



HELLENIC REPUBLIC



HELLENIC BUREAU FOR MARINE CASUALTIES INVESTIGATION

**MARINE CASUALTY SAFETY INVESTIGATION REPORT
01/2016**

**Fatal Fall of Bosun inside the Cargo Hold of
Bulk Carrier Doric Spirit**



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Foreword

The Hellenic Bureau of Marine Casualties Investigation (HBMCI) was established by Law 4033 / 2011 (Government Gazette 264 A/ 22 December 2011), within the scope of enforcement of the European Directive 2009/18 / EC.

HBMCI conducts technical investigations into marine casualties or marine incidents with the sole objective to identify and ascertain the circumstances and contributing factors that caused them through analysis and to draw useful conclusions and lessons learned that may lead, if necessary, to safety recommendations addressed to parties involved or stakeholders interested in the marine casualty, aiming to prevent or avoid similar future marine accidents.

The conduct of Safety Investigations into marine casualties or incidents is independent from criminal, discipline, administrative or civil proceedings whose purpose is to apportion blame or determine liability.

This investigation report has been prepared without taking into consideration any administrative, disciplinary, judicial (civil or criminal) proceedings and with no litigation in mind. It does not constitute legal advice in any way and should not be construed as such.

Its purpose is to comprehend and present the sequence of the events that occurred on 16th February 2016 and resulted in the examined very serious marine casualty and aims to prevent and deter repetition.

Fragmentary or partial disposal of the contents of this report, for purposes other than those for which it has been produced, may lead to misleading conclusions.

The investigation report has been prepared in accordance with the format in Annex I of the relevant law and references to times refer to local time (UTC +2).

Under the above framework HBMCI has examined the events, circumstances and contributing factors that led to the fatal injury of the Bosun on board the bulk carrier Doric Spirit, Greek Flag, IMO No: 9230763 at Monrovia Liberia port.

Glossary of abbreviations and acronyms

1	AB	Able seaman
2	Bfrs	Force of wind in beaufort scale
3	B/C	Bulk Carrier
4	C/O	Chief officer
5	CoC	Certificate of Competency
6	COSWP	Code of Safe working practices for Merchant Seamen
7	DOC	Document of Compliance
8	ILO	International Labor Organization
9	IMO	International Maritime Organization
10	ISM	International Management Code for the safe operation of ships and for pollution prevention
11	IMSBC	International Maritime Solid Bulk Cargoes
12	Knots	Unit of speed equal to one nautical mile (1.852 km) per hour
13	kW	Kilowatt
14	LT	Local time
15	MLC	Maritime Labor Convention
16	MSC	Maritime Safety Committee
17	Mt	Metric tones
18	OS	Ordinary seaman (deck crew)
19	P.D	Presidential Degree
20	Res.	Resolution
21	rpm	revolutions per minute
22	SMC	Safety management certificate
23	SMS	Safety management System
24	SOLAS	Convention for the Safety of Life at Sea 1974, as amended
25	STCW	International Convention on Standards of Training, Certification and Watchkeeping for seafarers
26	UTC	Universal coordinated time

1. Executive summary

On the 16th of February 2016 B/C DORIC SPIRIT (figure 1) was berthed alongside the port facilities in Monrovia, Liberia for unloading operations.

At approximately 10:45 while the Bosun was carrying out cleaning operations in No.3 cargo hold, he fell from a height of approximately 10.5m and landed on the tank top. The marine accident occurred while he was descending the cargo hold's vertical ladder, at a point located under the cargo hold's first platform. An AB that was standing on the platform of the cargo hold at the time, saw him lying on the tank top and reported the emergency situation to the Master and the C/O that went to the spot immediately. First aid was administered to the injured seafarer by the crew. Meanwhile paramedics, who were already informed by shore terminal personnel and the ship's agent, boarded the vessel 20 minutes later. The Bosun was transferred to the nearest medical center however at approximately 13:01 he was pronounced dead, due to the severe injuries he had suffered from the fall.

The safety investigation identified that the immediate cause of the marine casualty was that he had lost his grip whilst descending the vertical ladder while at the same time was performing dry cleaning operation.

It was further immersed that contributing factors leading to his fatal injury namely included:

- the failure to use Personal Protective Equipment (PPE) when working aloft such as the safety harness, goggles and filter mask;
- the lack of efficient supervision during the tank cleaning operation;
- the insufficient working aloft permit and the operation planned;
- the insufficient risk assessment analysis carried out for the task assigned.

On above grounds one safety recommendation was addressed to the Managing Company to revise specific parts of the Safety Management Manual.

2. Factual Information

2.1 Ship's particulars

Name of Vessel	Doric Spirit
Call Sign	SXQL
Company (ISM Code A 1.1.2)	Chios Navigation (Hellas) Ltd.
Ownership	Ocean Spirit Navigation Inc
Flag State	Greece
Port of Registry	Piraeus
IMO Number	9230763
Type of Vessel	Bulk Carrier
Classification Society	Lloyd's Register
Year built	2001
Material	Steel
LOA (Length Over All)	182.87m
BOA (Breadth Over All)	32.26m
Deadweight	52.428 mts
Gross Tonnage	30174
Net Tonnage	17907
Main Engine	MITSUI MAN B&W 6S50MC Mk. 6
Engine Power	11669 BHP
Document of Compliance	Issued on 17 March 2016 by Hellenic Lloyd's S.A
Safety Management Cert	Issued on 29 February 2012 by Hellenic Republic



Figure1 : B/CDORIC SPIRIT

2.2 Weather data

Wind – direction	3-4bf - variable direction
Wave height	Calm
Visibility	Clear
Light/dark	Light
Atmospheric temperature	26°

2.3 Voyage particulars

Port of origin	Varna,Bulgaria
Port of call	Monrovia, Liberia
Type of voyage	International
Cargo information	Cement clinker
Crew on board	19
Minimum safe manning	11

2.4 Marine casualty information

Type of marine incident	Very serious marine casualty
Date, time	16 February 2016 at 10:45 LT
Location	Monrovia, Liberia
Position	Lat.:6° 20' 45.6" N, Long. 10° 48' 14.4" W
Ship's operation, voyage segment	Berthed/Cargo unloading
Place on board	Cargo Hold No.3
Consequencetoindividuals	Yes / Bosun lost his life
Consequencestoenvironment	No
Consequencestoproperty	No

3. Narrative

3.1 Doric Spirit in discharging port

On 22 January 2016, B/C Doric Spirit under Greek flag laden with 43,999 MT of Clinker Cement, departed from the port of Varna (Bulgaria) to her destination port of Monrovia (Liberia). On 11 of February 2016, the vessel arrived at the anchorage area of Monrovia, waiting for the pilot's embarkation. The vessel's arrival condition that was calculated by the C/O and was countersigned by the Master, recorded 10,70m forward draught, 10,83m mid draught and 10,95m aft draught that resulted to a 0,25m trim by her stern.

On the next day around noon time, the pilot came on board and M/V Doric Spirit was safely berthed, with the assistance of the port tugs, in order to commence her discharging operations. Following the free pratique and port formalities, discharging operations commenced on the same day.

3.2 The crew

Doric Spirit's Minimum Safe Manning certificate, pursuant to SOLAS Regulation V/14 as applied, stipulated a crew of 11 seafarers. At the time of the marine casualty, the vessel had a crew complement of 19 seafarers. The crew was multinational composed by two main nationalities (see table 2) and the working language on board was English. No issues were reported or found related to the communication between the crew members.

Master	1 st Nationality	Chief Engineer	1 st Nationality
Chief Officer	1 st Nationality	Second Engineer	1 st Nationality
Second Mate	1 st Nationality	Third Engineer	1 st Nationality
Third Mate	2 nd Nationality	Electrician	3 rd Nationality
Bosun	2 nd Nationality	Apprentice Engineer	1 st Nationality
Five (05) Able Seamen	2 nd Nationality	Wiper	2 nd Nationality
Cook	2 nd Nationality	Two (02) Mess boys	2 nd Nationality

Table 2. Crew complement of Doric Spirit

According to the vessel's Safety Management Manual records, sufficient training and familiarization had been carried out on board by the vessel's senior staff to ensure that the crew, including the Bosun, was aware of the safety and emergency procedures and the proper use of the Personal Protective Equipment available.

