



**HELLENIC REPUBLIC  
HELLENIC BUREAU FOR MARINE CASUALTIES INVESTIGATION**



**MARINE CASUALTY SAFETY INVESTIGATION REPORT**  
**06/2014**

**FATAL FALL INTO THE SEA OF TECHNICIAN DURING  
DISEMBARKATION  
FROM OIL TANKER ROYAL OAK TO LAUNCH BOAT DRAKON  
TAXIARCHIS**



--- Piraeus January 2017 ---

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**GLOSSARY OF ABBREVIATIONS AND ACRONYMS**

1.	HBMCI	Hellenic Bureau for Marine Casualties Investigation
2.	IMO	International Maritime Organization
3.	SOLAS	Convention for the Safety of Life at Sea 1974, as amended
4.	ISM	International Management Code for the safe operation of ships and for pollution prevention
5.	SMSM	Safety Management System Manual
6.	UTC	Coordinated Universal Time
7.	Bf	Beaufort (wind force measuring unit of Beaufort Scale)
8.	HP	Horse Power
9.	m	meters
10.	AB	Able seaman
11.	Loa	Length over all
12.	C/O	Chief Officer
13.	GMDSS	Global Maritime Distress and Safety System
14.	P.D.	Presidential Decree
15.	min	minutes
16.	R.O.	Recognized Organization
17.	VHF	Very High Frequency
18.	DPA	Designated Person Ashore
19.	n.m.	Nautical mile
20.	CPR	Cardiopulmonary resuscitation

## Foreword

The Hellenic Bureau for Marine Casualties Investigation was established by Law 4033/2011 (Government Gazette 264/12.22.2011), 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 under 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 understand the sequence of the events that occurred on the 11th of April 2014 and resulted in the examined very serious marine casualty and aims to prevent and deter repetition.

Fragmentary or partial disposal of the contents of this report, for 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 local times (UTC +3) unless otherwise stated.

Under the above framework HBMCI has been examining the circumstances of the fatal fall into the sea of technician during disembarkation from oil tanker ROYAL OAK to launch boat DRAKON TAXIARCHIS at Piraeus anchorage.

## 1. Executive summary

On 10 April 2014 Oil Tanker ROYAL OAK was at Piraeus anchorage where her ownership was altered and she was delivered to new managers. On the same day the vessel got registered in Marshall Islands Registry and a Provisional Certificate of Registry was issued. On 11 April 2014 ROYAL OAK was still remaining at Piraeus anchorage in order to complete the required inspections by her Flag State and her Class for the issuance of the new Statutory and Class Certificates.

On 1400 a shore technician with his assistant boarded the ROYAL OAK in order to set up and inspect the GMDSS equipment. After the technicians concluded their work, at approximately 1650 the launch boat DRAKON TAXIARCHIS approached the vessel, for the embarkation of the two technicians and of one crew member in order to transfer them ashore.

During the embarkation procedure from the vessel's Starboard accommodation ladder located almost amidships, onto the launch's foredeck, one of the two technicians fell overboard. After his fall into the sea the technician, retained for a short time his consciousness and was swimming to remain on the sea surface. At the same time, ROYAL OAK crew and the launch's Skipper along with ROYAL OAK C/O and the technician's assistant who were already on the launch threw lifelines with rope to assist the technician to stay on the sea surface and to retrieve him; however, after a short time, the technician lost consciousness. The C/O of ROYAL OAK, dived into the sea from the launch, and caught the technician and held him on the surface. At the same time, ROYAL OAK crew lowered the accommodation ladder to sea level and the technician was placed on the ladder's lower platform. Immediately, C/O started CPR but without any results.

With the assistance of the vessel's crew, the technician was transferred on the launch, which sailed directly for Keratsini port. Throughout the course of the journey towards Keratsini port, ROYAL OAK C/O and the technician's assistant continued the CPR.

At the same time, the incident was reported to Keratsini Port Authority, the vessel's managers and agent requesting an ambulance to transfer the technician to the hospital.

When the launch arrived at Keratsini port the technician was placed in the ambulance, but the ambulance crew declared his death. According to the official postmortem report, his death was caused by myocardial infarction.



## 2. Factual information

### 2.1 Vessels' details



Figure 1: ROYAL OAK at Piraeus anchorage

Name of Vessel	ROYAL OAK
Flag State	Marshall Islands
Port & No of Registry	Majuro 5577
Call Sign	V7FA6
Type of Vessel	Oil Tanker
IMO Number	9164213
Loa (Length over all)	220.20 m
Breadth	32.20 m
Year built	1999
Place built	Rijeka, Croatia
Hull material	Steel
Gross Tonnage	40705
Net Tonnage	21529
Classification Society	DNV-GL (since 15 April 2014)
Main Engine	1 x WARTSILA 6RTA62U/ 11996 KW
Minimum Safe Manning	16
Trading Area	International (A1, A2, A3)
Managing Company	Coral Shipping Corp



Figure 2: Launch DRAKON TAXIARCHIS at Keratsini port

<b>Name of Vessel</b>	<b>DRAKON TAXIARCHIS</b>
Flag State	Greek
Port & No of Registry	Piraeus 10433
Call Sign	SVA3576
Type of Vessel	Passenger launch
IMO Number	N/A
Loa (Length over all)	15.00 m
Breadth	3.80 m
Year built	2010
Place built	Greece
Hull material	G.R.P.
Gross Registered Tonnage	23.23
Net Registered Tonnage	15.58
Certification Body	Hellenic Register of Shipping S.A.
Main Engine	2 x VOLVO PENTA D6 370 A-D / 370 HP
Crew	1
Trading Area	Short distance and internal waters (P.D. 270/1988)

## 2.2 Marine casualty information

<b>Type of casualty</b>	<b>Very serious</b>
Date and time	11 April 2014, 16:50
Position – location	Piraeus anchorage lat: 037° 56,4' N - long: 023° 31' E
External environment	Good visibility, Wind S 4-5 Bf, slight sea state, daylight
Ship operation	ROYAL OAK: Anchored DRAKON TAXIARCHIS: Passenger embarkation from anchored vessel
Area of casualty	ROYAL OAK: Starboard accommodation ladder on main deck DRAKON TAXIARCHIS: Fore embarkation deck
No of crew	ROYAL OAK: 11 DRAKON TAXIARCHIS: 1

Consequences (to individuals, environment, property)	Death of shore technician
Damages to vessel	No
Pollution	No

### 2.3 Emergency response actions

The incident was reported to Piraeus Vessel Traffic Monitoring System and to the competent Coastguard Authority, which notified the National Emergency First Aid Service and requested the deployment of an ambulance to the arrival area of the launch boat at Keratsini port.

