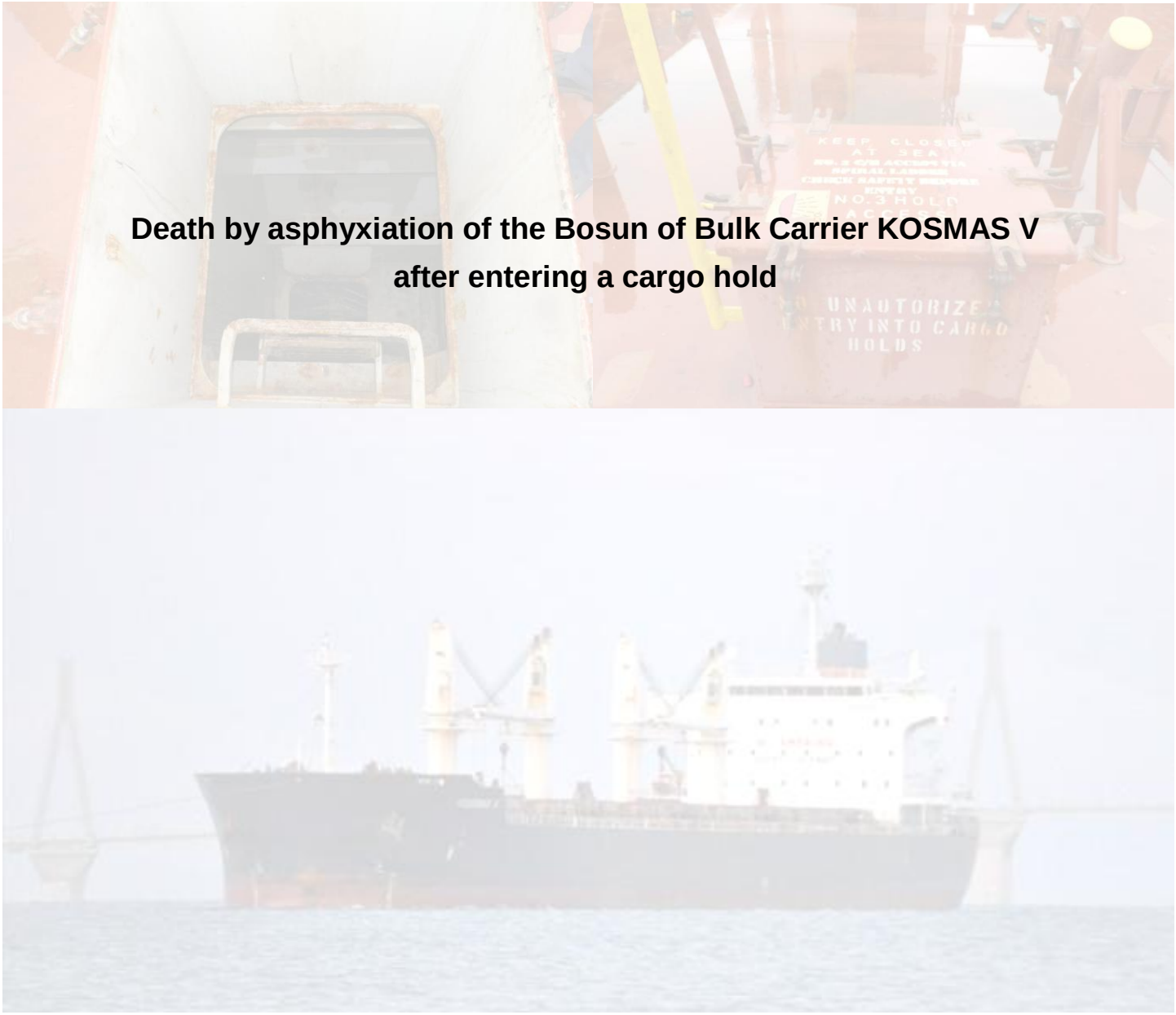
HELLENIC REPUBLIC
HELLENIC BUREAU FOR MARINE CASUALTIES INVESTIGATION

MARINE CASUALTY SAFETY INVESTIGATION REPORT 03/2015



Death by asphyxiation of the Bosun of Bulk Carrier KOSMAS V after entering a cargo hold

October 2016

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Foreword

The Hellenic Bureau for Marine Casualties Investigations was established by Law 4033/2011 (Government Gazette 264 A/22-12-2011), in the context of implementing EU 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 it 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 produced 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. It seeks to apprehend the sequence of events occurred on the 26th of February 2015 that resulted in the examined very serious marine casualty.

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

The investigation report has been prepared in accordance with the format of Annex I of respective Law (Directive 2009/18/EC) and all times quoted are vessel´s times (UTC +2) unless otherwise stated.

Within the aforementioned framework HBMCI has examined the death of the Bosun of the Panama flagged Bulk Carrier “KOSMAS V”, after entering a loaded cargo hold, while the ship was preparing for discharging at the port of Drepanon, Achaia, Greece on 26 February 2015.

Note: This report is mostly based on evidence collection and data acquired from the crew and the parties involved in the marine casualty.

The events timeline elaboration and positions of individuals involved are mostly based on statements, interviews from the crew and those involved in the marine casualty.

Glossary of Abbreviations, Acronyms and Terms

1.	AB	Able seaman
2.	Australian ladder	A combination ladder fitted in the cargo holds accesses compartments, facilitating the entry into cargo holds´ bottom. It consists of a vertical part that is followed by a spiral.
3.	BA	Breathing apparatus: self contained with compressed air device used by adequately trained personnel for entering enclosed or confined spaces with lack of oxygen.
4.	Bft	Beaufort (measurement unit of wind force)
5.	BLU Code	Code of Practice for the Safe Loading and Unloading of Bulk Carriers
6.	CGA	Compressed Gas Association
7.	CO	Carbon Monoxide
8.	CO_2	Carbon Dioxide
9.	C.P.R	Cardiopulmonary resuscitation
10.	EEBD	Emergency Escape Breathing Device
11.	IAPH	International Association of Ports and Harbors
12.	ICS	International Chamber of Shipping
13.	IMO	International Maritime Organization
14.	IMSBC Code	International Maritime Solid Bulk Cargoes Code
15.	ISGOTT	International Safety Guide for Oil Tankers and Terminals
16.	kW	kiloWatt
17.	LR	Lloyd's Register of Shipping.
18.	MSDS	Material Safety Data Sheet
19.	MT	metric ton
20.	O_2	Oxygen
21.	OCIMF	Oil Companies International Marine Forum
22.	OS	Ordinary seaman
23.	OOW	Officer of the Watch
24.	SMC	Safety management certificate
25.	SMM	Safety Management Manual
26.	SMS	Safety management system
27.	SOLAS	Convention for the Safety of Life at Sea 1974, as applied
28.	UTC	Universal Coordinated Time
29.	VHF	Very High Frequency portable communication device

1. Executive summary

Kosmas V, under Panama Flag, was a five cargo holds 57,000 tons Handymax Bulk carrier, geared with four cranes that was built in China in 2011 (figure 1/1). By the time of the marine casualty she was engaged in international trade.

Figure 1/1: Bulk carrier KOSMAS V.

On 26 February 2015, the Bosun of KOSMAS V lost his life after entering into cargo hold no 3 aft hold access compartment.

On the same day, Kosmas V had arrived from Richard's Bay, South Africa, laden with 44,000 MT of Steaming Coal in bulk and she had berthed at 08:15 alongside Drepanon port facilities, located at Achaia, Greece. Discharging operation was under preparation. At approximately 09:00 the Draught Surveyor along with the Chief Officer was carrying out the draught survey and requested from him that following the discharging commencement, he would need to receive a cargo sample. Until that time cargo hold hatch covers were still closed.

The Bosun, who was present, assigned one AB and one OS to collect cargo samples from all cargo holds and headed towards the accommodation. The AB, carrying a flashlight, some plastic bags and a small shovel, opened the hatch cover of the main hold access of no 3 Cargo Hold and entered the compartment via the Australian ladder.

After a few seconds, he collapsed. The OS, watching him from the hatch coaming opening, ran towards the accommodation and called the Bosun for help. Two other ABs standing nearby, having realized the emergency, entered the cargo hold along with the Bosun, in an attempt to recover their colleague. All three of them also collapsed. The OS still standing at the entrance of the manhole access, ran to the accommodation and reported the incident to the 3rd Officer who was the Deck Watch Officer. The 3rd Officer rushed his way to the cargo hold entrance and saw unconscious crew members lying on the Australian ladder´s landing platform. He immediately reported the emergency to the Master via his VHF radio.

Two breathing apparatuses as well as rescuing equipment were brought by other crew members on spot. While the 3rd Officer was putting on the rescue equipment,

the Chief Officer, who was the Ship's Safety Officer, entered the manhole compartment on his effort to help the unconscious Seamen, without taking any precautions, or even waiting for the Hold's hatch cover to be opened. He managed to recover one OS and push him out on deck however he also felt faint and struggled his way up to the main deck himself.

At that time, No 3 Hold hatch cover began to open and although the proper procedure for the rescue from an enclosed space was not followed, the gathered crew members managed to pull the other 3 unconscious crew members out. The Bosun was pulled out last, due to the fact that he had collapsed and fell at a lower spot than the rest of the crew members.

The Bosun lost his life due to the oxygen deficient atmosphere in the aft cargo hold access compartment that caused his asphyxiation. One AB and one OS were hospitalized and recovered a few days after the accident and joined Kosmas V before departing from Drepanon port. One AB was hospitalized for approximately fifteen days and was repatriated shortly after.

The investigation conducted indicatively identified that:

- ✓ the crew of Kosmas V failed to conceive that the loaded cargo hold was a dangerous enclosed space; and
- ✓ failed to consider the likelihood that the atmosphere within the space could be oxygen deficient and overlooked fundamental practices.

It also emerged that the crew's training regarding the procedure of entering an enclosed space had not been sufficient.

It was additionally brought to light that:

- → the Managing Company's policy "on entry into enclosed spaces" was not clear and updated and was not adequately implemented by the Officers;
- → the Managing Company had not taken any actions to rectify the gas monitor instrument that was not functioning due to its overdue calibration.

Recommendations have been addressed to the vessel's Managing Company, namely to take actions:

- to improve the standards of safety and training for shipborne personnel;
- to improve the response to maintenance of critical safety equipment;
- to review the Safety Management System in relation to cargo operations, recruiting policy and other safety related issues as presented in the report.

A Recommendation has also been addressed to Panama Authority as Flag Sate to take note of the identified issues in relation to crew communication language barriers and Safety Management Manuals and their emanating Manuals, check lists etc. produced in Languages that are not understandable in full by seafarers who are not capable of communicating in English and take actions as deemed appropriate.

Furthermore a safety recommendation has been addressed to Panama and Greek Administration to propose to international competent Bodies an amendment to BLU Code regarding cargo sampling procedure for shipborne personnel.

A Recommendation has also been addressed to Drepanon Terminal in order to review its safety procedures in view of a ship to shore check list (analogous to the one included in the BLU Code) to be completed prior to cargo handling commencement, even in cases when the loading or unloading is carried out solely with the ship's equipment and the BLU Code doesn't apply.

2. Factual Information

2.1 Particulars of Bulk Carrier KOSMAS V

Name of Vessel	**KOSMAS V**
Call Sign	3FHR4
Company (ISM Code A 1.1.2)	EDEM Marine S.A.
Ownership	Muscat Shipholding Inc.
Flag State	Panama
Port of Registry	Panama
IMO Number	9445681
Type of Vessel	Bulk Carrier
Classification Society	Lloyd's Register (LR)
Year built	2011
Ship Yard	Wafangdian, China by STX Dalian Shipbuilding
Construction	Steel
LOA (Length over all)	190.0 m
Breadth	32.26 m
Deadweight	57,295 MT
Gross tonnage	33,226
Net Tonnage	19,294
Main Engine	MAN B&W Diesel (6S50MC-C)
Engine Power /Speed	9,480 kW / 14.5 kts
Document of Compliance	Panama Register Corporation
Safety Management Cert.	Panama Register Corporation
Crew	22 (19 Ukrainian / 3 Filipinos)
Minimum safe manning	14

2.2 Voyage Particulars

Port of departure	Richard's Bay, South Africa
Port of arrival	Drepanon, Achaia, Greece
Type of voyage	International
Cargo information	Loaded with 44,000 MT of Steaming Coal
Crew	22 (19 Ukrainian / 3 Filipinos)

2.3 Marine casualty information

Type of casualty	Very serious
Date and time	26 February 2015, at approximately 0945
Position	Port of Drepanon, Greece lat: 38º 20´ 10.56´´,N / long:21º 50´ 38.04´´ E
Location	cargo hold no 3 aft access compartment
External environment	Moderate 1.5 m, Wind: 5 bfrs ESE, poor visibility, scattered clouds - day time
Ship operation	Discharging operation
Voyage segment	Berthed
Consequences (to individuals, environment , property)	3 injured hospitalized / 1 Fatality No damage to ship or cargo

2.4 Emergency response

Authorities – Services involved		
Rio, Patras Coastguard Authority	→	Coast Guard Officers
National Emergency First Aid Service	→	01 Ambulance with 03 attendants
Samaritans rescue team	→	Emergency Rescue & First Aid team

3. Narrative

Note: The sequence of the events leading to the examined marine casualty in relation to times and positions of individuals involved is mostly based on crew statements and interviews.

3.1 Bulk Carrier KOSMAS V

Bulk Carrier KOSMAS V was built by STX Dalian Shipbuilding Company at Wafangdian, China. She was ordered in 2007 and delivered to her registered owner in January 2011.
She was a relatively newbuilt 57,000 tons Handymax Bulk carrier, geared with four cranes and designed with five cargo holds, equipped with folding type hatch covers (figure 3.1/1).

Figure 3.1/1: KOSMAS V cranes and folding type holds' hatch covers.

Each cargo hold was accessed from main deck through two hatch coaming entrances. One entrance was located at the port forward section of each cargo hold and the second one at the starboard aft section respectively.
Each entrance was structured with a vertical ladder leading to a landing platform and following to a spiral ladder, also called "Australian ladder" (figure 3.1/2). The ladders' combination facilitated the crew access into cargo holds.
On 04 June 2015, she was renamed to "Focomar" and on 01 July 2016 she was renamed to "Iron Lady V" operating under a new registered owner, yet under the same Flag.

Figure 3.1/2: Australian Ladder and vertical ladder's landing platform at cargo hold no 3 aft entrance.

3.2 Voyage to destination port

On 28 January 2015, Kosmas V departed laden from Richard's Bay, South Africa where she had stayed for almost 2 days, loading 44.000 MT of Steaming Coal in bulk. The loading operation was reported to have been conducted in order, without any problems. Steam coal specifications and requirements were addressed to Kosmas V Master under the standard "Form of cargo information for Solid Bulk Cargoes" that was sent by the Shipper on 21 January 2015, before her arrival at the loading port. At that time Kosmas V was manned with 22 crew members, including Master. The crew was composed of 19 Ukrainian seafarers and 03 Filipinos.

Most of the crew members had joined her during her previous passage from Gdynia, Poland to Tanga, Tanzania that was her previous charter. More specifically, on 03 December 2014, an extensive crew change took place, that is 12 crew members disembarked Kosmas V at the anchorage of Las Palmas, Canary Islands, Spain, amongst which the Master, the Chief Engineer, the 2nd Officer, the 3rd Officer, the 4th Engineer, the Bosun, the AB and the OS that were injured during the accident. The joining crew boarded her and the handover procedure and crew overlap period was carried out in less than 4-5 hours. It was furthermore reported that during "Master's take over duties" process the cooperation of the relieved Russian Master with the relieving Master was extremely poor.