3.2.1 The Master

The 52-year-old Master had a total of 18 years sea experience. He had acquired his Master's COC certificate by the competent Maritime Administration in 2001. His career as a Master started in 2003 and he had served, among others, on similar to Doric Spirit type of vessels. He joined Doric Spirit on 13th of December 2015. At the time of the casualty the Master had three contracts with the Managing Company of the vessel and all of them were on board Doric Spirit.

3.2.2 The Chief Officer

The 43 year old Chief Officer acquired his Master's Class B'CoC issued by the competent Greek Maritime Administration, in 1995. He had joined Doric Spirit on the 03rd of December 2015 and it was his first time on board the vessel as a Chief Officer. He was holding also a Master's Class A'CoC issued by the competent Maritime Administration in July 2015. Since 2001 he had served mainly as a C/O on Bulk Carriers similar to Doric Spirit. He was in charge of the cargo operations and also performing bridge watches and Safety Officer's duties.

3.2.3 The Bosun

The 49 year old Bosun had acquired his CoC (Regulation II/5 of the STCW revised Manila amendments) issued by the Maritime Administration of Philippines. He had served as a Bosun for the last 20 years on board Company’s vessels. The Bosun had served three times on board Doric Spirit and three times on board B/C Doric Pride, the sister vessel of Doric Spirit. He had joined the vessel about 1 month before the day of the marine casualty. It was reported that he was an experienced seaman with 30 years career at sea and that he was familiar with his duties and tasks and that he could take initiatives, if deemed necessary. Main duties assigned were deck maintenance and repair, cargo handling and stowage

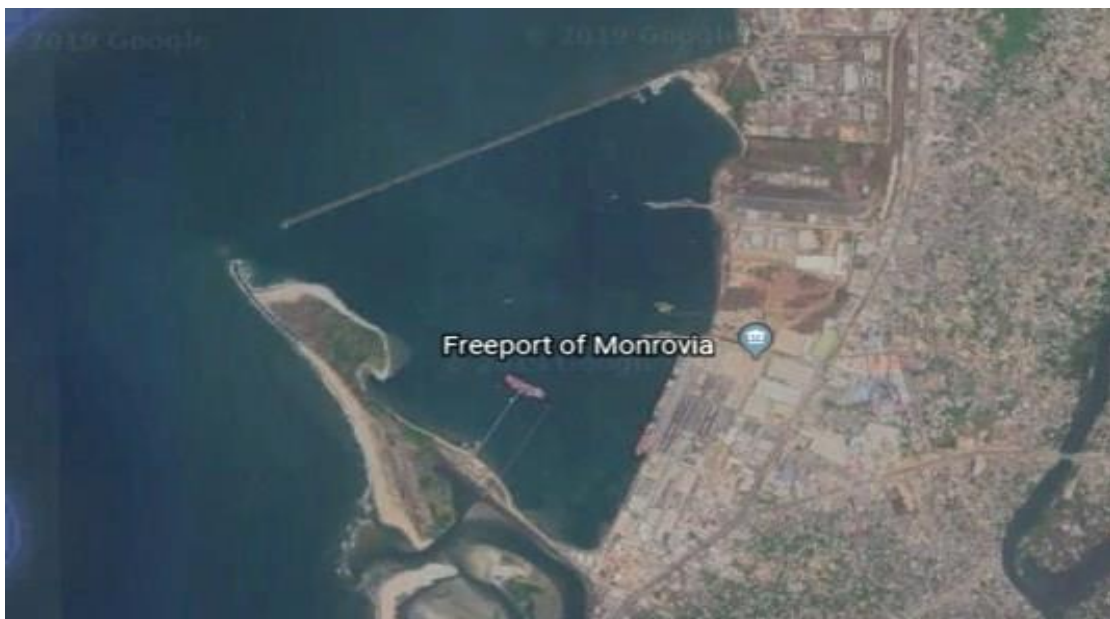


Figure2 :Overview of Monrovia port (Google maps)

3.3The discharging operation

According to her cargo plan and bridge log book entries, discharging operations commenced from cargo holds No 1,3,4 and 5 and were carried out by DORIC SPIRIT cranes. The discharging operation was normal with no specific issues and in parallel the ballasting operation was carried out, when required.

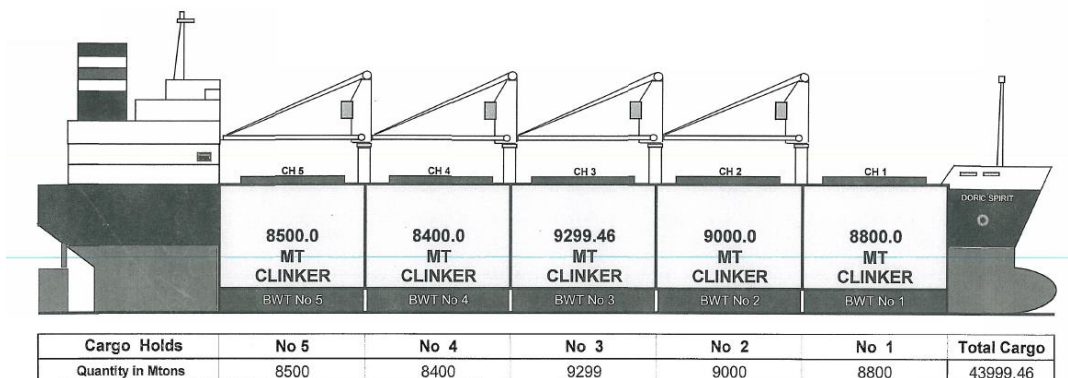


Figure 3: Cargo Plan

On 15 February 2016 at approximately 16:25, the discharging of No.3 cargo hold was completed and the unloading operation continued with cargo holds No 1,2,4 and 5.

3.4 Cargo hold cleaning operation preparation

On the next morning the Master decided to proceed with the cleaning of cargo residues in No.3 cargo hold and instructed the C/O accordingly. The C/O called the Bosun and one AB in order to discuss the standard working procedure to be followed. A toolbox meeting was held during which the C/O discussed with the Bosun and the AB the working details and arrangements and particular attention was given to all safety measures and procedures in order to carry out the job safely.

The provided risk assessment was prepared by the Chief Officer and was approved by the Master. Due to the fact that the cleaning operation required the Bosun and the AB to work at height the standard “working aloft” permit was documented.

Accordingly, the work team members were provided with personal protective equipment, such as protective safety gloves, a hard helmet, an overall suit and a safety harness equipped with a fall arrestor lanyard.

The “working aloft permit” designated the Chief Officer as the supervising Officer however due to the fact that he was also supervising the ongoing ballasting operation of No 4 side tank it was reported that he was not present during the marine casualty.

3.5 No 3 cargo hold cleaning operation

The No 3 cargo hold cleaning operation commenced at approximately 08:00. The Bosun and the AB started with the cleaning of the hatch cover channels, the hatch cover rubbers, the channel drainage and drainage holes. Due to the type of the loaded cargo the work team was spraying high pressure air with an air hose connected to an air supply pipe fitted on the main deck.

Aforementioned cleaning process required to stand on the top of the hatch coaming so both crew members were using their safety harnesses rigged to a secure point on the frames of the hatch coaming as shown in Figure 4.



Figure 4 :Simulation by a crew member securing the safety harness on the hatch coaming of cargo hold No.3.

It was reported that during the above mentioned operation the C/O was present supervising it.

At approximately 10:00 the Bosun and the AB went to the accommodation for the coffee break and it was reported that at approximately 10:30 they returned to continue their task; more specifically they proceeded with the cleaning of the cargo residues form inside the cargo hold. The cargo hatch was opened and the prevailing conditions at that time were good with no fog or rain. The Bosun entered the cargo hold from the vertical ladder fitted at the forward port side of the hold (figure 5 & 7) while the AB descended in the cargo hold via the “Australian ladder” (spiral), fitted at the aft starboard side (figure 6).



Figure 5 (upper left): No. 3 cargo hold access using the Australian ladder.

Figure 6 (upper right): No 3 cargo hold access using the vertical ladder.



Figure 7(down centre): Cargo hold vertical ladder as seen from main deck (top-down view)

According to information from the interview process, both seamen were handling an air hose to clean the ladder and the remaining residue dust from the cargo hold bulkheads and ladders platforms, during their descent.

It was reported that after the coffee brake and the C/O was not present to supervise the operation due to the fact that he got involved with the ballasting operation.