The launch's voyage time towards Keratsini lasted approximately 10-15 min. When the launch boat arrived in port Coastguard Officers had already been deployed and after a few minutes an ambulance came to receive the technician. However the technician was already dead and the ambulance crew declared his death.

### 2.4 Weather conditions

According to the official weather forecast bulletins by the Greek National Meteorological Service weather conditions for the Saronic Gulf on the day of the casualty provided South winds, 4-5 Bf with slight sea state, which would turn from northwest directions later on the same day.

However, according to information collected through the interview process, the prevailing weather conditions during early noon hours were good with a light breeze from variable directions and calm sea, whereas during the time of the casualty winds were up to 4 Bf blowing from South directions and the sea state was slight with wave height approximately 0.5m also from southern directions.

## 3. Narrative

### 3.1 Arrival at Piraeus anchorage – Change of ownership

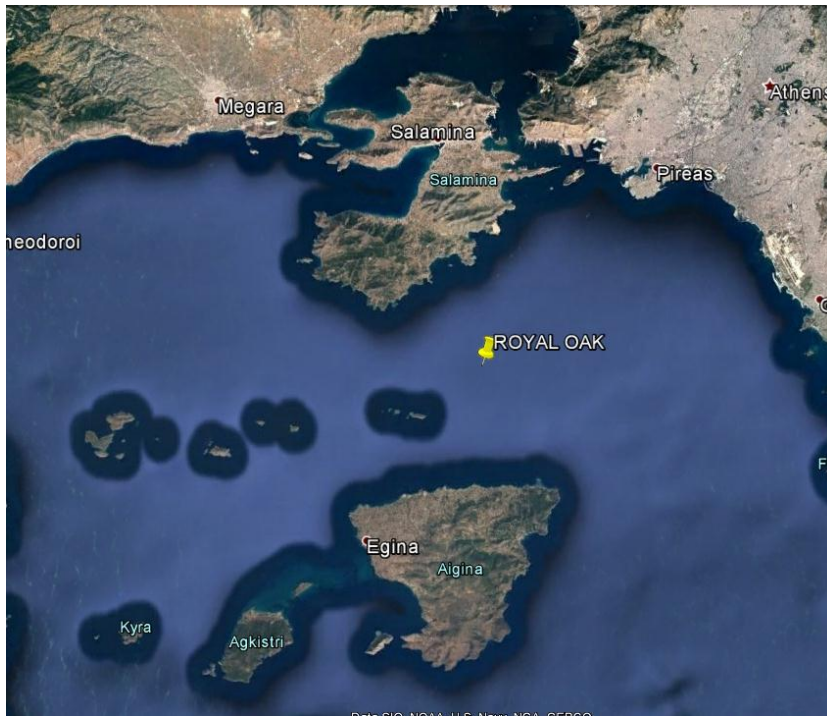
On 28 March 2014 ROYAL OAK, under the name ANDRE JACOB and flying the Gibraltar Flag, arrived at Piraeus anchorage, coming from Gibraltar, in order to be delivered to the new owners and managers.

Four crew members of the new managers, namely the Master, the Chief Officer, the Chief Engineer and the Electrician had already boarded the vessel on 21 March 2014 in Gibraltar, from where she sailed on 22 March 2014 heading to Piraeus.

On 10 April 2014 the delivery process was concluded and the vessel was renamed to ROYAL OAK and was registered to the Marshall Islands Registry. The crew of the former owners disembarked from the ship while seven new crew members from the new managers joined the vessel's crew, namely a second Chief Officer, one 2nd Mate, one 2nd Engineer, two ABs of which one was assigned as a Bosun and two Oilers.

After ROYAL OAK's delivery to the new owners/managers and her registration to Marshall Islands Registry, the vessel remained at Piraeus anchorage for the necessary surveys to be carried out by the Flag Administration and the R.O for the issuance of her Class and Statutory Certificates.





**Figure 3:** The position of ROYAL OAK at Piraeus anchorage. (source: Google Earth)

### 3.2 The marine casualty

In the context of the necessary surveys, the new managers appointed a specialized shore company to carry out inspections to the vessel's GMDSS and navigation equipment. On 11 April 2014, approximately at 13:30 one technician with his assistant boarded on the launch boat DRAKON TAXIARCHIS at Keratsini port in order to be transferred to ROYAL OAK at Piraeus anchorage. At approximately 14:00 the launch arrived at the sea area where ROYAL OAK was anchored and both technicians boarded on the vessel from the port accommodation ladder on the port side of the main deck. It was stated, that the embarkation of the two technicians was performed without any problem, while the weather was very good with a light breeze and no waves.

When the two technicians concluded their work, they informed ROYAL OAK crew and launch boat DRAKON TAXIARCHIS was called to receive them. The launch sailed from Keratsini port at 16:00 and arrived at the anchorage area at 16:30 where it waited for almost 10 minutes, until the two technicians along with the one Chief Officer started to disembark. For the disembarkation procedure the Starboard side accommodation ladder on the main deck was used and by that time weather conditions, with respect to the weather conditions during boarding had altered as South winds, 4 Bf were blowing and the sea state was rippled with waves of approximately 0.5m in height, also from southern directions.

During the disembarkation of the two technicians and the one Chief Officer, Bosun had the control of the accommodation ladder and he was standing at the ladder's control post while the process was supervised by the other C/O who was standing towards the aft at approximately 10m distance from Bosun (Figure 4).



**Figure 4:** The Starboard accommodation ladder at ROYAL OAK main deck and the position of the ladder's control post where Bosun was standing.

When the two technicians and the C/O got at the main deck and were ready to disembark, the launch's Skipper approached the accommodation ladder's lower platform with the bow, as he was about to embark the passengers from the fore embarkation deck, while the Bosun lowered the accommodation ladder at approximately 0,2m higher from the launch's embarkation deck (Figure 5).

C/O was the first one that walked down the ladder and when he got on the launch he decided to remain at the fore deck to assist the embarkation of the two technicians due to the pitching of the boat caused by the rippled sea.

After the C/O's embarkation, the technician's assistant walked down the ladder carrying a VHF equipment extracted from the vessel's bridge in order to be repaired and inspected at shore. When the technician's assistant got on the lower platform of the accommodation ladder he handed the VHF equipment to the C/O, who placed it inside the launch. Then he got on board the launch boat and moved inside the passenger's closed accommodation space through the fore opening.



