REPUBLIC OF THE MARSHALL ISLANDS

Maritime Administrator

TAMAR CASUALTY INVESTIGATION REPORT

Fire with Loss of Life

Atlantic Ocean | 24 April 2017

Official Number: 3703

IMO Number: 9456226

Published by: Republic of the Marshall Islands Maritime Administrator on 24 January 2020

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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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PART 1: EXECUTIVE SUMMARY

On 24 April 2017, the Republic of the Marshall Islands-registered bulk carrier TAMAR, managed by Splosna Plovba Ltd. (the "Company") was on a laden voyage from Baltimore, Maryland, United States of America (USA) to India with a coal cargo. Four crewmembers were preparing for an enclosed space entry into a Void Space, which was accessed through the Boatswain's Store. An explosion occurred while the crewmembers were working in the Boatswain's Store. All four crewmembers were severely burned but were able to exit the space on their own. The remaining crewmembers extinguished the fire and provided medical care to the injured crew. The Bosun and an Able Seafarer Deck (ASD) 1 succumbed to their injuries and were pronounced deceased by the Master. The other two injured crewmembers, an Ordinary Seafarer (OS) 1 and Apprentice Mate, were evacuated from the ship by helicopter and transferred ashore for treatment.

The Republic of the Marshall Islands Maritime Administrator's (the "Administrator's") marine safety investigation concluded that the causal factors which contributed to the explosion and subsequent loss of life were:

1. failure to properly maintain the access hatch seal for the forward ladder of Cargo Hold No. 1, which resulted in flammable gasses being emitted from the hatch;
2. TAMAR's design and construction which placed the access hatch of Cargo Hold No. 1's forward ladder in the Windlass Control Room, allowing for flammable gasses to collect in an enclosed space; and
3. improperly using a passive gas detection device to sample the remote atmosphere of the cargo holds and enclosed spaces, which likely resulted in inaccurate readings and prevented the identification of a hazardous atmosphere.

The Administrator's marine safety investigation also identified the following causal factors which may have contributed to this incident:

1. rough seas which prevented the Boatswain's Store from being opened for several days prior to the incident;
2. failure of the shipper (as required by the International Maritime Solid Bulk Cargoes (IMSBC) Code) to provide TAMAR's Master with information about the cargo's tendency to emit flammable gasses;
3. failure of TAMAR's Master and Chief Officer (C/O) to ensure the cargo information required by the IMSBC Code was received prior to loading; and
4. the Master and C/O's lack of familiarity with the IMSBC Code's special requirements for the carriage of coal cargoes.

PART 2: FINDINGS OF FACT

The following Findings of Fact are based on the information obtained during the Administrator's marine safety investigation.

1. Ship particulars: see chart to right.

General Arrangements

2. TAMAR has five cargo holds with folding hatch covers.
3. The Boatswain's Store is located forward with access through two watertight doors on the upper deck. The Windlass Control Room and Carpenter Room are accessible from within the Boatswain's Store *(see Figure 1)*.

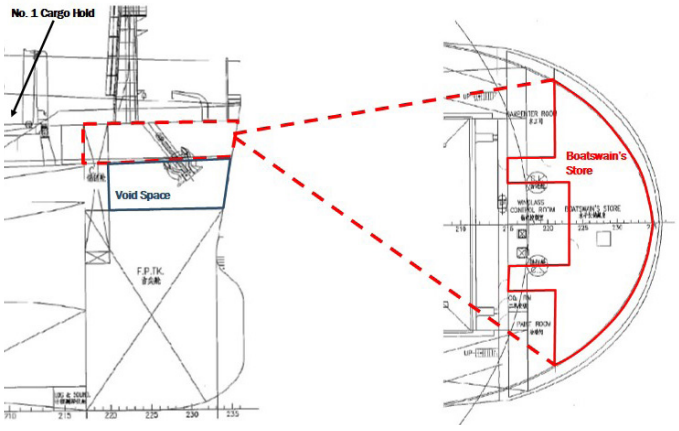

Figure 1: General arrangement plan showing Cargo Hold No. 1 and the Boatswain's Store.