3.6 The occurrence

At approximately 10:45 the AB saw the Bosun reaching the first platform. It was reported that afterwards he turn around his body and focused on the cleaning of the bulkhead.

After a few seconds the AB heard a loud thump and the Bosun shouting out and instinctively turned around and saw him lying on the tank top of the cargo hold. Based on the reports it was emerged that the Bosun was not wearing his safety harness while he was gradually descending the vertical ladder of No.3 cargo hold. He was found wearing his safety boots and a safety helmet and the air hose was found next to his body.

It became obvious that somehow he lost his gripping on the vertical ladder and consequently lost his balance and fell down from a height of about 10.5 m onto the tank

top. It was further deduced that based on the Bosun's body fractures and the damaged railing of the lower platform his body probably impacted on the lower platform railings before landing on the tank top. The casualty site is shown in following figure 8.

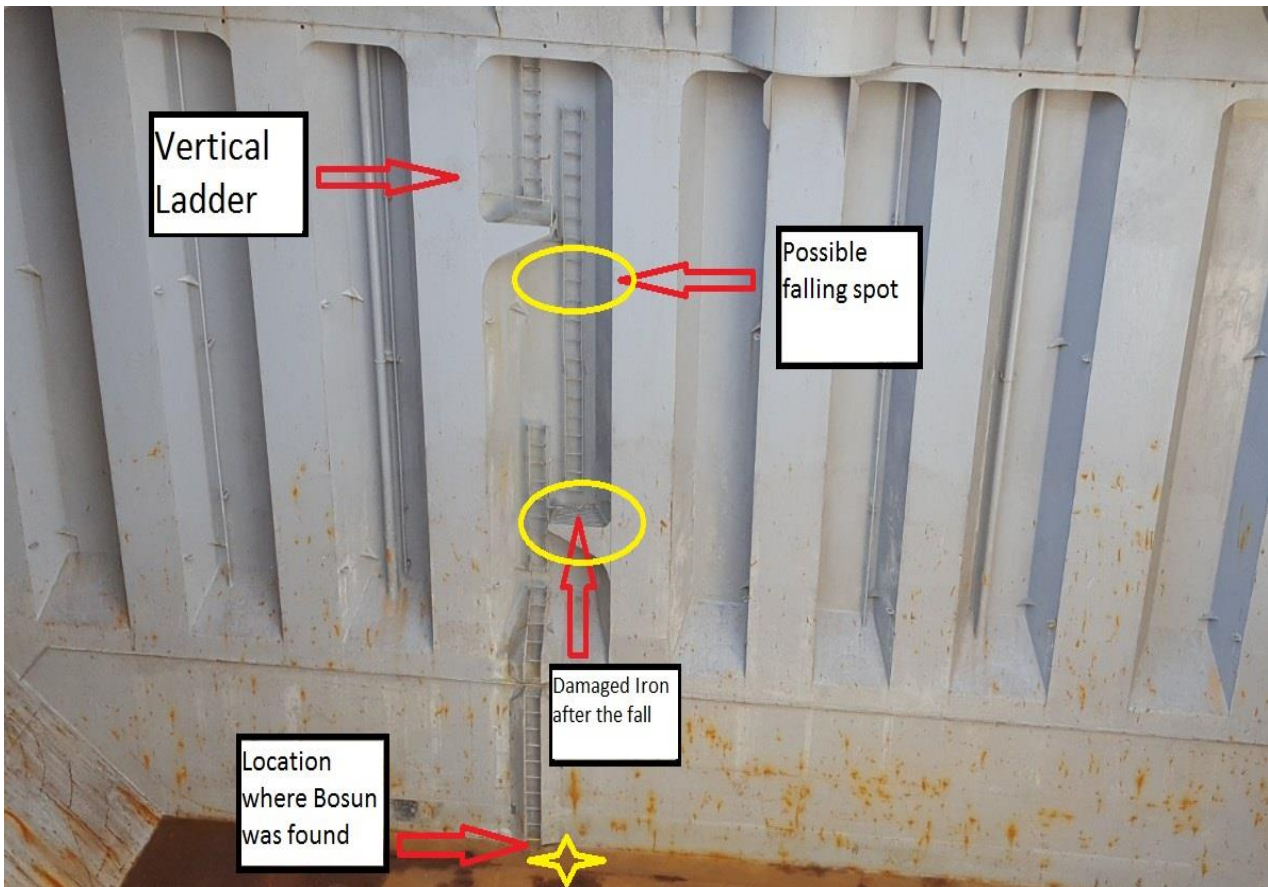


Figure 8: Cargo Hold no.3 -marine casualty site.

3.7 Emergency response actions

Following the Bosun's fall, the AB on the site immediately reported the emergency situation to the Chief Officer and the Master through his portable VHF. At approximately 10:47 the Master and the C/O together with the Second Mate and an AB came on the accident scene and administered first aid to the Bosun that was heavily injured. The Chief Officer further instructed crew members to urgently bring the stretcher in order to remove the Bosun from the cargo hold.

It was reported that by the time the crew checked the victim's blood pressure and pulse the Bosun was found conscious however he was breathing heavily and was bleeding from his head.

At approximately 10:50 the Master informed the local agent, the port authorities as well as the vessel's owners. The stretcher was lowered in the cargo hold and the injured seafarer was transferred to the ambulance that was already called by the port facilities personnel and was transported to the local hospital. Despite the medical assistance received at the hospital, the Bosun had succumbed to his injuries at 13:01.

A chronological chain of events is presented in the below table 1.

Chronological Chain of events	Local time
Injury of Bosun	10:45
Master informed	10:46
Master and Chief Officer attended the accident scene	10:47
Master informed local agent, vessel's owner, port authorities	10:50
Ambulance had arrived to pick up the injured Bosun	11:05
Bosun transferred to hospital	11:17

Table 1: Emergency response actions carried out by the crew

3.8 Cause of Death

According to the post mortem report obtained the Bosun's death was attributed to multiple fractures compatible with a severe fall from height. The violent impact of the Bosun onto the bottom of the cargo hold caused multi fractures on his left skull, rupture of the left collar bone, ten(10) broken left ribs that affected his liver and left kidney, and a broken neck.

According to the Autopsy report the victim was not alcohol or drugs intoxicated.

4. Analysis

The purpose of the analysis of the examined marine casualty is to determine the causal and contributing factors and circumstances that led to the Bosun's fatal injury, taking into account the sequence of events and the collection of evidence and information focusing on specific points of their temporal evolution, as well as to their root causes in order to draw useful conclusions leading to safety recommendations with the aim to prevent similar casualties in the future.

4.1 Doric's Spirit Cargo Hold arrangement

Doric Spirit is a standard design bulk carrier with 5 cargo holds structured forward of the accommodation superstructure. The No.3 Cargo hold is fitted between cargo holds 2 and 4 and is extended from frame No.108 to frame No.133 (figure 9).

