



Marine Safety Investigation Unit



Transport Malta



MARINE SAFETY INVESTIGATION REPORT

Safety investigation into a fatality and serious injuries on board the
Maltese-registered passenger/ro-ro vessel

Euroferry Malta

in position 40° 58.6' N 007° 58.4' E

on 07 October 2019

201910/009

MARINE SAFETY INVESTIGATION REPORT NO. 17/2020

FINAL

Investigations into marine casualties are conducted under the provisions of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 and therefore in accordance with Regulation XI-I/6 of the International Convention for the Safety of Life at Sea (SOLAS), and Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009, establishing the fundamental principles governing the investigation of accidents in the maritime transport sector and amending Council Directive 1999/35/EC and Directive 2002/59/EC of the European Parliament and of the Council.

This safety investigation report is not written, in terms of content and style, with litigation in mind and pursuant to Regulation 13(7) of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011, shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame, unless, under prescribed conditions, a Court determines otherwise.

The objective of this safety investigation report is precautionary and seeks to avoid a repeat occurrence through an understanding of the events of 07 October 2019. Its sole purpose is confined to the promulgation of safety lessons and therefore may be misleading if used for other purposes.

The findings of the safety investigation are not binding on any party and the conclusions reached and recommendations made shall in no case create a presumption of liability (criminal and/or civil) or blame. It should be therefore noted that the content of this safety investigation report does not constitute legal advice in any way and should not be construed as such.

© Copyright TM, 2020.

This document/publication (excluding the logos) may be re-used free of charge in any format or medium for education purposes. It may be only re-used accurately and not in a misleading context. The material must be acknowledged as TM copyright.

The document/publication shall be cited and properly referenced. Where the MSIU would have identified any third party copyright, permission must be obtained from the copyright holders concerned.

MARINE SAFETY INVESTIGATION UNIT
Blk H (Ent B)
Antonio Maurizio Valperga Street
Floriana FRN 1710
Malta

CONTENTS

LIST OF REFERENCES AND SOURCES OF INFORMATION	iv
GLOSSARY OF TERMS AND ABBREVIATIONS	v
SUMMARY	vii
1 FACTUAL INFORMATION	1
1.1 Vessel, Voyage and Marine Casualty Particulars	1
1.2 Description of Vessel	2
1.3 Anchor Securing Arrangements	5
1.4 Crew Members	7
1.5 Cargo on Board	8
1.6 Cargo Securing	9
1.7 Vessel's Stability	11
1.8 Passage Plan	11
1.9 Environment	11
1.10 Narrative	12
1.11 Injuries Suffered by the Crew Members	15
1.11.1 Fatal injuries suffered by AB 1	15
1.11.2 Injuries suffered by the other crew members	16
1.12 Damages	16
1.12.1 Damages to the cargo units	16
1.12.2 Damages sustained by the vessel's cargo securing devices	20
1.12.3 Damages sustained by the vessel	20
1.13 Subsequent Port State Control Inspection	23
1.14 Company's Procedures for Navigation in Heavy Weather	23
1.15 Data from the Voyage Data Recorder	24
1.16 Consumption of Drugs and/or Alcohol	24
1.17 Work/Rest Hour Records	24
2 ANALYSIS	25
2.1 Purpose	25
2.2 Cooperation	25
2.3 Safety Investigation Actions	25
2.4 Cause of the Injuries Suffered	25
2.5 Effects of the Prevailing Weather	26
2.6 Securing of the Anchors	26
2.7 Acceptance of Risk	27
2.8 Cause of Damages Sustained by the Cargo	28
2.9 Cause of Damages Sustained by the Vessel	29
2.10 Fatigue and Consumption of Drugs / Alcohol	30
2.11 Passage Plan	30
2.12 Stability of the Vessel	31
2.13 VDR Data	32
3 CONCLUSIONS	34
3.1 Immediate Safety Factor	34
3.2 Latent Conditions and Other Safety Factors	34
3.3 Other Findings	34
4 ACTIONS TAKEN	36
4.1 Safety Actions Taken During the Course of the Safety Investigation	36
5 RECOMMENDATIONS	37

LIST OF REFERENCES AND SOURCES OF INFORMATION

Documentary evidence collected from the vessel and received from the Company and the Italian Ministry of Infrastructure and Transport.