**Figure 5:** DRAGON TAXIARCHIS bow arrangement and the fore opening leading to the closed passenger accommodation area.

The last who walked down the ladder was the technician who was carrying an echo sounding device for repair at shore as well as a backpack with his tools on his back. When he arrived on the ladder's lower platform he handed the device to the C/O and he attempted to board on the launch. However, during his movement to step on the launch's deck he lost his balance and fell overboard. Immediately the launch's Skipper moved the engine controls to "astern" in order to clear the boat from the "man overboard" and avoid his injury.

The fall of the technician in to the sea was noticed by the Bosun and the C/O of ROYAL OAK who threw a lifering located near Bosun's position at a close distance from the technician, and reported the incident to the Master through his portable VHF device. It was reported that when the technician fell overboard he attempted to remove the backpack with the tools from his back but as he couldn't get rid of the extra weight he swam for a short time towards the lifering.



**Figure 6:** The lifering located close to the accommodation ladder control post.

At the same time, C/O who was in the launch boat took from the technician's assistant a lifering with rope which was placed at the stern of the launch and requested from the Skipper a longer and stronger rope in order to tie the lifering and throw it towards the technician and pull him close.

However, in the meantime he noticed that the technician had stopped swimming and his body had turned prone, with his face in to the sea. Immediately he told to the launch's Skipper to approach the "man overboard", jumped into the sea and caught the technician,



who was unconscious. Simultaneously, Bosun and the C/O from ROYAL OAK took a lifering with rope and went down at the ladder's lower platform, from where they threw it to the C/O, while the launch's skipper maneuvered the launch and approached the casualty and threw also a lifering with rope.



**Figure 7:** The lifering with rope which was placed close to the Stbrd accommodation ladder towards the fore.

The C/O, who was trying to keep the technician on the sea surface, managed to catch a lifering and both were pulled towards the ladder's platform which was already lowered at sea level. The crew placed the technician on the platform and started providing CPR with chest compressions and rescue breathing. However, the casualty was not responding and remained unconscious, therefore it was decided to place him on the launch and transfer him ashore to a hospital for medical assistance. With the crew's efforts the technician was placed in DRAKON TAXIARCHIS which immediately sailed directly to Keratsini port. The launch's Skipper reported the incident to "Piraeus Traffic" as well as to the competent local Coast Guard Authority of Keratsini which immediately notified the National Emergency First Aid Centre and requested the deployment of an ambulance at Keratsini port at the point of arrival of the launch boat.

During the voyage towards Keratsini port, C/O and the technician's assistant continued providing CPR, but still with no results. The crew of the ambulance that arrived on scene examined the casualty and declared his death. According to the official certificate the technician's death was caused by myocardial infarction in extension of past coronary heart disease.

After the casualty, ROYAL OAK remained in Piraeus anchorage until the completion of the necessary procedures and inspections from where she sailed the following days.

#### 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.

## 4.1 ROYAL OAK crew

### 4.1.1 The Master

The Master of ROYAL OAK, aged 40, started his naval career in 1995. He had served for several years on vessels of ROYAL OAK managing company on which he had been serving as a Master from 2008 and he was familiar with the company's procedures for the safe operation of their managed vessels.

He boarded ROYAL OAK on 21 March 2014 in Gibraltar, together with three other crew members in order to familiarize with the vessel and her equipment by the former crew before the vessel's delivery. He completed the provided by the vessel's Safety Management System Manual - SMSM familiarization procedure conducted by the previous Master of the ship, which was properly recorded in the dedicated form and signed by both seamen on the date of the vessel's delivery.

When DRAKON TAXIARCHIS arrived in the anchorage area, he ordered the C/O to go to the main deck with the Bosun, for the disembarkation of the two technicians and the other C/O. At the time of the accident he was on the bridge. He was informed about the casualty through VHF by the C/O supervising the disembarkation procedure and ordered the crew to throw liferings and proceed to the main deck to provide assistance. Simultaneously he reported the incident to the company's DPA and the Port Authority.

### 4.1.2 The Chief Officer

The C/O, 32 years old, Filipino citizen, started his naval career in 2003 and had his first contract as a C/O in 2009. This was his third contract with ROYAL OAK managers and he had been serving on their vessels from 2012. He had served one more time with ROYAL OAK Master on another vessel of the same managing company.

He boarded ROYAL OAK on 21 March 2014 in Gibraltar, together with the Master and another two crew members in order to familiarize with the vessel and her equipment before the vessel's delivery. The provided by the vessel's SMSM familiarization procedure was conducted by ROYAL OAK Master and was properly recorded in the dedicated form and signed by both seamen on the date of the vessel's delivery.

When DRAKON TAXIARCHIS approached the vessel he was ordered by the Master to proceed to the main deck with the Bosun for the disembarkation process. At the time of the accident he was approximately 10 meters away from the boatswain towards the stern of the ship. When he noticed the technician's fall into sea he threw the closest lifering. Then he ordered the Bosun to take a lifering with rope and went to the ladder's lower platform to recover the "man overboard".

### 4.1.3 The other Chief Officer

The other C/O of ROYAL OAK, 50 years old, Greek national, had a total of 18 years sea service of which the last 8 years as a Master. During the previous two years before the accident he had served on vessels of ROYAL OAK managing company as Master.

He signed on ROYAL OAK the previous day of the examined marine casualty when the hand over procedure to the new owners/managers was concluded in order to assist the vessel's commencement and inspection procedure for issuance of the Statutory and Class Certificates by the Flag Administration and the R.O. On the day he signed on the vessel he completed the familiarization process with the ship and her equipment according to the SMSM, which was recorded and signed at the dedicated form.



During the accident he was on the launch's bow voluntarily assisting the boarding of the technician and his assistant. When he realized the technician's fall he requested from his assistant to bring a lifering with rope. Meanwhile he noticed that the man overboard had stopped swimming and jumped into the sea to assist him. He managed to catch the technician as well as a lifering, by which they were pulled close to the ladder's platform and when the technician was placed on the platform he provided CPR, which continued also into the launch while sailing towards Keratsini port.

#### **4.1.4 The Bosun**

The Bosun of ROYAL OAK, 35 years old, signed on the vessel the previous day of the marine casualty. It was his sixth contract with ROYAL OAK managers of which the last three as a Bosun. At the time of the casualty he had the control of the accommodation ladder and he was standing at the ladder's control post. Following C/O's order he took the closest lifering with rope and together with the C/O walked down to the ladder's lower platform to recover the technician and the Greek C/O from the sea.

#### **4.2 DRAKON TAXIARCHIS Skipper**

The Skipper of DRAKON TAXIARCHI was also the owner of the launch boat. He carried a valid "Helmsman and Operator of Motor Boat License» issued by the Hellenic Coast Guard Authority and he was engaged for 19 years in Piraeus port launch boat services based in Keratsini. At the time of the marine casualty he was at the launch boat fore control station and when he noticed the technician's fall he maneuvered the boat astern in order to clear from the "man overboard" and avoid possible injury. Afterwards he maneuvered in order to come close to the C/O and the technician and threw to them a lifering with rope from the boat's stern.

