the ASD2 on the stretcher that had been lowered into the cargo hold together with a cargo net. They placed the stretcher with the ASD2 on it on the cargo net. The crewmembers who were assisting with the rescue on

deck then manually hoisted the ASD2 from the cargo hold.[9] The ASD2 was carried by stretcher to the ship's Hospital where he was administered first aid and his injuries were assessed.

At 1800, the Master informed the Company and requested immediate assistance arranging the ASD2's medical evacuation. At 2000, the Company instructed the Master to divert from the ship's planned route and proceed en route to Danang, Vietnam to rendezvous with a rescue boat with a medical doctor on board for the ASD2's medical evacuation. ASTERIS rendezvoused with the rescue boat at 0030 on 18 April 2024. At 0050, the ASD2 was transferred to the rescue boat, which immediately departed en route to shore. The ASD2 was reported to have died while on board the rescue boat.

Ship's Crew

On 17 April 2024, ASTERIS had a complement of 21 crewmembers, all of whom were Philippine nationals. Each held the appropriate Republic of the Marshall Islands-issued seafarer documentation for their position on board.

After being promoted from OS to ASD in 2017, the ASD2 had worked on board livestock carriers operated by another ship manager. In May 2023 he joined a Company-managed bulk carrier and completed one five-month contract before joining ASTERIS on 25 January 2024.

The ASD2 completed the Company required familiarization training, which included a review of the Company's safe work practices, after signing on board ASTERIS.

The Administrator did not observe any indication that the crewmembers involved with this incident had failed to receive the amount of rest mandated by the STCW Code, Section A-VIII/1, paragraphs 2 and 3 and MLC, 2006, regulation 2.3.

Company Procedures

As required by the ISM Code, the Company's SMS included procedures for routine shipboard tasks, including working aloft. The Company's procedures for working aloft or over the side required the Master or C/E to issue a permit authorizing any work aloft or over the side. The Company's procedures also required that a safety harness with lifeline or other arresting device be worn continuously when aloft or over the side and that a safety net be rigged "when necessary and appropriate." These procedures did not address the Company's expectations regarding securing lifelines to strong points when climbing vertical ladders or while on an elevated platform.[10] They also did not include guidance for determining when the use of a safety net would be necessary or appropriate.

Recommended Safe Work Practices

The ILO Accident Prevention on Board Ship Code and the UK MCA COSWP include recommended safe work practices. These internationally recognized recommended practices include guidance for seafarers to wear safety harnesses connected to a lifeline or other fall arresting device when working aloft and that safety nets be rigged when

9 A cargo crane was not used to lift the ASD2 from the cargo hold due to the weather conditions.

10 The Company's procedures did include a requirement to "where necessary" wear a safety harness with a lifeline secured above the position of work when working on a portable ladder at a height in excess of 2 m.

appropriate.[11] With the exceptions of working on a portable ladder or when accessing stacked containers,[12] neither provides guidance regarding securing lifelines to strong points when climbing vertical ladders or working from an elevated platform or other location where there is a risk of falling. Neither the ILO Accident Prevention on Board Ship Code nor the UK MCA COSWP included recommendations addressing when it would be appropriate to rig safety nets.

PPE

The Bosun, three ASDs, and two OSs were each wearing the required primary PPE while they were cleaning ASTERIS' cargo holds on 17 April 2024. Although safety harnesses were available on board, the Bosun and ASDs were each wearing a safety belt with lifeline connected to either a fall arrester or a suitable strong point while climbing vertical ladders or standing on an intermediate platform inside of Cargo Holds Nos. 1–3.

The ASD2 was wearing a safety belt with an attached lifeline when he was found lying on the tank top inside of Cargo Hold No. 4. The safety belt and lifeline were both intact and the clip (i.e., carabiner or snap hook) on the lifeline was operational *(see Figure 4)*. The ASD2's safety helmet was on the tank top about 1 m away from him.

Figure 4: Safety belt with lifeline and safety helmet worn by the ASD2.