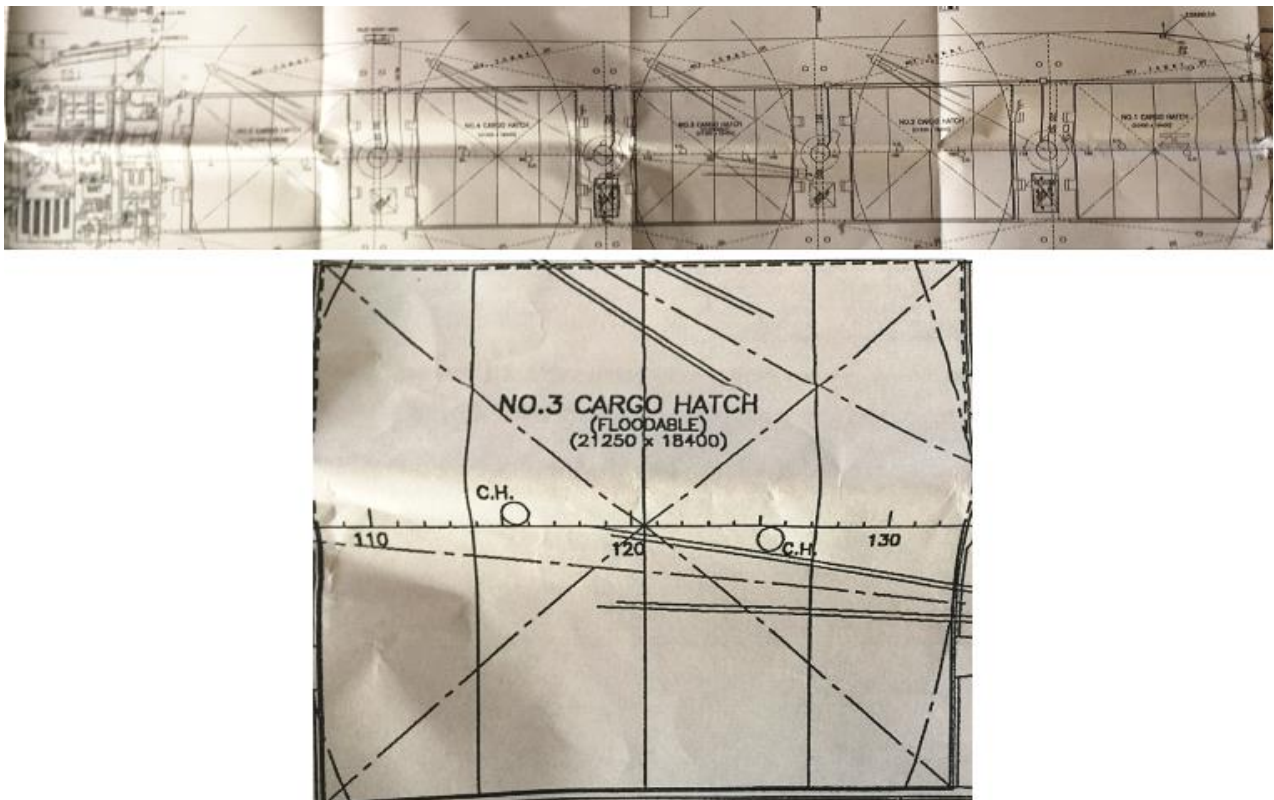


Figure 9: Overview from general arrangement plan, showing upper deck cargo holds arrangement and zoomed in the cargo hold No.3.

The cargo hatch dimensions are 21.25 X 18.4 meters wide and are about 17 meters high. Additionally No.3 cargo hold carries the notation floodable, meaning that it can be used as a water ballast tank in a heavy ballast condition.

The cargo hold No.3 is accessible via two fixed ladders, one vertical mounted at the forward port side of the tank bulkhead and one Australian type mounted at the aft starboard side of the tank bulkhead.

The vertical ladder is structured with a combination of separate parts that are linked with two intermediate platforms between the tank top and the deck. The platforms are fitted within approximately 4.5 m distance from each other as shown in figure 10. The vertical ladder was not structured with safety arrangements, such as a protective safety cage or housing.

However the Australian spiral type ladder was structured with protective railing for safely descending or ascending (figure 10).



Figure 10: Left: Australian ladder –Right: vertical ladder

The vertical ladder at a height of approximately six meters from the tank top, runs along the bulkhead with inclined ladder and its structure continues vertically towards the tank

4.1.1 Provisions for means of access for inspection

The existing provisions in SOLAS Ch II-1/Reg. 3-6 and IMO Res.MSC158(78) that foreseen the technical requirements for means of access for inspections to and within spaces such as cargo holds in bulk carriers were not mandatory for Doric Spirit, due to the fact that she was constructed before the 01st of January 2006. However the two access means to the cargo hold that is the vertical and spiral ladder, were found in line with the above mentioned technical rules and more specifically were satisfying par. 3.13.2 of IMO Res.MSC 158(78).

Based on the findings of the investigation carried out at the accident site it was concluded that no structural deficiencies existed, that could contribute to the Bosun's fall. It was also deduced that the deformation and the detachment that was evident at the second platform railings (figure 11), was caused by the Bosun's body impact before landing onto the tank top.



Figure 11:
The damages at the second platform railing of the vertical ladder

4.2 The cargo type characteristics

Doric Spirit was loaded with clinker cement. According to IMSBC Code¹, cement is formed by burning limestone with clay. This burning produces rough cinder lumps that are later crushed to a fine powder to produce cement. The rough cinder lumps are called clinker and are shipped in this form to avoid the difficulties of carrying cement powder. The cargo characteristics are shown in the following table 2.

Table 2: Cement clinker Characteristics

Angle of repose	Not applicable
Size	0 mm to 40 mm
Bulk density (kg/m ³)	1190 to 1639
Stowage factor (m ³ /t)	0.61 to 0.84
Class	Not applicable
Group	C

The clinker-cement has no special hazards; it is non - combustible and has a low fire-risk. Stowage and segregation have no special requirements, neither its discharge. According to IMSBC, during the clean-up procedure if the residues of the cargo are to be washed out, the cargo spaces and the other structures and equipment which may have been in contact with this cargo or its dust shall be thoroughly swept prior to washing out.

Cement dust should be dried and cleaned using brushes in order to remove the majority of cargo residues from the tank top and bulkheads. For this reason all solid residues should be dislodged, prior to wash out. Appropriate precautions shall be taken to protect machinery and accommodation spaces from the dust of the cargo. Bilge wells of the cargo spaces shall be protected from ingress of the cargo. Due consideration shall be paid to protect equipment from the dust of the cargo. Persons who may be exposed to the dust of the cargo shall wear protective clothing, goggles or other equivalent dust eye-protection and dust filter masks, as necessary.

Taking into consideration the aforementioned as well as the evidence and information collected during the investigation, it was deduced that the appropriate PPE such as goggles and dust filter mask were not assessed to be required during the preparation of the cargo cleaning operation.

In view of the above the fact that the cargo characteristics were disregarded by the competent Officers and crew during the «risk assessment» and «working aloft» documentation is considered a contributing factor in the marine casualty as analysed in par. 4.4.2 & 4.4.4.2 respectively.

¹**International Maritime Solid Bulk Cargo Code:**IMSBC Code facilitates the safe stowage and shipment of solid bulk cargoes by providing information on the dangers associated with certain types of solid bulk cargoes. It provides instructions on the procedures to be adopted when the shipment of solid bulk cargoes is contemplated. Observance of the Code harmonizes the practices and procedures to be followed and the appropriate precautions to be taken in the loading, trimming, carriage and discharge of solid bulk cargoes when transported by sea, ensuring compliance with the mandatory provisions of the SOLAS Convention.

4.3 Regulatory framework for safe access to hazardous areas (cargo holds)

In general International Safety Management Code and Maritime Labor Convention requirements amongst others stipulate that risks associated with all work tasks on board must be assessed in advanced.

4.3.1 National Legislation

On Greek registered vessels accident prevention, concerning casualties with persons is regulated by Presidential Decree 1349/81² by which inter alia art. 7 sets general requirements for safe access into hazardous areas such as cargo holds, to ensure that safe means of access are applicable free of obstacles and of efficient width, without presenting a danger to the crew and the shore workers.

4.3.2 International legislation

SOLAS Convention in Chapter II-/Reg. 3.6 «*Access to and within spaces in, and forward of, the cargo area of oil tankers and bulk carriers*» sets forth requirements related to the Safety arrangements and means of access for oil tankers and bulk carriers, yet the regulated issue concerns close-up inspections to tanks and holds.

By virtue of aforementioned legal framework MSC.158 (78) on 20 of May 2004 adopted requirements on the «*technical provisions for means of access for inspections*» and amended Res.MSC.133 (76) «*Adoption of technical provisions for means of access for inspections*» (12 December 2002).

Moreover IMO's Res. 1050(27) «*Revised recommendations for entering enclosed spaces*» encourage the adoption of safety procedures aimed to preventing casualties to ships' personnel entering enclosed spaces where there may be an oxygen-deficient, oxygen-enriched, flammable and/or toxic atmosphere.

The recommendations intended to complement national laws or regulations, accepted standards or particular procedures which may exist for specific trades, ships or types of shipping operations.

Nevertheless explicit measures or procedures or guidelines that directly address the risk of falling when entering a cargo hold in order to descend and/or to work are not approached.

Conclusively national and international legislation does not address explicit instructions, guidelines or recommendations for preventing falls from a height during operations/works carried out on board vessels.

4.3.3 Safety guidelines for working aloft

Flag States' Administrations, International Organizations and other stakeholders of the shipping industry (e.g. P&I Clubs) have issued guidelines addressing safety matters as well as health and safety risks that inter alia are associated with «working aloft» operations. These guidelines primary aim to be used as a «reference tool» for managing Companies and vessels in order to supplement safety issues that have to be managed by the company and are generated by general principals described in or derived from International Conventions; Codes, etc.