SHIP PARTICULARS

Ship Name
TAMAR

Registered Owner
Genshipping Corporation

ISM Ship Management
Splosna Plovba Ltd.

Flag State
Republic of the Marshall Islands

IMO No.	Official No.	Call Sign
9456226	3703	V7SQ6

Year of Build	Gross Tonnage
2010	32,987

Net Tonnage	Deadweight Tonnage
19,231	57,000

Length x Breadth x Depth
185.6 x 32.2 x 18.0 meters

Ship Type
Bulk Carrier

Document of Compliance Recognized Organization
Bureau Veritas

Safety Management Certificate Recognized Organization
Bureau Veritas

Classification Society
Lloyd's Register

Persons on Board
20

4. A void space is located below the Boatswain's Store *(see Figure 1)* and is accessed by two manholes located within the Boatswain's Store *(see Figure 2)*.

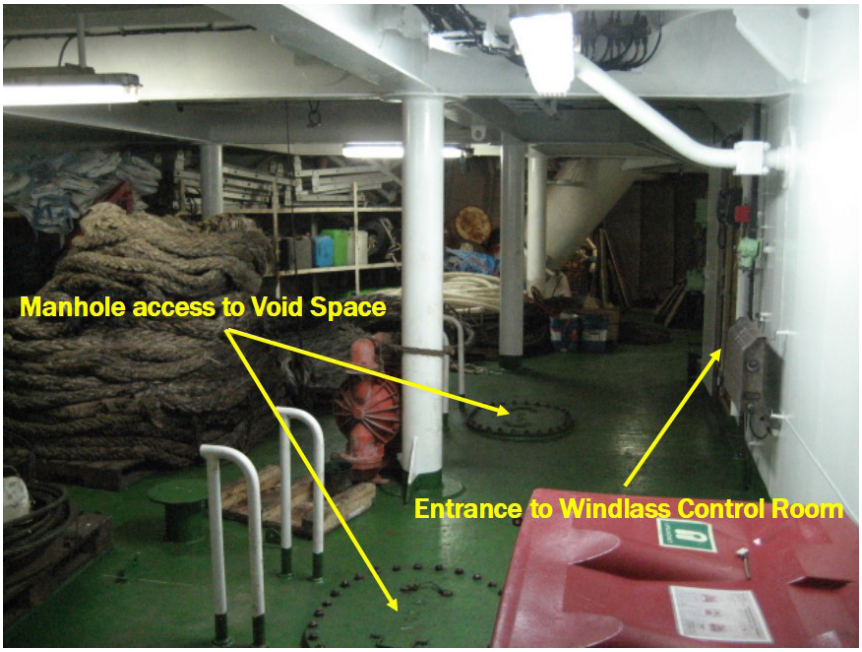

Figure 2: Boatswain's Store (viewed from port side).

5. The access hatch for the Cargo Hold No. 1 forward ladder is located within the Windlass Control Room *(see Figure 3)*.

Figure 3: Access hatch to the Cargo Hold No. 1 forward ladder located within the Windlass Control Room.

6. Each cargo hold cover has ventilation hatches fitted with watertight covers. Cargo Hold No. 1 has two ventilation hatches on the forward side of the hold cover and two on the aft side *(see Figure 4)*.

Figure 4: Ventilation hatch on the forward starboard side of the Cargo Hold No. 1 hatch cover.

Cargo Loading

7. TAMAR berthed in Baltimore, Maryland, USA on 16 April 2017 to load coal.

8. The coal shipper provided the vessel with a declaration form documenting the cargo and its properties, which was signed for by the Master on 16 April 2017.[1] The declaration indicated the cargo to be shipped was steam coal (size 0 to 50 millimeters (mm)) and classified as a Group B cargo.[2] In addition, the declaration identifies the cargo as "materials hazardous only in bulk."[3] The cargo declaration did not include information regarding the likelihood of toxic or flammable gas generation by the coal cargo. Additionally, the declaration did not provide information regarding the flammability, toxicity, corrosiveness, and propensity to oxygen depletion of the cargo.

9. The loading of 55,001 metric tons of coal was completed at 1950[4] on 16 April 2017 and the ship departed Baltimore that evening.