Cargo Hold Access Arrangements

The forward access ladder for Cargo Hold No. 4 consisted of three vertical ladders, two intermediate platforms, and a two-piece inclined ladder *(see Figure 5)*.[13]

11 *See* the ILO's Accident Prevention on Board Ship Code, sections 5.4.7, 15.1.6, and 20.10.3, and UK MCA COSWOP, section 17.2.6. It is noted that the ILO's Accident Prevention on Board Ship Code was most recently updated in 1996. The UK MCA's COSWOP was most recently amended in 2022.

12 *See* the ILO's Accident Prevention on Board Ship Code, sections 15.5 and 24.3.13, and UK MCA COSWOP, sections 17.3 and 28.3.5.

13 The dimensions of the vertical and inclined ladders, angle of the inclined ladder, and height of the guardrails were all consistent with those required by IMO Resolution MSC.133(76). This resolution was adopted by the IMO to facilitate the implementation of SOLAS regulation II-1/3-6 and is applicable to bulk carriers of 20,000 GT or more constructed on or after 1 January 2006, which includes ASTERIS.

The aft side of the upper and lower intermediate platforms were fitted in the corrugated bulkhead at the forward end of the cargo hold. There was a guardrail along the side of both intermediate platforms that was open to the cargo holds. The side of the platforms that faced the intermediate section of the vertical ladder was not fitted with a guardrail.[14]

The forward access ladder for Cargo Hold No. 4 was found in good condition and free of defects when inspected after the ASD2 fell.

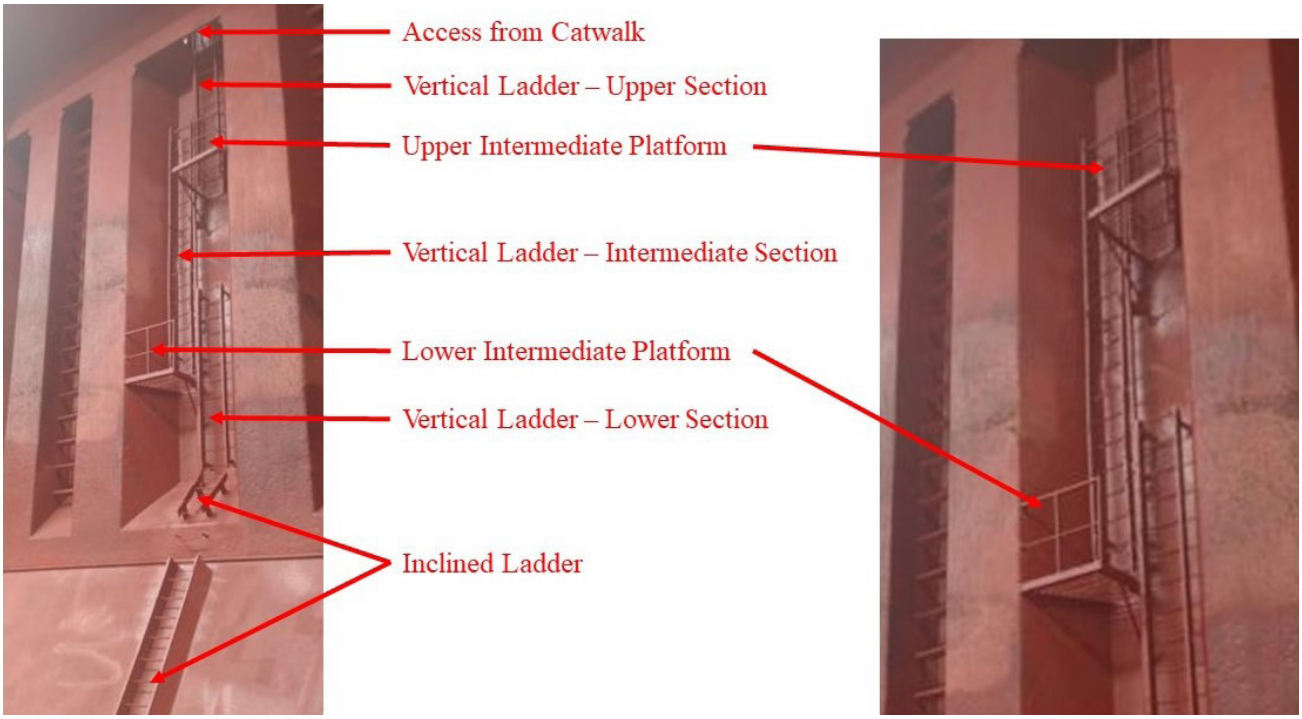

Figure 5: Vertical ladder at the forward end of Cargo Hold No. 4.

