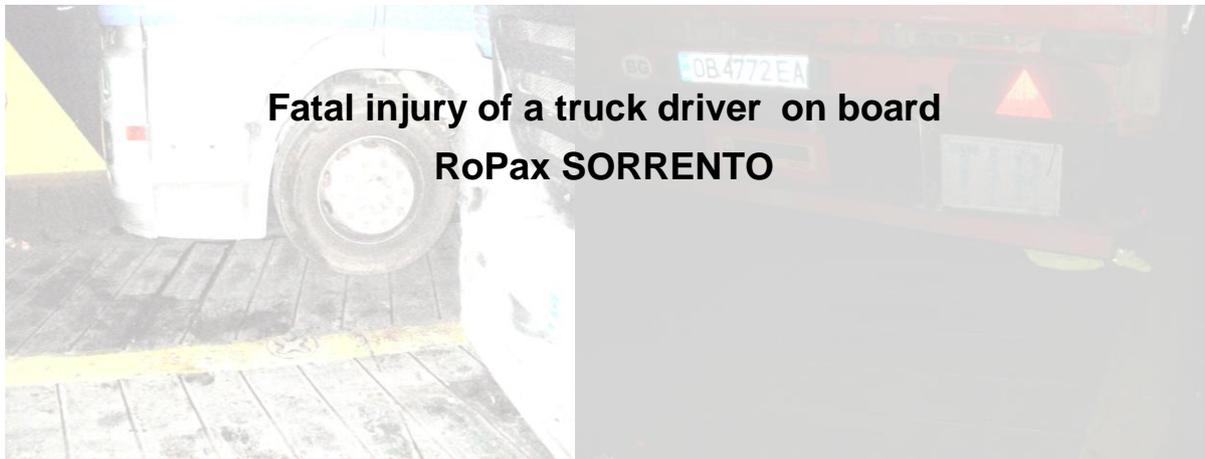




**HELLENIC REPUBLIC
HELLENIC BUREAU FOR MARINE CASUALTIES INVESTIGATION**

**MARINE CASUALTY SAFETY INVESTIGATION REPORT
10/2013**



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Foreword

The Hellenic Bureau for Marine Casualties Investigations 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 apprehend the sequence of events occurred on the 10th July 2013 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 +3) unless otherwise stated.

Within the aforementioned framework HBMCI has been examining the fatal injury of a track trailer driver, occurred on board ROPAX Sorrento following her departure from the port of Igoumenitsa-Greece, on the 10th of July 2013.

Note: The sequence of the events at the permanent ramp of Sorrento in relation to times and positions of individuals involved are mostly based on statements as recorded electronic sources of information could not contribute to events timeline elaboration.

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

1.	AB	Able seaman
2.	DOC	Document of compliance
3.	gt	gross tonnage
4.	HCG	Hellenic Coast Guard
5.	IMO	International Maritime Organization
6.	ISM	International Management Code for the safe operation of ships and for pollution prevention
7.	LT	local time
8.	RO	Recognized Organization. An organization which meets the relevant conditions set forth by respective international legislation and has been authorized by the flag State Administration to provide the necessary statutory services and certification to ships entitled to fly its flag.
9.	RINA	Registro Italiano Navale
10.	ROPAX	(roll-on/roll-off passenger ship) a RORO vessel built for freight vehicle transport along with passenger accommodation. Technically this encompasses all ferries with both a roll-on/roll-off car deck and passenger-carrying capacities.
11.	SMC	Safety management certificate
12.	SMS	Safety management system
13.	SOLAS	Convention for the Safety of Life at Sea 1974, as applied
14.	UTC	Universal Coordinated Time

1. Executive summary

Ro-Pax "Sorrento", under Italian Flag, was operating between the ports of Brindisi, Italy and Patra, Greece. Her voyage schedule also included the port of Igoumenitsa, Greece, as an intermediate port of call (figure 1).

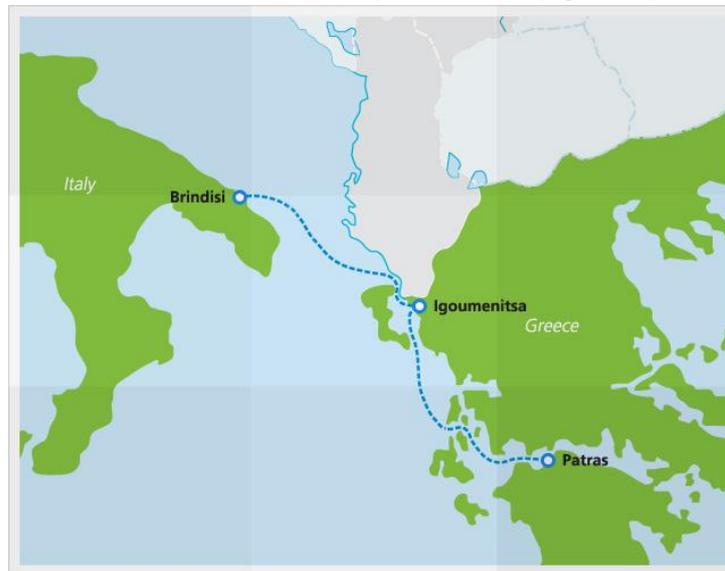


Figure 1. Depiction of Sorrento's itinerary.

On 09 July 2013 Sorrento had departed from the port of Patra and was heading to the port of Igoumenitsa.

Shortly after midnight at approximately 0020 on 10 July 2013, Sorrento arrived at the port of Igoumenitsa and following her berthing, the loading and embarkation operations commenced.

At approximately 0200, the loading operation had been completed and at 0205 Sorrento departed from port and commenced her voyage to the destination port of Brindisi.

By that time the deck personnel was still lashing and securing the loaded trucks and vehicles on garage spaces when a truck driver was found fatally injured at the permanent external port ramp, leading to car deck no 4.

According to statements the truck driver was passing through the accessible space between the front cabin of a tractor semi-trailer and the rear of a tractor semi-trailer that were parked in line when suddenly the latter shifted backwards onto the casualty. The truck driver was cornered by the shifting tractor semi-trailer onto the front of the cabin of the truck tractor suffering fatal injuries. His death was almost immediate as he was actually violently pinned between the two trucks. The incident was immediately reported to the bridge of Sorrento.

At 0220 the Master reported the casualty to the Coast Guard Authority of Igoumenitsa and maneuvered back to Igoumenitsa Port (figure 2).

The Coast Guard Authority of Igoumenitsa contacted the National Emergency First Aid Service and requested for an ambulance.

At 0250 Sorrento arrived at Igoumenitsa port and the casualty driver was delivered to the crew of the ambulance.

At 0739 Sorrento sailed from Igoumenitsa Port and continued her planned voyage to Brindisi.

2. FACTUAL INFORMATION

2.1 Particulars of RoPax Sorrento

Name of Vessel	Sorrento
Call Sign	IBDD
Company (ISM Code A 1.1.2)	Grimaldi Compagnia di Navigazione S.p.A
Ownership	Grimaldi Compagnia di Navigazione S.p.A
Flag State	Italy
Port of Registry	Palermo
IMO Number	9264312
Type of Vessel	Ro/Ro Passenger
Classification Society	RINA
Year built	2003
Ship Yard	Cantiere Navale di Viscentini / Donada /Italy
Construction	Steel
LOA (Length over all)	186.35
Breadth	25.6
Gross tonnage	25984
Net Tonnage	8362
Main Engine	2 x Ausburg (MAN)
Engine Power /Speed	2 x 9450 KW / 24 knots
Document of Compliance	RO RINA
Safety Management Cert.	RO RINA

2.2 Voyage Particulars

Vessel's name	Sorrento
Port of departure	Patra - Greece
Port of arrival	Igoumenitsa – Greece
Type of voyage	International
Cargo information	Loaded with 103 vehicles and 150 passengers
Manning	50 crew members

2.3 Marine casualty information

Vessel's name	Sorrento
Type of casualty	Very serious
Date and time	10 July 2013 at approximately 0210
Position	Departing from port – lat: 39° 29'.5 N / long:20° 14'.5 E
Location	external permanent ramp at the port quarter
External environment	Wind force 2-3 Bfs – sea state calm visibility very good – scattered clouds - night time
Ship operation	Departing from port - Lashing and securing vehicles
Voyage segment	Underway towards Igoumenitsa Channel
Consequences (to individuals, environment, property)	Fatal injury of a truck driver Minor structural damages on the front cabin of a tractor semi-trailer and the rear of a tractor semi-trailer

2.4 Emergency response

Authorities – Services involved

Igoumenitsa Coastguard Authority	→ Coast Guard Officers
National Emergency First Aid Service	→ 01 Ambulance with 03 attendants



Figure 2. Overview of Igoumenitsa Gulf and port. Depiction source Google Earth's maps.



Figure 3. Sorrento berthed at Igoumenitsa Port.

3. Narrative

Note: The sequence of the events at the permanent ramp of Sorrento in relation to times and positions of individuals involved are mostly based on statements as recorded electronic sources of information could not contribute to the elaboration of the events' timeline.

3.1 Description of Ro-Pax Sorrento

Ro-Pax Sorrento was a modernized roll-on/roll-off passenger ferry that was built in 2003 and was launched in January 2003, as Eurostar Valencia. She entered in service in July 2003, operating in the Mediterranean routes and was renamed to Sorrento in November 2006. Sorrento could accommodate 954 passengers cruising at 22.5 knots (figure 4).