On the matter reference should be made to:

²«*Regulation for preventing occupational accidents on board vessels*» (Official Government Gazette No. A' 336).

- the ILO's «Code of Practice for accident prevention on board ship at sea and in port³» and in particular to Chapter 15 «Working aloft and over the side»;
- the UK Maritime and Coast Guard Agency's (MCA) «Code of Safe Working for Merchant Seafarers⁴ (COSWP)» and in particular Chapter 17 «Work at height» as well as to the relevant on the case references, as cited in following par. 4.6.

Apart from the above the «International Safety Management Code» provides that the development and implementation of specific standards, procedures and instructions for safe shipboard operations that amongst others include the working aloft and cargo hold cleaning operations, is attributed to the Managing Company.

4.4 International Safety Management Code

The International Safety Management Code, as applies, mandatory under SOLAS Chapter IX, lays down the principal standards for the safe operation and management of ships and the prevention of pollution.

The ISM Code sets up the obligations for a safety management system and policy to be developed; established and implemented by the Company and its operating vessels in order to meet the requirements of the Code in compliance with the International Instruments, Rules and Regulations as well as to make sure that applicable codes; guidelines and standards recommended by the Organization, Administrations, Classification Societies and maritime industry Organizations are taken into account.

The safety management system to be implemented falls under the respective provisions for approval and certification by the competent Administrations and Recognized Organizations so as to be verified that it complies with the Code.

Under the above principals, the Code objectives aim amongst others to prevent human injury and loss of life.

Human life is one of the key objectives of the Code and thus many provisions⁵ are incorporated as obligations to be developed and implemented by the Company and its managing vessels.

³The «ILO Code» should not be regarded as a legally binding instrument, and was not intended to supersede national laws or regulations or other national safety and health rules. Its practical recommendations are intended for use by all those who have responsibility for safety and health on board ship. Its object is to provide guidance to shipowners and seafarers and others concerned with the framing of provisions of this kind in both the public and private sectors.

⁴ The «MCA Code» provides guidance on safe working practices for situations that commonly arise on ships, and the basic principles can be applied to many other work situations that are not specifically covered. However, it should not be considered a comprehensive guide to safety: the advice it contains should always be considered in conjunction with the findings of the Company's or employer's risk assessment, and any information, procedures or working instructions provided by the manufacturer, supplier or any other source should be followed.

⁵**ISM Code references to safety of life and safe working practices:**

1.2 Objectives

1.2.1 *The objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment, and to property.*

1.2.2 *Safety-management objectives of the Company should, inter alia: .1 provide for safe practices in ship operation and a safe working environment; .2 assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards;*

1.4 Functional requirements for a safety-management system.

.1 a safety and environmental-protection policy;

In view of the aforesaid regulatory framework, Doric Spirit was operating under her Company's «Safety Management Manual» system and thereupon Doric Spirit was provided with a Safety Management Certificate (SMC) issued by her Flag.

The implemented safety system was set to organize and control aspects of her safe operation and resource management.

4.4.1 ISM Code “Risk Assessment”

The ISM Code in Part A, section 1.2.2.2 states that:

«The Safety Management objectives of the Company should inter alia assess all identified risks to its ships, personnel and the environment and to establish appropriate safeguards».

ISM Code does not provide any further explicit reference apart from the above general requirement, nevertheless risk assessment or risk analysis is fundamental for the compliance with most of the Code's requirements and notably Chapter 7 “Shipboard Operations”.

The risks⁶ concerned are those that are reasonably expected and are related to shipborne procedures or operations in respect to:

- the health and safety of all those who are directly or indirectly involved in the activity, or who may be otherwise affected;
- the property of the company and others;
- the environment.

A hazard could be defined as a situation or practice that has the potential to cause harm. Hence a risk analysis process⁷ could concisely include the following phases:

- the identification of hazards;
- the assessment of the risks associated with those hazards;
- the application of controls to reduce the risks that are deemed intolerable. The controls may be applied either to reduce the likelihood of occurrence of an adverse event, or to reduce the severity of the consequences;
- the monitoring of the effectiveness of the controls.

The ISM Code does not lay down any particular venue models to the management of risk and therefore the company has to compile a system and methods under its organizational structure and ships' operations. The methods should be systematic, if assessment and response are to be complete and effective and the procedures should be documented so

.2 instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag State legislation;

7. Shipboard Operations:

The Company should establish procedures, plans and instructions, including checklist as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel.

⁶ IMO defines risk as: «The combination of the frequency and the severity of the consequence». (ref. to MSC/Circ.1023 - MEPC/Circ.392)

⁷ Risk management may be defined as: «The process whereby decisions are made to accept a known or assessed risk and/or the implementation of actions to reduce the consequences or probability of occurrence». (ref. to ISO 8402:1995/BS 4778).

as to provide evidence for the decision-making process as well as for inspections and audits by the Managing Company, the Competent Authorities and interested parties.

4.4.2 Doric Spirit Risk Assessment (R/A)

Shipboard operations on Doric Spirit were conducted under the controls measures identified by the Risk Assessment procedure, as provided in Chapter 1 of her Safety Management Manual for the purpose to reduce risks to human life; the environment or property.

On the day of the marine casualty that is 16 February 2016, the Risk Assessment process for the task to be performed was conducted prior to the commencement of the operation. It was documented in the standard «Risk Assessment Form» which was in appendix of Chapter 1 of her SM Manual. The operation was classified in the “Safety operations Group” and was recorded as a “Working Aloft or over side” operation.

The Form was further logging that it was prepared by the C/O and the R/A team consisting of the Second Officer, the Bosun and the AB that were both assigned to carry out the cargo hold cleaning operation. The documented R/A was further approved by the Master.

The R/A Form was recording certain info and data that were leading to the **«Description of hazards»** index which were concurrently leading to the correlated **«Control measures to be taken»** index.

The analysis of the «Risk Assessment Form» identified the following points that were considered pertinent with the occurrence:

- ✓ the **«Experience with same or similar task»** field that was specifying that the working aloft task have been done more than 5 times in the past by the crew involved;
- ✓ the **«Hazard description»** index quoted two recordings regarding the equipment to be used and more specifically:
 - *“Personnel safety clothing /equipment not used”;*
 - *“Defective equipment”*
 that were defined as “medium risk” category.
- ✓ The **«Control measures to be taken»** index for the aforementioned hazards was citing correspondingly the preventive precautions:
 - *“Familiarization /training and instructions/checklist”;*
 - *“Inspections / Permit to work aloft”.*

By the aforementioned measures the risk was controlled and was downgraded/reduced to “Low Category”.

Based on the aforementioned findings and taking into account that assigned tasks such as cleaning residues from cargo holds while working aloft could rationally pose risks such as falling⁸ and could cause heavy injuries or even threaten life, it was deduced that the risk assessment procedure and the documented Form was not encompassing:

⁸Studies have shown that factors leading to falls from height may be grouped as following:

- **Risk factors incumbent to the worker that were generated by work related behavior:** lack of safety culture (it won't happen to me); unexpected lack of attention; decision to continue even after identifying a dangerous situation; decision to continue without the PPE; adopting an insecure stand /posture; choice of inappropriate anchoring points; improper position; distraction; ignorance; reckless movement; etc.

- ✓ the “key risk” for working aloft that is “fall from height”;
- ✓ cargo characteristics for cleaning residues;
- ✓ deterioration of physical status (sight/breathing) due to raising dust from air-spraying the cement residues;
- ✓ the cleaning tasks during descending the vertical ladder;
- ✓ the safety harness functioning conditions and limitations, as cited in par. 4.7.3.

Above-mentioned hazards if identified could have led to appropriate controls measures in order to minimize or eliminate the risk of falling such as those presented in the following table:

Hazard description	Control measures to be taken
Inappropriate work process	permanent supervision / if not available work is stopped/postponed
Deterioration of physical status (vision/breathing)	appropriate PPE - safety mask & safety goggles
Cleaning cargo residues during descending	appropriate PPE - safety harness with double lanyard / Bosun’s chair
Safety harness function limitations	Appropriate scaffolding/Bosun’s chair

In this respect an “ad hoc” risk assessment for «working aloft cleaning cargo residues» deems to be necessary in order to avoid similar occurrences.