ILO. (2006). *Maritime Labour Convention*. Genève: Author.

IMO. (2018). *International convention for the safety of life at sea, 1974* (Consolidated ed.). London: Author.

IMO. (2010). *International convention on standards of training, certification and watchkeeping for seafarers, 1978, (STCW code)*. London: Author.

IMO. (2019). Guidelines on fatigue. In *MSC.1/Circ.1598*. London: Author.

Statements and interviews with the crew members of *Euroferry Malta*.

Vaughan, D. (2004). Theorizing disaster: analogy, historical ethnography, and the Challenger accident. *Ethnography*, 5(3), 315-347.

GLOSSARY OF TERMS AND ABBREVIATIONS

AB	Able seafarer (deck)
Cargo Securing Manual (CSM)	A vessel specific manual which provides guidance on cargo securing, and specifies the arrangements and devices provided on board for this purpose. It should be noted that the guidance contained in the CSM does not rule out the principles of good seamanship, neither does it replace experience in cargo stowage and securing practice. SOLAS Regulation VI/5.6 makes the carriage of an approved CSM mandatory.
Centre of Gravity (G)	The theoretical point from where the total weight force of the ship is considered to act vertically downwards.
gt	Gross tonnage
IACS	International Association of Classification Societies
IMO	International Maritime Organization
ISM Code	International Management Code for the Safe Operation of Ships and Pollution Prevention, as amended
KG	The vertical distance between the vessel's keel (K) and the centre of gravity (G)
KM	The vertical distance between the vessel's keel (K) and the vessel's metacentre (M)
LT	Local time
m	Metre
Metacentre (M)	The theoretical point at which an imaginary line passing through a floating vessel's centre of buoyancy and centre of gravity intersects the imaginary line passing through her new centre of buoyancy created after the vessel is heeled (tilted)
Metacentric Height (GM)	The vertical distance between the vessel's centre of gravity (G) and the initial transverse metacentre (M)
MLC, 2006	Maritime Labour Convention, 2006 (as amended)
MSC	Maritime Safety Committee of the IMO
mt	Metric tonnes
nm	Nautical mile
OOW	Officer in charge of the navigational watch
OS	Ordinary Seafarer
Passenger / ro-ro vessel	A passenger vessel with ro-ro (roll on – roll off) spaces, in accordance with SOLAS regulation II-2/3.42
RO	Recognized organization – An organization recognized as capable of performing statutory work on behalf of the flag State Administration, in terms of certification and survey functions connected with the issuance of international certificates
SMS	Safety management system, in accordance with the ISM Code

SOLAS	International Convention for the Safety of Life at Sea, 1974 (as amended)
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (as amended)
STCW Code	Seafarers' Training, Certification and Watchkeeping Code (as amended)
UTC	Coordinated Universal Time
VDR	Voyage data recorder

SUMMARY

On 06 October 2019, *Euroferry Malta* left the port of Cagliari, Sardegna, Italy, for a coastal voyage to Porto Torres. The vessel was already experiencing inclement weather.

On the following morning, the chief officer, the bosun, four ABs and an OS proceeded to the deck to inspect the cargo securing arrangements.

While the chief officer was inspecting some damages sustained by the trestles and the landing gear of some trailers, the bosun called for assistance on the forecastle deck to secure the anchors. Three ABs responded to the bosun and proceeded to the forecastle.

While on the forecastle deck, a wave washed over the vessel's bow and struck all four crew members, pushing them violently against the various structures and fittings on the forecastle deck. The bosun and two ABs suffered serious injuries, while one AB suffered fatal injuries, as a result of this occurrence.