#### **4.3 The casualty**

The technician was 54 years old and had been working for several years in the repair and maintenance sector of marine navigational and telecommunication equipment. Therefore he had visited several times vessels in the anchorage in which the transportation takes place with passenger launch boats and the embarkation/disembarkation is arranged through the vessels' accommodation ladders. Based on reports from the persons involved to the examined marine casualty, he was overweight and his physical condition affected his walk and retarded his movements during embarkation / disembarkation on vessels, especially on those that were in the anchorage as the transportation was performed with launch boats.

#### **4.4 Launch boat DRAKON TAXIARCHIS**

##### **4.4.1 Launch boat description**

DRAKON TAXIARCHIS was built in 2010 in Greece in order to be used as a passenger launch for the service of vessels calling at Piraeus anchorage area. It is equipped with two main engines situated under the aft main deck, as well as one bow thruster.

The launch's navigation is executed from the main control station located at the port side of the fore passenger area. However, it is equipped with an additional control station located at the open starboard aft deck, which is being used for the maneuvering when approaching vessels or the dock whenever deemed necessary. On the main control station are situated the engine monitoring instruments as well as the navigational and telecommunication equipment. The passenger embarkation / disembarkation is performed

either at the bow's or at the stern's deck area since no relevant specific provision or instruction is recorded in the launch's General Inspection Certificate. The fore embarkation deck is slip resistant coated with two guard railings. Passengers passage to/from the enclosed passenger area is performed through a weather tight opening located at the fore part of the launch's superstructure.

The main control station provides a good visual field to the skipper when approaching a vessel's accommodation or pilot ladder and the embarkation / disembarkation is performed from the launch's fore deck. However, according to the data collected during the investigation process, when the technician fell into the sea, the skipper was looking at the engine monitoring instruments on the control panel and he didn't notice the cause of his fall.



Figure 8: The fore control station.



Figure 9: The aft control station



Figure 10: The aft embarkation deck.



Figure 11: The fore embarkation deck with the weather tight opening for the access to the passenger area and the railings.

#### 4.4.2 Permitted voyages

According to the General Inspection Certificate in force at the day of the marine casualty, DRAKON TAXIARCHIS was permitted to sail at short distances and in inland waterways, according to the provisions of P.D 270/1998. In article 1 of the P.D 270/1998 (Government Gazette 120A'), "Regulation for the suitability and the inspections of small commercial boats which accommodate passengers and perform voyages at short distances and in

inland waterways”, the definition of the term short distance voyages and inland waterways is stated as the voyages which are performed:

- inside ports,
- at port areas up to 3 nautical miles from the port’s opening,
- at a distance up to 540 meters from the shore and up to 1,5 nautical miles from the departure point,
- at lakes and rivers.

ROYAL OAK position at Piraeus anchorage was approximately 8 n.m far from the point of the launch’s departure and approximately 7 n.m from Piraeus port opening.

Considering the above it is deduced that DRAKON TAXIARCHIS voyage to ROYAL OAK anchorage position was not included in the launch’s permitted voyage areas pursuant to the General Inspection Certificate in force at the day of the marine casualty.

#### 4.5 Technician’s fall

As mentioned above, the technicians’ embarkation was performed a few hours before the marine casualty from the vessel’s port side accommodation ladder at the main deck under good weather conditions and calm sea. Passenger launch boat DRAKON TACHIARXIS approached smoothly the platform of the accommodation ladder, without any rolling or pitching and the embarkation of the technicians was performed without any problem.

During the technicians’ disembarkation weather conditions had been altered and the sea was rippled with waves coming from south direction and height of 0,5 m approximately, causing DRAKON TACHIARXIS pitching and rolling. On this ground it was decided to use the starboard side accommodation ladder since it was at the vessel’s lee side. Nonetheless, during the interview process it was reported that the vessel’s angle in relation to the wave direction did not provide sufficient lee to the vessel’s starboard side and resultantly the sea area at the ladder was affected by the waves causing a 0,5 m pitching to the launch boat approximately equal to the wave height.

Consequently the embarkation to the launch boat required proper estimation and synchronization of movements not only from the launch’s skipper but from the C/O and the technicians as well. The skipper of the boat was required to perform the proper maneuvers so as to bring and keep the launch boat at a close distance to the ladder’s lower platform, without letting it drift underneath it, in order to avoid a possible impact due to the pitching. At the same time the C/O and the technicians would have to estimate the launch’s movement due to pitching so as to jump on the boat’s deck at the right moment when it would be at a close distance to the ladder’s platform in respect to the horizontal as well as to the vertical axis. It is noted that proper synchronization of movements would be required also in case that the embarkation would be performed at the launch’s aft deck. Nevertheless the embarkation point at the aft part was closer to the launch’s midpoint, and consequently the range of the boat’s vertical movement at that specific point would had been limited.

According to data obtained during the interview process, when the launch boat was close to the ladder and after the technician handed over the sonar device to the C/O positioned at the bow of the launch, he attempted to embark, however his movement was slow and not at the right time since it was performed when the boat was moving downwards and away from the ladder’s platform. Additionally there was no other factual information that could lead to the conclusion that at that moment the launch’s skipper attempted to maneuver with the engines or the bow thruster which could move the boat away from the accommodation ladder.

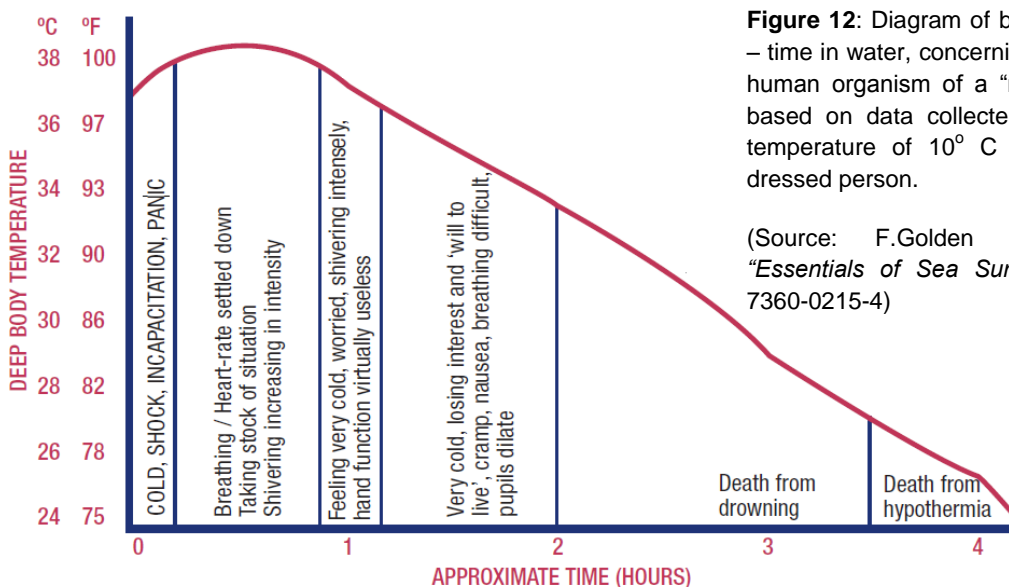
Under the light of the above it is deduced that the fall of the technician was caused by his erroneous action to embark on the launch boat due to a false estimation of the boat's movement which was caused by pitching.