In view of the above it is deduced that the lack of a “tailored to the needs” of the task at hand risk assessment is considered to have been a contributing factor in the examined case.

4.4.3 Doric Spirit Safety Management Manual for working aloft

Working aloft is falling within the relevant provisions of Chapter 7 of ISM Code and likewise it was stipulated in Chapter 7 of Doric Spirit Manual, titled «*Procedures for the preparation of plans and instructions for key shipboard operations*».

4.4.3.1 Procedures for the preparation of plans and instructions for key shipboard operations.

The Vessel’s SMM in Chapter 7, amongst other procedures illustrated instructions pertained to tasks to be performed at areas where the danger of falling from height is likely to occur that is “working aloft” and thus serious injuries or loss of life may result.

The Vessel’s Safety Management Manual defined those critical areas that could pose an increased risk when «working aloft» such as the masts, the holds sides, the ship sides, high up places in the Engine Room, outside the superstructure and any other place needing to ascend or descend and/or hang in order to carry out a specific task.

Under the abovementioned provisions the Manual was recording the following instructions that have to be taken into account by the vessel’s personnel, at all times:

- ✓ *The person performing the work should wear all prescribed protective clothing and gear i.e safety belts or harnesses, protective clothing, helmet, work shoes and life jacket if working above water.*

- **Risk factors related to the workload:** inadequate working standards; lack of supervision; lack of resource management; etc.
- **Risk factors related to the work environment:** unfavorable weather conditions such as rain; hanging objects; unfavorable environment due to raise of dust; slips or trips and falls; struck by an object; struck by moving equipment, etc.

- ✓ *The “3 point rule” should always be observed i.e the working person shall be able to hang to an additional point to his feet. Otherwise safety harness with line must be used.*
- ✓ *If working on ladder the “3 point rule” was satisfied if the ladder extended not less than 80cm from the point of contact of feet. Otherwise a hand help point or safety harness with line should be used.*
- ✓ *Ladders should be carefully inspected before use.*
- ✓ *When climbing ladders both hands should be free to hang. Preferably the side guides rather than the steps should be used to hang.*
- ✓ *Working tools must be carried in a separate basket with line or suitable belt and not carried at hands.*
- ✓ *A responsible member of the crew should be in constant attendance on the deck or the tank top, below the person working above and in direct contact with a responsible officer.*

Having scrutinized the aforementioned and evolution of the events led to the marine casualty it was brought out that that Doric Spirit Safety Management Manual instructions were not followed during the preparation, the arrangements and the execution of the working aloft and cargo cleaning operation.

The failure to follow Doric Spirit’s Safety Management Manual respective instructions is considered as a contributing factor in the examined case.

4.4.3.2 Company’s safety matters ‘«Booklet»

On October 2015 the Managing Company of Doric Spirit forwarded a safety circular⁹ to its managing fleet to be attached in the vessel’s SOLAS Training Manual as supporting documentation, in order to supplement the existing Safety Management Manual’s procedures with a set of explicit safety guidelines for working «aloft» or «over the side».

The Booklet was discussed during the monthly safety meeting on board Doric Spirit which was held on 30 November 2015, together with a risk analysis carried out.

It was also discussed during the safety meeting on 30 January 2016 during which the Bosun participated that is almost two weeks before the day of the marine casualty.

Considering the aforementioned and the safety investigation information and evidence collection it was inferred that Circular’s guidelines were not taken into account during the preparation of the working aloft and cleaning operations.

The failure to take into account the Company’s Booklet is suggested to have been a contributing factor in the marine casualty.

4.4.4 Working aloft permit

According to the evidence gathered during the safety investigation, the “working aloft” task was controlled by specific procedures to be documented and followed through Doric Spirit’s Safety Management Manual.

⁹The Booklet emphasized the importance that should be given when working aloft/overside due to concentrated inspections carried out by various PSC at the same period.

4.4.4.1 «Working aloft permit» document

In this respect a «working aloft permit» document for the cargo hold cleaning task was completed on 16 February 2016 in accordance with the Company's Manual. The work permit was also based on the risk assessment process for «working aloft», as analyzed in par. 4.4.2.

The «working aloft» permit was documented in the Form «D.07-32b» and was prepared by the C/O. More specifically the Form was recording the following information:

- the work description as «*cleaning cargo residues*»;
- the working team (Bosun and AB);
- the person in charge (Bosun);
- a ticking box table with the availability and condition of the equipment to be used;
- name and signature of the supervising Officer (C/O);
- the name and signature of the Officer charged with its preparation (C/O).

Ventilation and lighting were not required to be checked as the cargo hold was open during the unloading operation and for this reason it was air ventilated and the natural light was sufficient for the task assigned.

Nevertheless the document did not record a working team's signatures box and thus it was not signed by the Bosun and the AB.

4.4.4.2 «Working aloft permit» & Personal Protective Equipment

With regard to the equipment to be used the Form recorded: lifelines; harnesses; securing points; and that the responsible person (Bosun) was informed.

Based on the references in par. 4.3 related to the safety personal equipment to be used when conducting cleaning works for the clinker cement cargo carried on board Doric Spirit as well as par. 4.2 references to cargo characteristics it was highlighted that despite the fact that goggles and dust filter masks were required they were neither recorded in the «working aloft permit» nor used. The lack using appropriate PPE such as goggles and dust filter mask is presumed as a contributing factor in the examined case.

Having regard to the aforementioned it is suggested that specific references to PPE that is required for operations according to cargo characteristics should be documented in the «working aloft permit» and more specifically in the table «availability and condition of the equipment to be used».

4.4.4.3 «Working aloft permit» working description

Taking into account the statements during the interview process regarding the «tool box meeting» prior to the task commencement and based on the «Form» completed, it was pointed out to use the safety harness and securing points.

Nevertheless, as derived from the interview process it was deduced that the working description of the «working aloft permit» was construed by the working team to refer to the task of cleaning the cargo residues from the hatch coaming and the tank top of the cargo hold.

In this respect it was emerged that the documented «working description» was undetailed and general as the use of the vertical ladder for descending and in parallel the cleaning task of the cargo residues at areas close to the ladder holding arrangements and on the

platforms were neither taken into account in the “risk assessment” as analyzed in par. 4.4.2 nor recorded in the “working aloft permit” documentation.

The lack of a sufficiently detailed description of the work to be carried out is considered a contributing factor in the marine casualty.

4.4.4.4 «Working aloft permit» equipment

It was further highlighted that considering the task to be carried out while descending the vertical ladder and the use of the air hose as well as the evolvment of the events that led to the marine casualty, the safety harness used was not appropriate.

It is suggested that more appropriate equipment could have been available and used such as the Bosun’s chair in order to efficiently safeguard the task.

Likewise a lanyard attached to the air hose that would have been handled by a crew member in order to gradually lower the air hose would have been practicably convenient.

The lack of using the appropriate equipment for the task is suggested to have been a contributing factor in the marine accident.

4.4.5 Supervision and control

According to Doric Spirit Safety Management Manual the C/O was charged amongst others with the safety and cargo operations responsibilities.

On the day of the marine casualty he was also designated as the supervising Officer for the cargo residues cleaning operation of No 3 cargo hold as documented in the “working aloft permit” whilst he was additionally supervising the undergoing ballasting operation of No 4 side tank.

It was evident that neither he was present during No 3 cargo hold cleaning operation that was practiced during the Bosun’s gradual descending to the tank top nor he appointed another Officer or if appropriate another crew member to supervise the «working aloft cleaning» operation.

Had an Officer supervised the “working aloft cleaning operation” it is highly possible that he could had deter the Bosun from descending the vertical ladder without his safety harness and probably the marine casualty would not had happened.

The lack of supervision during the “working aloft” cleaning operation is considered a contributing factor in the examined case.

4.5 The human element

Human element and performance are the primary factors for maintaining high levels of a safe working environment by following procedures and safety measures in order to prevent accidents.

Nevertheless people consistently tend to believe that negative events and accidents are less likely to happen to them than to others. This applies frequently to accidents that happened and had serious consequences. This behavior can be described as “Unrealistic optimism” or “overconfidence”.

Likewise seafarers may have the perception that unsafe conditions that may lead to fatal accidents will not occur when performing task and duties despite the fact that they have to take reasonable care for their own health and safety and that of others on board who may be affected by their acts or omissions.

The International Maritime Organization recognizes that the human element is:

- a key factor of the safety of life on board ships;
- a complex multi dimensional issue;

that affects safe shipboard operations and is considered as a contributing factor to most of the casualties in the maritime sector.