The MSIU has issued one recommendation to the Company designed to minimize the possibility of under-declared cargo being loaded on board, and one recommendation to the flag State Administration, aimed at verifying that the posted VDR operating procedures are correct.

1 FACTUAL INFORMATION

1.1 Vessel, Voyage and Marine Casualty Particulars

Name	<i>Euroferry Malta</i>
Flag	Malta
Classification Society	RINA
IMO Number	9108556
Type	Passenger / RORO
Registered Owner	Malta Motorways of the Sea Ltd.
Managers	Valiant Shipping S.A.
Construction	Steel
Length overall	174.5 m
Registered Length	160.9 m
Gross Tonnage	21,664
Minimum Safe Manning	17
Authorised Cargo	Passengers and RORO units
Port of Departure	Cagliari, Italy
Port of Arrival	Porto Torres, Italy
Type of Voyage	Coastal
Cargo Information	RORO units – 2640 mt
Manning	26
Date and Time	07 October 2019, at 1010 LT
Type of Marine Casualty	Very Serious Marine Casualty
Place on Board	Forecastle Deck
Injuries/Fatalities	Three serious injuries and one fatality
Damage/Environmental Impact	Minor damages to the vessel / None
Ship Operation	Normal Service – In passage
Voyage Segment	Transit
External & Internal Environment	Daylight, clear weather. Visibility 8 nm, Northwesterly winds of Beaufort force 8, rough sea with a 5 m Northwesterly swell. Air temperature was recorded at 21 °C.
Persons on Board	27

1.2 Description of Vessel

MV *Euroferry Malta* (Figure 1) was a 21,664 gt passenger/ro-ro vessel, built in Italy in 1995. She was owned by Malta Motorways of the Sea Ltd. and managed by Valiant Shipping S.A., Greece, since 2006. The classification society as well as the recognized organization (RO) for the vessel was RINA.

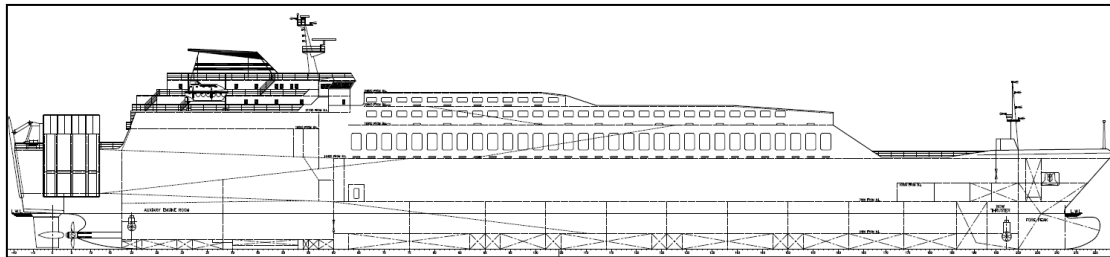


Figure 1: General Arrangement Plan – *Euroferry Malta* (Scale 1: 200)

The vessel had a length overall of 174.50 m, a moulded breadth of 24.40 m, a moulded depth of 7.50 m and a summer draught of 5.87 m, which corresponded to a summer deadweight of 6,722 metric tonnes (mt). At the time of the accident, the vessel was reported to have been drawing a forward draft of 5.0 m and an aft draft of 5.6 m.

Propulsive power was provided by a 9-cylinder, four-stroke, medium speed, OY Wärtsilä AB – Vasa 9L46A, internal combustion marine diesel engine, producing 8,145 kW of power at 474 rpm. This drove a single, right-handed, fixed-pitch propeller, through a reduction gear on the propeller shaft, which enabled the vessel to reach an estimated speed of 19 knots. The vessel was also fitted with a bow thruster and a stern thruster.

Euroferry Malta was fitted with two cargo holds – one upper cargo hold and a lower cargo hold – having a combined volume of 28,238.7 m³, above which were three decks, where ro-ro cargo could be stowed. Of these decks, Deck 4 was the uppermost deck of the vessel. This deck was flush with the forecastle and the poop deck, and parts of it were exposed to the weather, as seen in Figure 2.