Voyage

10. On departure, the exact discharge port in India had not yet been nominated. The voyage plan had the ship sailing to Gibraltar, where bunkers would be taken on, and then continuing through the Suez Canal to India.

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1 The International Maritime Organization's (IMO's) IMSBC Code, Resolution MSC.268(85), Section 4.2 details the information to be provided to the Master or their representative in advance of loading.

2 The IMSBC Code defines Group B cargoes as those "which possess a chemical hazard which could give rise to a dangerous situation on a ship."

3 The IMSBC Code defines "materials hazardous only in bulk" as "materials which possess chemical hazards when transported in bulk other than materials classified as packaged dangerous good in the International Maritime Dangerous Goods (IMDG) Code."

4 Unless otherwise stated, all times are ship's local time (UTC -3).

11. Atmospheric testing of all cargo holds was completed daily during the voyage by the C/O. The holds were monitored for flammable gases,[5] carbon monoxide, oxygen, and temperature. Records of atmospheric testing of all cargo holds did not note any irregularities from the day of departure to 23 April 2017 (no flammable gases or carbon monoxide, adequate oxygen, and stable temperature were reported each day). Measurements were not taken on 21 April 2017 as no crewmembers were allowed on deck due to rough seas.[6]

12. It was reported that the ventilation hatches for all cargo holds were opened between approximately 0900 to 1700 each day, except for 21 and 22 April (due to the rough seas).

13. High winds and rough seas were experienced between 20 and 23 April 2017. Conditions peaked on 21 April 2017 with Beaufort Force 10 winds and 8 meter (m) seas recorded. During this time, it was reported that no work was done on deck.

14. On 24 April 2017, weather conditions had subsided, and the C/O determined that it was safe to resume normal work on deck.

15. The C/O decided that the daily work would include cleaning a Void Space under the Boatswain's Store and moving a pneumatic diaphragm pump from the Boatswain's Store to the upper deck. The pump was scheduled to be landed ashore on arrival at Gibraltar.

16. In accordance with the Company's Safety Management System (SMS), the Void Space was considered an enclosed space, requiring that certain actions be taken before and during entry.

17. The C/O reported that he carried out atmospheric testing of Cargo Hold No. 1 at around 0815, with no flammable gasses detected. He then reportedly entered the Boatswain's Store, with the gas detector running, to check the Void Space atmosphere. The C/O reported that he did not detect any flammable vapors in the Boatswain's Store or Void Space. He then went to the Accommodation to enter the results into the enclosed space entry checklist. During this time, the Bosun, ASD1, OS1, and Apprentice Mate were transferring plastic garbage from the Boatswain's Store to Masthouse No. 1.

18. An enclosed space entry checklist was completed by the C/O, which noted the reason for entry as "Cleaning Void Space" and was valid from 0830 to 1600 on 24 April 2017. The checklist identified the Bosun, ASD1, OS1, and Apprentice Mate as the persons entering the space.

19. The C/O instructed the Bosun to transfer the pneumatic diaphragm pump from the Boatswain's Store to the upper deck while he was completing the enclosed space entry checklist in the Accommodation.

20. At about 0835, the crew reported hearing a loud explosion from the forward part of the ship. The Third Officer (3/O), who was on watch on the Bridge at the time, reported seeing heavy smoke coming from the Boatswain's Store. He immediately activated the general alarm and made an announcement regarding a fire

5 Measurements of flammable gases were recorded as a percent of the lower explosive limit (LEL). A flammable gas's LEL is the minimum concentration of that gas that can produce a flash of fire when exposed to an ignition source.

6 IMSBC Code, Resolution MSC.268(85), Appendix 1 (Individual Schedule for Coal) Section 2.3.4 requires that gas measurements be logged on a form which records the cargo space, date and time for each measurement, and the readings. These were recorded on an electronic log which lists the date and time the samplings were started and the results for each cargo hold. No handwritten notes, or other rough log, were available on board.

in the Boatswain's Store over the ship's public address system. It is not known with certainty where the four crewmembers were within the Boatswain's Store at the time of the explosion.