Her structural design included four vehicles decks with a carrying capacity of 160 cars or 97 trucks. At the time of the marine accident she was operating in the Adriatic Routes between the Italian port of Brindisi and the Greek port of Patra with an intermediate call at the port of Igoumenitsa, Greece.



Figure 4. RoRo/Passenger Sorrento.

Sorrento was equipped with a main stern loading ramp with two entrances; one starboard stern entrance leading to the main vehicle deck No 3 and one port stern entrance leading to the upper vehicle deck No 4 through a permanent sloped ramp (figure 5). The permanent ramp had three parking lanes and a parking capacity of 09 tractor semi-trailers (figures 6 & 7).

The inclined permanent ramp was fitted with 33 securing points (anchor holes) throughout its layout for the lashing of vehicles and trailers and with anti skid surface (figure 6 & 7).

The grading of the permanent external ramp leading to car deck no 4 was 7° and the inclination rate was 12.5 %.



Figure 5. Sorrento stern view. The loading ramp and the two entrances to car deck No 3 (starboard) and to car deck No 4 (port).

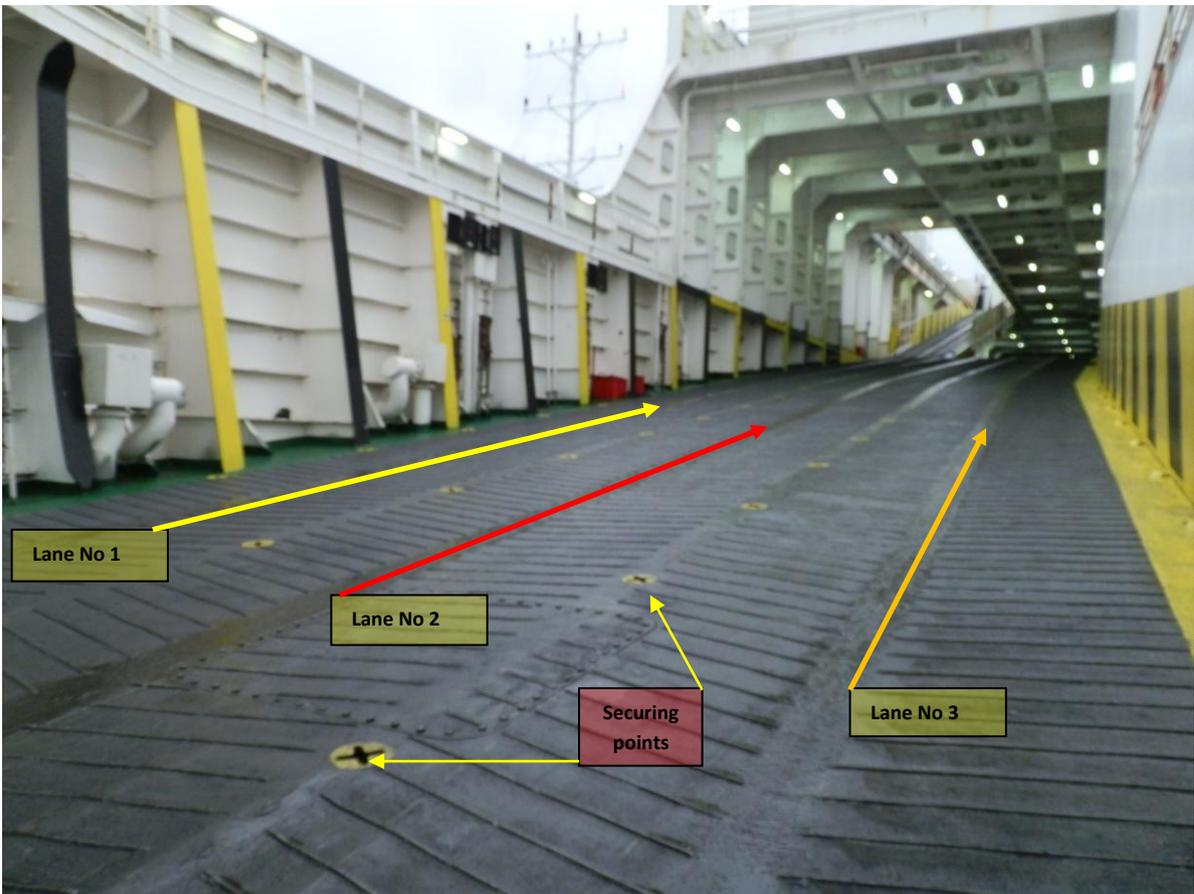


Figure 6. The permanent stern port ramp leading to car deck no 4, looking upwards and forward .



Figure 7. The permanent stern port ramp leading to car deck no 4, looking downwards and astern.

3.2 Voyage segment from Patra to Igoumenitsa

On 09 July 2013, Sorrento was berthed at the port of Patra and she was under loading and passengers' embarkation operations, scheduled to depart at afternoon hours for her voyage to Italy.

At 1724 Sorrento departed from the port of Patra with 145 passengers and 50 crew members on board, loaded with 13 cars and 66 trucks, mostly tractor semi-trailers and commenced her voyage to the destination port of Brindisi with the intermediate call at the port of Igoumenitsa, Greece.

On 10 July, at 0020 she arrived at the port of Igoumenitsa and following her mooring at dock no 3, the embarkation and loading operation began.

3.3 Loading operations at Igoumenitsa Port

At approximately 0025 loading and handling operations of vehicles, freight vehicles and passengers' embarkation commenced. The Chief Officer was in charge of the operation assisted by the Second and the Third Officer and by deck crew personnel composed of the Bosun and four ABs.

Parking, securing and lashing was carried out by the competent deck crew during the loading of vehicles and freight vehicles.

Freight vehicles were being loaded at car deck No 3 which got eventually fully loaded. As Igoumenitsa was the last port before Brindisi it was planned to load trucks on the permanent port ramp, that could offer a parking capacity of 09 tractor semi-trailers close to 20 meters of length.

At approximately 0200 the loading operation of freight tractor semi-trailers had been completed and Sorrento was under departure preparations.

At 0204 Sorrento unmoored from berth and was under maneuvering for heaving up her anchor.

By that time the Chief Officer and the deck crew engaged with the lashing and securing operation of the loaded trucks, were still on car main deck No 3 and on the permanent ramp.

3.4 The parking arrangement on the permanent ramp

Freight vehicles and vehicles were mostly loaded and parked at deck No 3 which got eventually full loaded.

The permanent ramp was loaded with 09 tractor semi-trailers which were the last trucks to enter Sorrento before her departure from Igoumenitsa, as vehicle deck No 4 had already been fully loaded (figure 8).

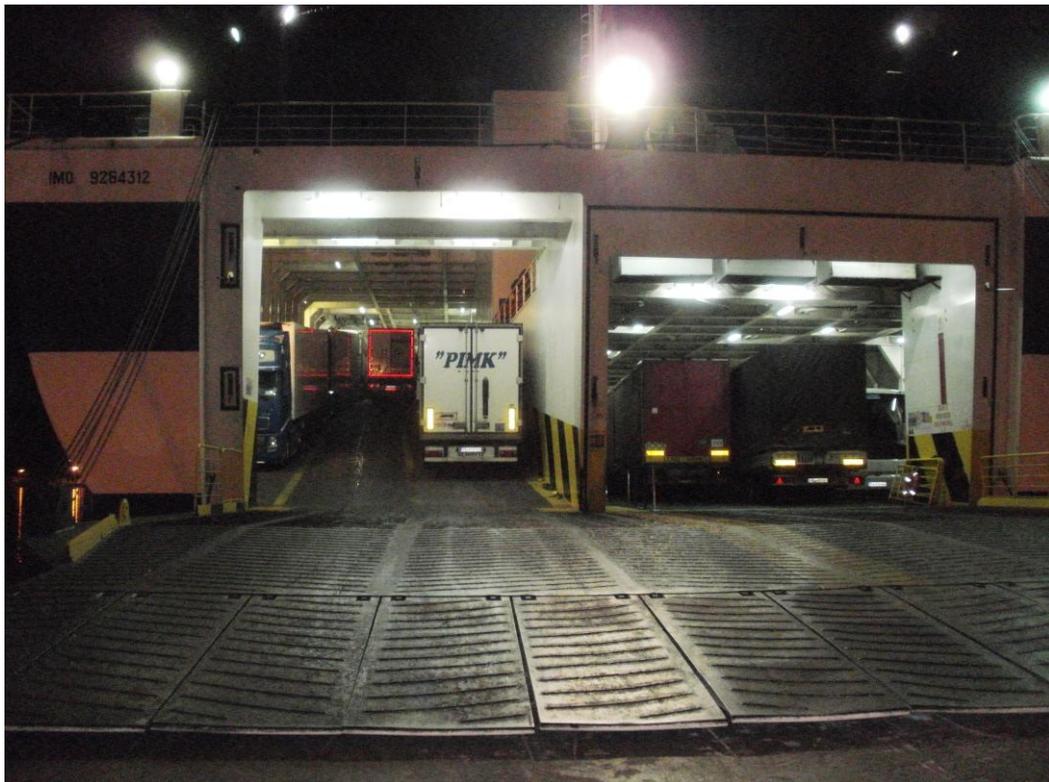


Figure 8. The arrangement of the parked tractor semi-trailers post to the marine casualty. Shifted truck and parked truck at Lane no 2 have been unloaded.