The vessel was also certified to carry a maximum of 60 passengers, on short international voyages.

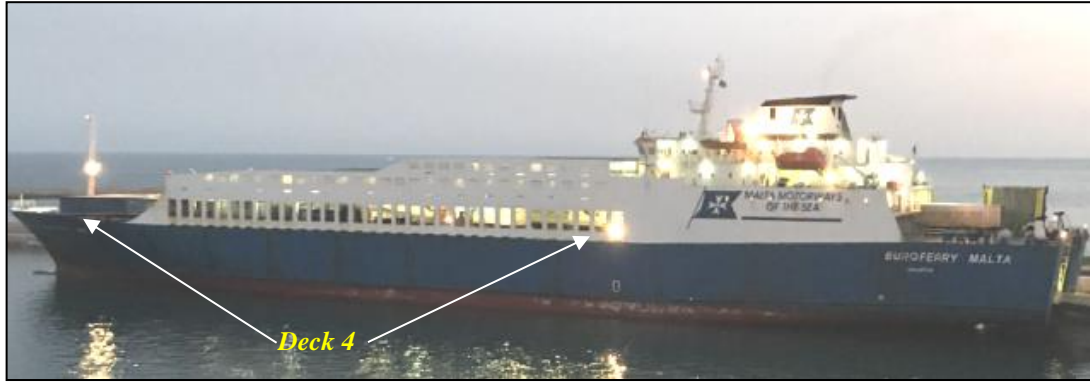


Figure 2: Euroferry Malta – Deck 4 (Upper Deck)

A deckhouse (Figures 3, 4 and 5) separated the forecastle of the vessel from the upper deck. The aft section of this deckhouse contained an access, leading to the stores and cargo holds, and the ventilation systems of these spaces. The forward bulkhead of the deckhouse served as a wave breaker.



Figure 3: Deckhouse, as seen from forward



Figure 4: Deckhouse, as seen from aft



Figure 5: Deckhouse serving as a wave breaker

1.3 Anchor Securing Arrangements

The vessel was fitted with two stockless anchors, each weighing about 4.2 tons, with, at least, 10 shackles¹ of anchor cables that ran via windlasses (Figure 3) into their respective chain lockers.

The securing arrangements for each anchor included the brake, tightened or slackened via a handwheel (Figure 6), and the chain stopper (indicated by the red arrow in Figure 7). In addition, arrangements were made by the crew members to add additional securing devices, as required. This arrangement consisted of a steel wire, chain and turnbuckle, secured via shackles to the windlass (Figure 8).

The Company's procedures stipulated that the anchors had to be secured with the brake, chain stopper, as well as the additional securing arrangements, upon departure from every port, irrespective of the type of voyage and the expected weather conditions.