4.5.1 The Bosun's performance

From the human element perspective it may be challenging and perplexing to apprehend, why an experienced crew member (Bosun), decided to descent the vertical ladder without using a safety harness while in parallel had to use the air hose for cleaning the cargo residues. In order to substantiate the probable cause of such an action under the conjunction of circumstances that led to the marine casualty, the following factors are examined:

4.5.1.1 Failure to follow rules and safe practices

Similar cases have shown that seafarers may deviate from performing tasks under applied rules, procedures and safe practices established on board ships by which personal safety is enhanced and fortified.

In particular, despite the fact that seafarers are familiar with the Safety Management System and Company's Policy implemented on board, working procedures that safeguard safety are not followed, habitually due to poor judgment of the circumstances.

Seafarers may often be overwhelmed for getting stuck into the job and get it done and many times they do not follow the provisions and guidelines of the relevant safety management forms or relevant guidelines issued by the Company and discussed in the safety meetings.

Eventually such behavior or attitude if not controlled and corrected could become a practice and could lead to dangerous situations and marine accidents.

In view of the above the Bosun's actions to descent the vertical ladder for the "working aloft cleaning cargo residues operation" without following the established and documented Safety Management Manual's procedures is considered a contributing factor in the examined marine casualties.

4.5.1.2 Overconfidence

People may have the tendency to overestimate their abilities and knowledge and disregard safety measures that can safeguard apparent hazards like falling from height. An objective self-assessment is often perceived as laborious and superfluous.

It is considered likely that the Bosun felt overconfident due to his experience that probably under a "can do" attitude affected his decision not to use the safety harness that was an essential requirement for his safety by the respective rules and safe working practices applied for the task.

The Bosun's overconfidence that led to the decision not to use the safety harness during the task performed is considered a contributing factor in the marine casualty.

4.5.1.3 Working Stress

On the day of the marine casualty the cleaning operation task during "working aloft" that was to be carried in parallel with the discharging ongoing operation did not point out working load that generated working stress to the Bosun.

Nonetheless It was emerged that the use of safety harness during his descend via the vertical ladder that would require continuous changing of the safety belt's anchoring points would extent his descent time and consequently the "working aloft" cargo residues cleaning.

In light of the above it is presumed that the Bosun's actions were driven by a "get the job done" attitude that is an improper attempt to save time or effort disregarding proper guidelines and safety practices and is considered a contributing factor in the marine casualty.

However such attitude was not identified as an underline factor that was stemming from instructions, orders or the vessel's operation.

4.5.1.4 Fatigue

The Bosun's working and resting hours were examined during the safety investigation and did not indicate any fatigue issues that affected his performance.

4.6 Personal Protective Equipment (PPE)-Use of protective barriers

The «Code Of Safe Working Practices» issued by the UK Maritime and Coast Guard Agency¹⁰, in Chapter 8.2 states that:

"the Company must ensure that seafarers are provided with suitable PPE where it is needed."

Falling from a height is one of the most common causes of personal injury or loss of life in the workplace. It is emphasized that PPE are used as a protective barrier against risks which are associated with working aloft and may occur in order to minimize or mitigate their consequences to an acceptable level.

In the examined case, the safety harness, although could not prevent or eliminate the risk of falling from the vertical ladder nonetheless, it could had minimized its consequences.

On above grounds the following guidelines of the Code that are associated with the case deem to be applied:

«par.8.2.3: The Company should assess the equipment required to ensure that it is suitable and effective for the task in question, and meets the appropriate standards of design and manufacture.»

«par.8.2.4 Suitable equipment should:

¹⁰ See Chapter 8 of COSWP 2015 edition - amendment 5 - October 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938726/Code_of_Safe_Working_Practices_for_Merchant_Seafarers_Amendment_5_Oct_2020_v.2.pdf

- *be appropriate for the risks involved and the task being performed, without itself leading to any significant increased risk;*
- *fit the seafarer correctly after any necessary adjustment;*
- *take account of ergonomic requirements and the seafarer's state of health; and*
- *be compatible with any other equipment that the seafarer has to use at the same time, so that it continues to be effective against the risk.».*

«**par. 8.2.7** All seafarers required to use protective equipment must be properly instructed and trained in its use. This should include being advised of its limitations and why it is needed. A record should be kept of who has received training.».

4.6.1 The safety harness used

On the day of the marine casualty, the Bosun initially used a five point full body harness, as shown in Figure 12, for cleaning the cargo hatch coaming of cargo hold No.3.

The safety harness was combined of straps designed to pass over the shoulders, across the chest and around the legs and was connected with a shock (or energy) absorber, a rope lanyard attached on a small “D” ring carabiner.



Figure 12: Full body safety Harness used by the Bosun on the morning of the accident

The full body safety harness is a key part of an active fall arrest system and is generally suitable when working aloft as a full body harness can more efficiently protect an individual than a standard safety belt.

The full body harness can serve two purposes and more specifically:

- ✓ can distribute fall forces safely across a worker's body in the event of a free fall;
- ✓ can provide freedom of movement to allow the worker to effectively perform a working aloft task.

The full body harness combines the features of a sit harness which supports in parallel the hips and upper legs, and a chest harness, which supports the shoulders and chest. When properly used, the full body design contains the human torso and aides in keeping it upright during a fall event avoiding severe back and abdominal injuries.

4.6.2 Safety harness used specifications

The safety harness used was manufactured under the European standards EN 355:2002 in conformance with respective European standards and requirements¹¹.

The safety harness was found to be in good condition and its label (figure 13) was marked with the following specifications that deem relevant with the case under examination:

▪ the European standards CE 1019–EN 355:2002;	
▪ the 2 m length of the lanyard;	
▪ the manufacture date 10/15;	
▪ a 6.75 m protection limit from the securing point that results by adding:	<ul style="list-style-type: none"> ✓ 2m length of the lanyard; ✓ 1.75m length of the shock absorber extended when a fall occur; ✓ 2m of the human body as provided by EU standards; ✓ 1m of safety margin as provided by EU standards;



Figure 13:
The safety harness label markings used on the day of the marine accident.

4.6.3 Safety harness used and working environment

Having examined thoroughly the arrangement of the working area; the task to be conducted and the safety harness specifications, as presented in previous par. 4.6.2 it was inferred that the safety harness could not provide efficient protection in full.

This is based on the understanding that even if the Bosun was wearing and using it while descending the vertical ladder, due to the fact that in case of falling from a height less than 6.75 m, measured from a securing point, it was highly possible that he would have landed onto the tank top and would have suffered injuries.

Taking into consideration the aforementioned specifications concerning the safety harness effective use, it is deduced that the functioning limitations should have been taken into account during the work task preparation and the risk assessment carried out.

¹¹EU standards and requirements:

- Regulation (EU) 2016/425 of the European Parliament and of the Council of 9 March 2016: «on personal protective equipment and repealing Council Directive 89/686/EEC».
- article 30 of Regulation (EU) 2008/765 of the European Parliament and of the Council of 9 July 2008: «on setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93».
- European standards EN 355:2002.

Under this context it is deduced that the Risk Assessment Analysis did not recognize the safety harness functioning conditions and limitations and on these grounds did not identified the specific hazards associated with the PPE used.

Consequently no control measures were documented or put in place to safeguard those who were involved with the operation.

The lack of properly encompassing the safety harness operating limitations is considered a contributing factor to the marine casualty.

4.6.4 Other type of harness lanyard as control measure

The analysis of the facts in relation to the equipment used identified that the single lanyard attached on the safety harness used and available on board could not facilitate in full permanent holding on securing points.

Said observation was noted due to the fact that a seafarer when using a single lanyard has to change the anchoring point by unclipping the carabiner and clipping it again on the next one in order to descend the vertical ladder. This means that during the re-anchoring process the harness is not secured and the only holding option is seafarer's hand gripping.

On above grounds a fall arrestor with a double lanyard, as shown in Figure 14, deems appropriate to facilitate constant anchoring when descending/ascending vertical ladders and securing points have to be changed.



Figure 14: Fall arrestor with a double lanyard

Considering the above it is deduced that a double lanyard properly used could safeguard in full a seafarer from the risk of falling when ascending/descending vertical ladders.