The parking arrangement of the loaded tractor semi-trailers that were involved in the examined case was as follows (figures 9 & 10):

- The tractor semi-trailer S (*S stands for shifting*) entered the loading ramp and was guided by Sorrento's deck crew to parking position no 2 of Lane no 2.
- The tractor semi-trailer P (*P stands for parked*) entered the loading ramp and was guided by Sorrento's deck crew to parking position no 3 of Lane no 2.
- The casualty's tractor semi-trailer entered the loading ramp and was guided by Sorrento's deck crew to parking position no 3 of Lane no 3 (figure 10).

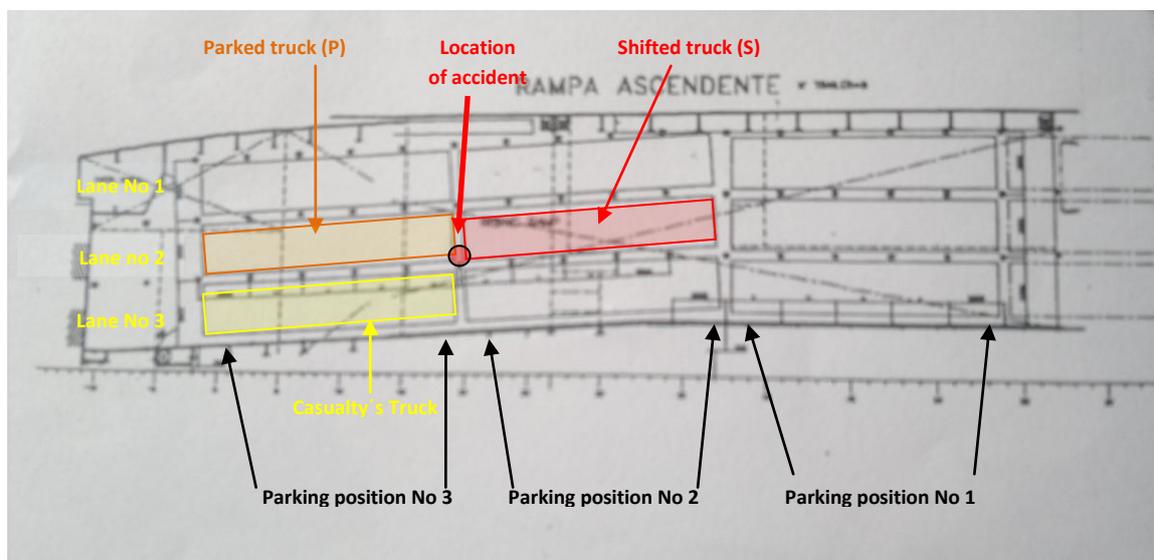


Figure 9. Sketch of the tractor semi-trailers arrangement prior to the casualty. Parking lanes and parking positions also marked.

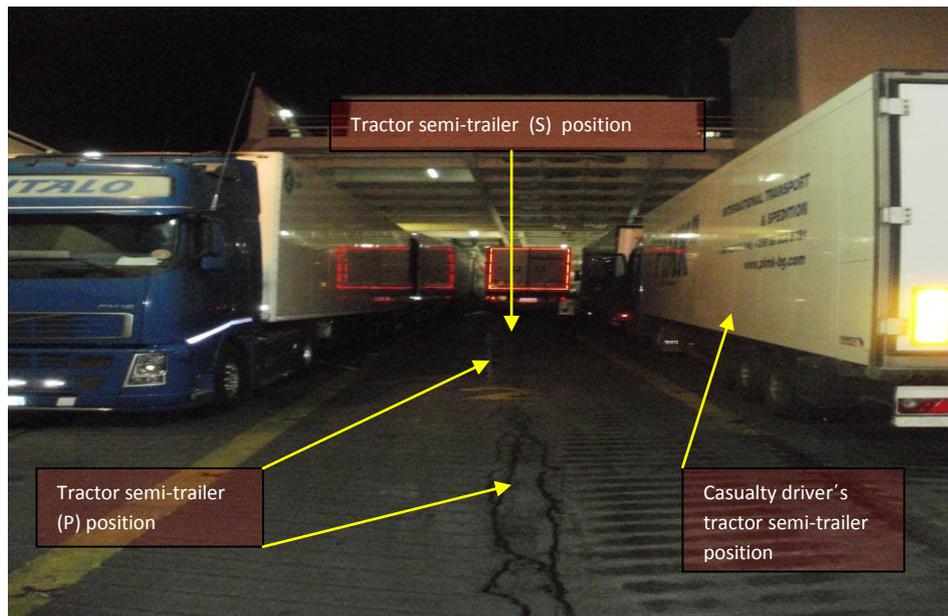


Figure 10. View of the permanent ramp with the tractor semi- trailers arrangement post to the occurrence.

3.5 The occurrence

At approximately 0205, Sorrento had just cast off from Igoumenitsa port and was under maneuvering for heaving up her anchor, hundreds of meters away from the mooring dock towards Igoumenitsa Channel (figure 11).

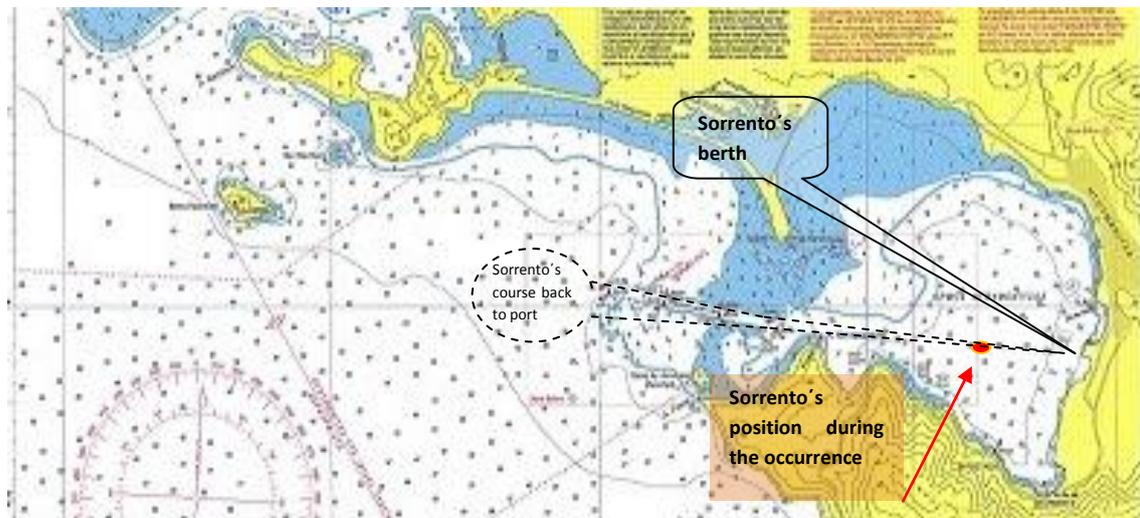


Figure 11. Depiction of Igoumenitsa Gulf showing Sorrento's position during the occurrence and her course to Igoumenitsa channel and back to port. Chart source Hellenic Hydrographic Service.

The trucks' securing and lashing operation was still ongoing, as Sorrento had sailed almost four minutes after the last truck was loaded onboard at the permanent ramp.

At that time the Chief Officer and part of the deck crew were on deck No 3 and one AB was at the permanent ramp. They were all engaged with the securing and lashing of the loaded transport units.

The drivers of aforementioned in par. 3.4 tractor semi-trailers, having parked their freight vehicles a few minutes earlier, was reported to have been still at the permanent ramp.

The driver of Truck (S) had parked shortly before at no 2 parking position of Lane no 2 of the permanent ramp. The AB that was securing the trucks placed two rubber wheel chocks at its rear no 2 axle wheels (figure 12). It was reported that

the AB had asked the driver in English, to get out of his tractor cabin and to proceed to the accommodation spaces, however it was not possible to understand each other as they were not speaking a common language.



Figure 12. One of the chocks that were placed to secure the truck (S).

The truck (S) driver reported that without being able to understand the AB, had answered back on his mother tongue asking him to lash his tractor semi-trailer, as he was concerned that it might roll back with only the chocks placed and moved on to the upper part of the ramp to meet his colleague driver of truck (P), parked at position no 3 of lane no 2.

However said allegation could not be confirmed as the AB stated that by the time of the occurrence the truck (S) driver was still in his truck's cabin.

According to statements the casualty driver, having parked his tractor semi-trailer on the permanent ramp at parking position no 3 of no 3 Lane, had just stepped off his truck and was about to walk between the accessible spaces of the parked trucks so as to meet his colleague-drivers at the upper part of the ramp and to go over to Sorrento's reception desk at deck no 7.

According to statements by the drivers of tractor semi-trailers (S) and (P), by that time they were at the upper end of the permanent ramp, waiting to meet the casualty driver, almost 40m away from their colleague's truck. As their colleague was a little late it was reported that they started calling him but he was not replying. However, said statements were not confirmed by the AB.