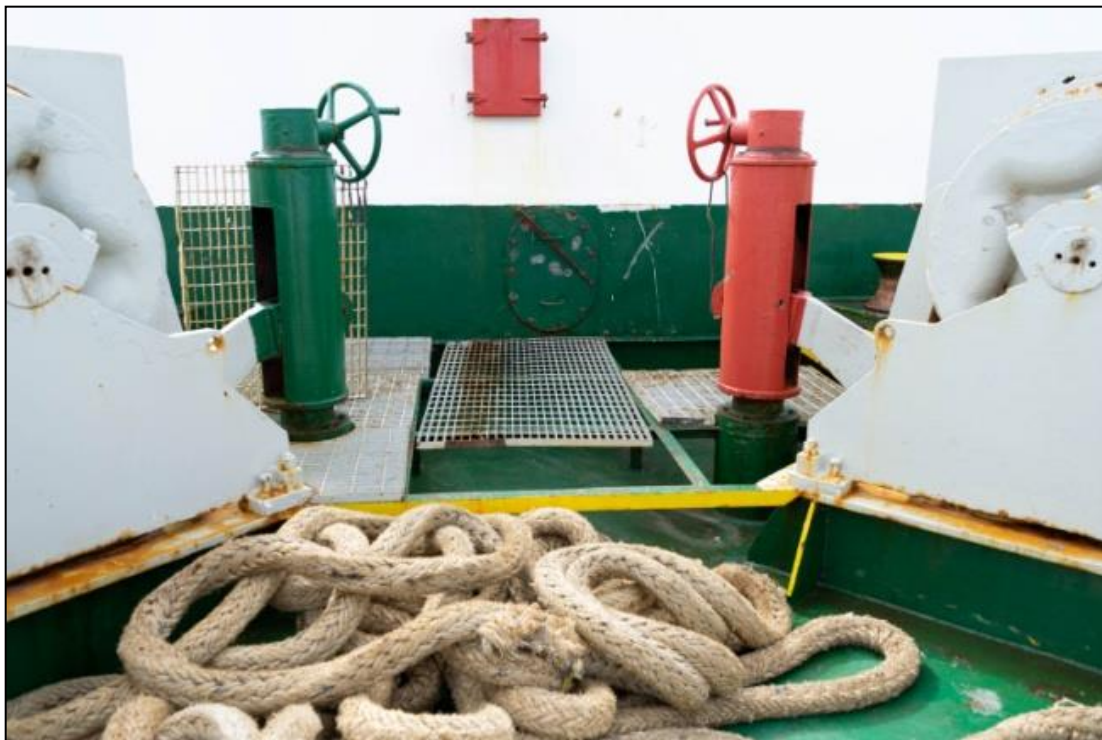


Figure 6: Handwheels to operate the brakes of the windlasses (port windlass brake – red; starboard windlass brake – green)

¹ One of the anchor's cables had 10 shackles, while the other had 11 shackles. One shackle = 27.5 m.

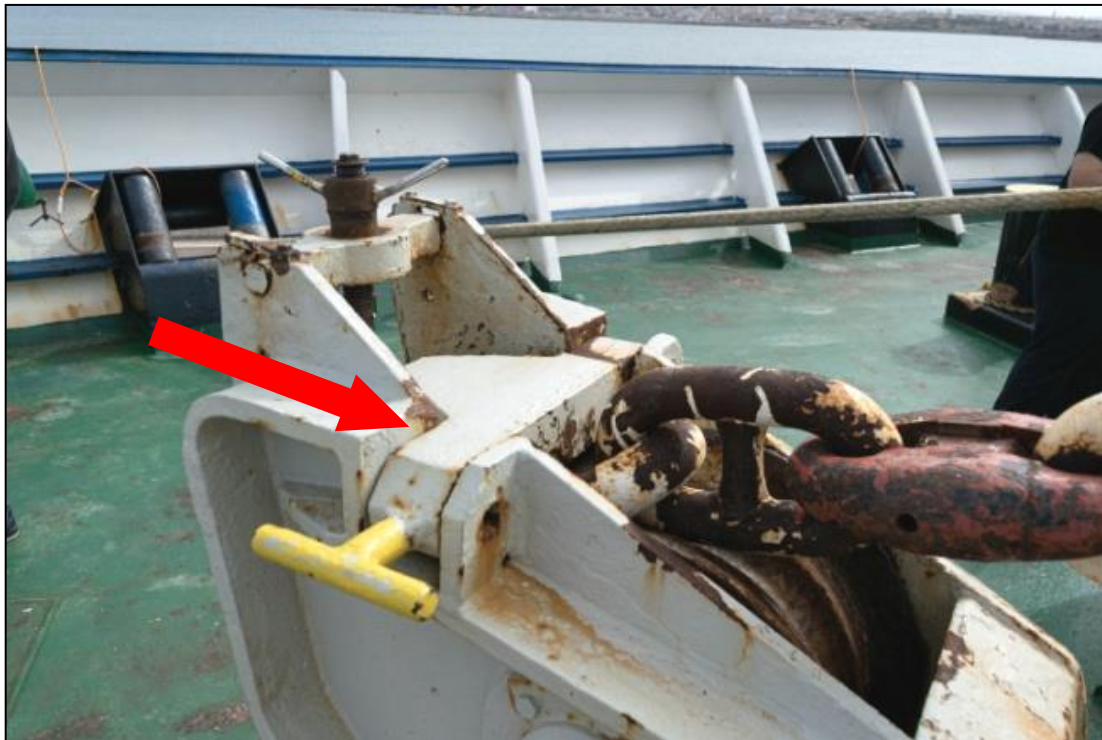


Figure 7: Chain stopper (in shut position)