4.6.5 Other means of access as control measures

Taking into consideration the aforementioned in par. 4.6.3 it came into light that control measures should have been taken in order to prevent the consequences of a possible fall while carrying out the cleaning operations in No.3 cargo hold, at least for the last few meters of descending the vertical ladder.

Such control measures could ostensibly include other means of access to the work area such as the use of:

- scaffolding arrangements as indicated in Figure 14, that could ensure a safe access to the work area at least for the last 6-7 meters of the vertical ladder;
- the Bosun's chair, that could provide efficient protection from falls during the descending of the vertical ladder. It would however require an extra crew member to control the lowering process.

Above-mentioned measures were also recommended in the Booklet sent by the Company, as referred in previous par.4.4.3-2. It is noted that the Bosun's chair practice would as well require a safety harness to be used by the seafarer.

Had other means of access used for the working aloft cleaning operation, it is highly possible that the marine casualty would not have occurred.

The lack of assessment not to use other means of access to the working area, disregarding the Company's Booklet instructions is considered a contributing factor in the marine casualty.

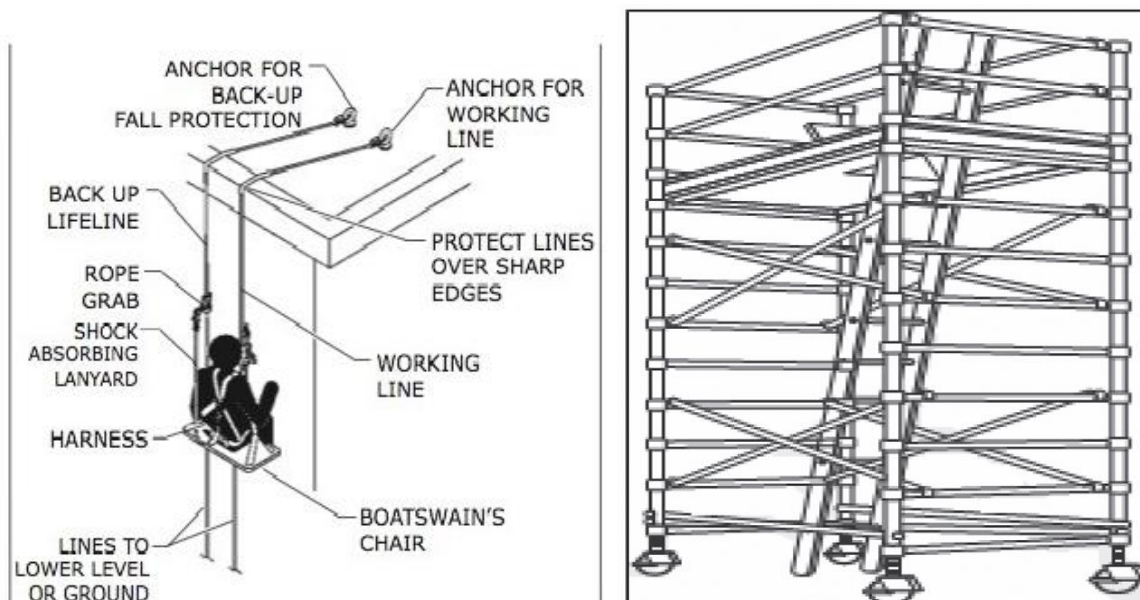


Figure 15: Left: Bosun's chair arrangement. Right: Mobile scaffold with an access ladder and trapdoor to provide the largest possible hazard-free working condition

4.7 Environmental Conditions

On the day of the marine accident, the prevailing weather conditions at Monrovia port were reported to be very good with slight wind of 3-4 bfrs; daylight; temperature at 26°C; and visibility was very good.

The risk assessment documentation did not identify any risks associated with the environmental conditions.

Environmental conditions are not considered to have been a contributing factor to the marine casualty.

The following conclusions, safety issues and safety recommendations should not be taken as a presumption of blame or liability under any circumstances. The juxtaposition of these should not be considered with any order of priority or importance. Conclusions and safety issues derive from specific paragraphs of the analysis.

5. Conclusions

5.1 Conclusions and safety issues leading to safety recommendations

- 5.1.1** The appropriate PPE, based on the cargo characteristics such as goggles and filter masks, were not assessed to be required during the preparation of the cleaning operation(**§ 4.2**).
- 5.1.2** Competent Officers and crew disregarded the cargo characteristics during the “risk assessment” and “working aloft” documentation(**§ 4.2**).
- 5.1.3** The risk assessment was not encompassing key risks and thus was not “tailored to the needs” of the task at hand (**§ 4.4.2**).
- 5.1.4** The Safety Management Manual’s instructions were not followed for the preparation; arrangements and execution of the working aloft and cargo cleaning operations(**§ 4.4.3.1**).
- 5.1.5** Company’s safety matters Booklet’s guidelines were not taken into account during the preparation of the working aloft and the cleaning operations (**§ 4.4.3.2**).
- 5.1.6** The «working aloft permit» document did not record a working team’s signatures box(**§ 4.4.4.1**).
- 5.1.7** The «working aloft permit» did not identify appropriate PPE such as goggles and dust filter masks sufficient for the task at hand.(**§ 4.4.4.2**).
- 5.1.8** Specific PPE that is required for operations according to cargo characteristics should be documented in the «working aloft permit» and more specifically in the table «availability and condition of the equipment to be used»(**§ 4.4.4.2**).
- 5.1.9** The documented “working description” in the working aloft permit was undetailed and general»(**§ 4.4.4.3**).
- 5.1.10** The appropriate equipment for the task such as the Bosun’s chair was not used. (**§ 4.4.4.4**).
- 5.1.11** PPE are used as a protective barrier against risks which are associated with working aloft and may occur in order to minimize or mitigate their consequences to an acceptable level (**§4.6**).
- 5.1.12** The Risk Assessment Analysis did not recognize the safety harness used functioning conditions and limitations(**§4.6.3**).
- 5.1.13** A fall arrestor with a double lanyard deems appropriate to facilitate constant anchoring when descending/ascending vertical ladders(**§ 4.6.4**).
- 5.1.14** The Company’s Booklet for using other means of access to the working area was disregarded during the preparation and documentation of the task (**§4.6.5**).

5.2 Conclusions and safety issues that did not lead to safety recommendations

- 5.2.1** The post mortem report showed that the Bosun was not alcohol or drugs intoxicated (§ 3.8)
- 5.2.2** No structural deficiencies were found on the accident site, that could contribute to the Bosun's fall. (§ 4.1.1).
- 5.2.3** National and international legislation does not elaborate explicit instructions, guidelines or recommendations for preventing falls from a height (§ 4.3.1 & 4.3.2)
- 5.2.4** Flag States' Administrations, International Organizations and other stakeholders of the shipping industry have issued guidelines as a «reference tool» addressing safety matters; health and safety risks (§ 4.3.3).
- 5.2.5** «International Safety Management Code» foresees that the Managing Company develops and implements procedures of standards and instructions for safe operations such as working aloft; cargo hold cleaning etc. (§ 4.3.3).
- 5.2.6** The cargo hold cleaning operation was carried out without supervision by the C/O or another crew member although foreseen by the «working aloft permit» (§ 4.4.5).
- 5.2.7** The Bosun failed to follow the documented rules and safe practices (§4.5.1.1).
- 5.2.8** The Bosun felt overconfident due to his experience that probably under a “can do” attitude affected his decision not to use the safety harness (§4.5.1.2).
- 5.2.9** The Bosun's actions were driven by a “get the job done” attitude that is an improper attempt to save time or effort (§4.5.1.3).
- 5.2.10** Time and work load stress for completion the cleaning operation of the No 3 cargo hold within a short timeframe were not identified (§4.5.1.3).

6. Actions taken

During the consultation period pursuant to par.6.2 of the Commission Regulation 1286/2011/EU, the Company reported that safety matters Booklet «Safety Guidelines while working aloft / overside guidelines» was amended and more specifically:

- ✓ The descent into the cargo hold via vertical ladders was classified as a dangerous situation, especially while cleaning works are carried out at the same time.

7. Safety recommendations

The Managing Company of Doric Spirit is recommended to:

01/2016: Review the SMS procedures fleet-wide concerning the «risk assessment» and the «working aloft permit», in order to ensure that both procedures are «tailored to the needs» of the scheduled operations taking into account the appropriate PPE and equipment (specifications/limitations). (**Conclusions 5.1.1 to 5.1.14**)