Furthermore taking under consideration the location of the occurrence, it could be presumed that the casualty driver, having the intention to walk the accessible space between the front of tractor semi-trailer (P), that was parked beside his tractor semi-trailer and the rear of tractor semi-trailer (S), was probably on his way to the cabin of tractor semi-trailer (S), seemingly to its driver's door to meet his colleague-driver, that had parked on the front left of his truck, as shown in figures 9, 10 & 13.

It is apparently more practicable and safer for a driver to follow the accessible way between Lane 1 and Lane 2 if intends to proceed to the upper end of the permanent ramp, leading straight to deck no 4 (figure 13) than to walk between a truck's trailer and a tractor's cab.

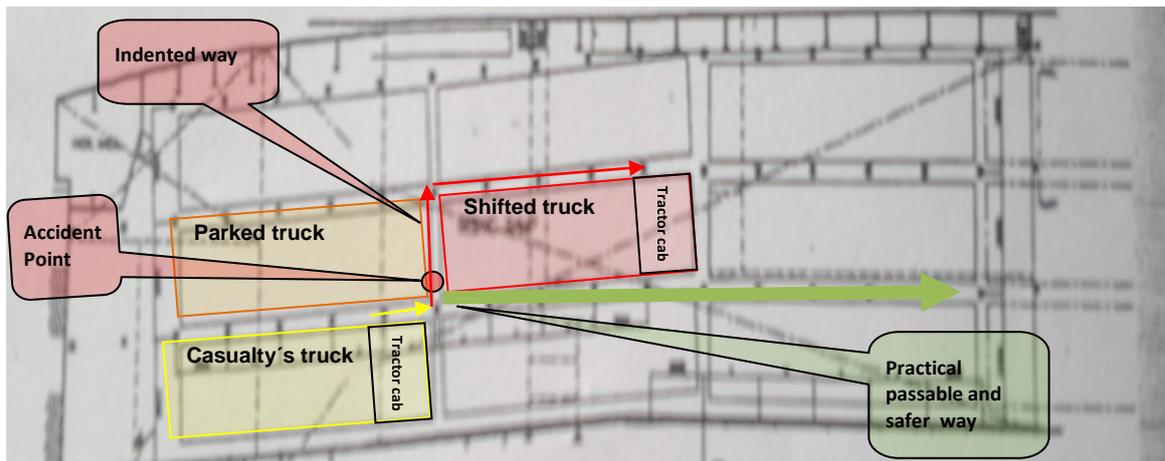


Figure 13. Sketch of the tractor semi-trailers arrangement prior to the casualty. Parking lanes and parking positions are also marked.

At approximately 0210, the casualty truck driver having just stepped off his truck, was intending to walk between the parked trucks while the AB was on the left side of tractor semi-trailer (S).

By the time the casualty driver was attempting to pass between the accessible space of the tractor cab (P) and the rear of the truck trailer (S), the latter tractor semi-trailer suddenly shifted backwards on to the front of the truck cab that was parked behind it, although chocks were placed on two axles of the trailer, shortly before.

The truck driver that was attempting to pass between the two trucks was run over and stomped by the shifted tractor semi-trailer and was actually pinned between the rear of truck trailer (S) and the cab truck (P), parked at the end of the ramp (figure 13).

His colleagues (drivers) and the AB having heard the noise of the crash, ran to the scene and saw that the truck driver was trapped unconscious between the right side of cab truck (P) and the right side of the rear of the truck trailer (S), with his head and hands hanging motionless (figures 13, 14 & 15).



Figure 14. The location of the casualty post to the occurrence.



Figure 15. The rear of tractor semi-trailer (S) marked at the point the casualty was trapped.

3.6 Emergency response actions

The AB immediately called through portable VHF for the Chief Officer while the driver of the tractor semi-trailer (S) got on his tractor, started the engine and immediately moved forward in order to release the trapped victim.

The Chief Officer came on the scene seconds after and reported the accident to the bridge and Sorrento's Doctor was called by the Master.

The Doctor delivered first aid to the casualty and performed CPR (Cardiopulmonary resuscitation) for almost 20 minutes, however the casualty remained unconscious.

At 0220 the Master reported the occurrence to the Coast Guard Authority of Igoumenitsa and requested for shore medical assistance. Furthermore he informed Igoumenitsa Vessel Traffic Service for his intention to return to port and informed the passengers through the public address system that a passenger got injured and Sorrento would be returning to port.

As Sorrento had already entered Igoumenitsa Channel, the Master maneuvered back to port as soon as she exited the Channel.

At 0250 Sorrento having returned to Igoumenitsa port, berthed again and Coast Guard Officers boarded her. An ambulance of the National Emergency Aid Center had already arrived on scene and the casualty was delivered to its attendants that transferred him to Igoumenitsa Health Center where the truck driver was unfortunately pronounced dead.

3.7 Post actions to the occurrence

The Coast Guard Authority of Igoumenitsa during the next hours that followed the occurrence held a preliminary inquiry on the casualty and consequently Sorrento was detained in port.

The trucks that were involved in the incident were unloaded from Sorrento so as to

be examined by the Coast Guard (figures 16 & 17). The tractor semi-trailer (S) was taken for examination to the Vehicle Technical Inspection & Control Centre of Igoumenitsa.

The drivers of the tractor semi-trailers (S) and (P) were subjected to alcohol test with a portable alcohol testing breathalyzer by the Coast Guard Authority whereas the fatality was subjected to a toxicological analysis by the laboratory of Forensic and Toxicology of Medical School of Ioannina University.

The screening results for the drivers of trucks (S) and (P) showed that there was no alcohol content in their breath.

The casualty's toxicological analysis' findings showed a quantity of 0.54 gr per 1 lt of blood which is over the highest permissible level of the mean acceptable limit of blood alcohol content rate within the European Union.

At 0739 Sorrento departed from the port of Igoumenitsa and continued her voyage to Brindisi.

On 11 July 2013 the tractor semi-trailer (S) that had been involved in the casualty underwent an inspection at the Vehicle Technical Inspection & Control Centre of Igoumenitsa. The results of the inspection are presented in the following table:

Table 1. Inspection's results of tractor semi-trailer (S).

	Tractor	Trailer
Steering arm of center bar of the steering system	Serious problem	-
Tires	In good condition	In good condition
Lights	Operating	Operating
Brakes	In good condition	
Braking		Serious problem - lopsided at no 1 & no 3 axles Good condition at no 2 axles
Suspension	In good condition	In good condition
Inspected by Vehicle Technical Roadworthiness Centre in Bulgaria	Valid until 24-07-2013	Valid until 19-08-2013

According to the results of the inspection the tractor semi-trailer (S) had a serious problem on its braking system at no 1 and no 3 axles while its braking system at no 2 axles was in good condition.

Furthermore it was evident that the roadworthiness certificates issued by a Vehicle Technical Inspection Center of its registered State, were valid.



Figure 16. The damaged front right side of the tractor (P).



Figure 17. The right rear of semi-trailer (S).

4. Analysis

The analysis of the examined marine casualty aims to identify and determine the factors and causes 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 these, as well as to the root causes in order to draw useful conclusions leading to safety recommendations.

Note: The sequence of the events at the permanent ramp of Sorrento in relation to times and positions of individuals involved are mostly based on statements as recorded electronic sources of information could not contribute to the elaboration of the events' timeline.

4.1 Crew of Sorrento engaged in securing and lashing procedure

Each crew member of Sorrento, as per her Safety Management System familiarization procedure, was informed and aware of Company SMS policy, procedures and targets to be achieved. This task was finalized and recorded among onboard familiarization process.

4.1.1 Master

The Master aged 63 had serviced on board RoPax ships and Ro-Ro ferries for several years and he had been contracting with the Company of Sorrento for 8 years on its vessels, as Master.

He was familiar with RoPax and ro-ro operations and experienced in operating in the Adriatic routes.

4.1.2 Chief Officer

The Chief Officer was 33 years of age and he had been under regular employment on Company's vessels and was familiar with ro-ro ferries operations.

4.1.3 Securing & lashing deck personnel

The securing and lashing personnel of Sorrento was comprised of the Second Officer and the Third Officer, the Bosun and four ABs. They were familiar and experienced with loading, lashing and securing operations on ro-ro ferries and were regularly contracting with the Company of Sorrento.

4.2 Environmental conditions

At night hours on the 09th and 10th of July, weather conditions were forecasted to be good with Northerly winds 4-5 bfs and good visibility.

During the time of the occurrence, the prevailing weather conditions in Igoumenitsa port were reported to be very good with slight N wind 5-10 knots and calm sea.

Table 2 . Actual weather conditions at Igoumenitsa port :

Sea state	almost calm
Wind speed	5-10 knots (light breeze)
Air temperature	28 ° C
Barometric pressure	1013 mb
Visibility	Very good

Weather conditions are not considered to have been a contributing factor to the casualty as Sorrento had just unmoored from berth and was under underway in Igoumenitsa Gulf, well protected by prevailing winds.

4.3 Stowage and securing of vehicles on board RoPax vessels

Roll on/roll off - passenger vessels have been built for vehicles and freight vehicles transport along with passenger accommodation. They are designed to carry wheeled cargo such as cars, trucks, tractor semi-trailers etc that are driven on and off the vessel on their own wheels. Technically this includes all ferries with both a roll-on/roll-off car deck and passenger-carrying capacities.