On 16 February 2015, she also had a short few hours stay in Las Palmas, for bunkering. Kosmas V departed Las Palmas and headed towards Gibraltar in order to follow her passage in the Mediterranean Sea. According to interview statements, a Safety Committee meeting had been conducted prior to her arrival at the discharging port of Drepanon, in relevance to the discharging operation and cargo specifications and properties.

At approximately 02:00, on 26 February 2015, she arrived at the discharging port anchorage of Drepanon, Achaia, Greece and dropped her anchor (figure 3.2/1). At approximately 06:00, deck crew was ordered to stand by for the mooring operation and at 06:30 the anchor was heaved up and following the Port Pilot embarkation, Kosmas V headed towards the port facilities berth. The mooring operation was completed at 08:15.

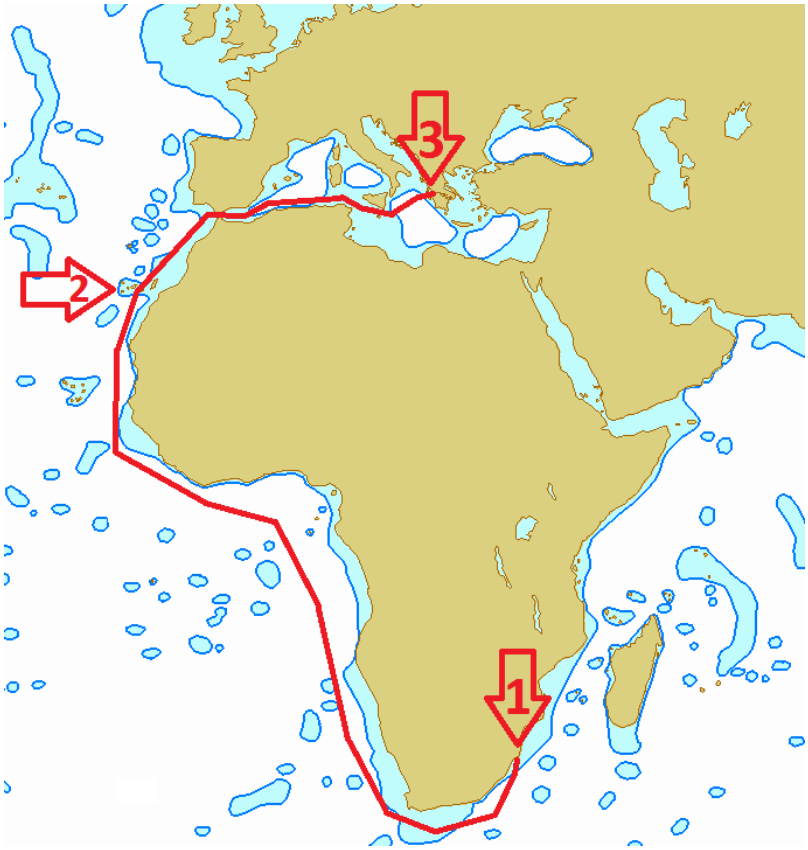

Figure 3.2/1: Kosmas V general voyage depiction from Richard's Bay, South Africa (1) through Las Palmas, Canary Islands, Spain (2) and destination port of Drepanon, Achaia, Greece (3).

3.3 Discharging preparation

Following Kosmas V berthing alongside the berthing dock, at 08:45, amongst Authorities representatives, the appointed Agent together with the Draught Surveyor came on board.

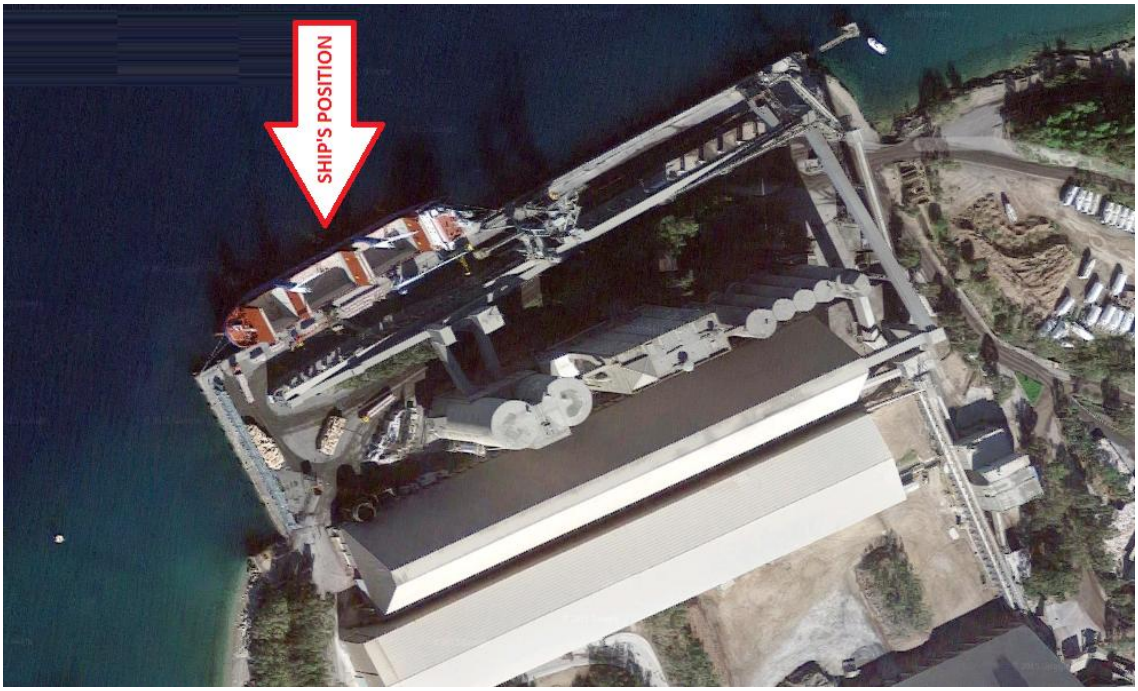

Fig. 3.3/1: Indicative picture of the ship's position at the time of the marine casualty, moored alongside at the port facility of Titan Group at Drepanon , Achaia, Greece (Source: Google Maps)

At approximately 09:00, the Chief Officer in charge of the discharging operation, along with the Draught Surveyor proceeded with the draught survey process. By that time, the Chief Officer and the Surveyor were in the Ship's Office checking cargo documents and the Bosun was present too. The Surveyor requested the Chief Officer for cargo samples. The Draught Surveyor, being Greek communicated with the Ukrainian Chief Officer in English while the Bosun, present at that time, had a very poor knowledge of English.
Following the information provided through the interview process it could not be determined whether the Bosun was ordered to proceed with the cargo sampling or having overheard the discussion between the Chief Officer and the Draught Surveyor, he decided to carry out the sampling task.
The Bosun instructed the AB on the deck watch and one OS to collect samples from all cargo holds while the cargo hold hatch covers were still closed. Both crew members opened the hatches of all cargo hold entrances.

3.4 The marine casualty

The AB carrying a flashlight, some plastic bags and a small shovel, entered cargo hold no 3 through the aft manhole and the OS remained on top of the hatch coaming watching his colleague. Seconds after, the AB having descended a few steps of the Australian ladder felt faint and tried to climb back up however he collapsed on the ladder's stairs.
The OS standing on top of the entrance, immediately ran towards the accommodation and called the Bosun for assistance. The Bosun moved rapidly to no3 cargo hold aft entrance together with the OS, without reporting the incident or taking any other precautionary measure. One AB and one OS, standing nearby and having realized the emergency, joined the Bosun and all three entered the cargo hold entrance in order to recover their colleague. However having entered the hold access compartment with no breathing apparatus (BA) set or without carrying an emergency escape breathing device (EEBD), they all fainted and collapsed on their effort to pull their colleague from the cargo hold.
The Bosun was stated to have collapsed and fell onto the cargo that was almost reaching the height of the landing platform, in prone position while his legs were lying on the ladder. The AB and OS collapsed on the ladder landing platform while the AB that had originally entered the access compartment remained lying on the Australian ladder's first stairs.
The OS that was initially deployed for the cargo sampling, having remained at the entrance on deck, saw the evolving events and ran towards the accommodation to report the emergency situation to the 3rd Officer on Deck Watch who rushed up to the hold entrance and immediately reported the situation to the Master via his portable VHF device.

3.5 Emergency response actions by the crew

The Master, being in his cabin and speaking on the phone with the Managers for cargo related matters, did not go down on deck immediately, however he ordered the Chief Officer via his portable VHF to go and take control of the emergency situation and also instructed two other crew members to go to the forecastle and activate the hydraulic pumps in order to open the cargo hold's hatch covers. The 3rd Officer, that was also afforded with the duties of the Assistant Safety Officer, having reported the emergency to the Master, ordered the OS on scene to bring two sets of breathing apparatus stored in the accommodation on main deck as well as the stretcher, rope and lifting slings and water.
At that time, the Chief Officer was on the bridge engaged with clerical work regarding

the draught survey. Having heard the emergency on the VHF, rushed up to the casualty scene. By the time the chief Officer arrived on scene, the 3rd Officer was putting on the breathing apparatus and seconds after he entered the hold entrance hatch. However, as he was going down he realized that the valve of the air cylinder hit on the inner side of the hatch coaming entrance and started malfunctioning. Consequently he climbed back on the main deck. By that time the Master was still in his cabin monitoring the situation through VHF.

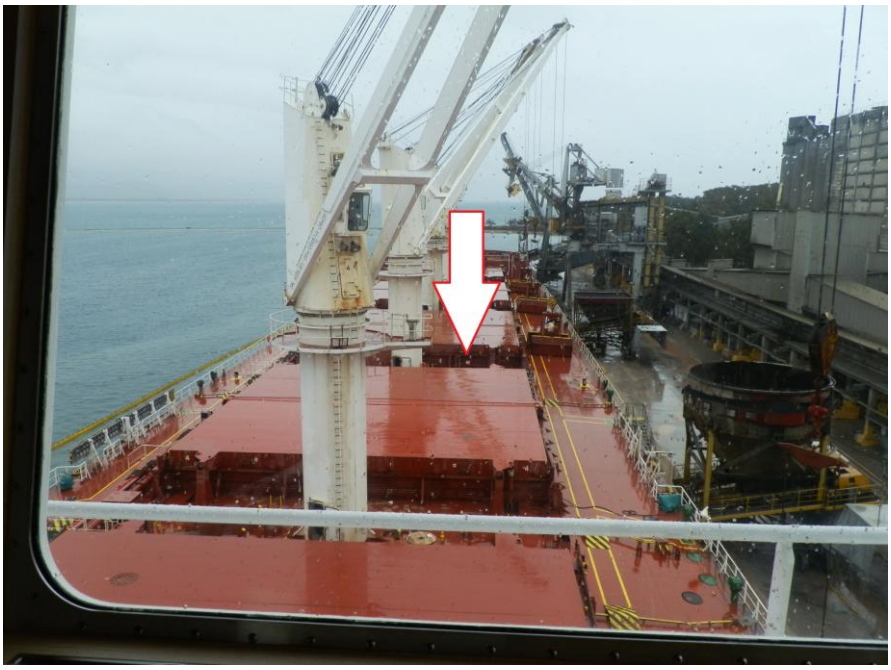

Fig. 3.5/1: The view from the fore window of the Master's cabin.
The location of the aft entrance of the Cargo Hold no 3, is indicated by the arrow.

The Chief Officer, seeing that the 3rd Officer's attempt to recover the casualties had failed, immediately entered the hold access compartment with no BA on and while the cargo hold hatch cover had not been opened yet. The Chief Officer tried to recover the OS lying on the ladder's landing platform by shaking him. Seconds after, the OS regained consciousness and was assisted by the Chief Officer to climb the ladder. He was finally pulled over the hatch coaming by the assembled crew and exited the compartment.
The Chief Officer remained on the ladder's landing platform and tried to assist the AB lying on it unconscious. Nonetheless he was forced to leave the space as he started feeling faint and exited the cargo hold entrance while the hatch covers were not opened yet.
At that time the hatch covers started opening. Another AB on his own initiative entered the space also with no BA set and managed to pass lifting slings around the fallen AB on the platform who was recovered on deck by the summoned crew.
The Chief Officer reentered into the compartment and together with the assisting AB managed to pull up the unconscious AB that had first entered the hold compartment for the cargo sampling.
The Bosun was the last casualty to be recovered as he was lying further down on the cargo surface as already described.

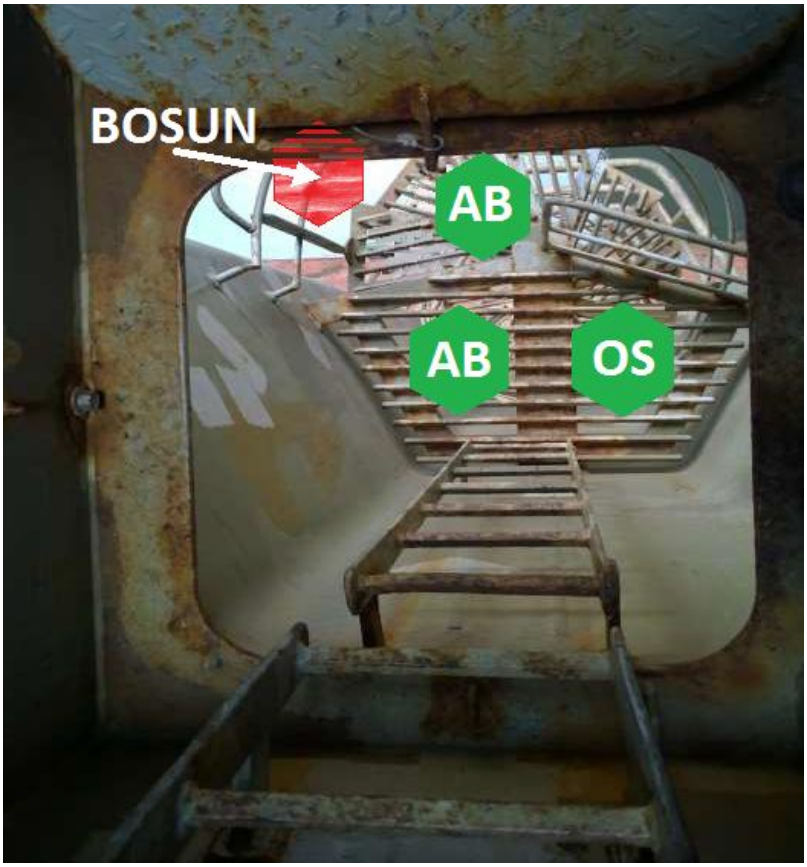

Figure 3.5/2: The positions where the 04 crew members involved in the casualty were found by their colleagues. The Bosun was lying on the cargo with his legs remaining on the ladder.

The rescued crew members sustained serious respiratory problems. First Aids were offered by the crew while shortly after, a port emergency First Aids Samaritans Team, that had arrived on scene, attended the rescued crew by performing CPR. The two ABs and the OS were resuscitated and survived. However, although the Bosun was offered CPR for at least 25 minutes and a defribillator was also used, he did not regain consciousness and the doctor of the National Emergency First Aid Service who had arrived on scene in the meantime, pronounced him dead. All 04 crew members were transported by ambulances to local hospitals.

The recovered crew members and the casualty were transported by National Emergency First Aid Center Ambulances to Local Hospitals. The OS and the AB who had been rescued first, were hospitalized for a short period and rejoined Kosmas V prior to her departure on 06 March 2015 for the next discharging port of Elefsis.

The AB who was recovered after the aforementioned crew members, was hospitalized until 10 March 2015 and was repatriated shortly after.

3.6 Coastguard Authority actions

Following the marine casualty, the Local Coast Guard Authority held a preliminary inquiry and issued a “no permission to sail” order for Kosmas V.