Figure 8: Additional securing arrangement

1.4 Crew Members

The Minimum Safe Manning Certificate of *Euroferry Malta* stipulated a crew of 17. At the time of the occurrence, the vessel had 26 crew members on board. Besides the master and the chief officer, there were three navigational watchkeeping officers and a deck cadet. The deck ratings consisted of a bosun, five able seafarers (deck), and one ordinary seaman. Several of them had been assigned watchkeeping duties. All crew members were Bulgarian nationals.

The master, who was on the bridge at the time of the occurrence, had joined the vessel on 27 September 2019. He was 49 years old, and had 17 years of seagoing experience, seven years of which in the rank of a master with STCW II/2 qualifications. His certificate of competency was issued by the Bulgarian authorities, in 2010. He had served as a master on board the Company's vessels since 2015. He had a total of one year of experience in navigating *Euroferry Malta*, in the area of the occurrence, under heavy weather conditions.

The chief officer had joined *Euroferry Malta* on 28 September 2019, and this was his first contract in this rank. He was 43 years old, and had 4.5 years of seagoing experience. He held STCW II/2 qualifications, and his certificate of competency was issued by the Bulgarian authorities, in August 2019. He had served on board the Company's vessels since 2015.

The third officer, who was the OOW at the time of the occurrence, had joined the vessel on 20 September 2019. He was 30 years old and had two years of seagoing experience, one year of which as a third officer with STCW II/1 qualifications. His certificate of competency was issued by the Bulgarian authorities, in October 2018. He had served on board the Company's vessels since 2017.

The bosun had joined the vessel on 10 August 2019. He was 51 years old and had nine years of sea experience, 4.5 months of which were served in the rank of a bosun. All of his sea experience was acquired serving on board the Company's vessels. He held STCW II/4 qualifications (rating forming part of a navigational watch) and his certificate was issued by the Bulgarian authorities in 2016.

The fatally injured able seafarer (AB 1) had joined the vessel on 26 June 2019. He was 29 years old and had 1.5 years of seagoing experience, four months of which were served in the rank of an able seafarer (deck). He held STCW II/4 qualifications, and his certificate was issued by the Bulgarian authorities in July 2018.

One of the two injured able seafarers (AB 2) had joined the vessel on 22 July 2019. He was 24 years old and had about eight months of sea experience, 2.5 months of which were served in the rank of an able seafarer (deck). He held STCW II/4 qualifications, and his certificate was issued by the Bulgarian authorities in July 2018.

The other injured able seafarer (AB 3) had also joined the vessel on 22 July 2019. He was 23 years old and had 7.5 months of sea experience, all of which were served in the rank of an able seafarer (deck). He held STCW II/4 qualifications and his certificate was issued by the Bulgarian authorities, in April 2018.

The uninjured able seafarer (AB 4) had joined the vessel on 04 October 2019, and this was his first contract in the rank of an able seafarer (deck). He was 26 years old and had about 1.5 years of sea experience as an ordinary seafarer, prior to joining *Euroferry Malta*. He held STCW II/4 qualifications and his certificate was issued by the Bulgarian authorities on 02 October 2019.

The ordinary seafarer (OS) had also joined the vessel on 04 October 2019. He was 33 years old and had three years of sea experience, two of which were served in the rank of an OS.

1.5 Cargo on Board

At the time of the accident, the vessel was reported to have been loaded with around 2,640 mt of cargo, including containers, cars, trailers and a lorry.