Stowage and securing procedures on Ro-Ro/ROPAX vessels are crucial for their stability and safety during voyages and therefore are regulated by international rules as set out in SOLAS '74, as amended and in force.

4.3.1 Stowage and securing applicable regulatory framework

The International Convention for the Safety of Life at Sea (SOLAS) on Chapter VI «Carriage of cargos and oil fuels», Regulation 5 «Stowage and securing» provides the principal rules applicable for RoRo ships when carrying freight vehicles. Following listed provisions are pertinent in the examined case:

SOLAS Chapter VI	Regulation 5
	<p>5.1 «Cargo, cargo units¹ and cargo transport units² carried on or under deck shall be so loaded, stowed and secured as to prevent as far as is practicable, throughout the voyage, damage or hazard to the ship and the persons on board, and loss of cargo overboard.»</p> <p>5.4 «Appropriate precautions shall be taken during loading and transport of cargo units and cargo transport units on board ro-ro ships, especially with regards to the securing arrangements on board such ships and on the cargo units and cargo transport units and with regard to the strength of the securing points and lashings.»</p> <p>5.6 «All cargoes, other than solid and liquid bulk cargoes, cargo units and cargo transport units shall be loaded, stowed and secured throughout the voyage in accordance with the Cargo Securing Manual approved by the Administration. In ships with ro-ro spaces, as defined in regulation II-2/3.41, all securing of such cargoes, cargo units and cargo transport units, in accordance with the Cargo Securing Manual, shall be completed before the ship leaves the berth. The Cargo Securing Manual shall be drawn up to a standard at least equivalent to relevant guidelines developed by the Organization***.</p> <p>*** Refer to the Revised Guidelines for the preparation of the Cargo Securing Manual, approved by the Maritime Safety Committee of the Organization and promulgated by circular MSC/Circ.1353.»</p>

In addition to the above rules applying in freight vehicles' carriage by RoRo ships, on 06 November 1991 the IMO adopted the «Code of safe practice for cargo stowage and securing» (Resolution A.714(17) as amended by MSC/Circ.812) by which a composite code of international standards of safe practice for cargo stowage and securing, including road vehicles transported on board ships, was issued.

Furthermore Resolution A.581(14) «Guidelines for securing arrangements for the transport of road vehicles on ro-ro ships», adopted on 20 November 1985, as amended by MSC./Circ.812 and MSC.1/Circ.1355, has set out guidelines in order to enhance safety in the transportation of road vehicles on ro-ro ships targeting in a unified implementation on an international basis.

¹ Cargo unit – a vehicle, container, flat, pallet, portable tank, packaged unit or any other entity.

² Cargo transport unit – a road freight vehicle, a freight container, a road tank vehicle, a railway tank wagon or a portable tank.

It is noted that aforementioned provisional framework is also included in Directive 1999/35/EC, as applied.

Having regard to the examined case and to the evolution of the events prior and post to Sorrento's departure from Igoumenitsa port, the following references of aforesaid resolutions, are applied:

Resolution A.714 (17)	Code for safe practice for cargo stowage and securing Annex 4 Safe stowage and securing of wheel-based (rolling) cargoes par. 2. GENERAL RECOMMENDATIONS 2.5 When in stowage position, the brakes of a wheel-based unit, if so equipped, should be set. 2.10 The wheels of wheel-based cargoes should be blocked to prevent shifting.
Resolution A.581 (14)	Guidelines for securing arrangements for the transport of road vehicles on RO-RO ships par. 7. STOWAGE 7.5 Wheels should be chocked to provide additional security in adverse conditions. 7.6 Vehicles with diesel engines should not be left in gear during the voyage. 7.8 Stowage should be arranged in accordance with the following: .1 The parking brakes of each vehicle or of each element of a combination of vehicles should be applied and locked.

4.3.2 Sorrento's Cargo Securing Manual

(1) Following the international legislation applied for the stowage and securing of freight road vehicles, as well as provided guidelines by IMO for the preparation of the Cargo Securing Manual in accordance with SOLAS Chapter VI/Reg. 5.6, Sorrento was carrying a Cargo Securing Manual that was approved by the Administration of her flying Flag.

The Cargo Securing Manual provisions were ensured to be followed through procedures, incorporated in Sorrento's Safety Management System under the title "*Deck Officers signature for acknowledgement of Cargo Securing Manual*" under FM/USQA/RV/PN/079 form.

Following the provided procedures, the Master and the recruited Deck Officers were informed and familiarized with the instructions set out for the loading, securing and lashing of transport units.

Sorrento's Cargo Securing Manual, in paragraph 3.4 under the title «Supplementary requirements for ro-ro ships» provided instructions applicable for the securing and lashing of road vehicles, trailers with a maximum total mass between 3,5 t and 40 t and articulated road trains with a total mass not more than 45 t while busses were excluded from said instructions.

The Cargo Securing Manual also encompassed instructions to be implemented and supervised by the competent personnel engaged with the lashing and securing operation of vehicles, as below:

- *Wheels should be chocked to provide additional security in adverse conditions, while vehicles with diesel engines should not be left in gear during the voyage.*
- *The parking brakes of each vehicle or of each element of a combination of vehicle should be applied and locked.*

Despite the fact that Sorrento's Cargo Securing Manual was incorporating the IMO «Code of safe practice for cargo stowage and securing» (Res. A. 714(17), as amended) as well as IMO «Guidelines for securing arrangements for the transport of road vehicles on ro-ro ships» (Res. A. 581(14) as amended), however the provision of Reg. 5.6 of SOLAS Chapter VI was not recorded so as to emphasize to Sorrento's Master, Chief Officer and Deck Officers

involved with the lashing and securing operation that the “operation had to be completed before the departure of the ship from berth”.

The lack of incorporating aforementioned provision in Sorrento’s Cargo Securing Manual is considered to have been a contributing factor into the examined case.

- (2) Furthermore, having scrutinized Sorrento’s Cargo Securing Manual, it was highlighted that its content although concurrent with the IMO «Code of safe practice for cargo stowage and securing», however it was rather generic as no specific provisions pertinent to Sorrento’s loading, securing and lashing operations were set out “tailored to the needs” of her car decks structural design and stowage arrangement, such as loading and securing of freight vehicles on the inclined permanent ramp.

It is very likely that by the time Sorrento was departing from Igoumenitsa port and her speed was gradually increasing, the tractor semi-trailer (S), stowed at the permanent inclined ramp, was subjected to dynamic forces induced by the ship’s vibration which could have contributed to truck (S) shifting, once the parking brake was not properly applied or not applied at all and the only restraining means applied on it from rolling backwards, were the chocks placed on its wheels.

It is noted that chocks could be capable of restraining a freight vehicle from shifting at first, following its parking on deck, primarily on flat vehicle decks. It is underlined that chock securing is a supplementary restraining system to parking brake engagement and to the lashing arrangement while said methods are capable of securing a road transport unit and withstand the forces likely to be encountered while at sea.

Sloped decks with regular inclination, increase the necessary restraining capacity of the lashing and securing system, including chocks that is practiced on ro-ro ships. It could be inferred that chock securing system for inclined ramps could be reinforced with different design specifications in relation to height, width and friction factor from those used on flat vehicle decks.

The SOLAS requirement applied, that all securing of cargo units and cargo transport units, shall be completed before the ship leaves the berth, substantiates said consideration.

Moreover it could be noted that a ro-ro ship at berth bears minor or no vibration, which could affect the friction factor of the chocks and vehicle wheels on inclined ramps’ floors.

Having regard to the above it is suggested that Sorrento’s Cargo Securing Manual did not comprehend explicit guidelines and instructions for the securing and lashing operation of vehicles’ stowage on the inclined permanent ramp.

4.3.3 Lashings, chocks and securing points on the permanent ramp

- (1) According to Sorrento’s Cargo Securing Manual the permanent sloped ramp from Deck No 3 to Deck No 4 was fitted with 33 securing points marked with yellow color for the lashing of loaded freight vehicles (figure 18).

The permanent ramp was designed for the stowage of cargo transport units such as tractor semi-trailers with no structural restrictions and was equipped with chain lashings and rubber chocks (figure 19).



Figure 18. Securing points fitted on permanent ramp. Figure 19. The Chain lashing and rubber chocks placed at the permanent ramp.

The securing points were mounted and shaped so as to allow four lashings to be attached to each securing point.

According to Sorrento's Cargo Securing Manual, at least four lashings had to be used for the securing of each road vehicle.

The chocks, used to supplement the lashings of vehicles, were of rubber with no available data of their performance efficiency and the practice on board was to place one rubber chock facing upward at each of the rear or forward last wheels depending on the marshalling direction of the loaded tractor semi-trailers.

However the securing operation was not thoroughly recorded and described, apart from the general guidance in section 3.4.1 of the Cargo Securing Manual, stating that:

«wheels should be chocked to provide additionally security in adverse conditions».

- (2) Taking into account the above mentioned, as well as the factual events leading to the marine accident it was emerged that the number of the chocks placed at each wheel of a tractor semi-trailer, parked on the permanent inclined ramp, could not alone be efficient to restrain it from rolling backwards, as such an additional safeguard is apparently adequate for freight vehicles or tractor semi-trailers parked on flat vehicle decks.