Additionally the Port State Control Authority boarded Kosmas V and inspected her.

The inspection findings that were considered to be directly related to the marine accident included:

- Gas instruments – Not as required.
- Personal equipment – Missing.
- Entry dangerous spaces – Not as required.
- ISM – Not as required.

PSC findings were grounds for detention and Kosmas V was detained in port. The detention was lifted on 04 March 2015 following RO and Flag State audits and corrective actions taken.

Based on Kosmas V PSC inspection record, it was found that since the beginning of her trading operation, 19 inspections had been carried out by various PSC regional regimes while she had been detained 03 times during a period of less than two years prior to the investigated casualty: on 18 June 2013 at Incheon, South Korea, on 15 October 2014 at Antwerp, Belgium and on 03 November 2014 at Gdynia, Poland. Aforementioned inspections had identified various safety issues out of which ISM related observations and deficiencies related to “Personal Equipment for fire safety” and “Emergency Escape Breathing Device and disposition”.

4. Analysis

The analysis of the examined marine casualty aims to identify and determine the factors and causes which contributed to the occurrence, taking into account the sequence of events and the collection of the investigation information and data focusing both on specific points of the temporal evolution of them, as well as on the root causes in order to draw useful conclusions leading to safety recommendations.

Note: The sequence of the events on board Kosmas V in relation to times and positions of individuals involved are based on statements as recorded electronic sources of information could not contribute to the elaboration of the events' timeline.

4.1 Manning and Personnel

Kosmas V minimum safe manning under SOLAS Regulation V/14, as applied, as well as under her Flag requirements, provided a minimum crew of 14 seafarers. Nevertheless, she was manned with 08 crew members in excess of her Flag requirements, that is 22 mariners in total. At the time the marine accident occurred, 19 crew members were Ukrainian nationals while 03 seafarers were Filipinos with the capacities of AB, Motorman and Fitter.

Most of them had joined Kosmas V on 03 December 2014 at Las Palmas, Canary Islands, where she had a few hours stay. Based on the above the newly recruited crew had been on board Kosmas V for almost two and a half months prior to the casualty. As already stated and according to evidence Kosmas V crew change in Las Palmas was extended, as 12 out of the 22 crew members were replaced, amongst which the Master, the Chief Engineer, the 2nd and 3rd Officer, the 4th Engineer, an AB (the one that firstly entered the enclosed space), an OS (the one that entered the cargo hold compartment with the Bosun and the AB) and the Bosun.

Each crew member, according to Kosmas V Safety Management System familiarization procedure, was informed and aware of the Company's SMS policy, procedures and targets, as the personnel's familiarization had been completed and recorded during the onboard familiarization process, before crew members resumed their respective duties.

Nevertheless, having examined the factual information provided, it was identified that Kosmas V crew change was carried out in a limited period of time during her stay in Canary Islands that was less than three hours suggesting that the hand over procedures and their emanating documentation, especially for the Master and the Chief Engineer, were not carried out in sufficient time.

On above grounds it is questioned whether the procedure had been completed in full regard to Kosmas V Safety Management System and related procedures.

4.1.1 The Master

The Master aged 39, based on his professional credentials was experienced and familiar with bulk carriers operations. He had started his seagoing career in 1999, as a deck Officer and had served on Bulk Carriers for many years as Chief Officer and Master. He had acquired his Master Certificate approximately 7 years prior to the casualty. It was his second contract with the managing Company of Kosmas V and by the time of the marine casualty he was running his third month on board.

Based on evidence related to Kosmas V crew change at Las Palmas on 03 December 2014 as well as on information deriving from the interview process, it was identified that the Masters' hand over period lasted only a few hours and it was not cooperative enough as reported by the crew.

The Master was fluent in spoken and written English.

4.1.2 The Chief Officer

The 47 year-old Chief Officer of Kosmas V was firstly positioned as a Deck Officer in 2004, after having graduated from the Odessa Maritime College where he acquired his Certificate of Competence as an Officer on board ocean going vessels and he started contracting on cargo vessels as a 3rd Officer while in 2014 he was promoted to a 2nd Officer. It was his second contract with the managing Company of Kosmas V and his previous contract had lasted for approximately 11 months.
It was his first time to be positioned as a Chief Officer and to be charged with the duties of the Safety Officer.
The Chief Officer had joined Kosmas V on 01 January 2015, at Tanga Port, in Tanzania which was the discharging port of her previous charter before her next laden voyage from Richard's Bay Port to Drepanon, Greece and he had been serving on board for approximately one and a half months prior to the casualty.
Based on evidence and the interview process it was sprung up that the previous Chief Officer had signed off Kosmas V by the time she arrived at the discharging port, that is four days before his reliever got on board. Consequently, no hand over duties procedures were carried out, although the Chief Officer's position is a mandatory capacity included in the "Minimum safe Manning Certificate". Consequently the discharging operation was conducted and supervised by the Master.
It was furthermore emerged through the interview process that the Chief Officer was not experienced enough and he used to ask for the Master's advice and instructions in order to perform his charged duties, pertaining to his tasks and decisions.
The Chief Officer's spoken English was poor.

4.1.3 The 3rd Officer

The 3rd Officer was 26 years old and had graduated from the Urshakov Academy in 2013. It was his first time to be employed as a Deck Officer after graduating the Marine Academy however his seagoing career had started in 2009, serving as an OS and later as an AB. He had boarded Kosmas V on 03 December 2014 at Las Palmas. He was also appointed as the Safety Officer's assistant. His service on board Kosmas V as an Officer counted approximately two and a half months prior to the casualty and his experience is considered to have been limited. At the time of the casualty he was performing the deck watch.

The 3rd Officer's spoken and written English was good.

4.1.4 The Bosun

The 47 year-old Bosun was an experienced seafarer based on his 21 years seagoing career. He had joined Kosmas V on 03 December 2014 at Las Palmas, approximately two and a half months prior to the casualty.

Based on the interview information it was reported that his English was poor and he could barely understand basic English marine phrases, an issue that was considerably limiting his communication with the English spoken Filipino AB. In view of the above it is highly presumed that he had a very poor understanding of Kosmas V manuals and provided procedures written in English.

It was furthermore reported that he was not very cooperative with the Chief Officer and aggressive to the deck personnel.

4.1.5 The deck crew involved in the casualty

.1 The **AB** who firstly entered the no 3 cargo hold access compartment to take cargo samples, was 33 years old.
He had started his seagoing career as an OS approximately 04 years prior to the casualty, all served on bulk carriers. He had embarked on 03 December 2014, approximately two and a half months prior to the casualty at the port of Las Palmas, Canary Islands.
Although he was a holder of a STCW A-II/4 Certificate of Competency for "ratings forming part of the navigational watch" he was assigned with the duties of a seafarer deck.
He could not communicate in English or understand basic English marine phrases regarding his work on board.

.2 The 30 year-old Filipino **AB** who entered the cargo hold compartment access together with the Bosun and the OS, had a seagoing experience of approximately 06 years, all served on Bulk Carriers.
He had joined Kosmas V on 10 October 2014, approximately four and a half months prior to the occurrence.
He was a holder of a STCW A-II/5 Certificate of Proficiency for "ratings forming part of the navigational watch", performing the 0800-1200 navigational watch and was considered to be an experienced Seaman.
His spoken English was good.

.3 The **OS**, aged 25, who entered the no 3 cargo Hold compartment access together with the Bosun had no previous sea experience. It was his first employment as a seafarer and he had boarded Kosmas V at the port of Las Palmas on 03 December 2014, that is two and a half months before the marine accident.
His spoken English was poor.

.4 The 20 year-old **OS** who was assisting the AB that initially entered no 3 cargo hold for taking samples and witnessed the occurrence had no previous sea experience.
He had also joined Kosmas V on 03 December 2014 during the crew change at Las Palmas.
He could not communicate in English or understand basic English marine phrases.

4.2 Carriage of bulk cargoes regulatory framework

Bulk Carriers are special purpose ships designed, constructed and used for the carriage of solid bulk cargoes. Bulk carriers safety has been of high significance as their operations and trading are compound, interacting with several risky and critical aspects associated with the shipment of solid cargo, such as inappropriate cargo distribution and structural damages, loss or reduction of stability during passage and chemical reactions of cargo.

4.2.1 Bulk Carriers' SOLAS provisions

General safety issues and related aspects of Bulk Carriers trading and operation requirements have been controlled and regulated by SOLAS Chapter VI Part A and B and Chapter VII Part A-1.
More specifically, SOLAS principal provisions that are related with the examined case are quoted below. It is noted that said provisions have been also reproduced and incorporated in "International Maritime Solid Bulk Cargoes Code (IMSBC Code)".

SOLAS/Chapter VI/Part A

- *Regulation 2 - Cargo Information:*
  "***The shipper shall provide the master or his representative with appropriate information on the cargo*** *sufficiently in advance of loading to enable the precautions which may be necessary for proper stowage and safe carriage of the cargo to be put into effect. Such information shall be confirmed in writing and by appropriate shipping documents prior to loading the cargo on the ship. …*"

- *Regulation 3 - Oxygen analysis and gas detection equipment*:
  "1. When transporting a solid bulk cargo which is liable to *emit a toxic or flammable gas, or* ***cause oxygen depletion in the cargo space, an appropriate instrument for measuring the concentration of gas or oxygen in the air shall be provided together with detailed instructions for its use.*** *Such an instrument shall be to the satisfaction of the Administration.*
  2. The Administration shall take steps to ensure that crews of ships are trained in the use of such instruments."

In relevance, the IMSBC Code, that came into force in 2011 by Res.MSC.268(85) under SOLAS/Chapter VI/Part A/Regulation 1-1, has embodied and intensified a more extended set of mandatory, recommended and optional provisions. The Code was amended by Res.MSC 354(92) in 2013 and by Res.MSC 393(95) in 2015.
In view of the fact that Kosmas V was trading in the bulk industry and at the time of the marine casualty she was laden with coal, the IMSBC respective standards and provisions were primarily applied for her safe operation.

4.2.2 The International Maritime Solid Bulk Cargoes Code

The IMSBC Code in its updated version, as already mentioned, sets key principles, recommendations and guidelines to be adopted by Governments as a basis for national regulations to be implemented by Bulk Carriers managers, operators, solid bulk cargo shippers and interested stakeholders, in order to harmonize procedures, practices and precautions for the safe and effective loading, trimming, carriage and discharge of solid bulk cargoes.
The IMSBC Code, as applied, is subdivided into14 sections and 5 Appendices[1].
Although the Code refers to a vast array of issues steering the bulk carriers operation, a non-exhaustive list of the provisions which are directly or indirectly pertinent to the examined casualty, is quoted in the following subparagraphs:

4.2.2.1 IMSBC Code – Section 3 (Safety of Personnel and ship)

According to Par. 3.2 – Poisoning, corrosive and asphyxiation hazards:

[1] **IMSBC Code**

Section 1	General provisions
Section 2	General loading, carriage and unloading precautions
Section 3	Safety of personnel and ship
Section 4	Assessment of acceptability of consignments for safe shipment
Section 5	Trimming procedures
Section 6	Methods of determining the angle of repose
Section 7	Cargoes that may liquefy
Section 8	Test procedures for cargoes that may liquefy
Section 9	Materials possessing chemical hazards
Section 10	Carriage of solid wastes in bulk
Section 11	Security provisions
Section 12	Stowage factor conversion tables
Section 13	References to related information and recommendations
Section 14	Prevention of pollution by cargo residues from ships
Appendix 1	Individual schedules of solid bulk cargoes
Appendix 2	Laboratory test procedures, associated apparatus and standards
Appendix 3	Properties of solid bulk cargoes
Appendix 4	Index
Appendix 5	Bulk Cargo Shipping Names in three languages (English, Spanish and French)

"*3.2.3.* ***Many solid bulk cargoes are liable to cause oxygen depletion in a cargo space*** *or tank. These include, but are not limited to, most vegetable products and forest products, ferrous metals, metal sulphide concentrates* ***and coal cargoes***.

*3.2.4. Prior to entry into an enclosed space aboard a ship, appropriate procedures shall be followed taking into account the recommendations developed by the Organization.*** ***It is to be noted that, after a cargo space or tank has been tested and generally found to be safe for entry, small areas may exist where oxygen is deficient or toxic fumes are still present****.*

3.2.5. When carrying a solid bulk cargo that is liable to emit a toxic or flammable gas, and/or cause oxygen depletion in the cargo space, ***the appropriate instrument(s) for measuring the concentration of gas and oxygen in the cargo space shall be provided****.*

3.2.6. *Emergency entry into a cargo space shall be undertaken* ***only by trained personnel wearing self-contained breathing apparatus and protective clothing and always under the supervision of a responsible officer.*** *..."*

4.2.2.2 IMSBC Code – Section 4 (Assessment of acceptability of consignments for safe shipment)

According to Par. 4.2 – Information of cargo:

"4.2.1 The shipper shall provide the master or his representative with appropriate information on the cargo sufficiently in advance of loading to enable the precautions which may be necessary for proper stowage and safe carriage of the cargo to be put into effect.

4.2.2.1 Cargo information shall be confirmed in writing and by appropriate shipping documents prior to loading. ***The cargo information shall include****:*

…

.12 flammability, toxicity, corrosiveness and ***propensity to oxygen depletion of the cargo****, if applicable;*

…"

4.2.2.3 IMSBC Code - Appendix 1 (Individual schedules of Solid Bulk Cargoes)

As regards to Coal hazards, presented in Appendix 1 of the Code "Individual schedules of solid bulk cargoes", it is stated that:

"*Coal may create flammable atmospheres, may heat spontaneously,* ***may deplete the oxygen concentration****, may corrode metal structures …".*

Furthermore, under the section "Properties and characteristics" of the Appendix, it is mentioned:

"2. *Coals may be subject to oxidation, leading to* ***depletion of oxygen and an increase in carbon dioxide or carbon monoxide concentrations*** *in the cargo space. Carbon monoxide is an odourless gas, slightly lighter than air, and has flammable limits in air of 12% to 75% by volume. It is toxic by inhalation with an affinity for blood haemoglobin over 200 times that of oxygen."*

Whereas under the section "General requirements for all types of coal cargoes" of the Appendix, it is mentioned:

"3. The ship shall be suitably fitted and carry on board appropriate instruments for measuring the following without requiring entry in the cargo space:

.1 concentration of methane in the atmosphere;

.2 concentration of oxygen in the atmosphere;

.3 concentration of carbon monoxide in the atmosphere; and
.4 pH value of cargo space bilge samples.

4. ***These instruments shall be regularly serviced and calibrated. Ship personnel shall be trained in the use of such instruments**. Details of gas measurement procedures are given at the end of this appendix."*

4.2.3 Additional Bulk Carriers operating legal framework

As already stated bulk carriers' transport domain is principally governed by IMSBC Code. Additionally a composite "Code of practice for the safe loading and unloading of Bulk Carriers", also known as "BLU Code" was firstly adopted in 1997 by IMO resolution A.862(20) with the aim of preventing accidents or loss of ships carrying solid bulk cargoes as a result of improper loading and unloading practices and was slightly amended by resolutions MSC.238(82) and MSC.304(87).
The BLU Code, which provides guidance to ship masters of bulk carriers, terminal operators and other parties concerned for the safe handling, loading and unloading of solid bulk cargoes, is also linked to SOLAS/Chapter VI/reg. 7 (Loading, unloading and stowage of bulk cargoes), as amended by resolution MSC.47(66).
In Supporting BLU Code requirements, the Maritime Safety Committee approved the Manual on loading and unloading of solid bulk cargoes for terminal representatives by MSC.Circ.1160 (BLU manual) and urged Member Governments, ship owners, ship operators and terminals to apply the guidance contained therein.
The BLU Manual has been amended by MSC.1/Circ.1356 (2010).