#### 4.6 Loss of life

According to the official certificate, the technician's death occurred as a result of a myocardial infarction in extend to a past coronary heart disease. As it emanates by the professional views of specialized medical personnel, a coronary heart disease minimizes the endurance of a human in conditions of intense psychological and physical burden which can be caused from an unexpected fall at sea with a low water temperature. It is noted that on the day of the casualty the water temperature at Piraeus anchorage was 17°C. This temperature is not considered low enough; nevertheless it can cause to the human body a "cold shock" which is attributed to the sudden fall of a person in waters with lower temperature than that of the human body.

In more detail and based on studies carried out concerning human behavior after falling at sea, high fatality rates are observed during the first minutes of immersion, from the so called "cold shock" which is caused concurrently with panic and immobilization (Figure 12). During the contact with the sea water, as mentioned by Frank Golden and Michael Tipton in their book under the title "Essentials of sea survival" (ISBN 0-7360-0215-4), due to the vascular contraction caused by the low temperature in conjunction with the increased heart rate due to agony or panic and the hydrostatic pressure from the water, the person's blood pressure is increased in such a level that a cardiac arrest or stroke can be caused particularly in less healthy and susceptible people.

It is noted that a person who suffers from a coronary heart disease, as in the examined marine casualty, can be included in the category of "susceptible" organisms. In addition, the technician's clothing as well as the backpack he was carrying, the weight of which could not be established, nevertheless it was stated that it was heavy, overburdened his efforts to swim and remain afloat.



**Figure 12:** Diagram of body temperature – time in water, concerning the impact on human organism of a "man overboard", based on data collected for sea water temperature of 10° C and a normally dressed person.

(Source: F.Golden and M.Tipton, "Essentials of Sea Survival", ISBN: 0-7360-0215-4)

Typical change in deep body temperature during immersion in stirred water at 10°C (50°F) for an average clothed individual (F. Golden).



Further to the above the Marine Accident Investigation Branch – MAIB of the United Kingdom in a recent safety investigation report concerning the death of a Fishing vessel's crew member after falling at sea<sup>1</sup>, included a table in which the time periods from the falls of persons in the water until the loss of their consciousness are recorded, in relation to the temperature and state of the sea (Figure 13). From the aforementioned table it is noted that in all cases unconsciousness had occurred in less than 15 minutes.

Vessel name	Date	Sea state	Water temperature	Victim unresponsive in water
<i>King Challenger</i>	23/06/2016	Slight	10.5°C	4 minutes
<i>Our Sarah Jane</i>	09/06/2016	Slight	12°C	8 minutes
<i>Apollo, INS179</i>	18/04/2016	Rough	9°C	7 minutes
<i>Annie T</i>	04/10/2015	Heavy swell	12°C	10 minutes
<i>Aquarius</i>	17/08/2015	Slight	14°C	10 minutes
<i>Enterprise</i>	09/07/2015	Rough	13°C	15 minutes
<i>Barnacle III</i>	13/05/2014	Slight	9°C	5 minutes*
<i>Vidar</i>	28/01/2013	Rough	8°C	11 minutes
<i>Zenith</i>	29/01/2012	Rough	8°C	10 minutes
<i>About Time</i>	16/06/2011	Moderate	12°C	Not known**
<i>Optik</i>	18/11/2009	Moderate	10°C	10 minutes
<i>Osprey III</i>	11/11/2009	Slight	10°C	12 minutes
<i>Maggie Ann</i>	12/02/2009	Moderate	6°C	8 minutes
<i>Apollo, INS179</i>	03/09/2007	Moderate	12°C	15 minutes

\*mob was probably entrapped and pulled overboard and underwater by potting gear

\*\*mob accident was not observed and body was not recovered

**Figure 13:** Table of MAIB Safety Investigation report concerning time periods into the sea until victims became unresponsive.

#### 4.7 ISM Code procedures

In accordance with the requirements of Chapter 7 of the International Safety Management Code (ISM Code - Chapter IX SOLAS 74), the managing company of a vessel on which the Code applies should establish procedures, plans and instructions, including checklists as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel.

<sup>1</sup> [https://assets.publishing.service.gov.uk/media/5819caeee5274a03c0000004/MAIBInvReport23\\_2016.pdf](https://assets.publishing.service.gov.uk/media/5819caeee5274a03c0000004/MAIBInvReport23_2016.pdf)



In the above context, ROYAL OAK managing company had developed a set of guidelines for the embarkation / disembarkation of persons through launch boats, which had been incorporated to the relevant Chapter of its managed vessels' SMSMs.

It is noted that on the day of the examined marine casualty, ROYAL OAK was under survey regime for the issuance of her Statutory and Class Certificates and she did not carry a valid Safety Management Certificate. On this ground her crew was not required to follow procedures provided by the vessel's SMSM. An Interim Safety Management Certificate was issued by the R.O. on 25 April 2014, whereas ROYAL OAK managing company had a valid Document of Compliance, issued by the R.O. on 11 December 2013 following an inspection, which was completed on 05 April 2013.

Nonetheless, the Master and the two C/Os had served on vessels of the same managing company in the past. The manning of new vessels of a company's fleet with experienced crew members who have sufficient service time on its managed vessels, has been established as 'good practice' followed by vessel managers, as they are considered to be familiar with the company's procedures concerning the vessels' safety and operational procedures.

On the above grounds it could be inferred that ROYAL OAK Master, C/Os and Bosun were familiar with the company's instructions concerning the embarkation / disembarkation process of persons through launch boats, which was incorporated in the SMSMs of its managed vessels.