Following consultation on said matter with tractor semi-trailers operators, truck drivers and ro-ro operators it was noted that the outcome of tests has shown that the restraining capacity of chocks placed on wheels of a transport unit significantly decreases mainly in relation to the increase of the sloping gradient and the weight of the freight vehicle.

Based on the above it is considered that the chock securing practiced on board Sorrento's permanent sloped ramp could not alone ensure the blocking of a tractor semi-trailer on a potential rolling backwards if parking brake is not properly applied or not applied at all.

On above grounds it is suggested that the lack of efficient chock securing system of tractor semi-trailers parked on the permanent inclined ramp, incorporated in Sorrento's Cargo Securing Manual or Safety Management System, have been a contributing factor in the examined case.

4.4 Loading, lashing and securing procedures

The loading, lashing and securing procedures are inherent to ISM Chapter 7 "Development of plans for Shipboard operations" by which it is stated 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".

The Safety Management System of Sorrento included procedures for the loading, lashing and securing operation for vehicles and freight vehicles loaded on board that were partly supplementing or incorporating her Cargo Securing Manual provisions.

4.4.1 Sorrento's loading operation procedures

According to the Cargo Securing Manual of Sorrento, provided instructions have to be implemented by the Master.

More specifically it was provided that the loading procedures are under the Master's supervision and responsibility.

However, said responsibility had been assigned to the Chief Officer through «Master's Proxies Duties» order, included in Sorrento's Safety Management System under FM/UTEC/AB/RV/012 form, by which the Master delegated the cargo handling operation responsibility to the Chief Officer.

Following the above, the Chief Officer was positioned at main car deck no 3, supervising and guiding the loading operation and was assisted by the Second and the Third Officer.

The completion of the loading operation was reported by the Chief Officer to the Master, so as to proceed with the departure operation.

Based on the evolution of the events prior and post to the examined case, it was emerged that the completion of the loading operation was reported by the Chief Officer through VHF as soon as the last tractor semi-trailer was loaded on the permanent ramp. Following, the Master proceeded with the departing process while the lashing and securing operation of the loaded trucks was still ongoing and consequently SOLAS Chapter VI/Reg. 5.6, was not satisfied, that is:

“all securing of cargo transport units shall be completed before the ship leaves the berth”.

On above grounds it is considered that SOLAS said related regulation was disregarded and therefore is suggested to have been a contributing factor in the examined marine casualty.

4.4.2 Sorrento's loading – Unloading operation

Loading and unloading operations were also incorporated in Sorrento's Safety Management System.

According to the «Loading – Unloading / Safety - Security Check List» recorded in FM/ING DG/FG/RV 001/2000 form, listed procedures have to be followed during the loading and embarkation operations by the competent personnel involved and have to be signed by the Chief Officer and Master and where appropriate by the shore representative (agent).

The «Loading – Unloading / Safety - Security Check List» was subdivided into five parts, with (Yes) or (No) ticking boxes options, under the following headings:

- Part I – “Safety” (to be filled by Chief Mate (Ship Security Officer – SSO) and terminal representative, together).
- Part II – “Security” (to be filled by Chief Mate (Ship Security Officer – SSO) and terminal representative, together).
- Part III – “Safety of working sites” (to be filled by the Chief Mate).
- Part IV – “Cargo handling equipment” (to be filled by shore terminal representative).
- “Quality report” (to be filled by the Chief Mate).

The referred form's Quality report part, included a list of eight checks that had to be controlled by the Chief Officer and the deck crew personnel, during the loading operation. Amongst the listed checks, item (c) indicated:

«(c). Car roofs and windows are properly closed. Hand brake has been engaged».

On the day of the marine accident and following the completion of the loading operation at Igoumenitsa port, said list was filled and signed by the Master, the Chief Officer and the terminal representative, however, item (c) was marked on (No) ticking box. The time recorded on the check list was 0200.

Taking under consideration the above it is inferred that the Chief Officer and the Deck personnel, assigned to perform the loading and securing procedures have to confirm that the brake is applied on a vehicle or transport unit after being parked, practically by checking with the drivers.

In the examined case it was not evident that the AB on the permanent ramp that was securing the loaded tractor semi-trailers had checked if their drivers had activated the braking system.

Under the above, it is presumed that, had the referred check been carried out on tractor semi-trailer (S), the truck driver would have applied the brake properly and the truck would have remained in parking position.

The failing of implementing the control of hand brake engagement check procedure by the deck personnel is suggested to have been a contributing factor to the marine casualty.

4.4.3 Supervision and control of loading operation

The supervision and control of the loading operation, as reported in par. 4.4.1 was under the Chief Officer's duties who was assisted by the Second and the Third Officer.

Based on the above and the examination of the events leading to the marine accident, it was emerged that following the loading of the last tractor semi-trailer on the permanent ramp the only deck crew member positioned at it was the AB, tasked with the securing and lashing operation.

It was reported that neither the Chief Mate in charge of the operation nor one of the Deck Officers that were assisting the operation had been on the permanent ramp in order to supervise and control the procedures.

Had the Chief Officer or a Deck Officer been on the permanent ramp it is highly possible that they could have advised the tractor semi-trailer (S) driver to apply the parking brake or check that it had properly been applied, following the process set out in «Loading – Unloading / Safety - Security Check List».

Under the above it is considered that the insufficient supervision and control of the loading operation in relation to parking, securing and lashing procedures on the permanent ramp have been a contributing factor to the examined marine accident.

4.4.4 Loading completion

Having regard to the «Loading - Unloading / Safety - Security Check List» completed by the Chief Officer and signed by the Master, the loading operation was commenced at 0030 and was completed at 0200, that is four minutes before Sorrento departed from port.

Nevertheless as stated, by the time Sorrento departed from port the lashing procedure was still in progress and some freight vehicles were still unsecured, including the tractor semi-trailer (S) parked on the permanent stopped ramp, despite the fact that the securing and lashing procedures have to be completed before a ship leaves the berth (SOLAS Chapter VI/Reg. 5.6).

It is highly unlikely that had the tractor semi-trailer (S) been secured and lashed, it would have rolled towards truck (P), parked behind it.

In consideration of the above it is inferred that the departure of Sorrento before the completion of securing and lashing procedures, have been a contributing factor in the examined case.

4.5 Master's Standing Orders

The Standing Orders are a set of instructions to ensure safe ship navigation and operations whether at sea or at port. This set of directives by the Master encompasses a very wide list of aspects of navigation and rules for the Officers. Standing Orders are to be followed at all times by the Officer on duty and are duly signed by every Officer on board, making them liable to adhere to the orders. That means that the standing orders are in-force and applicable at all times the ship is at sea, at port or at anchor.

4.5.1 Sorrento's Master's Standing Orders

Master's Standing Orders on board Sorrento apart from defining navigational procedures were also specifying the loading and stowage operation in line with the Cargo Securing Manual and were incorporated in Sorrento's Safety Management System under FM/UTEC/AB/RV/010 form.

The Master's Standing Orders included the following orders and instructions:

- a. *"Stowage lanes must be respected and right distance must be maintained."*
- b. *"Sharp verify that the air operate parking brake has been activated."*
- c. *"Sharp verify that wedges (chocks) have been for the wheels and the trailer horse has been put in place."*
- d. *"Make sure that the cargo securing manual rules have been sharp respected."*
- e. *"Make sure that the lashing device have been fixed correctly."*

Aforesaid Standing Orders were signed by the recruited Deck Officers on board Sorrento. In respect to the examined occurrence they had been signed by the Chief Officer, the Second Officer and the Third Officer.

Having regard to the examined case and the sequence of events leading to the marine accident, it is resulted that the Chief Officer and the Deck Officers engaged in the loading operation did not follow in full Master's Standing Orders, in order to properly control and supervise the stowage operation of tractor semi-trailers on the permanent inclined platform.

It follows, that the failure of the Officers in charge of the loading operation to implement in full Master's Standing Orders has been a contributing factor in the marine accident.

4.5.2 SOLAS Chapter VI/Reg. 5.6 requirements

As reported in par. 4.3.1 under captioned requirement, all securing of cargo transport units on Ro/Ro passengers vessels have to be completed before the ship leaves the berth.

Said requirement as stated, was not incorporated in Sorrento Master's Standing Orders, so as to draw the attention of the involved Deck Officers and ensure that the loading and securing operation completion would be timely reported to the Chief Officer and under his call, to the Master.

It is considered that if the Deck Officers that were supervising the loading and securing operation were duly aware of the foresaid obligation, prioritizing the loading and securing handling of freight vehicles and vehicles by ensuring that each truck's loading would be followed by its securing and lashing, it is highly possible that the marine accident could have been avoided.

Under the above it is suggested that the failure to incorporate SOLAS Chapter VI/Reg. 5.6 requirement in Master's Standing Orders or Sorrento's SMS has been a contributing factor in the examined marine accident.

4.5.3 Passengers' stay in garage spaces

SOLAS/Chapter II-1/Regulation 23 "Special requirements for ro-ro passenger ships", paragraph 1 provides that:

"Special category spaces and ro-ro spaces shall be continuously patrolled or monitored by effective means, such as television surveillance, so that any movement of vehicles in adverse weather conditions and unauthorized access by passengers thereto can be detected whilst the ship is underway."