According to the BLU Code, Section 4 - Procedures between the ship and terminal prior to cargo handling, a Safety Check List (see Appendix 1) should be completed and agreed by both the ship and the terminal prior to the loading or the unloading of the cargo. One of the list's recorded checks related to the examined case is quoted below:

"13. Is the atmosphere safe in holds and enclosed spaces to which access may be required, have fumigated cargoes been identified, and has the need for monitoring of atmosphere been agreed by ship and terminal?"

The aforementioned control is deemed to be arising from BLU Code/ Section 6/par 6.2 "Ship duties"/subpar. 6.2.2 stating that:

"6.2.2 At the start and during all stages of unloading cargo, the master should ensure that frequent checks are made so that:
.1 cargo spaces and other enclosed spaces are well ventilated, and persons are allowed to enter them only after they have been declared safe for entry in accordance with the guidelines developed by the Organization;*
** Reference is made to Assembly resolution A.864(20) on Recommendations for Entering Enclosed Spaces Aboard Ships.".*

BLU code said provision signifies that the Master prior to commence the unloading operation has to make sure that the cargo holds' atmosphere has been checked by the competent Officers and crew using the gas detector and has been found safe for entry. Described procedure previously requires the cargo holds to be ventilated and declared free of harmful gases either by opening the cargo hold hatch covers or by forcing fresh air circulation in the cargo holds.
The whole process is considered to necessitate cargo holds to be opened prior to any procedure or task related with the discharging operation.
Said important point is also enhanced by the requirement to complete the Safety Check List (see Appendix 1) provided by BLU Code, already recorded above.

Conclusively, IMSBC Code comprehensive provisions together with the applied regime in force, establish a clear operational framework to be observed, understood and implemented by the interested parties engaged in bulk carriers safe operation and effective trading, in order to avoid hazardous situations.
However, according to MSC.Circ.1160 (BLU manual):

"*INTRODUCTION*

*1 …**The BLU Code does not apply to**: Ships which are not bulk carriers, by definition, ships which are loading, carrying or unloading grain and ships which are being loaded or unloaded using shipboard equipment only*."

Therefore the BLU Code provisions do not apply to the unloading operation which was to be carried out by Kosmas V at Drepanon since solely the ship's cranes would be used for said operation.

4.2.4 Kosmas V cargo data and information requirements

Kosmas V loaded her cargo of steaming coal in Bulk of South African origin at Richard's Bay Coal Terminal. In view of the relevant provisions for cargo information to be provided to the consignee by the shipper, the IMSBC Code cargo information form was completed and signed by the Shipper and was granted to the Master, as attached in Appendix 2.
The declaration of cargo information provided general data for the cargo proper storage and safe carriage to be considered during the cargo shipment by the Master of Kosmas V.
Concisely, the transported coal was classified as a Group B cargo (cargo with chemical hazards) and its temperature needed to be maintained below 45 ^{o}C.
Furthermore the MSDS (Material Safety Data Sheet) had also been forwarded by the Shipper to the Master of Kosmas V, who acknowledged and countersigned it, as seen in the document attached in Appendix 3.
The MSDS contained general information regarding coal and focused on the hazards mainly due to the exposure at the dust produced during loading and unloading operations. It was highlighted that precautions would have to be taken to avoid ingestion, inhalation and contact without Personal Protective Equipment during handling operations.
The only reference in the MSDS relevant to the hazard of oxygen depletion in the cargo holds, was recorded on sheet's page no4. It was referring to the cargo's decomposition products (CO and CO_2), viz:
"Hazardous decomposition products:

- *Carbon monoxide and carbon dioxide".*

Having regard to oxygen depleted spaces, according to Compressed Gas Association, the following table is presenting the physiological effects on humans if present in a space where the concentration of oxygen is reduced to levels lower than 21%.

Atmospheric Oxygen Concentration (%)	Physiological effects
19.0 - 20.9	Normal
16.0 – 19.0	Some unnoticeable adverse physiological effects
14.0 - 16.0	Increased pulse and breathing rate, impaired thinking and attention, reduced coordination
12.5 – 14.0	Abnormal fatigue, emotional upset, faulty coordination, poor judgment
10.0 – 12.5	Very poor judgment and coordination, impaired respiration that may cause permanent heart damage, nausea and vomiting
0.0 – 10.0	Inability to move, loss of consciousness, convulsions, death

Table 4.2.3/1: Physiological effects of oxygen depletion. (Source: CGA)

In view of the aforementioned and the sequence of the events leading to the marine casualty, it is suggested that the Master and the Chief Officer did not observe coal cargo's information as recorded in the "IMSBC Code cargo information form" and MSDS in relation to hazardous decomposition products and oxygen depleted cargo hold atmosphere.
It is subsequently presumed that that the coal properties and cargo holds oxygen depletion hazards were disregarded by the Master and the Chief Officer and consequently were not explained to competent crew in order to raise their personal safety awareness. To that end said omission is suggested to have been a contributing factor in the examined case.

4.3 The International Safety Management Code (ISM 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 established and implemented by the Company and its operating vessels in order to meet the requirements of the Code and the relevant international Instruments by providing amongst others the necessary resources on board ships and ashore.
The implementing safety management system falls under the respective provisions for acceptance and certification by the competent Administrations and Recognized Organizations so as to be verified that it complies with the Code.

4.3.1 Kosmas V Safety Management System (SMS)

In view of the aforesaid regulatory framework, Kosmas V was operating under her Company's "Safety Management and Environmental Protection Procedure" system. The implemented safety system was set to organize and control aspects of Kosmas V safe operation and resource management.
Under the title "Purpose" of the SMS, the Company had defined the fundamental operational objectives as presented below:

(1) establish and promote a safe working environment on board;
(2) establish safeguards against identified risks and potential pollution;
(3) prepare and exercise for emergency situations;
(4) provide the ship´s personnel with the necessary information on Company Management System in a working language understood by them;
(5) continuously improve the Company's safety and environmental protection system.

4.3.1.1 Safety management System follow up

Kosmas V was delivered to her registered owners/managers in 2011, however until the time of the examined marine accident her Safety Management System had never been supplemented or revised since the date it was firstly produced, that is on 01 September 2010.

Said point was cropped up having examined Kosmas V Safety Management Manual System and indicatively by identifying that:

- ✓ the "Enclosed Space entry Check List" included in her Safety Management Manual (form S024), was developed under I.S.G.O.T.T.[2] (2006 edition), despite the fact that the enclosed entry procedure had been recently amended and described in IMO Res. A.1050(27) that was adopted in November 2011; on that account Kosmas V check list was noted to have significant gaps related to information entailed in the "Revised recommendations for entering enclosed spaces aboard ships", such as the pre-entry atmosphere test readings:
  a. oxygen ..... % vol (21%);
  b. hydrocarbon ..... % LFL (less than 1%);
  c. toxic gases ..... ppm.
- ✓ Kosmas V SMS in par. 3 under the title *"Procedures"* was recording a general instruction to Masters, as follows:
  "For Dangerous Goods BC Code and IMDG Code must be consulted and relevant steps taken".
- ✓ Likewise, in SMS par 3.2 *"Planning of Cargo operations",* a reference to BC Code was recorded, despite the fact that the vessel came into service in 2011 and BC Code (MSC.193(79)) had been superseded by MSC.268(85) by which the IMSBC Code was adopted in December 2008, and took effect on 1 January 2011.

Considering the above it was observed that the Company was not properly monitoring regulatory developments at international level and consequently Kosmas V SMS was not applicably revised in view of International Safety Management Code/ par. 1.2 "Objectives"/ subpar. 1.2.3 by which it is stated that:

"1.2.3 The safety management system should ensure:

.1 compliance with mandatory rules and regulations; and

.2 that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account.".

Taking into consideration the above, it was deduced that the Safety Management System was not reflecting the requirements of the up to date legal framework in order to give concrete and detailed directives and instructions to the Master and the operating crew and was not considered effective in full for a safe operation and trading.

In respect to the above it is inferred that Kosmas V Safety Management System was not effective in full.

4.3.1.2 Safety management System communicating information

During the investigation process and the evidence collection procedure, Kosmas V SMS that was written in English as well as documentary procedures emanating from it such as the Training Manual, the Fire Safety Operation Manual, the on board

[2] International Safety Guide for Oil Tankers and Terminals, sponsored by ICS, OCIMF and IAPH.

familiarization check lists, safety committee meetings and hours of rest records were requested and furnished to the Investigating Team.

Fig. 4.3.1.2/ 1&2: Training manuals and Safety markings written in English.

Nonetheless it emerged that most of the lower rank crew members had either poor or no knowledge of English, as they could not understand basic English marine phrases and terms and consequently the interview process was carried out with the assistance of a translator.

Seeing the aforementioned, it was inferred that the Company's policy and likewise Kosmas V SMS, Manuals, check lists etc. could be neither understood nor implemented in full by most of the lower rank crew members at least, an issue that has been in general identified as a basic root cause of erroneous acts on board a ship.

Kosmas V crew members' lack of understanding the safety management system and its provided procedures, established in English, is considered to have been a contributing factor in the examined occurrence.

4.3.1.3 Safety management System verification review and evaluation

ISM Code/Chapter 12 stipulates a set of provisions to be followed by the Company of a managed vessel in order to improve the Safety Management System by establishing a system of internal audits and by recording findings, conclusions and recommendations. The results of the Company's internal audits and reviews have to be promulgated to all persons having responsibility for the implementation of the managing System and Policy in order for the persons having the responsibility of the findings and conclusions fields to take timely and corrective actions.

Taking into account the investigation conducted on board Kosmas V, the evidence collection findings as well as par. 4.3.1.1, 4.3.1.2 and the following paragraphs' analysis related to the Safety Management System implemented on board Kosmas V, it is suggested that the Company was not observing in full the internal audits System under the principal standards set by ISM Code/Chapter 12 for the evaluation and review of its managed vessels' System.

4.3.2 Kosmas V equipment maintenance (gas detector)

In pursuance of ISM Code Chapter 10 "Maintenance of the ship and Equipment", par. 10.1, the Company should establish procedures to ensure that the ship and her equipment are maintained in conformity with the provisions of the relevant rules and

regulations and with any additional requirements which may be established by the Company.
Furthermore, par. 10.3 provides that operational failures of equipment and systems that may result in hazardous situations should be identified by the Company while the implementing system should provide specific measures aimed at promoting the reliability of such equipment. These measures should include the regular testing of stand-by arrangements and equipment or technical systems that are not in continuous use.
Said requirements should be met by amongst others conducting inspections at appropriate intervals and by maintaining records of these activities according to par.10.2 while based in par.10.4, the inspections and measures should be integrated into the ship's operational maintenance routine.

4.3.2.1 Bulk Carriers oxygen analysis and gas detection equipment

Oxygen analysis and gas detection equipment is imperative and of paramount importance on board bulk carriers as the following two basic parameters for their safe and effective operation, are to be covered by its reliable operation:

- the safety of the ship and its crew in relation to flammable or toxic gases and oxygen depletion in cargo holds and adjacent spaces;
- the effective shipment of cargos that are subjected to special carriage conditions in the cargo holds due to their substances and properties and their behavior during the voyage both directly related to the trading performance of a bulk carrier.

Said equipment is mandatory to be available on board bulk carriers primarily under the respective provisions of SOLAS/Chapter VI/Part A/Regulation 3 that is additionally reproduced in IMSBC Code Section 3, par. 3.2.5 (see par.4.2.2.1).
According to the above, the requirements and procedures to be followed as well as the implementing practices in maritime transport bulk industry for the safe and effective carriage of many cargoes depend upon the atmosphere control in the cargo space.
Indicatively, in view of respective provisions of IMSBC code and in regard to the examined case, the determination of hydrogen and oxygen levels deemed necessary for the carriage of coal based on the conditions that coal may evolve flammable gas (methane) or may heat spontaneously resulting in the emission of toxic gas (carbon monoxide) and deplete oxygen in the hold to low levels. Respectively, regular monitoring of the cargo hold atmosphere on a daily basis is essential for ventilation or sealing conditions.

4.3.2.2 Kosmas V Gas detection Equipment

Kosmas V was equipped with a Q-RAE Plus PGM "Multi-Gas monitor Instrument" (figure 4.3.2.2/1), a programmable multi-gas monitor device designed to provide continuous monitoring of toxic gases and combustible gases emissions as well as oxygen concentration in enclosed spaces such as cargo holds as well as their exposure limits to ship and shore personnel.

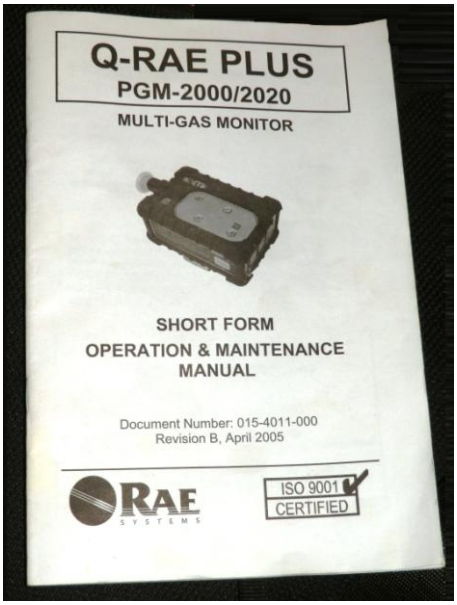

Fig. 4.3.2.2/1: Operating manual of the gas detection equipment.

The investigation process identified that Kosmas V "Gas detection Equipment" was not operating, whereas its calibration date had been overdue since 12 January 2013 (Figure 4.3.2.2/2).

Fig. 4.3.2.2/2: Calibration due date of the gas detection equipment.

It was witnessed by the investigation team that when trying to set it in operational mode a warning *"Calibration date expired"* would appear on its screen and reported that thereon competent crew could not operate it. Furthermore, crew statements pointed out that the instrument had not been used prior to the casualty. The operation manual of the monitor included also instructions in English regarding its calibration method on board (Figure 4.3.2.2/3), however no one had managed to perform this operation until the casualty date.

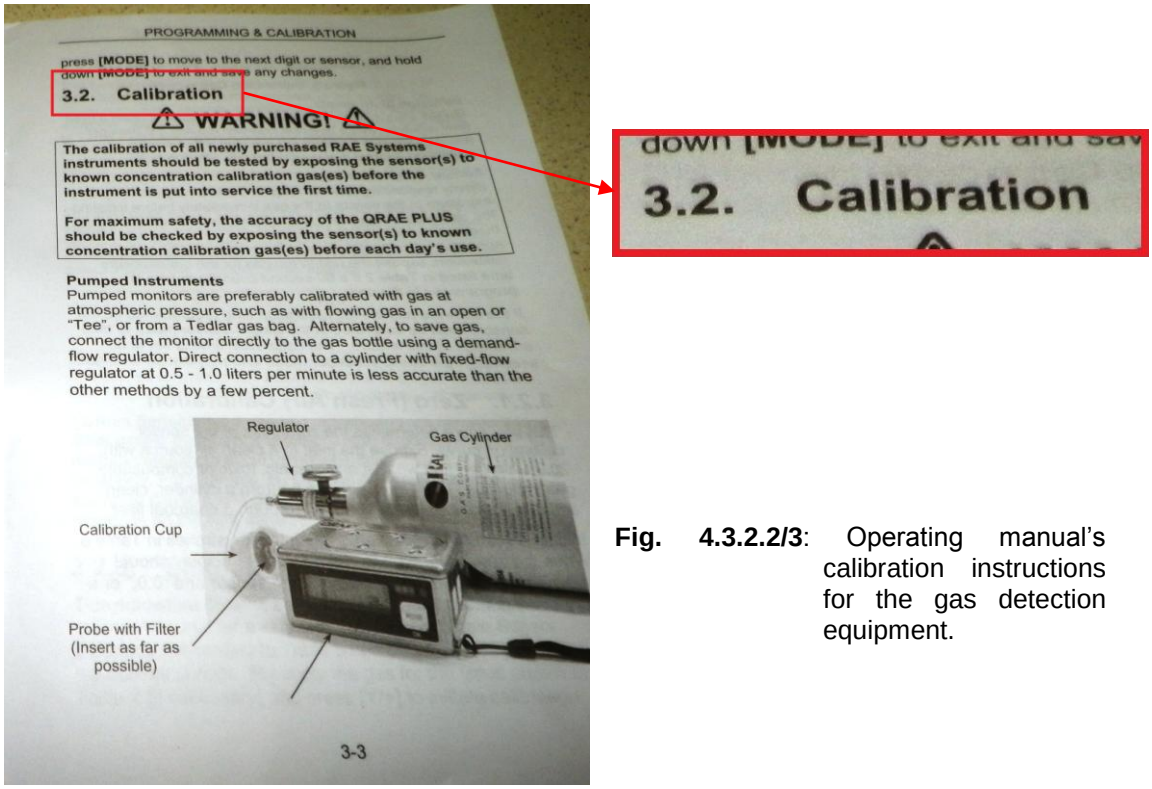

Fig. 4.3.2.2/3: Operating manual's calibration instructions for the gas detection equipment.