43 trailers were stowed on Deck 4 of which, 14 were stowed in the unsheltered foremost location of this deck (Figure 9).

There were no passengers on board the vessel, at the time of the accident.

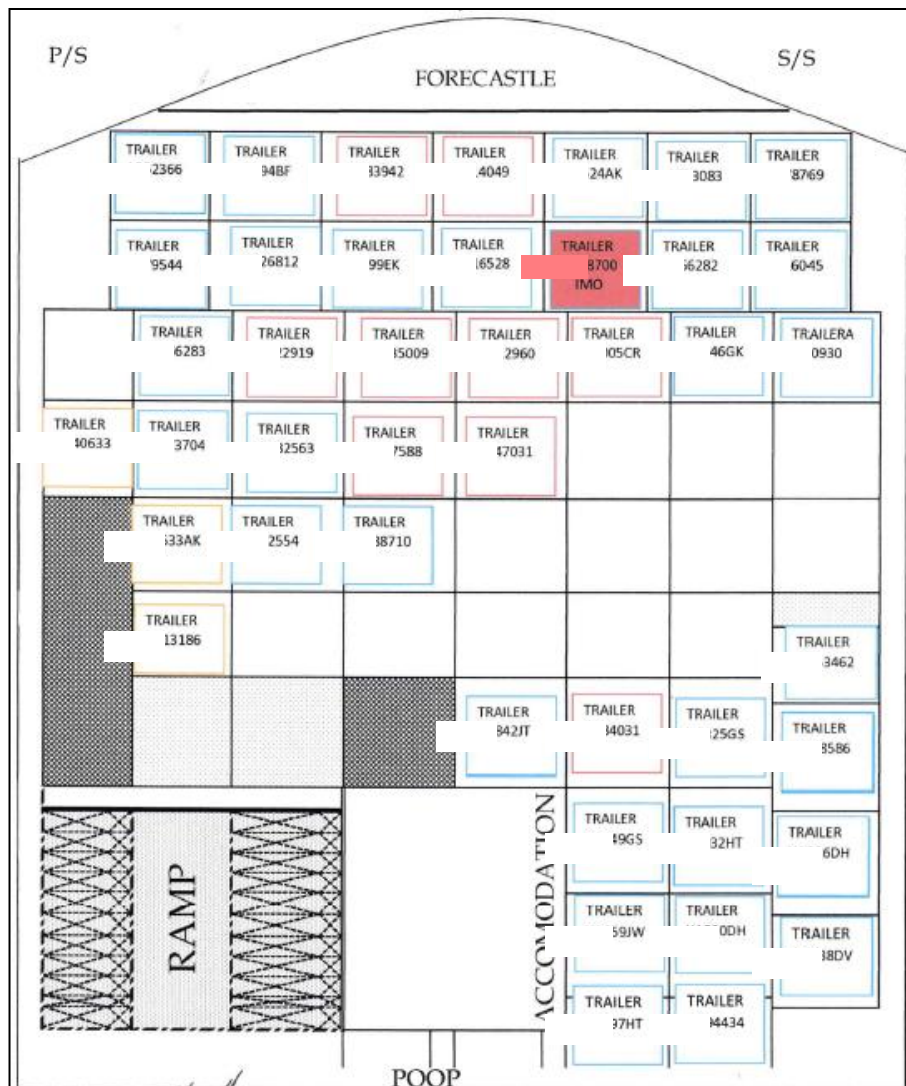


Figure 9: Stowage Plan for Deck 4

1.6 Cargo Securing

The cargo securing devices on board *Euroferry Malta* were subjected to routine weekly inspections by the chief officer, in accordance with a Company' checklist. Inspection results were all recorded. It was reported that damaged devices found during the inspections had been immediately condemned.