Additionally, paragraph 9 states that:

"In all ro-ro passenger ships, the Master or the designated Officer shall ensure that, without the expressed consent of the Master or the designated Officer, no passengers are allowed access to an enclosed ro-ro deck when the ship is underway".

Under the aforementioned provisions it is inferred that passengers, including drivers, have to proceed to the accommodation spaces, before the departure of a ro-ro passenger ship from berth, as depending on a port's structure and breakwaters formulation, a ship may encounter bad weather conditions as soon as she departs from berth that may cause unexpected situations and endanger persons safety, still being at the permanent sloped ramps or in garage enclosed decks.

Consequently, in respect to truck drivers, the parking operation has to be completed, before the departure from berth and if ship's procedures require their presence in the securing or lashing operation, said operations have to be completed granting adequate time for the drivers to exit the garage spaces, before the ship leaves the berth.

In the examined case it was evident that truck drivers were still at the permanent ramp despite the fact that Sorrento had left the berth. It is therefore concluded that referred provision was not implemented through the procedural operation of Sorrento.

As already reported in paragraph 4.5.2 prioritization of loading, handling and securing of vehicles is considered essential for a safe loading operation before departing from port. Consequently and based on the above, it is presumed that the controlled implementation and practice of said SOLAS requirements could had led to prompt actions by the designated crew personnel on loading decks, advising the drivers to proceed to the accommodation spaces, once the tractor semi-trailers were parked and secured.

Based on the above it is considered that the failure to incorporate SOLAS referred provisions in Master's Standing Orders or Sorrento's SMS has been a contributing factor in the examined marine accident.

4.6 Use of brake and engine gear

4.6.1 Parking brake and engine gear

The parking brake is the fundamental and most important system for parking a vehicle and preventing it from moving.

It is a professional driver's obligation and practice to secure his vehicle by applying the parking brake correctly after having immobilized it in order to park it so as to avoid any detrimental situations to people or property.

Consequently the driver has to be certain that the brake is properly applied and the vehicle well secured at parking position.

Although following the marine casualty on board Sorrento the truck driver had to remove his vehicle in order to release the casualty from being trapped between the two trucks and any inspection on truck's parking gear was not achievable, it is considered highly possible that he had not properly applied the parking brake at stowage position or had not applied it at all, as his truck, post to the accident, after being parked few meters forward, remained in parking position while Sorrento was underway in Igoumenitsa Channel until lashed by Sorrento deck crew, almost 10 minutes following the incident.

Similar marine casualties occurred, after trucks were shifted while ro-ro ships were underway, have highlighted that truck drivers may sometimes neglect to adequately apply the parking brakes before leaving their trucks and for this reason have to be reminded therein by the deck crew, as reported in paragraph 4.4.2 & 4.4.3.

Based on the above many Operators of ro-ro ships have taken measures in order to draw the attention to drivers to apply the hand brake and engage gear once parked on a car deck and not to walk behind vehicles or transport units by warning signs, labels, posters and hand-held by crew instruction boards. Such methods are indicatively shown in figure 20.



Figure 20. Indicative signs that could be used in car decks

4.6.2 Engine gear in parking stowage

The use of engine gear for parking a vehicle with diesel engine when being transported by ro-ro ships is not recommended by IMO Res. A. 581(14) adopted in 1985, as it was considered that the engagement of engine gear in parking position could cause engine ignition following slightly movements of the vehicle.

However, nowadays such an option is not likely to occur, due to the developments in vehicle's advanced engineering and there are ro-ro Operators that require vehicles and freight vehicles to be left in gear while loaded and parked on board.

Having examined Sorrento's Cargo Securing Manual as well as the Safety Management System implemented on board, there was no requirement for drivers to set the engine in gear, as an additional parking control measure.

4.7 The driver of the shifted tractor semi-trailer (S)

The driver of the shifted truck was aged 36 and had been working as a driver in road international transports for more than 12 years. He had arrived at Igoumenitsa port at approximately afternoon hours, long before Sorrento's arrival and had travelled to Italy several times in the past, using the ferry links from Greece.

Following the marine casualty and Sorrento's berthing at Igoumenitsa port, at 0355 he was subjected to a breath alcohol test with a portable breathalyzer carried out by Coast Guard Officers and was not found to be positive to alcohol.

In respect to the marine casualty he had alleged that he had stepped off his truck and had walked towards the upper end of the permanent platform to meet his colleague and that he was worried whether the rubber chocks placed on his truck wheels could block and restrain his truck from rolling back. However his allegations were not confirmed due to the fact that when his truck shifted backwards it was restrained by the tractor semi-trailer (P), parked behind his truck, which was not lashed yet but was in parking brake and its wheels were blocked by two rubber chocks.

Furthermore his tractor semi-trailer remained parked without being lashed for approximately 10 minutes after slightly driven forward in order for the casualty to be released.

Based on the above and the AB's statement it is considered highly possible that the shifted truck's driver was in his tractor's cabin and the parking brake was not properly applied.

4.8 The casualty truck driver

The casualty driver was aged 48 and had been working in road international transports services for many years using the ferry link Greece-Italy. It was reported that he had arrived in Igoumenitsa at afternoon hours, before Sorrento's arrival.

Following the marine accident Sorrento's doctor administered first aid and performed CPR³ to the casualty, however when he was taken at shore by the ambulance's attendants he was unconscious and was pronounced dead at Igoumenitsa Health Center.

According to the forensic autopsy report prepared on 19 July 2013 he died at 0220 approximately 10 minutes after the occurrence and causes of death were determined as traumas on chest and vertebral column, compatible with being run over by a truck.

Additionally, the fatality was subjected to a toxicological assessment and analysis test by the laboratory of Forensic and Toxicology of Medical School of Ioannina University. According to the "toxicological report analysis" the casualty was found to have been intoxicated having alcohol in his blood, with concentration 0,57 gr/lit of blood.

In most EU States a person with Blood Alcohol Concentration (BAC)⁴ higher than 0.5 gr/lit is considered legally intoxicated. Although the immediate effects of alcohol on the body are directly related to the amount consumed, it is noted that individual reactions to alcohol vary and are influenced by many factors such as alcohol drinking regularity, age, gender, fatigue and the amount of food consumed before drinking.

³ Cardiopulmonary Resuscitation (CPR) consists of mouth-to-mouth respiration and chest compression. CPR allows oxygenated blood to circulate to vital organs such as the brain and heart. CPR can keep a person alive until more advanced procedures (such as defibrillation - an electric shock to the chest) can treat the cardiac arrest. CPR started by a bystander doubles the likelihood of survival for victims of cardiac arrest.

⁴ BAC, represents the amount of ethanol in a given amount of blood, and is noted as "weight by volume." The most commonly used measurements are grams of ethanol per 100 millilitre of blood (g/100ml), sometimes expressed as percentage by volume commonly used in the United States, and milligrams of ethanol per millilitre of blood (mg/ml), equivalent to grams per litre (g/L), used in much of Europe. For example, 0.05 g/100ml=0.05%=0.5 mg/ml=0.5g/L. The measurement, g/L is used in this investigation report.

Following, the specific effects on drivers, related to driving under the influence of alcohol, are presented according to formal data of Ministry of Infrastructure, Transports and Networks, as are internationally acknowledged:

Table 3. Effects on drivers under alcohol influence.

	BAC grams/1 Litre	Influence phase	Symptoms
1.	0.1-0.5	Not visible	Effect not evident. Normal behavior. Driving ability reduce requires specialized tests.
2.	0.3-1.2	Sense of euphoria	Increased speech communication. Increased self confidence. Minor motor coordination. Information process slowing down.
3.	0.9-1.25	Nervous	Unstable emotional status. Memory impairment. Significant reduce to reaction time. Significant impairment of motor coordination and loss of good judgment. Drowsiness.
4.	1.8-3.0	Disorder	Orientation difficulty, mental disorder, dizziness. Impaired vision and hearing. Increased pain tolerance. Serious impairment of motor coordination and speech. Impassibility. Lethargy.
5.	2.5-4.0	Medical shock	General mental inertia. Serious loss of motor coordination. Significant loss of senses.
6.	3.5-5.0	Coma	Loss of consciousness. Hypothermia. Serious breathing problems. Possible death.
7.	4.5 +	Death	Death due to respiratory arrest.

Table 4. Fatal Accident risk factor at different BAC levels

BAC (gr alcohol/ 1000 ml blood)	Fatal Accident risk factor
0	1
0.2- 0.4	1.4
0.5- 0.9	11.1
1.0- 1.4	48
1.5+	380

Based on above attributed data it is concluded that the influence of alcohol causes serious negative effects on an individual’s behavior and performance when driving. It is highlighted that when an individual is alcohol intoxicated within the rates of 0.3 gr/lit of blood to 1.2 gr/lit of blood alcohol content, could have increased speech communication, increased self confidence, minor motor coordination and information process slowing down.

On the grounds of the above it is considered that the casualty driver, having been alcohol intoxicated as evidenced, could had been under minor motor coordination and information process slowing down status that could have contributed to his decision making and fatal injury.

4.9 The shifted tractor semi-trailer (S)

Following the marine accident the tractor semi-trailer (S) that shifted on the permanent ramp was inspected by the Vehicle Technical Inspection & Control Centre of Igoumenitsa.