Aforementioned malfunction had been reported to Kosmas V Company since 11 December 2014, together with other safety related issues found during an inspection of LSA and FFE Certificates, by noting that the last calibration date was carried out in 10 September 2010, that is before Kosmas V was even brought into service, and requesting calibration to be conducted at first convenient port.

Nevertheless no actions were taken to rectify Kosmas V Multi-Gas Monitor malfunction, as it became known to the investigation team, at least until the casualty date (26 February 2015), that is almost two and a half months after malfunction reporting.

In consideration of aforestated it is deduced that Kosmas V Company's lack of implementing ISM provisions in relation to equipment maintenance as provided under the respective SOLAS applicable requirements and IMSBC Code for the oxygen analysis and gas detection equipment and respective parts thereto including calibration and service issues, is considered to have been a contributing factor in the examined marine casualty.

4.3.3 Kosmas V cargo handling operations procedures

ISM Code in Chapter 7 under the title "Development of plans for Shipboard operations" states that:

> *"The Company should establish procedures for the preparation of plans and instructions, including checklists as appropriate, for key shipboard operations concerning the safety of the ship and the prevention of pollution. The various tasks involved should be defined and assigned to qualified personnel".*

Cargo handling procedures and requirements are fundamental shipborne operations of a bulk carrier trading engagement. For these requirements, as already mentioned, Kosmas V was operating under the Safety Management and Environmental Protection System produced by her Company.

More specifically, under the heading "Cargo Operations" Kosmas V SMS was incorporating basic instructions and directives, namely related with the preparations for next cargo; planning of cargo operations; cargo care during voyage; safe working practices and so forth.

Nonetheless, having scrutinized the respective part of Kosmas V SMS it was identified that it was rather generic as it was not incorporating specific provisions pertinent to the applied regulatory framework for Bulk Carriers (IMSBC Code) as well as the relevant to their operation BLU Code and BLU Manual.
The lack of incorporating aforementioned provisions in Kosmas V Safety Management System is considered to have been a contributing factor in the examined marine casualty.

4.3.3.1 Cargo handing operations supervision

As already reported above Kosmas V cargo handling operations were governed by her Safety Management System provisions although generic and unfocused.
SMS (P11) in par. 3.4 “Safe Working Practices”, stipulated that:
“In order to enhance safety on board, work is always to be supervised by responsible personnel.”.
Taking into consideration that the Master of Kosmas V had the overall command and was charged with the responsibilities of her safe and efficient operation, the cargo loading and unloading aspects were all assigned to be supervised by a deck Officer under the overall supervision of the Chief Officer.
Based on the above as well as on the examination of the events that led to the marine accident, it was identified that despite the fact that the 3rd Officer was on Deck Watch during the evolution of the events, he was not informed about the sampling operation that was being carried out and moreover he was not ordered to supervise it. Furthermore the Chief Officer although responsible for all aspects related to cargo discharging neither paid any attention to supervise the undergoing procedure nor he ordered the Officer on Deck watch to do so.
Seeing the above it is highly possible that if the Chief Officer had ordered the 3rd Officer to supervise the sampling process or had supervised it by himself a proper procedure would have been followed such as sampling from the open deck, cargo holds opening or entry into the enclosed space following the respective adequate procedures and the marine casualty would not have occurred.
In view of the aforementioned it is deduced that Chief Officer’s lack of supervision and control of the unloading procedures in regard to sampling procedures has been a contributing factor in the examined marine casualty.

4.3.3.2 Cargo sampling procedures

Cargo sampling procedures are specified in IMSBC Code/Section 4 “Assessment of acceptability of consignments for safe shipments/par. 4.4 “Sampling procedures”.
The Code’s respective part set the basic standards for the sampling procedures to be carried out prior to loading a bulk cargo in order to identify its physical properties (content of moisture, Transportable Moisture Limit[3], bulk density/stowage factor, angle of response etc.) that are concerning the quality and trading aspect of the consignment to be shipped as well as issues related to the vessel condition under the cargo transportation.
The referred provisions additionally include standards for the persons to conduct “sampling” that are to be suitably trained thereto and under the supervision of someone who is fully aware of the cargo properties (chemical hazards) and also of

[3] TML: the maximum moisture content of the cargo which is considered safe for carriage (IMSBC Code/Definitions par. 1.7.27)

the applicable principles and practices while the chemical hazards are highlighted as one of the factors to take into account when employing sampling techniques.
Said requirements are considered to mostly apply to terminal key personnel while they could be also seen as a general implied instruction to be implemented by shipborne personnel for ship's and crew's safety as well as cargo efficient transport. It could be also linked with the following IMSBC Code forming framework to be implemented by parties and individuals concerned.
In relation to the aforementioned, IMSBC Code in Appendix 1 "Individuals Schedules for Solid Bulk Cargoes" introduces further essential conditions and elements for a large scale of bulk cargoes to be transported by bulk carriers, including Coal.
The "Coal schedule" of the Code, presents its basic elements, characteristics, etc while in depth details and information are specified in its attached Appendix, namely regarding:

- properties and characteristics;
- segregation and stowage requirements;
- general requirements for all types of coal cargoes;
- special precautions;
- loaded voyage procedures for atmospheric monitoring of cargoes;
- ventilation and procedures for gas monitoring of coal cargoes;
- sampling and measurement procedure and so forth.

Apropos of Coal carriage requirements and in view of "Coal Schedule", the provisions of its appendix are applied and respectively establish a concrete framework of factual tasks to be exercised by Master and crew when coal is transported by bulk carriers. A critical factor of cargo's safe carriage, ship's safety and consignment's delivery as per charter party terms and clauses, is the cargo sampling and measurement procedures requirements.
By reason of the aforementioned procedures "Coal Schedule" foresees the following provision:

3. *The ship shall be suitably fitted and carry on board appropriate instruments for measuring the following without requiring entry in the cargo space:*
   .1 concentration of methane in the atmosphere;
   .2 concentration of oxygen in the atmosphere;
   .3 concentration of carbon monoxide in the atmosphere; and
   .4 pH value of cargo space bilge samples.".

Considering that Kosmas V "Multi Gas monitor Instrument" was inoperative it is inferred that presented measurements above could not be performed and consequently IMSBC Code "Coal Schedule" provisions were neither followed nor satisfied.
Having examined Kosmas V SMS and its deriving parts and instructions, for example Master's Standing Orders, no reference was found to instruct the Master and the crew for the cargo sampling procedure prior to loading that could be also applied to the same process prior to discharging operations as well as daily cargo sampling and measurement procedures and related tasking while as already referred in par. 4.3.2.2 the gas detection equipment was inoperative.
In light of the above it is deduced that the Safety Management System under which Kosmas V was operating is further supported to have been generic, as identified in paragraph 4.3.1.
Seeing the above it is considered possible that if aforementioned procedures had been incorporated in Kosmas V SMS and consequently had been exercised by the competent Officers and crew, the oxygen depleted cargo spaces and emanating hazards would have been recognized by the Master, the competent Officers and the crew. To this end sampling procedure would call either for the cargo sampling

execution without entering the cargo hold (e.g. by using equipment for taking samples from the deck) or for practicing the respective protective measures for entering an enclosed oxygen depleted cargo space. However, taking into consideration that Kosmas V gas monitoring instrument was not functioning, the only necessary arrangement for cargo hold entry and sampling deemed to be the hatch covers' opening process which nevertheless was not carried out.
In view of the above Kosmas V SMS lack of incorporating specific sampling procedures' instructions in regard to the transported cargo is considered to have been a contributing factor in the examined occurrence.

4.3.4 Kosmas V resources and personnel

4.3.4.1 The working language

ISM Chapter 6 "Resources and personnel" charges the Company operating a vessel under SOLAS Convention with certain obligations and more specifically in par. 6.4 states that:

"The Company should ensure that all personnel involved in the Company's SMS have an adequate understanding of relevant rules, regulations, codes and guidelines.";

while par. 6.6 & 6.7 provides respectively that:

"The Company should establish procedures by which the ship's personnel receive relevant information on the SMS ***in a working language or languages understood*** *by them.";*

and

"The Company should ensure that the ship's personnel are able ***to communicate effectively*** *in the execution of their duties related to the Safety Management System.".*

In view of the above and taking into consideration that:

→ a major number of Kosmas V crewmembers could not communicate in English;
→ her Safety management System as well as relevant training manuals and procedures, as already reported, were written in English;
→ abovementioned documents could not be read and consequently understood by all crew members;

it is suggested that the afore mentioned ISM provisions were not satisfied in full.
On above grounds it is considered that ISM Chapter 6/ par. 6.6 and 6.7 requirements were not implemented in full by the Company and that is presumed to have been a contributing factor in the examined marine casualty.

4.3.4.2 The recruiting policy

STCW Code/Chapter I/ Section A-I/14 19 lays down the "Responsibilities of the Companies" in relation to crew employment and assignment of duties. Said responsibilities and procedures are directly associated with ISM Code provisions/Chapter 6 "Resources and Personnel".
Under the above framework the Company had manned Kosmas V with a crew complement of 22 seafarers including the Master. As already stated, 19 crewmembers were Ukrainians while remaining 03 were Filipinos, whereas Kosmas V working language, was English.
The Company in order to satisfy Kosmas V crew manning resources was cooperating with the "Tenet Marine Company Ltd" crew managing Agency, located in Ukraine. Based on information collected during the investigation process said Agency was collaborating with local Training Centers for managing its registered Seafarers' training needs.

In view of the English communication issues that were identified during the investigation process it was emerged that despite the fact that working language on board Kosmas V was English, the recruited seafarers were not meeting the basic language requirements that deemed appropriate to work on an English language operated vessel.
To that end it was concluded that the Company was not properly assessing English communication performance of recruited crew, disregarding respective requirements of STCW Code and ISM Code, an issue that was neither observed in full by the recruiting Agency, at least for the seafarers supplied on Kosmas V.
Furthermore and taking into consideration the aforementioned in relation to the Company's accountability (ISM Code/par. 6.7) to establish procedures by which the ship's personnel receives relevant information on the SMS in a working language understood by them, no actions were found to have been taken in meeting said requirement.
Kosmas V Company's inefficiency to implement an effective recruiting policy under the applicable rules and regulations and the standards of its Safety Management System is presumed to have been a contributing factor in the examined case.

4.3.4.3 The Chief Officer's performance

The Chief Officer was a holder of STCW / A-II/2 Certificate and it was the first time he was charged with Chief Officer's responsibilities.
He was primarily assigned with the Safety Officer's duties as well as with all cargo loading and unloading aspects.
The investigation process conducted on board Kosmas V highlighted that he was requesting the Master's advice for cargo handling matters while being the Safety Officer he did not properly observe the "Multi Gas monitor instrument" condition that led to coal's and cargo holds' measurements and sampling lack of monitoring during transport.
Further it was brought to light that his inability to communicate and read efficiently in English created problems during the training activities on board Kosmas V. Additionally, it rendered him unable to effectively implement the on board safety procedures and policy that were established in English. Given his inefficiency in English, he could hardly read and understand the gas instrument manual.
In view of the above it is suggested that the Chief Officer's performance was poor and considered to have been a contributing factor in the marine casualty.

4.3.4.4 The Master's performance

The Master of Kosmas V, as already reported, was experienced in bulk carriers operating industry as most of his career was on board bulk carriers.
By the time of the marine accident he had been on board Kosmas V for almost three months.
During the interview process it was pointed out that the Chief Officer was often requesting his advice for cargo related matters, an issue that denoted that he was not confident for carrying out his cargo handling supervising duties.
Considering the above, as well as the fact that the unloading operation that was about to commence at Drepanon Terminal was the first to be conducted by the Chief Officer it deemed advisable and appropriate for the Master that he had to closely monitor his Chief Officer's performance at the discharging port at least during its commencement.
However, following the completion of Kosmas V berthing operation, he went to his cabin in order to deal with procedural matters regarding the unloading.
Seeing the aforementioned as well as the following facts:

→ the handing over procedure of Kosmas V command was carried out in a short period of time;
→ the cargo was transported without the gas detector instrument in operation;
→ drills and training on board were not effectively carried out as reported in following paragraph;
→ the Safety Committee Meeting held under the Master's chairmanship was typical as referred in a following paragraph (par. 4.3.6)

and others as respectively recorded in this report, it is inferred that the Master's performance was not effective.

4.3.5 Kosmas V shipborne drills and training

ISM Chapter 8 in par. 8.2 foresees regarding the Company:

"The Company should establish programmes for drills and exercises to prepare for emergency actions.".

In view of said provisions a set of drills and exercises had been established to be conducted on board Kosmas V, according to respective applicable international Instruments (SOLAS etc.) as had been incorporated in the Safety Management and Environmental Protection Procedure (P11)/par. 3.3 "Safety drills program".

However during the interview process it was identified that communication during the training drills and exercises between the crew members was poor as most of them could not communicate in English, including the Chief Officer whose English was poor, despite the fact that drills and training issued materials were produced in English as well as check lists that were completed and signed by the participating crew.

During the investigation procedure it was further highlighted that the communication language during drills and training was in Ukrainian posing barriers to the Filipino crew to fully participate and understand them.

In view of the above, it was suggested that training on board Kosmas V was not effective, reducing her safe operational level.

Furthermore and taking into consideration the evolution of the events resulting in the marine casualty it is inferred that ISM Code Emergency preparedness provisions under par. 8.1 stating that:

"The Company should identify potential emergency shipboard situations and establish procedures to respond to them",

were not met, as crew members that were involved in the sampling process and the emergency situation raised, failed to recognize the loaded cargo hold as an enclosed space that urged special procedures to be implemented prior to entry, disregarding fundamental instructions foreseen in IMO Res. A.1050(27) for "Entering Enclosed Spaces aboard ships".

Crew actions denoted their lack of training for such procedures such as authorization of entry, general precautions, precautions during entry and so forth.

Considering the above it is inferred that the lack of fully implementing Emergency Preparedness plans and procedures and on board training as described in Kosmas V respective SMS parts and ISM Code is presumed to have been a contributing factor in the examined case.