#### 4.7.1 Embarkation / disembarkation procedure

The procedure referred in the previous paragraph concerning the "Safe embarkation / disembarkation whilst at anchorage" had been incorporated in Chapter 7.9.11 of ROYAL OAK SMSM, which inter alia provided:

- .1 a designated Deck Officer supervising the procedure equipped with a portable VHF device,*
- .2 Master's and designated Deck Officer's responsibility for ensuring, as far as possible, that transferees are in fit condition,*
- .3 suitable weather conditions to be ensured,*
- .4 adequate lee to ensure safe transfer of personnel,*
- .5 provision of Crewsaver or a self-inflating buoyancy aid to the personnel that are about to disembark,*
- .6 availability of safety harness with line which should be offered to all transferees,*
- .7 Master's discretion to insist on use of safety harness when deemed necessary by the prevailing circumstances,*
- .8 provision of baggage and other items handling facilities (e.g. heaving line) to ensure that transferees have both hands free.*

As mentioned above, the technician was overweight and his body feature affected his movement when walking down the vessel's ladder as well as during boarding on DRAKON TAXIARCHIS. Consequently, the risk factor of the overall disembarkation and boarding on the launch boat process had been increased due to the aforementioned casualty's movement difficulty.

However, according to information collected during the investigation process it was emerged that company's instructions for safe disembarkation / embarkation of personnel whilst at anchorage were not fully implemented.

It is noted that following all company's guidelines would have contributed to the implementation of the following measures which solely or combined could have functioned preventively to the examined marine casualty:

- disembarkation would have been delayed until the vessel's position provided sufficient lee which would minimize the launch's pitching,
- the technician would have been provided with "Crewsaver" or other self-inflating buoyancy aid, which would keep him afloat without the efforts he had to pay due to his clothing and the backpack with tools he was carrying on his back,
- safety harness would have been used,
- the technician would have handed over the backpack with tools which overburdened his swimming efforts to remain on the sea surface.

In light of the above it can be concluded that the partial implementation of company's guidelines concerning the safe embarkation / disembarkation whilst at anchorage, which had been incorporated in the relevant Chapter of SMSM's of its managed vessel's had contributed to the occurrence.

ROYAL OAK condition, under of which she did not carry a valid Safety Management Certificate and consequently there was no obligation to implement the provisions of the SMSM, is considered as a contributing factor to the examined marine casualty.

#### 4.7.2 Risk assessment

The risk assessment procedure is practiced on board vessels in the context of compliance with the requirements of Ch.1.2. of ISM Code and in particular par. 1.2.2.2, whereby the company's safe management objectives should inter alia assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards.

In relation to the above, ROYAL OAK's managing company had performed a risk assessment for the safe embarkation / disembarkation of personnel while vessels remained at anchor, which was recorded and incorporated in the vessels' SMSMs.

According to said risk analysis, with regard to the potential of serious injury or fatality, the existing controls were taken into consideration, which inter alia included:

- implementation of SMSM guidelines, as recorded in the previous paragraph,
- monitoring weather conditions and
- emergency procedure for serious injury and man overboard.

Based on the above controls the risk factor of the procedure was considered high and additional measures were provided which included amongst others Master's responsibility for understanding the SMSM guidelines and confirm their implementation.

According to data collected during the investigation process ROYAL OAK Master did not confirm the implementation of the SMSM respective guidelines with regard to the safe embarkation / disembarkation of personnel whilst at anchorage.

Considering the above as well as the analysis of the previous paragraph it derives that Master's lack of verifying the implementation of all company's respective guidelines, which at the time of the casualty were not mandatory, contributed to the occurrence of the examined marine casualty.

#### 4.8 DRAKON TAXIARCHIS manning

The manning of DRAKON TAXIARCHIS, as derives from the launch's General Inspection Certificate, was comprised of one person with the capacity of a skipper. The skipper, during embarkation/disembarkation, would be stationed at the launch's control station, performing the appropriate maneuvers so the boat would remain close to the point of embarkation/disembarkation.

On the examined marine casualty, due to the boat's pitching which was caused by the rippled sea, the C/O of Royal Oak remained voluntarily at the launch's bow in order to assist the technicians embarkation, since according to his experience the boat's pitching in connection to the technician's movement difficulty and the equipment they carried, that is the VHF and the sonar devices, created an unsafe situation.

After the technician's fall from the launch boat the C/O and the technician's assistant provided all available emergency response to the "man overboard" and they attempted to throw a lifering which was placed at the launch's aft deck. Meanwhile, the skipper remained at the controls maneuvering immediately in order to clear the boat away from the area of the technician's fall to avoid hitting him and later to approach him for the rescue.

The absence of a second crew member on the launch boat DRAKON TAXIARCHIS had contributed, as already stated, to the C/O's decision to remain at the launch's bow in order to assist the technicians' embarkation as well as to engage to the emergency response actions after the technician's fall into the sea together with his assistant.

In the light of the above it is deduced that a second person as a crew member may contribute to avoid unsafe situations such as for example providing assistance during embarkation with rippled sea which would cause pitching and rolling to the launch or during response to emergency situations such as a passenger's fall at sea as occurred at the examined marine casualty.

#### 4.9 Use of available equipment

After the technician's fall into the sea, ROYAL OAK crew, as well as the skipper and the passengers of the launch boat DRAKON TAXIARCHIS proceeded to immediate actions for the recovery of the technician using the available at that time equipment.

##### 4.9.1 ROYAL OAK equipment

ROYAL OAK C/O, who supervised the procedure from vessel's deck, when he noticed the technician's fall he took the closest lifering (Figure 6) and threw it into the sea as close as possible to the technician. At the same time he reported the incident to the Master via the portable VHF device and instructed the Bosun to get the lifering with rope which was placed forward of the accommodation ladder and together they walked down to the lower platform of the ladder.

The Master, who at that time was on the bridge, when he was informed about the incident, he instructed the C/O to throw the liferings and the rest of the crew to muster at the accommodation ladder area. Additionally he went out to the starboard side bridge wing in order to have a visual contact with the area of the incident.

The C/O with the Bosun and two other crew members walked down to the ladder's platform where the technician was placed and CPR with artificial respiration and chest compressions was provided, without any success. Then the technician was placed to the launch boat and during the voyage towards Keratsini port the C/O and the technician's assistant continued providing CPR.

According to the data collected during the investigation process ROYAL OAK medical inventory included special equipment for CPR. However, such equipment was not used as it was not transferred by any crew member to the location of the incident. It is noted that the use of said equipment would probably not have been feasible when the technician was placed on the ladder's platform, however, after his transfer to the launch boat and throughout the duration of the return voyage to Keratsini port could have been used.