PART 3: ANALYSIS

The following Analysis is based on the above Factual Information.

ASD2's Fall

The ASD2 fell soon after the OS2 opened the fire hydrant in response to the ASD2's direction to turn on the water. The hoses used to wash the cargo holds could not be handled with one hand when the water was running so it would not have been possible for the ASD2 to hold onto the vertical ladder while the water was turned on and running. Therefore, he most likely had been standing on the upper intermediate platform, which was open on the side that faced the intermediate vertical ladder, just before falling.

14 IMO Resolution MSC.133(76) does not include minimum dimensions for platforms, which are intended as places to rest while climbing a vertical ladder located in a cargo hold or tank but does require platforms be "of adequate dimensions." It also requires that the vertical separation of platforms normally not exceed 6 m.

The ASD2 was wearing a safety belt with an attached lifeline and clip when he was found lying on the tank top inside of Cargo Hold No. 4. Both the safety belt and the lifeline and clip were intact when found *(see Figure 4)*. This indicates the ASD2's fall was not due to a failure of either the safety belt or the attached lifeline and clip. It also indicates the lifeline was not connected to a strong point (i.e., guardrail on the platform or a rung on the vertical ladder) immediately before he fell. Why the lifeline was not connected to a strong point cannot be determined.

The ASD2's fall inside Cargo Hold No. 4 was not witnessed so it is not possible to determine why he fell. It also could not be established why the ASD2 did not use a fall arrester when he entered Cargo Hold No. 4.

Company's Procedures for Working Aloft

Although crewmembers were wearing safety belts rather than safety harnesses while cleaning ASTERIS' cargo holds on 17 April 2024, the available information indicates they were familiar with the Company's procedures for working aloft and that they had been connecting the lifelines to strong points or a fall arrester when they were working inside of Cargo Holds Nos. 1–3.

As previously stated, the Company's procedures did not:

(a) address Company expectations regarding securing lifelines to strong points when climbing vertical ladders or working on an elevated platform; or

(b) provide guidance regarding when the use of a safety net would be necessary or appropriate.

The guidance in the Company's procedures was consistent with internationally recognized recommended safe work practices regarding wearing harnesses and the use of safety nets when working aloft that also do not address securing lifelines to strong points except when working on portable ladders or accessing stacked containers, or when it would be appropriate to rig a safety net.

PPE for Fall Protection

Seafarers frequently use safety belts and safety harnesses interchangeably to protect against the consequences of a fall from height. This is contrary to recommended best practice, which is to use a safety harness.[15] It is noted that US OSHA has prohibited the use of body belts (i.e., safety belts) for arresting or stopping a fall since 1998 because they may damage the spine and internal organs.[16]

The safety harnesses and safety belts on board ASTERIS were fitted with a single lifeline. The fact that there was only one lifeline made it necessary to disconnect the lifeline when moving it from one strong point to another while aloft. This would have increased the likelihood of falling since the lifeline would have been disconnected for the length of time required to disconnect the clip from one strong point and then reconnect it to another strong point.

It is possible to maintain continuous, positive fall protection by using a safety harness with two lifelines and clips since one lifeline can remain connected to a strong point while the other one was being connected to the next strong point. Continuous, positive fall protection can also be maintained by using a safety harness connected to a portable fall arrester.

15 *See* the ILO's Accident Prevention on Board Ship Code, sections 5.4.7 and 15.1.6, and UK MCA COSWOP, section 17.2.6.