The results of the inspection showed that:

- the truck was in general good condition and apart from the problem on its steering system, the hand brake mechanism and the braking system were functioning correctly.
- the trailer was found to have a serious problem with its braking application system, lopsided braking at no 1 and no 3 axles but the general condition

was reported as good, despite the aforementioned deficiencies. The condition of the truck as described above taking under consideration the evolution of events leading to the occurrence, is not alleged to have been a contributing factor to the accident, as referred problem is likely to contribute to road accidents yet not in the investigated case.

4.10 Fatigue

The working routine followed on board Sorrento was normal as the vessel had sailed from Patras at afternoon hours on the day prior to the marine casualty. Scheduled voyages included many hours of stay at destination or arrival ports. Having examined the working and resting hours of Sorrento's crew there was no indication that the performance of the involved personnel into the examined case was influenced by fatigue.

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

5.1 Conclusions and safety issues leading to safety recommendations

- 5.1.1** Respective provision of SOLAS Chapter VI Regulation 5.6 was not incorporated in Sorrento's Cargo Securing Manual, to emphasize that the securing and lashing operation has to be completed before the ship leaves the berth {par. 4.3.2(1)}.
- 5.1.2** Sorrento's Cargo Securing Manual did not comprehend explicit instructions for the loading, securing and lashing operation, tailored to the structural requirements of the sloped permanent ramp {par. 4.3.2(2)}.
- 5.1.3** The chock securing system on board Sorrento, used for her inclined ramps could be reinforced with different design specifications in relation to height, width and friction factor {par. 4.3.2(2)}.
- 5.1.4** The chock-securing operation was not thoroughly recorded and described in the Cargo Securing Manual {par. 4.3.3(1)}.
- 5.1.5** The chock-securing system for tractor semi-trailers stowage on the sloped permanent ramp, was not efficient enough {par. 4.3.3(2)}.
- 5.1.6** SOLAS Chapter VI/Reg. 5.6 "*all securing of cargo transport units shall be completed before the ship leaves the berth*" was not satisfied {par. 4.4.1}.
- 5.1.7** The parking brake was not properly applied by the driver of the shifted tractor semi-trailer {par. 4.7}.
The hand-brake engagement checking procedure was not implemented by the competent deck crew {par. 4.4.2}.
- 5.1.8** The supervision and control of the loading operation in relation to parking, securing and lashing procedures was insufficient {par. 4.4.3}.
- 5.1.9** Sorrento departed from berth before the completion of the securing and lashing operation {par. 4.4.4}.
- 5.1.10** Master's Standing Orders in relation to the loading operation were not implemented in full {par. 4.5.1}.
- 5.1.11** The requirement of SOLAS Chapter VI/Reg. 5.6 "*all securing of cargo transport units shall be completed before the ship leaves the berth*" was not incorporated in Master's Standing Orders or Sorrento's SMS {par. 4.5.2}.
- 5.1.12** The requirements of SOLAS Chapter II-I/Reg. 23/par. 1 & 9, inferable related to passengers stay on garages, following ship departure from berth, were not incorporated in Master's Standing Orders or Sorrento's SMS {par. 4.5.3}.
- 5.1.13** Warning signs, labels or posters and hand-held by crew instruction boards reminding drivers to apply the hand brake could be an additional safeguard for preventing potential omission of putting parking brakes on car decks {par. 4.6.1}.

- 5.1.14** Warning signs drawing the attention to drivers or crew not to pass behind transport units and vehicles parked on sloped ramps could be a safeguard for preventing accidents to individuals {par. 3.5, 4.5.3, 4.6.1}.
- 5.1.15** Truck drivers were not advised to engage engine gear as an additional parking control measure {par. 4.6.2}.
- 5.1.16** The Incident report analysis conducted by the Master of Sorrento, presented in following “actions taken” section did not highlight in full safety issues and lessons learned related to ship’s operations.

6. Actions taken

- 6.1 Following the marine casualty on 10-07-2013, the Master of Sorrento prepared an incident report analysis into the marine casualty according to internal procedures indicated by the ship’s Safety Management System and suggested to the Company of Sorrento that “*drivers must come on board more sober*”.
- 6.2 The Owners of Sorrento have conducted the incident investigation analysis into the marine casualty according to internal procedures of Company’s Safety Management System under the «Guidelines for the operational implementation of the International Safety management Code ISM Code» by Companies MSC-MEPC.7/Circ.5. par. 4.2.3 & par. 6. The root cause analysis conducted highlighted the following corrective actions proposed:
“To improve the surveillance of the truck driver during the progress of the loading operation.
As general rule the following tasks shall be taken into account:
- *The movement, stowage and securing of vehicles on vehicles decks and ramps should be supervised by a responsible ship’s Officer assisted by at least one competent person;*
 - *Crew members should exercise great care when supervising the driving, marshalling and stowing of vehicles to ensure that no person is put at risk;*
 - *Crew members should be wary that vehicles may lose control on ramps or sloping deck, especially when wet, and that vehicles on ramps with steep inclines may be susceptible slip resistance surfaces;*
 - *Vehicles should be parked and secured so as tightly as the lashing tensioning device will permit, in case of compressed air suspension system, by first releasing the air pressure where this facility is provided.”*
- 6.3 Following relevant correspondence in regard to “Actions Taken” subject, the Owners/Managers of Sorrento reported the following:
- .1 The Company SMS Manual at its 11th Revision, dated on July 31st 2014, in par. 12.4.13, incorporated instructions for “Lashing and Securing to be completed before Vessel leave the berth”.
 - .2 On October 8th 2014 the Company held an extraordinary meeting for SMS review focused on the incident of Sorrento. As a result of the meeting and awaiting the findings of the external investigations in progress, Company supposed that the driver of shifting truck was not correctly engaging the hand brake; considering this, the Company issued a series of recommendations circularizing the minutes of the meeting to all fleet vessels.

- .3 On January 15th 2015 the Company sent to all fleet vessels a detailed instruction for incident analysis form in order to enable DPA to perform the incident management based on comprehensive information.
- .4 An additional training module related to incident analysis will be added to internal training modules periodically performed at Company headquarter for vessel's officers.
- .5 On January 30th 2015 the Company deeply reviewed the SMS Manual:
 - i. Chapter 10 (Reports and analysis of incidents).
 - ii. Chapter 12.4 (procedures for Cargo and passengers management).Such revision has been performed in order to better clarify and improve the application of Company existing procedures.
- .6 Following the casualty internal Audits were carried out regarding lashing material conformity and lashing operations performed according Company procedures by ISO/ISM internal Auditors and Damage Prevention dept. internal Auditors. Masters standing orders, as part of SMS procedures, are systematically verified during periodical ISM internal Audit.

7. Safety recommendations

Taking into consideration the analysis and the conclusions derived from the safety investigation conducted as well as the remedial actions taken by the Owners of Sorrento, related to the examined marine casualty, the following recommendations are issued:

7.1 The Owners/Managers of Sorrento are recommended to:

- | | |
|----------|--|
| 63/2013: | supplement the Company's Safety Management System fleet-wide in order to ensure that the lashing and securing procedure is completed prior to vessels' departure by setting up rules to be adhered at any time by Masters and key personnel involved. |
| 64/2013 | revise respective pre-departure loading operation check lists fleet-wide, particularizing concrete instructions for parking, securing and lashing of loaded road vehicles to be followed and filled on the spot during loading operations by key personnel involved. |
| 65/2013 | supplement the Cargo Securing Manuals fleet-wide in order to draw the attention to Master and Deck Officers that the securing and lashing procedure has to be completed before the departure of the ship. |
| 66/2013 | carry out internal audits fleet-wide to verify that loading operations are performed in compliance with the Safety Management System and Cargo Securing Manual applied as well as relevant Master's Standing Orders. |
| 67/2013 | review the Cargo Securing Manuals fleet-wide in respective sections of chock securing by incorporating explicit instructions and guidance to deck crew personnel. |
| 68/2013 | examine the effectiveness of chock securing system equipment on the permanent sloped ramps fleet wide in relation to chocks height and width so as to ensure that chocks could restraint any |

transport unit from rolling and if deemed necessary, replace existing chocks in order to reinforce the restraining capacity.

69/2013 reassess fleet-wide the training procedures of competent crew personnel for conducting marine accidents investigation analysis in consistence with ISM Code.

70/2013 examine the necessity of using signs and labels in car decks and hand-held instruction boards shown by competent crew in order to draw the attention:

- to drivers for properly applying the hand brake or engage gear.
- not to pass behind transport units or vehicles.

7.2 The Safety of Navigation Directorate of the Hellenic Shipping Administration and the competent Directorate of the Italian Shipping Administration are kindly invited to:

71/2013 consider of proposing to the competent European and International Instruments the necessity of supplementing existing provisions of SOLAS Chapter II-I/Reg. 23 with a circular interpreting said regulation or with a supplementing provision, if deemed appropriate, specifying that drivers of freight vehicles and vehicles as well as passengers must proceed to accommodation spaces prior to ship's departure from berth.

72/2013 consider of proposing to the competent European and International Instruments the necessity of the conduct of a study focusing in gear engagement of diesel motored road vehicles transported on ro-ro ships, with the aim to update par. 7.6 of IMO Res. A. 581(14) adopted in 1985, if deemed appropriate.

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Accident Investigation Report 10/2013

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