4.3.6 Kosmas V Safety Committee Meetings shipborne drills and training

Safety Committee Meetings requirement stems from ISM Code/Chapter 5, Masters responsibility and Authority and more specifically par. 5.1.1 & 5.1.2 stating that the Master is responsible for:

- implementing the safety and environmental protection policy of the Company; and

- motivating the crew in the observation of that policy.

The obligation also generally derives from MLC 2006/Standard A4.3.2d and International Labour Conventions.

Kosmas V Safety management System was incorporating instructions and directions for the conduct of Safety Committee meetings in "Safety Management and Environmental protection procedure (P11)/par.3.2/"Safety Management System Review and Verification" under the Master Chairmanship with the participation of specific crew members or if necessitated of all crew members.

Safety Committees Meetings Agenda was primarily based on Company's policy assessment of effectiveness and review and could include the following subjects:

- *safety and environmental requirements and training;*
- *performance during safety drills and suggested improvements;*
- *condition of safety equipment;*
- *cargo operations (especially if dangerous cargo on board)*
- *Port state control requirements of next port;*
- *analysis of accidents, incidents dangerous occurrences and near misses;*
- *results of audits, non conformities, identified and corrective/preventive actions taken;*
- *suggestions for improvements;*
- *actions decided;*
- *revision of the management system and reporting any deficiencies found (at least once during Master's service on board or once a year whichever is the minimum).*

Having examined the Safety Committee Meeting dated on 25 February 2015 that is one day prior to the casualty, it was noticed that the meeting agenda was mainly focusing on Ship Security related aspects while Safety issues were limited to inspections expected to be conducted (PSC and Flag) and safety helmets and shoes of crew while a general instruction was recorded that all crewmembers should follow the rules of safe practice on board.

No specific recording was found pertinent to cargo discharging operation or coal's properties and related hazards to draw the attention to crew members engaged in the unloading operation.

Furthermore, it was identified that the Safety Committee Meeting Minutes, SMS form (VS-02) had been signed by all crew members as participants (see Appendix 4), however the interview process indicated that not all of the lower rank crew participated or were respectively informed of the minutes.

Considering the above it is inferred that Safety Committee Meetings onboard Kosmas V were not properly conducted under the provisions of her Safety Management System, that were disregarded by the Master.

On above grounds it is considered that Safety Committee Meetings were held and documented with the aim of fulfilling the typical aspect of the respective requirements and standards to be followed.

Additionally, they were not including cargo unloading safety matters such as cargo hazards, cargo holds oxygen depletion and measures to avoid likely to occur accidents that could have been promptly identified through a risk assessment process. All the more the gas detector was not functioning which was an issue that should have raised concerns for the safety of the unloading operation.

Furthermore, safety committee meetings did not steer any revisions to Kosmas V Management System, that was found to be under its initial version.

The Master's failure to fully implement Safety Committee Meetings provisions for the benefit of ship's safety as well as the Company failure to monitor their results, decisions and efficiency that could have led to the SMS revisions, is considered to have been a contributing factor in the examined case.

4.3.7 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. The risks[4] 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 process[5] 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 as to provide evidence for the decision-making process as well as for inspections and audits by competent authorities and interested parties.

During the interview process, the investigation Team notwithstanding requested the "risk assessment documents" for the sampling and cargo handling procedures, it was found that no risk assessment had been conducted for said operations.

However, if a risk assessment had been carried out for the sampling process, the hazards to crew engaged with the task could have been indentified and effective preventive measures could have been taken in order to control those hazards, intricately such as:

- ✓ the opening of cargo holds as appropriate;
- ✓ proper sampling collection process;
- ✓ procedures for entry into cargo holds, if deemed necessary;
- ✓ breathing apparatus or emergency escape breathing device placed near cargo hold entrances etc.

If referred controls had been identified and applied the examined marine casualty would have been prevented.

The lack of implementing the risk assessment procedure as required by ISM Code for shipborne operations and inductively for Kosmas V unloading operation and sampling procedure has been a contributing factor in the examined case.

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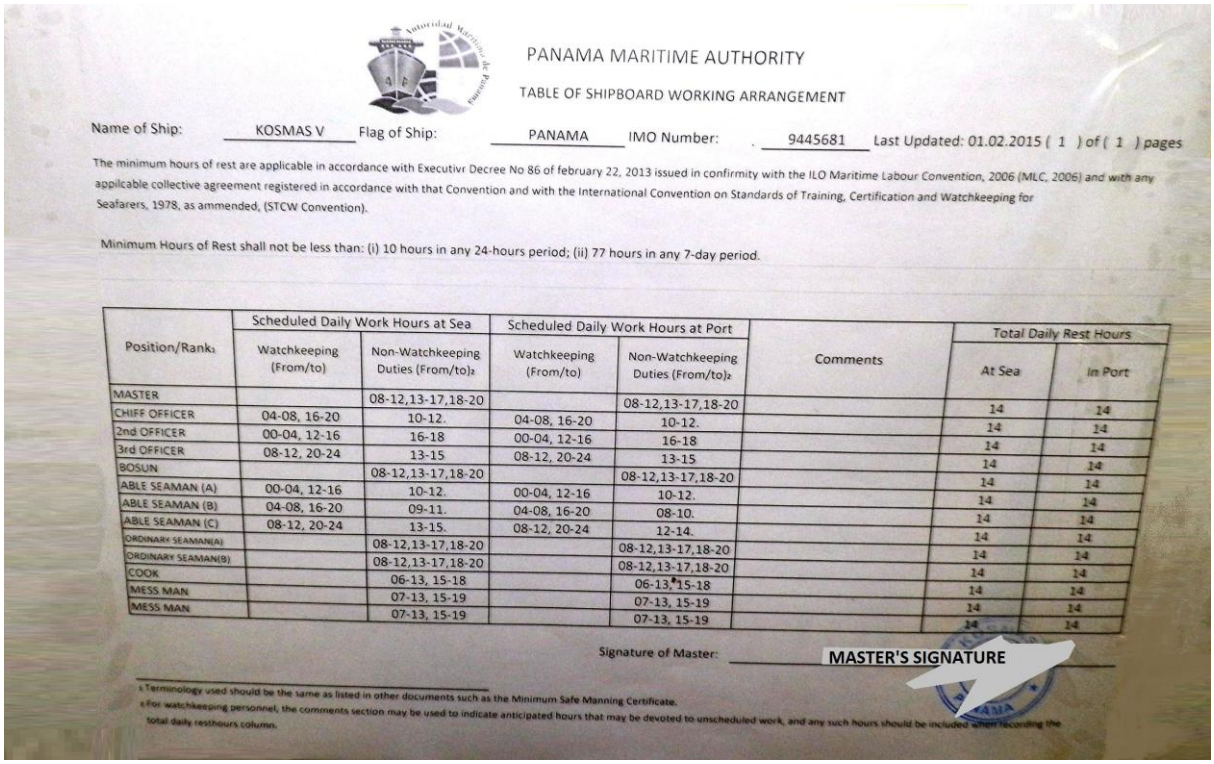
[4] IMO defines risk as: "The combination of the frequency and the severity of the consequence" (ref. to MSC/Circ.1023 - MEPC/Circ.392)

[5] 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).

4.4 Working and resting hours records

Under ILO Convention N. 180 (Seafarers' Hours of Work and the Manning of Ships Convention) MLC Convention 2006 and IMO's STCW Convention as applied, a standardized table showing shipboard working arrangements and a standard format for records of seafarer's daily hours of work and rest has been developed through IMO/ILO respective Guidelines.
During the investigation process Kosmas V "Table of shipboard working arrangement" shown in Figure 4.4/1 and "Records of hours of rest" shown in table fig. 4.4/2 were examined.
Based on the documentation record crew resting hours had to be in line with the provisional schedule for daily work and hours of rest.



PANAMA MARITIME AUTHORITY

TABLE OF SHIPBOARD WORKING ARRANGEMENT

Name of Ship: KOSMAS V Flag of Ship: PANAMA IMO Number: 9445681 Last Updated: 01.02.2015 (1) of (1) pages

The minimum hours of rest are applicable in accordance with Executivr Decree No 86 of february 22, 2013 issued in confirmity with the ILO Maritime Labour Convention, 2006 (MLC, 2006) and with any appilcable collective agreement registered in accordance with that Convention and with the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as ammended, (STCW Convention).

Minimum Hours of Rest shall not be less than: (i) 10 hours in any 24-hours period; (ii) 77 hours in any 7-day period.

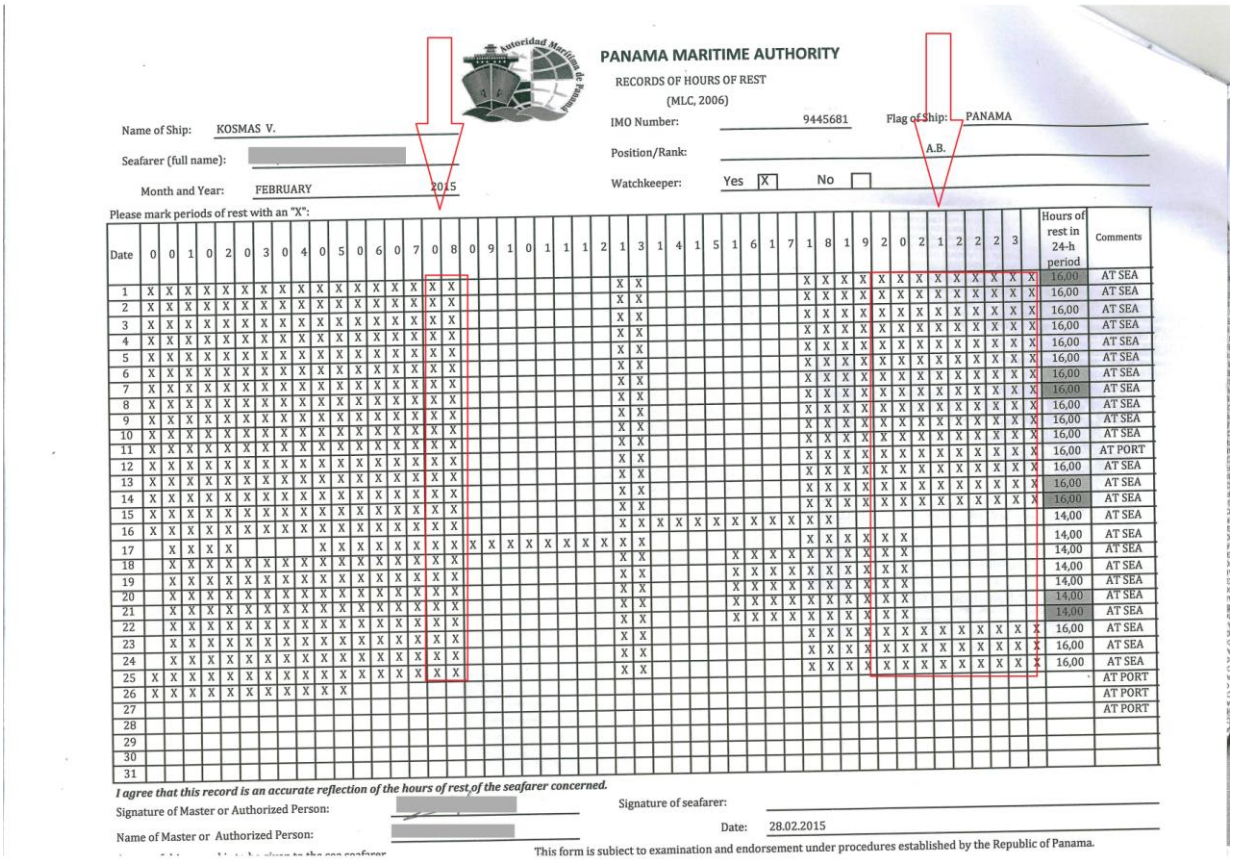
Position/Rank[1]	Scheduled Daily Work Hours at Sea		Scheduled Daily Work Hours at Port		Comments	Total Daily Rest Hours	
	Watchkeeping (From/to)	Non-Watchkeeping Duties (From/to)[2]	Watchkeeping (From/to)	Non-Watchkeeping Duties (From/to)[2]		At Sea	In Port
MASTER		08-12,13-17,18-20		08-12,13-17,18-20		14	14
CHIFF OFFICER	04-08, 16-20	10-12.	04-08, 16-20	10-12.		14	14
2nd OFFICER	00-04, 12-16	16-18	00-04, 12-16	16-18		14	14
3rd OFFICER	08-12, 20-24	13-15	08-12, 20-24	13-15		14	14
BOSUN		08-12,13-17,18-20		08-12,13-17,18-20		14	14
ABLE SEAMAN (A)	00-04, 12-16	10-12.	00-04, 12-16	10-12.		14	14
ABLE SEAMAN (B)	04-08, 16-20	09-11.	04-08, 16-20	08-10.		14	14
ABLE SEAMAN (C)	08-12, 20-24	13-15.	08-12, 20-24	12-14.		14	14
ORDINARY SEAMAN(A)		08-12,13-17,18-20		08-12,13-17,18-20		14	14
ORDINARY SEAMAN(B)		08-12,13-17,18-20		08-12,13-17,18-20		14	14
COOK		06-13, 15-18		06-13, 15-18		14	14
MESS MAN		07-13, 15-19		07-13, 15-19		14	14
MESS MAN		07-13, 15-19		07-13, 15-19		14	14

Signature of Master: MASTER'S SIGNATURE

[1] Terminology used should be the same as listed in other documents such as the Minimum Safe Manning Certificate.
[2] For watchkeeping personnel, the comments section may be used to indicate anticipated hours that may be devoted to unscheduled work, and any such hours should be included when recording the total daily resthours column.

Fig. 4.4/1: Photo of the "Table of shipboard working arrangement" of Kosmas V.

Nevertheless, crew members' records of hours of rest were found to not accurately reflect crew's working and resting periods under Kosmas V actual operation during the time period she arrived in Drepanon and afterwards.
More specifically, the AB who firstly entered the enclosed space for cargo sampling, according to information derived from the interview process had worked for 14 hours on the previous day of the casualty, being also a member of the anchoring team when Kosmas V arrived at Drepanon roadstead. However, his record showed that he had worked for 11 hours and rested for 13 hours on 25 February 2015.
Furthermore, the AB's who also entered the enclosed space record of hours of rest, was inconsistent with his actual duties, since he was a Watch keeper and he was performing the Bridge Watch from 0800-1200 to 2000-0000 at sea. As can be seen through the "Records of hours of rest" (Figure 4.4/2) that had been filled in until the casualty date, his working and resting periods had not been properly recorded.



PANAMA MARITIME AUTHORITY

RECORDS OF HOURS OF REST
(MLC, 2006)

Name of Ship: KOSMAS V.
IMO Number: 9445681
Flag of Ship: PANAMA
Seafarer (full name): [redacted]
Position/Rank: A.B.
Month and Year: FEBRUARY 2015
Watchkeeper: Yes [X] No [ ]

Please mark periods of rest with an "X":

Date	0	0	1	0	2	0	3	0	4	0	5	0	6	0	7	0	8	0	9	1	0	1	1	1	2	1	3	1	4	1	5	1	6	1	7	1	8	1	9	2	0	2	1	2	2	2	3	Hours of rest in 24-h period	Comments
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
7	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT PORT
12	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X	X	X	X	X	X	X	X	X	X	X										14,00	AT SEA
16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X									14,00	AT SEA
17		X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X									14,00	AT SEA
18		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X				X	X	X	X	X	X	X	X									14,00	AT SEA
19		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X				X	X	X	X	X	X	X	X									14,00	AT SEA
20		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X				X	X	X	X	X	X	X	X									14,00	AT SEA
21		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X				X	X	X	X	X	X	X	X									14,00	AT SEA
22		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
23		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
24		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	16,00	AT SEA
25	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																																AT PORT
26	X	X	X	X	X	X	X	X	X	X																																							AT PORT
27																																																	AT PORT
28																																																	
29																																																	
30																																																	
31																																																	

I agree that this record is an accurate reflection of the hours of rest of the seafarer concerned.