16 *See* 29 C.F.R. § 1915.159.

PART 4: CONCLUSIONS

The following Conclusions are based on the above Factual Information and Analysis and shall in no way create a presumption of blame or apportion liability.

1. Causal factors that contributed to this very serious marine casualty include:
   (a) the lifeline on the ASD2's safety belt not being connected to either a strong point or fall arrester when he fell; and
   (b) the safety harnesses and safety belts on board the ship, which had a single lifeline and clip, made it necessary to disconnect the lifeline when changing it from one strong point to another.
2. Additional causal factors that may have contributed to this very serious marine casualty include:
   (a) the Company's procedures for working aloft or over the side did not address:
      (i) the Company's expectations for securing lifelines when climbing vertical ladders or working on an elevated platform; and
      (ii) when it may be necessary or appropriate to use a safety net; and
   (b) available internationally recognized recommended safe work practices that do not include guidance addressing:
      (i) securing lifelines when climbing vertical ladders or working from an elevated platform or other location where there is a risk of falling; and
      (ii) when it would be appropriate to rig a safety net.
3. Additional issues that were identified but that did not contribute to this very serious marine casualty include:
   (a) the use of safety belts rather than safety harnesses when working aloft;
   (b) the OS2 entering Cargo Hold No. 4 without wearing either a safety belt or a safety harness; and
   (c) the lack of evidence that the atmosphere inside the cargo holds had been checked before crewmembers entered them on 17 April 2024.

PART 5: PREVENTIVE ACTIONS

In response to this very serious marine casualty, the Company has taken the following Preventive Actions:

1. A special Safety Committee meeting was conducted on board ASTERIS during which the Master reviewed the ASD2's fall with the ship's crewmembers while emphasizing the importance of complying with established safety rules and procedures. Additional training, which included a demonstration of the proper use of PPE and safety equipment while working aloft, was also conducted.
2. The Company issued a Safety Circular to all ships in the Company's managed fleet communicating the findings of the Company's investigation and identified preventive actions and lessons learned, which included that:

(a) a proper pre-meeting should be held before commencing work;

(b) personnel should be clearly instructed of the work scope, procedures, and precautions to be taken;

(c) personnel carrying out the work must wear all appropriate clothing with full provided PPE;

(d) the condition and strength of safety belts, helmets ropes, and lifelines should be properly checked prior to use;

(e) the rolling period and wind speed must be taken into consideration to find out if the work can be carried out safely;

(f) warning notices for the use of protective equipment must be posted at working areas;

(g) safety checks during operation must be maintained;

(h) there is to be enhanced on-the-spot supervision by the person in charge during cargo hold cleaning; and

(i) if portable ladders are used, they must be checked if they have been set correctly at suitable places. Fatal accidents do not occur only while working aloft. Several accidents occurred when seafarers slipped / tripped and fell from heights.

3. The Administrator has taken the following Preventive Action:

(a) Issued MSA No. 10-24 addressing fatalities due to falls from height. MSA No. 10-24 includes recommendations based on a review of fatal falls from height that have occurred on board Republic of the Marshall Islands-registered ships since 2019 through the date it was released. It also includes a safety flyer intended to be posted on board ships in areas where seafarers are likely to see it on a daily basis.

PART 6: RECOMMENDATIONS

The following Recommendations are based on the above Conclusions and in consideration of the Preventive Actions taken.

1. It is recommended that the Company:

(a) require the use of two lifelines or fall arresters when climbing vertical ladders or while working on elevated platforms that have an open side;

(b) remove safety belts from the ships in their fleet;

(c) revise the Company's procedures for working aloft or over the side to address:

(i) the Company's expectations for securing lifelines when climbing vertical ladders or while on an elevated platform; and

(ii) when it may be necessary or appropriate to use a safety net.

2. It is recommended that the Administrator bring to the attention of the ILO the identified gap in the guidance included in their Accident Prevention on Board Ship Code regarding securing lifelines and rigging of safety nets.

The Administrator's marine safety investigation is closed. It will be reopened if additional information is received that warrants further review.