As mentioned in par. 4.7.2, the documented Risk Assessment took into account the existing procedures of the SMSM, including the emergency procedure for the response to a "man overboard". Part of said procedure included instructions for dealing with "man overboard" incident through a "checklist" which recorded the required actions and the responsible crew member for each action. These instructions composed a set of actions related to vessel's maneuver, the recovery of an individual from the sea, first aid treatment etc. The "checklist instructions" concerning first aid provided a general reference for the need to transfer the person to a medical facility ashore for examination and medical care, and did not set out any specific actions for the crew. It is noted that in cases of person recovery from the sea, as occurred in the examined marine casualty, there may be no available time for the transfer of the person to the ship's "hospital room" or ashore and first aid must be provided "on scene" at the recovery location. Therefore, it deems appropriate to mobilize a crew team with dedicated tasks of transferring the appropriate medical equipment at the recovery location in order to avoid any potential delays.

Considering the above it may be inferred that the immediate transfer of the appropriate medical equipment of Royal Oak at the recovery location could have led to its use on the launch boat during voyage to Keratsini port.

#### **4.9.2 DRAKON TAXIARCHIS equipment**

The provided lifesaving equipment for the launch boat DRAKON TAXIARCHIS according to P.D. 270/1988 was, inter alia, a lifering with 15 m rope and a lighting device fitted in a way that its use would be easy and immediate. Launch boat DRAKON TAXIARCHIS was equipped with two liferings with rope that were placed at the stern outside of the protective railing.



Figure 14: The two liferings placed on the aft railing.

After the technician's fall into sea, his assistant, who was in the passenger compartment rushed to the stern, took a lifering and handed it over to the C/O at the bow. Meanwhile and before throwing the lifering to the "man overboard" the C/O noticed that the technician had lost consciousness and fell into the sea to catch him. Considering the above, in relation to the reaction of the human body after the fall at sea as described in par. 4.6, it is deduced that the time response margin of the persons in the launch after the technician's fall was limited, thus the immediate throwing of the lifering was required.

In light of the above it can be concluded that the position where the liferings were placed on the launch boat, although provided easy and rapid utilization nevertheless contributed to the delay of throwing one of them. An alternative mounting position of the lifering close to embarkation/disembarkation area could have contributed to its immediate throwing after the technician's fall and before the launch boat cleared the area due to the steering maneuver made by the skipper to avoid hitting the technician with the launch boat.

Apart from the above, in the examined marine casualty, all operations for throwing the lifering were made by the passengers of the launch boat as the skipper remained at the controls to perform the appropriate maneuvers. In any similar case, at which there would be no passengers in the launch boat, all actions for throwing the lifering and the recovery of the "man overboard" would have been performed by the skipper resulting in further delay as they would be performed in conjunction with the necessary maneuvers of the boat.

It is also noted that on passenger launch boats the risk of person falling overboard increases during embarkation / disembarkation, especially when it's performed at anchorages where the sea area is open and the weather conditions are heavier in respect to ports. Therefore, the mounting of liferings as close as possible to the embarkation / disembarkation points could minimize the time required for throwing them near the "man overboard" and enhance the effectiveness of the emergency response.



#### 4.10 Similar incidents – use of Personal Floating Device

During the interviews with the involved persons to the examined casualty it was emerged that some of them had previously encountered similar incidents with persons falling overboard during boarding from launch boats to ships or vice versa. These incidents were managed effectively with no loss of life or injury, however, it was acknowledged that boarding to ships through launch boats or vice versa is dangerous since it is affected by several factors such as weather conditions, the limited space of movement at the launch boat and the accommodation ladder, the fitness of people as some of them are not sailors and are not familiar with the process, etc., which increase the probability of accidents.

In addition, HBMCI had conducted a safety investigation in a similar "very serious marine casualty" involving the death of a seaman after falling into the sea during the boarding process at a launch boat in the sea area of Elefsis anchorage<sup>1</sup>.

Among the aforementioned marine casualty and the examined one common factors had been highlighted that primarily are focused on the fitness of the casualties, the cause of death and heart diseases, the movement of the launch boat caused by the rippled sea, and the fact that they were not wearing a life jacket or other equipment with a buoyant capacity. In said cases the efforts of the victims to remain at the sea level were overburdened by additional factors, such as the limited swimming ability, the carriage of the backpack as well as the sea temperature, which when it is much lower than the body temperature may produce a "cold shock".

Taking into account factors that have emerged from the analysis of the abovementioned marine casualties, it may be concluded that the use of a lifejacket or other equipment with buoyant capacity during the boarding process to the launch boat would have contributed significantly to panic avoidance and to minimize the stress of the individual's body to stay at the sea level, factors which enhance the possibility of a cardiac arrest.

In light of the above, it is concluded that the use of a personal life jacket or other buoyancy equipment is considered as a key factor to the effective emergency response on incidents of person's falling overboard during embarkation/disembarkation in ships through launch boats.

Casualty preventive measures derive by the provisions of P.D. 270/1988, according to which the launch boat skippers must ensure the safe embarkation/disembarkation of the passengers. In the same direction, the provisions of the General Port Regulation No. 17 "For the launch boats operations", as amended, provide that those exercising the command of the launch boats are afforded with the safe transport of passengers and their baggage from the ship to shore and vice versa.

Considering the above it derives that the mandatory use of equipment with a buoyant capacity during the embarkation/disembarkation process in vessels through launch boats is not provided by the existing regulatory framework. Therefore it lies on the launch boat skippers' judgment as well as on the vessels' Masters. It is noted that on the examined marine casualty, the relevant procedures of ROYAL OAK SMSM, had foreseen the provision of an inflatable lifejacket activated automatically or other inflatable buoyancy aid with automatic activation. Said provision was recorded due to a risk based process which may cause the fall of a person overboard, however, as mentioned in par. 4.7.1, had not been applied by the ship's crew.

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<sup>1</sup> The Safety Investigation Report was published in Greek language at the Bureau's webpage on 09-05-2014 and can be found at the following link: <http://hbmci.gov.gr/js/investigation%20report/final/01-2013%20LAUNCH%20VAGGELIO.pdf>

#### 4.11 Fatigue

During the investigation process no evidence were found which can lead to the conclusion that fatigue either of the technician or any other person involved in the examined marine casualty contributed to the occurrence or the events leading up to it.