Signature of Master or Authorized Person: [redacted]
Signature of seafarer:
Name of Master or Authorized Person: [redacted]
Date: 28.02.2015

This form is subject to examination and endorsement under procedures established by the Republic of Panama.

Fig. 4.4/2: Record of rest hours for the AB who entered the enclosed space, inconsistent with his actual work schedule, as indicated by the red marked periods.

Additionally, the OS's working and resting hours record - who also entered the enclosed space – were likewise inconsistent with his actual duties, as in the morning of the casualty he was part of the fore mooring team, deployed at 0600, however his working hours were not properly recorded.

In view of the above it is suggested that Kosmas V records of working and resting hours were not properly recorded and actual working hours were not in line with the respective provisions of MLC 2006.

4.4.1 Fatigue

Taking into account the information recorded in above par. 4.4, it is likely that fatigue could have an impact on Kosmas V crew, that was assigned with watchkeeping duties as well as unloading operations that resulted to their impaired performance and diminished alertness.

The following conclusions, safety measures 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.

5. Conclusions

(references denote respective parts of the analysis)

5.1 Conclusions and safety issues leading to safety recommendations

5.1.1 The handing over procedure for the Master, the Chief Engineer and other crew and its emanating documentation was carried out insufficiently in a limited time period ***(par. 4.1)***.

5.1.2 The Master's, Chief Engineer's and crewmembers' familiarization procedure for resuming duties was not sufficient in relation to the time lapse available ***(par. 4.1)***.

5.1.3 The BLU Code provisions did not apply to the unloading operation which was to be carried out by Kosmas V at Drepanon since solely the ship's cranes would be used for said operation, therefore the BLU Code, Section 4 - specific Safety Check List between the ship and terminal was not completed prior to cargo handling, although there was an interaction between the terminal and the ship ***(par. 4.2.3)***.

5.1.4 The coal properties and cargo holds oxygen depletion hazards were disregarded by the Master and the Chief Officer and consequently were not passed to competent crew in order to raise personal safety awareness ***(par. 4.2.3)***.

5.1.5 Kosmas V Safety Management System was not effective in full, not reflecting up to date respective to bulk carriers operating framework rules and regulations ***(par. 4.3.1.1)***.

5.1.6 The Company's policy and likewise Kosmas V SMS, Manuals, check lists etc. could be neither understood nor implemented in full by most of the lower rank crew members ***(par. 4.3.1.2)***.

5.1.7 The verification, review and evaluation system through internal audits (ISM Code/Ch.12) was not observed in full by the Company ***(par. 4.3.1.3)***.

5.1.8 Kosmas V "Multi Gas monitor Instrument" was not functioning due to overdue calibration date while no actions were taken to render the instrument operative ***(par. 4.3.2.2)***.

5.1.9 ISM Code/ Ch. 10 for equipment maintenance system was not followed for the "Multi Gas monitor Instrument" failing to follow respective rules and regulations ***(par. 4.3.2 & 4.3.2.2)***.

5.1.10 Kosmas V Safety Management System was generic, not incorporating specific instructions of IMSBC Code, BLU Code and BLU Manual ***(par. 4.3.3)***.

5.1.11 The cargo sampling process was conducted disregarding the supervision instructions of the Company's Safety Management System ***(par. 4.3.3.1)***.

5.1.12 Cargo sampling procedures specified in IMSBC Code/Section 4/par. 4.4 are applicable for terminal key personnel ***(par. 4.3.3.2)***.

5.1.13 Coal Schedule measurements and sampling were neither followed nor satisfied ***(par. 4.3.3.2)***.

5.1.14 Kosmas V SMS was not incorporating specific instructions for the sampling procedure which was assigned to an AB ***(par. 4.3.3.2)***.

5.1.15 ISM Chapter 6 “Resources and personnel”/par. 6.6 and 6.7 requirements were not satisfied and implemented in full by the Company ***(par. 4.3.4.1)***.

5.1.16 The Company was not properly assessing English communication performance of recruited crew, not following in full STCW Code and ISM Code respective requirements ***(par. 4.3.4.2)***.

5.1.17 The Company was not observing (ISM Code/par. 6.7) to provide crewmembers with relevant information on the SMS in a working language understood by them ***(par. 4.3.4.2)***.

5.1.18 The Chief Officer’s performance was poor in relation to his assigned cargo handling supervising and safety Officer’s duties ***(par. 4.3.4.3)***.

5.1.19 The Master’s performance was not effective failing to follow rules and regulations related with the marine casualty and assess Chief Officer’s performance ***(par. 4.3.4.4)***.

5.1.20 Kosmas V training was not effective, reducing her safe operational level ***(par. 4.3.5)***.

5.1.21 Kosmas V crewmembers involved in the occurrence, failed to recognize the cargo hold as an enclosed space disregarding fundamental instructions foreseen in IMO Res. A. 1050 (27) and on board training ***(par. 4.3.5)***.

5.1.22 Safety Committee Meeting, prior to the marine casualty, was not conducted according to Kosmas V SMS and was not reflecting factual details ***(par. 4.3.6)***.

5.1.23 Risk assessment process was not carried out prior to the discharging operations ***(par. 4.3.7)***.

5.1.24 Kosmas V records of working and resting hours were not properly filled ***(par. 4.4)***.

5.1.25 Fatigue could have an impact on Kosmas V crew involved in the marine casualty that impaired performance and diminished alertness ***(par. 4.4.1)***.

6. Actions taken

The Hellenic Bureau for Marine Casualties Investigation having regard to par. 6.2 of Commission Regulation (EU) 1286/2011 circulated the draft report of the examined case to involved vessel’s owners/managers, however no information concerning actions taken following the marine casualty on their behalf were notified.

7. Safety recommendations (references denote conclusions based grounds)

Taking into consideration the analysis and the conclusions derived from the safety investigation conducted, the following recommendations are addressed:

7.1 The Owners/Managers are recommended to:

11/2015 review the handing over procedure for owned/managed vessels in view of providing sufficient time for relieving Masters, Chief Engineers and Officers to assume duties and responsibilities and effectively complete familiarization procedure in due regard of ship's and personnel Safety.
(con. 5.1.1 & 5.1.2)

12/2015 review the Safety Management System fleet-wide taking into account the requirements, recommendations and guidelines of IMSBC Code, BLU Code and BLU Manual in order to ensure that cargo loading carriage and unloading operations are carried out safely in full regard by Masters and all personnel engaged.
(con. 5.1.3, 5.1.4, 5.1.5, 5.1.7 & 5.1.10)

13/2015 take appropriate actions to review Safety Management System for equipment maintenance in order to safely and effectively execute operations and cargo handing during loading, carriage and unloading operations under transported cargo Schedules.
(con. 5.1.8, 5.1.9 & 5.1.13)

14/2015 stress fleet wide the significance that shipborne operations and procedures are performed under Masters' or Competent Officers' responsibility, supervision and effective performance in full regard to rules and regulations applied to managed/owned vessels' operations.
(con. 5.1.11, 5.1.18, 5.1.19 & 5.1.21)

15/2015 take appropriate actions to supplement fleet-wide Safety Management System with instructions related to cargo sampling procedures prior to loading or unloading operations in full regard of related IMSBC Code, BLU Code and Entry into Enclosed Space provisions applied.
(con. 5.1.14, 5.1.21)

16/2015 reassess the recruiting policy fleet-wide of shipboard personnel under the respective requirements of STCW Code and ISM Code.
(con. 5.1.15, 5.1.16 & 5.1.17)

17/2015 review the safety Management System for shipborne drills and training and in particular for enclosed spaces entry in full respect to ISM Code/ Chapter 6/par 6.7 and crew communication language.
(con. 5.1.17, 5.1.18, 5.1.20 & 5.1.21)

18/2015 take appropriate actions to ensure that risk assessment procedures are carried out and documented fleet-wide for shipborne operations.
(con. 5.1.23)

19/2015 stress fleet-wide the importance of proper Safety Committee Meetings and control documented minutes to promote safety culture on board managed/owned vessels.
(con. 5.1.18, 5.1.19 & 5.1.22)

20/2015 take appropriate actions fleet-wide to control the proper recording of crew working and resting hours based on the working arrangements practiced in order to prevent fatigue symptoms.
(con. 5.1.24 & 5.1.25)

7.2 Drepanon Terminal is recommended to:

21/2015 review its safety procedures in view of a ship to shore check list (analogous to the one included in the BLU Code) to be completed prior to cargo handling commencement, even in cases when the loading or unloading of a Dry Bulk cargo Carrier is carried out solely with the ship's equipment and the BLU Code doesn't apply.
(Con. 5.1.3)

7.3 The Panama Shipping Administration is kindly invited to:

22/2015 take note of the identified issues in relation to crew communication language barriers and Safety Management Manuals and their emanating Manuals, check lists etc and take actions as deemed appropriate.
(Con. 5.1.6, 5.1.15, 5.1.16 & 5.1.17)

7.3 The Hellenic Shipping Administration/Safety of Navigation Directorate and the Competent Directorate of Panama Shipping Administration are kindly invited to:

23/2015 consider of bringing forward to competent International Bodies a proposal introducing supplements to IMSBC Code for shipborne sampling collection of cargo based on the provisions foreseen in Code´s Section 4 "Assessment of acceptability of consignments for safe shipments/par. 4.4 "Sampling procedures" that are addressed to Terminal personnel.
(Con. 5.1.12)

Prepared and edited by the Hellenic Bureau for Marine Casualties Investigation (HBMCI), under the provisions of the article 16 of Law 4033/2011 (Government Gazette A' 264)
This report has been solely published for the purposes of the investigation and is uploaded on the website of HBMCI (see below).
Accident Investigation Report 03/2015
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Appendix 1

The BLU Code Ship/Shore Safety Check List

(02 pages)

BLU Code

Appendix 3

SHIP/SHORE SAFETY CHECKLIST

For Loading or Unloading Dry Bulk Cargo Carriers

Date.....

Port..... Terminal/Quay.....

Available depth of water in berth .....Minimum air draught*.....

Ship's name.....

Arrival draught(read/calculated).....Air draught.....

Calculated departure draught.....Air draught.....

* The term air draught should be construed carefully: if the ship is in a river or an estuary, it usually refers to maximum mast height for passing under bridges, while on the berth it usually refers to the height available or required under the loader or unloader.

The Master and terminal manager, or their representatives, should complete the checklist jointly. Advice on points to be considered is given in the accompanying guidelines. The safety of operations requires that all questions should be answered affirmatively and the boxes ticked. If this is not possible, the reason should be given, and agreement reached upon precautions to be taken between ship and terminal. If a question is considered to be not applicable write "N/A", explaining why if appropriate.

	SHIP	TERMINAL
1.Is the depth of water at the berth, and the air draught, adequate for the cargo operation?	□	□
2.Are mooring arrangements adequate for all local effects of tide, current, weather, traffic and craft alongside?	□	□
3.In emergency, is the ship able to leave the berth at any time?	□	□
	SHIP	TERMINAL
4.Is there safe access between the ship and the wharf? Tended by Ship/Terminal (cross out the appropriate)	□	□
5.Is the agreed ship/terminal communications system operative? Communication method.....Language..... Radio channels/phone numbers.....	□	□
6.Are the liaison contact persons during operations positively identified? Ship contact persons..... Shore contact person(s)..... Location.....	□	□
7.Are adequate crew on board, and adequate staff in the terminal, for emergency?	□	□
8.Have any bunkering operations been advised and agreed?	□	□
9.Have any intended repairs to wharf or ship whilst alongside been advised and agreed?	□	□
10.Has a procedure for reporting and recording damage from cargo operations been agreed?	□	□
11.Has the ship been provided with copies of port and terminal regulations, including safety and pollution requirements and details of emergency services?	□	□
12.Has the shipper provided the Master with the properties of the cargo in accordance with the requirements of chapter VI of SOLAS?	□	□

13.Is the atmosphere safe in holds and enclosed spaces to which access may be required, have fumigated cargoes been identified, and has the need for monitoring of atmosphere been agreed by ship and terminal?	□	□
14.Have the cargo handling capacity and any limits of travel for each loader/unloader been passed to the ship/terminal? Loader..... Loader..... Loader.....	□	□
15.Has a cargo loading or unloading plan been calculated for all stages of loading/deballasting or unloading/ballasting? Copy lodged with.....	□	□
16.Have the holds to be worked been clearly identified in the loading or unloading plan, showing the sequence of work, and the grade and tonnage of cargo to be transferred each time the hold is worked?	□	□
17.Has the need for trimming of cargo in the holds been discussed, and the method and extent been agreed?	□	□
18.Do both ship and terminal understand and accept that if the ballast programme becomes out of step with the cargo operation, it will be necessary to suspend cargo operation until the ballast operation has caught up?	□	□
	SHIP	TERMINAL
19.Have the intended procedures for removing cargo residues lodged in the holds while unloading, been explained to the ship and accepted?	□	□
20.Have the procedures to adjust the final trim of the loading ship been decided and agreed? Tonnage held by the terminal conveyor system	□	□
21.Has the terminal been advised of the time required for the ship to prepare for sea, on completion of cargo work?	□	□

THE ABOVE HAS BEEN AGREED:

Time..... Date.....

For Ship..... For Terminal.....

Rank..... Position/Title.....

Appendix 2

The IMSBC Code cargo information form

(01 page)

INTERNATIONAL MARITIME SOLID BULK CARGOES FORM

Bulk Cargo Shipping name: COAL

Shipper:
EXXARO INTERNATIONAL TRADING AG

Transport document number:

Carrier:
MV KOSMAS V

Consignee:
TO THE ORDER OF TITAN CEMENT COMPANY SA
22A, HALKIDOS STR.
ATHENS - GREECE

Instructions or Other Matters:
CONTRACTUAL SULPHUR CONTENT: <1.50%. RANGE OF MOISTURE CONTENT : 5% TO 12%. MATERIAL OFFERED FOR SHIPMENT HAS BEEN SUFFICIENTLY TREATED AND IS READY TO LOAD

Name/Means of Transport: Ocean Transport
Port/Place of Departure:
RICHARDS BAY COAL TERMINAL, SOUTH AFRICA

Gross mass (kg/tonnes):
40 000 MT +/-10%

General description of the Cargo:
STEAMING COAL IN BULK OF SOUTH AFRICAN ORIGIN

Port/Place of Destination:
ELEUSIS AND PATRAS PLANT PORTS, GREECE

Type of material/particle size)
Solid 0 x 50mm

EHS/HME (see Chapters 2.10 and 2.9.3 of the IMDG Code and Marpol Annex V)residues must be disposed of in accordance with Marpol annex V

EHS/MARINE POLLUTANT	☐	Yes	☒	No		
HUMAN HEALTH CRITERIA MET	☒	Yes	☐	No	☐	Not available
RUBBER/PLASTIC	☐	Yes	☒	No		

Note: Human Health Criteria date may not be available on until 31 December 2014 From 1 January 2015 Human Health Criteria data must be available

Specifications of bulk cargo, if applicable: COAL
Stowage factor: 1.02 - 1.25 M3 /mt 36 - 44 Cu.ft /mt
Angle of repose, if applicable: 35-37
Trimming procedures: SPOUT TRIMMED
Chemical properties if potential hazard*: *eg., Class & UN No. or "MHB"

Group of the cargo:
☐ Group A and B*
☐ Group A*
☒ Group B
☐ Group C

MARO COAL (PTY) LTD
ROGER DYASON ROAD
PRETORIA WEST
PRETORIA, 0183
TEL: 012-307 4355

* For cargoes which may liquefy (Group A and Group A and B cargoes)

Transportable moisture limit:
N/A

Moisture content at shipment:
N/A

Relevant special properties of the cargo:
(e.g., highly soluble in water)

Stowage	:	AS PER IMDG CODE
Levelling	:	LEVELLED
Temperature control	:	MAINTAIN AT LESS THAN 45 DEG.C
Protective means	:	DUST MASKS
Enviromental protection	:	NIL
Fire	:	WATER

The commodity is not considered a cargo which may liquefy during the voyage.