21. At that time, ASD2, ASD3, and OS2 were chipping paint on the aft deck. After hearing the explosion, they proceeded forward along the starboard side. They reported encountering OS1 walking aft in the vicinity of Cargo Hold No. 1. The crewmembers reported that OS1 appeared badly burned and was in a daze. He told them that ASD1 and the Bosun were still inside the Boatswain's Store.

22. When ASD2, ASD3, and OS2 arrived at the Boatswain's Store, the Bosun, ASD1, and the Apprentice Mate had exited the space and were on the starboard side main deck just outside the entrance. All three were reported to have been badly burned and disoriented. They did not enter the Boatswain's Store to check for other injured crewmembers or fire since they did not have a self-contained breathing apparatus (SCBA).

23. At about the same time, the Electrician and an Oiler, who were conducting maintenance on Deck Crane No. 3[7], arrived with a SCBA. The Oiler donned the SCBA and entered the Boatswain's Store to look for injured crewmembers, reporting that he did not find anyone else in the space.

24. By 0855, the fire was extinguished by the ship's crew using fire hoses and portable extinguishers.

25. The Second Officer (2/O), who was sleeping in his cabin at the time, was awakened by the Apprentice Mate who had walked aft to the Accommodation. Seeing his burn injuries, the 2/O took him to the ship's hospital to begin treatment. The 2/O then heard OS1 screaming on the main deck near the Accommodation and brought him into the hospital as well. He told the Apprentice Mate to go to his cabin and spray himself with water in the shower while he attended to OS1.

26. While treating OS1, the 2/O was notified that ASD1 was also badly burned and was being brought to the hospital by stretcher. To make room for the more seriously injured ASD1, the 2/O sent OS1 to his cabin to spray himself with water in the shower. When ASD1 was brought to the Hospital, it was noted that he was severely burned and unable to speak.

27. The 2/O was then notified that the Bosun was also badly burned and was taken to his cabin. The Electrician was directed to stay with ASD1 and continue administering care while the 2/O went to the Bosun's cabin. The 2/O observed that the Bosun was also badly burned but able to speak.

28. At 0923, the Master notified Maritime Rescue Coordination Center (MRCC) Lisboa regarding the injured crew. MRCC Lisboa provided a location for the vessel to meet with a rescue aircraft. The ship altered course to proceed to this location.

29. At 1350, the 2/O was notified that ASD1 had stopped breathing. He went to his cabin and found that he had no pulse or respiration. Crewmembers began cardiopulmonary resuscitation (CPR) without a response from ASD1. Shortly after, the 2/O reported to the Master that ASD1 was deceased.

30. At about 2200, a rescue aircraft from the United States Air Force arrived at the location of TAMAR. They advised that they would drop a rescue boat, seven medical responders, and the necessary medical equipment.

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7 Deck Crane No. 3 is located between Cargo Hold Nos. 3 and 4.

31. At 2245, the 2/O was notified that the Bosun had stopped breathing. He went to his cabin and initiated CPR. With no pulse or breathing observed, CPR was stopped and the Bosun was determined to be deceased.

32. By 0055 on 25 April 2017, all seven Air Force medical responders, along with their equipment, were on board TAMAR. They commenced treatment of OS1 and the Apprentice Mate.

33. The vessel was directed by MRCC Lisboa to proceed to a rendezvous point where a helicopter would remove the two injured crewmembers from the vessel for transfer ashore.

34. At 0805, OS1, the Apprentice Mate, and three of the responders were hoisted to the helicopter for transport ashore.

Damage

35. Damage in the Boatswain's Store was mainly limited to melted plastics and burned combustible materials. The heaviest damage was near the entrance to the Windlass Control Room, whose door was open at the time of the explosion. However, combustible materials (such as rags, brooms, boxes, etc.) throughout the space were damaged by fire and heat.

36. It was reported that the doors to the Boatswain's Store from the upper deck were open when the explosion occurred. This is evidenced by the smoke and heat damage seen outside the entrances to the space.

37. The port and starboard covers of the ventilation hatches for Cargo Hold No. 1 had heat damage to the outside of their covers. The insides of the ventilation hatch covers and their screens did not show any damage from exposure to fire, heat, or smoke. This indicates that the ventilation hatches were closed at the time of the explosion *(see Figure 5)*.