**The following conclusions, safety measures and safety recommendations should not under any circumstances be taken as a presumption of blame or liability. The juxtaposition of these should not be considered as an order of priority or importance.**

#### 5. Conclusions

1. Embarkation and disembarkation of launch boat DRAGON TAXIARCHIS was performed either by the bow or the stern as there was no respective provision in the valid Certificate of General Inspection (§4.4.1).
2. The sea area where ROYAL OAK was anchored was out of the permitted voyage areas of DRAGON TAXIARCHIS, as provided by the valid Certificate of General Inspection (§4.4.2).
3. Boarding on a launch boat which is pitching and/or rolling requires proper assessment and synchronization of movements by the launch's Skipper as well as the transferees (§4.5).
4. The technician's fall was caused by his slow action to board on the launch boat due to his poor estimation of the launch's pitching movement (§4.5).
5. Upon contact with water, blood pressure is increased to such an extent that it can cause cardiac arrest or stroke in susceptible organisms due to vascular contraction caused by the low temperature, in combination with increased heart rate caused by anxiety or panic situation, and the hydrostatic pressure of water (§4.6).
6. The technician's death was caused by myocardial infarction in extension of past coronary heart disease. Coronary heart disease reduces the human resilience in situations of intense psychological and physical burden generated by an unexpected drop in the low temperature seawater (§4.6).
7. On the day of the casualty, ROYAL OAK was under necessary surveys for the issuance of Statutory Certificates and did not carry a valid Safety Management Certificate. Consequently there was no obligation to implement the respective SMSM guidelines considering the safe embarkation / disembarkation at anchorage (§4.7).

8. ROYAL OAK managing company had developed a set of guidelines governing the embarkation / disembarkation of persons at anchorage, which had been incorporated to the SMSMs of their managed vessels (§4.7).
9. Master and the two C/Os had served in the past on vessel's managed by ROYAL OAK managing company and were familiar with its guidelines for the safe embarkation / disembarkation whilst at anchorage (§4.7).
10. The managing company's guidelines for safe disembarkation / embarkation whilst at anchorage were not fully implemented. Their partial implementation is considered to have contributed to the occurrence of the examined maritime casualty (§4.7.1).
11. ROYAL OAK Master did not confirm the implementation of the managing company's guidelines for the safe embarkation / disembarkation whilst at anchorage, as provided by the documented risk assessment (§4.7.2).
12. ROYAL OAK C/O remained voluntarily on the launch's bow to assist the technicians' boarding and also voluntarily was involved to the man overboard emergency response actions together with the technician's assistant as DRAKON TAXIARCHIS Skipper was the only crew member of the launch boat (§4.8).
13. A second crew member on the launch boat could contribute to avoid unsafe situations during boarding with rippled sea causing rolling and pitching or during emergency response actions (§4.8).
14. ROYAL OAK CPR medical equipment was not used as it was not carried on scene. ROYAL OAK SMSM guidelines concerning emergency response actions for "man overboard" did not incorporate the transfer of proper medical equipment on scene (§4.9.1).
15. The location of the launch boat's liferings provided easy and quick use, however it contributed to a short delay as it was at a distance from the fore embarkation deck (§4.9.2).
16. On passenger launch boats the risk of a person falling overboard increases during embarkation / disembarkation, especially when performed at anchorages where the sea area is open and the weather conditions are heavier in respect to weather conditions in ports.  
Placing liferings as close as possible to the embarkation / disembarkation points could minimize the time required to throw them and enhance the effectiveness of emergency response to a "man overboard" incident (§4.9.2, §4.10).
17. The use of Personal Floating Device or other buoyancy equipment during embarkation / disembarkation procedure on vessels by launch boats is not required by the existing regulatory framework, however, it is considered as an key factor for an effective emergency response of "man overboard" incident which may occur during said procedure (§4.11).

## 6. Actions taken

Following the examined marine casualty ROYAL OAK managers had taken the following actions:

- The casualty was discussed in the supplementary safety committee meeting on board.
- The vessel was provided with a safety net.
- The investigation report was distributed to all vessels in the Fleet.
- The vessel was provided with an approved basket for personnel transfers.

Furthermore, during the consultation period of the draft investigation report, as per the respective provisions of Com. Regulation 1286/2011, the managing company implemented HBMCI's safety recommendations. More specifically:

- The company produced and distributed fleet wide a Safety Bulletin highlighting root causes, critical factors, lessons learnt and actions taken, stressing the great importance of ensuring the full implementation of SMSM requirements in respect of embarkation/disembarkation procedures at all times, even when a new vessel is entering Company's Management and the Safety Management Certificate is not yet issued.
- The Actions' checklist of contingency plan for "*Man Overboard/Search and Rescue/Recovery from the Water*", had been revised to include reference to transfer of appropriate medical equipment on scene.

## 7. Safety Recommendations

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

### 7.1 The managers of ROYAL OAK are recommended to:

40/2014: Supplement the SMSM guidelines for the safe disembarkation / embarkation of personnel whilst at anchorage, fleet wide, providing the deck officer in charge or the Master the authority to refuse the embarkation of a person from a launch boat, because of concerns about the person's safety during the embarkation procedure.

### 7.2 The owner of launch boat DRAKON TAXIARCHIS is recommended to:

41/2014: Follow the provisions of the valid Certificate of General Inspection concerning the permitted voyage areas.

42/2014: Consider supplementing the launch boat's manning with one crew member when the prevailing conditions upgrade the risk of "man overboard".

43/2014: Consider placing one lifering with line close to the fore embarkation deck.

### **7.3 The issuance Organization of DRAKON TAXIARCHIS Certificate of General Inspection is recommended to:**

44/2014: Consider supplementing DRAKON TAXIARCHIS Certificate of General Inspection with a guideline indicating the embarkation / disembarkation areas close to which a lifering with line should be placed.

### **7.4 The Port Police Directorate of the Hellenic Coast Guard is recommended to:**

45/2014: Consider the supplement of the General Port Regulation No. 17 "For the launch boats operations" with mandatory use of Personal Floating Devices or other buoyant equipment during embarkation / disembarkation of personnel on vessels by launch boats, in cooperation with the competent directorate of Ships Inspections General Directorate with regard to specifying the technical requirements for said equipment.

### **7.5 The Competent Directorate of Ships Inspection General Directorate is recommended to:**

46/2014: Consider supplementing the existing regulatory framework so that the embarkation / disembarkation areas of the launch boats should be recorded on the issued Certificates of General Inspections and that a lifering with line should be placed close to them.

### **7.6 Piraeus Central Port Authority is recommended to:**

47/2014: Review the voyage control system of launch boats operating in Piraeus port to the direction of establishing a procedure concerning the reporting of launch boats' departures and destinations to Piraeus traffic in order to prevent voyages not permitted by the General Inspection Certificates.

### **7.6 The casualty's company is recommended to:**

48/2014: Ensure that the personnel who are required to board on vessels whilst at anchorage are fit and that during the boarding procedure they would not encounter difficulties due to their physical condition.

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Accident Investigation Report 06/2014

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