Additional certificates(s)*:
*if required
☐ Certificate of moisture content and transportable moisture limit
☐ Weathering certificate
☐ Exemption certificate
☐ Other (specify)

DECLARATION
I hereby declare that the consignment is fully and accurately described and that the given test results and other specifications are correct to the best of my knowledge and belief and can be considered as representative for the cargo to be loaded

MASTER'S SIGNATURE

Name/status, company/organization of signatory:

Place and date
Richards Bay, 2015/01/21
Signature on behalf of Shipper
EXXARO INTERNATIONAL TRADING AG
SHIPPER'S SIGNATURE

THIS CARGO IS NOT CONSIDERED LIABLE TO EMIT SIGNIFICANT AMOUNTS OF METHANE.
THIS CARGO IS CONSIDERED NOT LIABLE TO SPONTANEOUS COMBUSTION.

Appendix 3

The Material Safety Data Sheet (MSDS) for the cargo of "KOSMAS V"

(05 pages)

Material Safety Data Sheet (MSDS): COAL

Sect. 1. Chemical product and company identification

MSDS name: Coal

Company Identification: **EXXARO INTERNATIONAL TRADING AG**

Sect. 2. Composition and information on ingredients

Coal – a natural product consisting family of carbon and mineral matter.

Sect. 3. Hazards identification

Emergency overview

Appearance: Black

CAUTION: MAY CAUSE MECHANICAL EYE AND SKIN IRRITATION.

Potential health effects:

EYES:	Dust may cause mechanical irritation.
SKIN:	Dust may cause mechanical irritation.
INGESTION:	Ingestion of large amounts may cause gastrointestinal irritation.
INHALATION:	Dust is irritating to the respiratory tract.
CHRONIC:	Chronic inhalation may lead to decreased pulmonary function.

Sect. 4. First-Aid Measures

EYES: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Seek medical aid.

SKIN: Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid of irritation develops or persists.

INGESTION: If victim is conscious and alert, give 2-4 cupfuls of milk or water, Never give anything by mouth to an unconscious person. Seek medical aid.

INHALATION: Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical aid.

NOTE TO PHYSICIAN: Treat symptomatically and supportively.

Sect. 5. Fire-fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus and full protective gear.

Extinguishing Media: For small fires, use water spray, dry chemical, carbon dioxide or chemical foam.

Explosion Limits: Lower: Not available
Upper: Not available

Sect. 6. Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Sect.8.

Spills / Leaks: Vacuum or sweep up material and put into a suitable disposal container. Avoid generating dusty conditions.

Sect. 7. Handing and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin and clothing. Avoid ingesting and inhaling.

Storage: Store in a cool, dry, well-ventilated area with a concrete ground base, away from incompatible substances.

Sect. 8. Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.

Exposure Limits: Not applicable.

Personal Protective Equipment:

Eyes: Wear appropriate protective eyeglasses or safety goggles.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Sect. 9. Physical and Chemical Properties

Physical State:	Solid
Appearance:	Black
Odor:	Odorless
PH:	Not available
Vapor Pressure:	Not available
Vapor Density:	Not available
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	Not available
Freezing/Melting Point:	Not available
Decomposition Temperature:	Not available
Solubility:	Not available
Specific Gravity/Density:	1.3 – 1.8
Molecular Formula:	Not applicable – natural substance
Molecular Weight:	Not applicable

Sect. 10. Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. May ignite / spontaneously combust if openly exposed or if piles of coal are not properly stacked and compacted.

Conditions to Avoid: Incompatible materials, ignition sources, dust generation, moisture, excess heat.

Incompatibilities with Other Materials: Alkali metals, chlorinated paraffins, lead oxide, manganese oxide, dibenzoyl peroxide, 1,4-diazabicyclo (2.2.2) octane, iron oxide, liquid oxygen, metallic salts, molybdenum (IV) oxide, nitrobenzaldehyde, oxidizing agents, potassium hydroxide, sodium hydrogen carbonate, sodium tetrahydroborate, unsaturated oils.

Hazardous Decomposition Products:
- Carbon monoxide, carbon dioxide.
- Hazardous polymerization: has not been reported.

Sect. 11. Toxicological Information

No data available.

Sect. 12. Ecological Information

No data available.

Sect. 13. Disposal Considerations

Dispose of in a manner consistent with local regulations.

Sect. 14. Transport Information

Not regulated as a hazardous material.

Sect. 15. Regulatory Information

Consult local regulations.

Sect. 16. Additional information

MSDS creation date: July 1, 1998.

The above information is believed to be accurate and represents the best information currently available to us. However, we make no warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

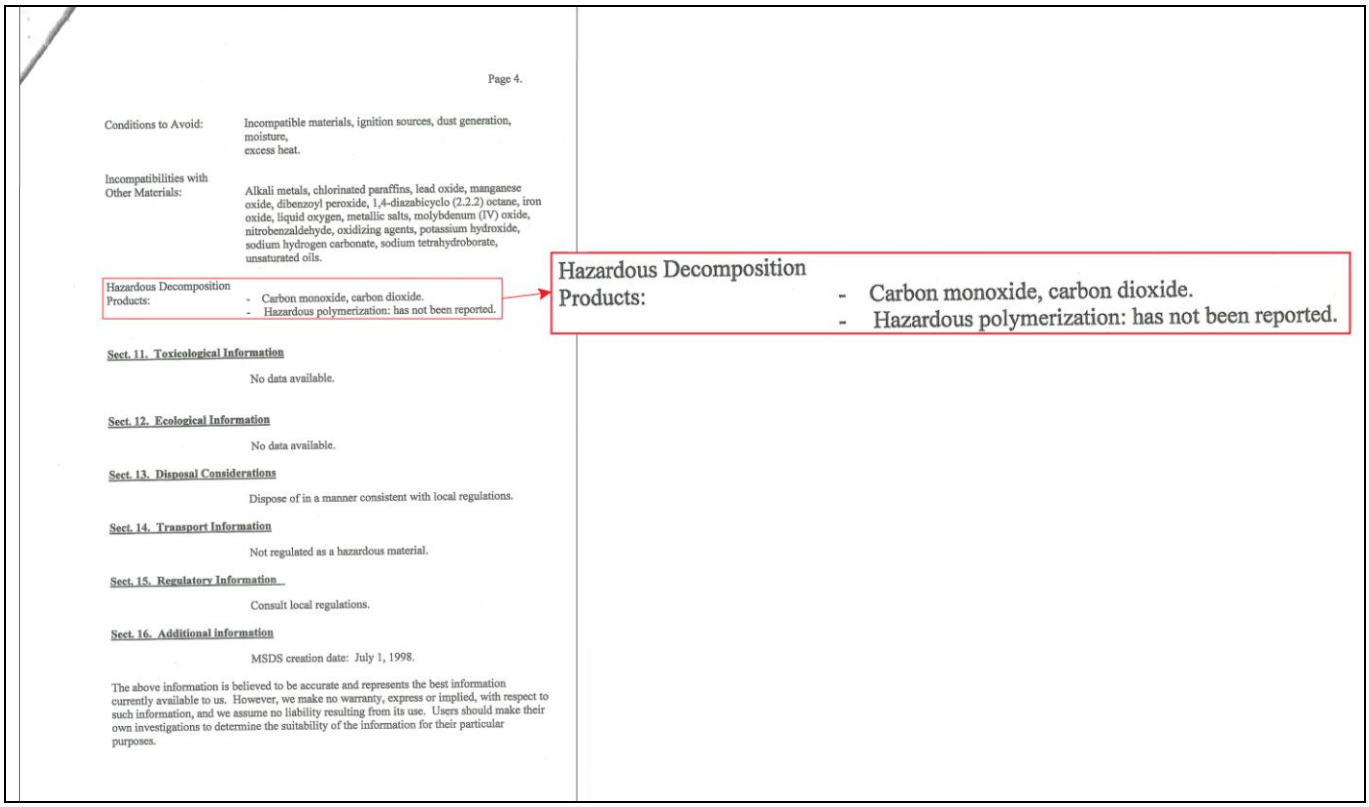
In no way shall **EXXARO INTERNATIONAL TRADING AG** be liable for any claims, losses or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if **EXXARO INTERNATIONAL TRADING AG.** has been advised of the possibility of such damages.

Date: .....

MV KOSMAS V

DATE OF ISSUE: 24 JANUARY 2015

The reference of the decomposition products of COAL on Material Safety Data Sheet (MSDS) page no 04 is marked in red.



Page 4.

Conditions to Avoid:	Incompatible materials, ignition sources, dust generation, moisture, excess heat.
Incompatibilities with Other Materials:	Alkali metals, chlorinated paraffins, lead oxide, manganese oxide, dibenzoyl peroxide, 1,4-diazabicyclo (2.2.2) octane, iron oxide, liquid oxygen, metallic salts, molybdenum (IV) oxide, nitrobenzaldehyde, oxidizing agents, potassium hydroxide, sodium hydrogen carbonate, sodium tetrahydroborate, unsaturated oils.
Hazardous Decomposition Products:	- Carbon monoxide, carbon dioxide. - Hazardous polymerization: has not been reported.

Sect. 11. Toxicological Information

No data available.

Sect. 12. Ecological Information

No data available.

Sect. 13. Disposal Considerations

Dispose of in a manner consistent with local regulations.

Sect. 14. Transport Information

Not regulated as a hazardous material.

Sect. 15. Regulatory Information

Consult local regulations.

Sect. 16. Additional information

MSDS creation date: July 1, 1998.

The above information is believed to be accurate and represents the best information currently available to us. However, we make no warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

Hazardous Decomposition Products:
- Carbon monoxide, carbon dioxide.
- Hazardous polymerization: has not been reported.

Appendix 4

The Safety Committee Meeting Minutes form of the previous day of the casualty

(02 pages)

EDEM MARINE MANAGEMENT SYSTEM VS-02

SAFETY COMMITTEE MEETING MINUTES

Note:
1. Safety Meetings MUST be conducted at least once a month
2. Safety topics should be discussed (some examples in company's procedure)
3. This form MUST be completed after each meeting and posted in the mess rooms.

VESSEL: M/V "KOSMAS V" **DATE: 25.02.2015**

ATTENDED BY:

NAME	RANK	SIGNATURE	NAME	RANK	SIGNATURE
	MASTER			A/B	
	CH.OFF			A/B	
	2ND Off			OS	
	3RD OFF			O/S	
	CH/ENG			FITTER	
	2ND/ ENG			OILER	
	3RD ENG			OILER	
	4TH/ ENG			OILER	
	ELECTRIC'N			COOK	
	BOSUN			M/MAN	
	A/B			M/MAN	

	TOPICS DISCUSSED
1	Minutes of the previous meeting and a report on actions taken.
2	Preparedness of the vessel according ISPS code and SSP for arrival in Patras, Eleusis, Greece.
3	Preparation vessel for bunkering in Patras /Greece. S.O.P.E.P.
4	Preparation vessel for ANNUAL SURVEY by LR, PSC PARIS MOU, ILO/MLC, PANAMA FLAG, items to checked/inspected.
	ACTIONS AGREED
1	**Report from Master:** As Master has informed, that according schedule of Management office EDEM MARINE S.A. has planned to arrange ANNUAL SURVEY, LR, PSC PARIS MOU, ILO/MLC, PANAMA FLAG, of the vessel expected visits during next port of call at Patras, Elevsis, Greece. For ensure this ANNUAL SURVEY by LR, PSC PARIS MOU, ILO/MLC, PANAMA FLAG, the crew during next running voyage to be prepared the vessel, her engines, safety equipments and items etc. according Requirements PSC Paris memorandum and SMS EDEM MARINE S.A., in order to be ready show to Surveyor full readiness vessel and her seaworthiness. All these tasks would be provided good maintaining of the vessel and her engines, therefore the Officers and Ratings would be execute their duties with high responsibilities and hold all parts and engines in good working condition. As Master remind you that proper attention should be paid to ISPS Code, security of crew on board – security watches must be maintained at all times during the voyage . The plastic cards must be given to all visitors with records into ISPS Visitors Log Book. The crew is to be reminded about their duties according to ISPS Code, especially security gangway watch and security patrol of ship's Access points. All non-using accommodations doors must be locked, unmanned rooms – closed/locked. Officers and crew should not permit unauthorized persons on board, check visitors ID cards, all outside doors must be closed, the gangway entrance at all times must be kept under crew supervision. The proper attention also should be paid to Safety on board. The safety helmets, safety shoes should be carrying by the officers and by the crew during cargo operations all the times. All crewmembers should follow the rules of Safe practice on board. Crew has to pay attention for general hygiene and cleanliness of accommodation in all times.

EDEM MARINE MANAGEMENT SYSTEM VS-02

2	**Report from Chief Officer:** Are minor outstanding regarding Safety arrangement on board at the present moment. All outstanding were reported to the company and necessary requisition were done as required. All the requiring instructions for the Safety and Security on board are given to the crew, all necessary preparations and trainings/drills this month carrying out successfully. Trainings/drills been held for all crewmembers in accordance with SOLAS, MARPOL, ISM and ISPS Codes, Companies regulations/ requirements and ship's schedule. All FFE, LSA, Oil Spill, ISPS equipments and appliances were inspected, checked found in good working order. Maintenance of cargo holds greasing points and mooring arrangements carried out before port operations all the time with satisfactory results. All "Permit-to-Work System" covering "Enclosed Space Entry" and "Hot Work Permit", safety forms been daily completed as well. Weekly sanitary and fire precaution inspections carried out on a regular basis.
3	**Report from Chief Engineer:** During voyage the engine department were provided maintenance of the vessel. Engine department will be assist as much as possible deck crew to prepare the c/holds, and cranes for discharging cargo operations. Main Engine, engine equipment and systems were maintained and prepared for expected ANNUAL SURVEY by LR, PSC PARIS MOU, ILO/MLC, PANAMA FLAG, of the next ports of call. Maintenance of Engine room items were performed as per planning schedule with satisfactory results and in progress all the time during sea passage. All Safety equipments are in workable condition. All of them are checked according to special schedule and Companies instructions.
4	**Report from 3rd off.:** The monthly checks of all safety items had been completed and found in order/ready for immediate use. This months Freefall, and Rescue boat been cleaned. The Freefall, and Rescue boat motors and winches been maintained by Eng Dept. as well. LSA & FFE are prepared for expected ANNUAL SURVEY by LR, PSC PARIS MOU, ILO/MLC, PANAMA FLAG, of the next ports of call.
5	**Report from Bosun:** Prepared mooring equipment for arrival, maintenance of main deck and accommodation items had been performed as per planning schedule satisfactory result.
6	**Report from Chief Cook:** Condition of Galley, Provision Store rooms is satisfactory, hygiene OK.
	REQUESTS FROM COMPANY
1	Emission control areas (ECA). New regulations. Exchange procedure to LSDO before arrival/during port staying European ports.
2	Guidelines on application of MARPOL annex VI reg. 18 in at Emission Control Area/(ECA) Paris memorandum
3	Paris Mou PSC procedure of inspection.
4	Works –Rest Hours of the Crew. Flag Regulations regarding Rest Hours. Approved by Panama Rest Hors Forms.

Master:__[redacted] Safety Officer:__[redacted]