Figure 5: Port and starboard ventilation hatches for Cargo Hold No. 1. Heat damage present on exterior side of hatch only.

Gas Detection Equipment

38. The IMSBC Code required that the ship be provided with appropriate instruments for measuring methane, oxygen, and carbon monoxide without requiring entry into the cargo space. The instrument is required to be fitted with an aspirator, flexible connection, and a length of spark-proof metal tubing.[8]

39. The C/O used a "T4 Portable Multigas Detector" to conduct atmospheric testing of the cargo holds, Boatswain's Store, and Void Space. The unit is designed to measure oxygen, carbon monoxide, hydrogen sulfide, and flammable gasses. This gas detection device is designed for personal use and is passive in nature (the unit does not have an internal pump). An aspirator plate can be attached to the device and used with a hand pump for sampling remote areas. There was no evidence that the C/O was using an aspirator with the gas detection device before or at the time of the incident.

40. The gas detection device that the C/O used was calibrated by a manufacturer's authorized service company on 23 February 2017. The test record indicated that the unit passed all parameters and that the next calibration was due by 19 May 2018.

41. The cargo hold atmospheric testing record indicated that no flammable gasses were detected in any cargo hold between loading on 16 April and 25 April 2017. The record indicates that flammable gasses were then found within Cargo Hold No. 1 from 26 April until discharge, with a peak of 45% LEL being recorded on 26 April 2017.

Work Rest Hours

42. The Administrator did not find any indication that any crewmembers involved with this incident did not receive the amount of rest mandated by the IMO's Seafarers Training, Certification and Watchkeeping (STCW) Code, Section A-VIII/1, paragraphs 2 and 3 and the International Labour Organization's Maritime Labour Convention, 2006, regulation 2.3.

SMS

43. As required by the IMO's International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code), the Company's SMS provided procedures for shipboard tasks. These SMS procedures included requirements for personal protective equipment use, conducting pre-task hazard assessments (Toolbox Talks), and issuing a permit to work when conducting various shipboard tasks (including enclosed space entry).

44. On 24 April 2017, the C/O completed the required "Safety Check List Before Entry into Enclosed Spaces" with the reason for entry noted as "Cleaning Void Space FT." The permit was valid from 0830 to 1600 that day and listed the Bosun, ASD1, OS1, and Apprentice Mate as the entrants. The Bosun was indicated as the team leader. The permit required that atmospheric testing be conducted from several levels and through as many openings as possible. The C/O recorded that he completed this testing at 0820 and that no flammable gasses were detected.

8 IMSBC Code, Resolution MSC.268(85), Section 3.2.5 and Appendix 1 (Individual Schedule for Coal).

Cargo Hold No. 1 Forward Ladder Access Hatch

45. Following the incident, the access hatch cover for the Cargo Hold No. 1 forward ladder was found to not seal tightly. When closed, the coaming and the cover gasket had a gap between them, resulting in air leaking from the hold into the Windlass Control Room. Following the incident, flammable gasses (up to 18% LEL) were detected entering the Windlass Control Room from the access hatch.

46. The crew stated that this access hatch was not frequently used as there were other more convenient means of access to the cargo hold.

47. The International Convention for the Safety of Life at Sea, 1974 as amended (SOLAS 74), Chapter II-1 Regulation 3-6 requires that all bulk carriers of 20,000 gross tonnage and over, constructed on or after 1 January 2006, be provided with two widely-separated means of safe access to cargo holds. The means of safe access to cargo holds "shall be direct from the open deck". Following the incident, the ship's classification society conducted a review of the design of the cargo hold access arrangements on board TAMAR. They determined that TAMAR's construction complied with this requirement since the aft ladder accessed the hold from the open deck.

IMSBC Code Cargo Hold Ventilation Requirements

48. The IMSBC Code requires providing surface ventilation to all cargo spaces carrying coal for the first 24 hours after departure from the loading port. During this period, atmospheric testing of the cargo holds must be conducted, with the ventilation stopped for an appropriate period prior to monitoring. When methane concentrations measured within the first 24 hours after departure are acceptable low, the ventilation openings shall be closed, and atmosphere continued to be monitored.[9]

PART 3: ANALYSIS

The following Analysis is based on the above Findings of Fact.

IMSBC Code "Provision of Information"

The IMSBC Code Section 4.2 requires that certain information regarding bulk cargoes be provided to the Master or their representative "sufficiently in advance of loading to enable precautions which may be necessary for proper stowage and safe handling to be put into effect."

While the shipper provided a declaration to the Master in the form recommended by the IMSBC Code, it failed to include information regarding the likelihood of generation of toxic or flammable gasses by the coal cargo. The declaration did not provide information regarding the flammability, toxicity, corrosiveness, and propensity for oxygen depletion of the cargo.

Cargo Hold Atmospheric Testing

The IMSBC Code Annex to the Individual Schedule of Solid Bulk Cargo for Coal requires that "the space above

9 IMSBC Code, Appendix to the Individual Schedule of Solid Bulk Cargoes for COAL.

the cargo in each space shall be regularly monitored for the concentration of methane, oxygen, and carbon monoxide […] The frequency of the monitoring shall be determined based upon the information provided by the shipper" and the atmospheric testing results from the cargo spaces.

Even though the cargo declaration provided by the shipper did not include information regarding the hazardous gas generation, or propensity for the depletion of oxygen, the C/O conducted daily atmosphere testing of all cargo holds.

The C/O's gas test meter was not suitable for the intended use. The meter did not have an internal pump, nor was an external aspirator used. All the testing was passive in nature. This prevented any sample from being drawn from the cargo holds and would result in reporting inaccurate readings. The sudden change in recorded values of flammable gasses detected in Cargo Hold No. 1 indicates that readings before the incident may have been inaccurate.

Cargo Hold Ventilation

On Tamar's departure from Baltimore, it was reported that all cargo hold ventilation hatches were closed and not opened until 0850 the next day (17 April 2017). The first atmospheric testing was conducted for all holds beginning at 0830 on 17 April 2017. Ventilation hatches for all cargo holds were closed overnight and opened each day between approximately 0900 and 1700. However, the IMSBC Code states:

Surface ventilation shall be conducted in all cargo spaces carrying this cargo for the first 24 hours after departure from the loading port. During this period, the atmosphere in the cargo spaces shall be monitored once from one sample point per cargo space and for the purpose of the gas monitoring, the ventilation shall be stopped for an appropriate period prior to the gas monitoring.

When the methane concentrations monitored within 24 hours after departure are at an acceptably low level, the ventilation openings shall be closed and the atmosphere in the cargo spaces shall be monitored. When the methane concentrations monitored within 24 hours after departure are not at an acceptably low level, surface ventilation shall be maintained, except for an appropriate period for gas monitoring, and the atmosphere in the cargo spaces shall be monitored. This procedure shall be followed until the methane concentrations become acceptably low level. In any event, the atmosphere in the cargo spaces shall be monitored on a daily basis.

The failure to keep the vents open for the first 24 hours would have likely increased the rate of flammable gas accumulation. Further, opening the ventilation hatches of all holds every day was not in compliance with the requirements of the IMSBC Code. This allowed continued exposure of the coal cargo to oxygen, which could have increased the rate of oxidation and flammable gas generation.

Cargo Hold No. 1 Forward Ladder

The access hatch for the Cargo Hold No. 1 forward ladder was in the Windlass Control Room inside the Boatswain's Store. Following the incident, it was noted that the access hatch did not seal tightly, even when fully tightened. Air movement from the cargo hold into the Windlass Control Room was felt and subsequently

tested with gas detection equipment. It was found that the air entering the Windlass Control Room from the hold contained up to 18% LEL. While this concentration of flammable gas is theoretically not high enough to ignite, it would likely build up over time in the Windlass Control Room and the Boatswain's Store. There was no access to these spaces for several days before the incident and it is likely that flammable gasses accumulated until they reached ignitable levels.

Crewmembers stated that the forward ladder for Cargo Hold No. 1 was not used regularly as there was another more convenient access point. As the forward ladder access hatch was protected from the elements and seawater, it probably did not receive the same preventative maintenance as the on-deck hatches.

SOLAS 74 Ch. II-1/3-6 requires safe access to cargo holds accessible from an open deck. The ship's classification society confirmed that TAMAR's design and construction complied with this regulation since the aft ladder was accessible directly from the open deck. When the cargos carried were dangerous and hazardous materials, fitting the hold access ladder in an enclosed space was a risk not considered by SOLAS, the IMSBC Code, nor TAMAR's design.

This casualty may not have occurred had the access hatch for the forward ladder been designed and constructed to lead directly to an open deck.

Coals Emitting Methane

The IMSBC Code requires special precautions for coals emitting methane when significant concentrations[10] are observed in unventilated cargo spaces. When adjacent to cargo spaces, an enclosed or cargo space is required to be ventilated and the atmosphere tested to ensure it is free of harmful gases before entry. An adequate oxygen concentration is required. Special precautions include requirements to regularly monitor enclosed working spaces, such as the Boatswain's Store, for the presence of methane and to provide adequate ventilation. However, as no flammable gasses were detected within the cargo holds before the incident, these requirements were not implemented.

Ignition Source

The exact ignition source is not known. The Windlass Control Room entrance presumably had the highest flammable gas concentrations. The Boatswain's Store had electric lights, space heaters, and other electrical control panels. The Windlass Control Room also had lights and contained all the electrical components for the windlasses. Energizing any electrical circuit within either of these two compartments could have provided an ignition source due to a latent fault. The condition before the explosion of the electrical equipment installed within these two spaces could not be verified due to the fire damage.

10 The IMSBC Code defines significant concentrations as the presence of methane in excess of 20% of the LEL.

PART 4: CONCLUSIONS

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

Causal factors that contributed to the explosion and subsequent loss of life include:

1. failure to properly maintain the access hatch seal for the forward ladder of Cargo Hold No. 1, which resulted in flammable gasses being emitted from the hatch;
2. TAMAR ‘s design and construction which placed the access hatch of Cargo Hold No. 1’s forward ladder in the Windlass Control Room, allowing for flammable gasses to collect in an enclosed space; and
3. improperly using a passive gas detection device to sample the remote atmosphere of the cargo holds and enclosed spaces, which likely resulted in inaccurate readings and prevented the identification of a hazardous atmosphere.

Additional causal factors that may have contributed to this incident include:

1. rough seas which prevented the Boatswain’s Store from being opened for several days prior to the incident;
2. failure of the shipper (as required by the IMSBC Code) to provide TAMAR’s Master with information about the cargo’s tendency to emit flammable gasses;
3. failure of TAMAR’s Master and C/O to ensure the cargo information required by the IMSBC Code was received prior to loading; and
4. the Master and C/O’s lack of familiarity with the IMSBC’s special requirements for the carriage of coal cargoes.

PART 5: PREVENTIVE ACTIONS

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

The Company’s SMS was amended to include:

1. the requirement to complete a checklist pertaining to the carriage of dangerous or hazardous cargo prior to commencing loading. The newly created checklist outlines the safety considerations and actions to be taken to ensure safe carriage;
2. the requirement for atmospheric testing of spaces adjacent to cargo holds while carrying dangerous or hazardous cargos; and
3. the requirement for spaces with limited ventilation (due to design or weather considerations) to be considered enclosed spaces, to which the enclosed space entry procedures would apply.

The lessons learned from this incident were circulated to the Company’s entire managed fleet.

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 implement actions to ensure all deck officers are knowledgeable about the IMSBC Code and the special requirements for the cargoes being carried.
2. It is recommended that the Company ensure that all vessels within their fleet are provided with appropriate gas detection equipment in accordance with the requirements contained with the IMSBC Code.
3. It is recommended that the Company implement actions to ensure all deck officers are properly trained in the selection and use of gas detection equipment for the planned task.
4. It is recommended that the Administrator consider submitting a proposal to the IMO to amend the IMSBC Code, Resolution MSC.268(85) to require that openings of bulk cargo holds utilized for the carriage of cargos with a propensity to give off flammable or toxic gases be designed and maintained in a manner which prevents harmful gases from accumulating in work spaces above or below deck.

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