For the voyage from Cagliari to Port Torres, all cargo units on board were reported to have been secured in accordance with the vessel's approved Cargo Securing Manual (CSM); however, the safety investigation was unable to visually verify this². The

² The MSIU was only able to board the vessel the day after the cargo discharge operation had commenced.

efficiency of the securing arrangements for semi-standardized and non-standardized cargo was assessed on board, using a software program developed by Det Norske Veritas (DNV).

Reportedly, this programme was based on the calculation procedures outlined in Annex 13 to the Code of Safe Practice for Cargo Stowage and Securing, 2003 Edition. It also included the procedures for calculation of accelerations and lashing arrangement given within this Annex.

Although the software program only made reference to maximum securing loads (MSL) of 9.99 mt, it was observed that vessel was provided with a number of securing devices which had a maximum breaking load of 20 mt (Figure 10). The chief officer stated that only 20 mt cargo securing devices were used on board.

Reportedly, the cargo securing arrangements consisted of a trestle, in addition to eight cargo securing devices in the form of shackles, hooks, chains and turnbuckles secured to each trailer. Four of these cargo securing devices were secured from the port side (two in the forward section of the trailer and two in the aft) and, similarly, four from the starboard side. Such an arrangement took into account securing of the trailers against longitudinal and transverse sliding, as well as tipping. In addition, the trailers also had their landing gear lowered to the vessel's deck.

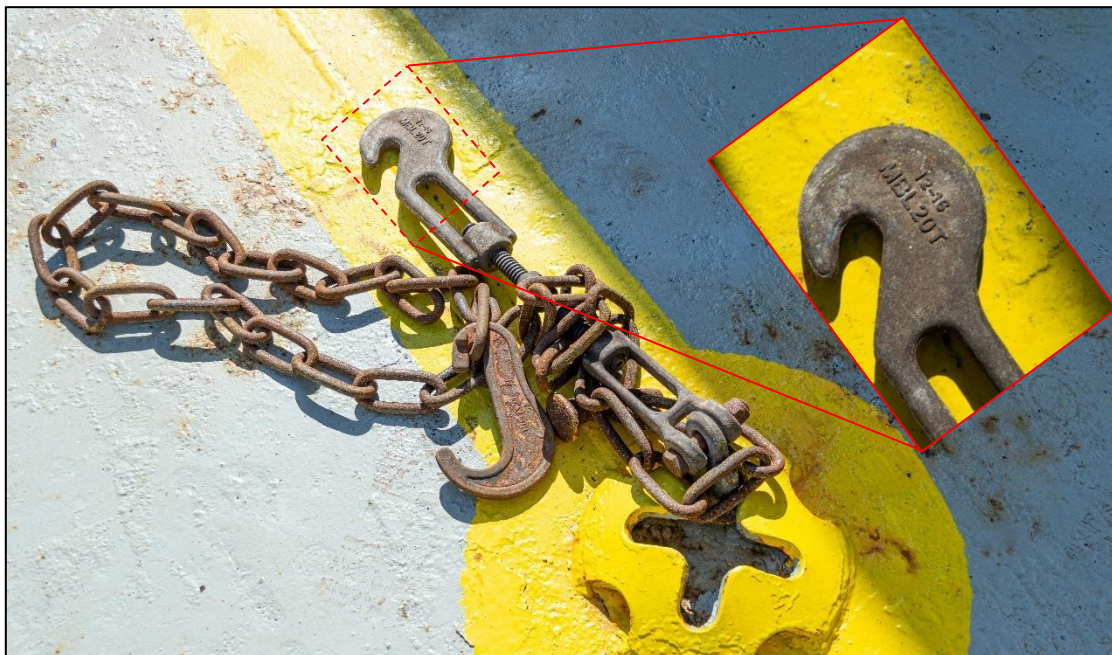


Figure 10: Cargo securing device (chain, hook and turnbuckle)

1.7 Vessel's Stability

The stability calculations of the vessel conducted for her departure condition from Cagliari, indicated that she met the relevant intact stability requirements. These calculations also indicated that the vessel was upright and had a trim of about 0.60 m by her stern. The distance between the vessel's keel and her centre of gravity (KG) was calculated as 10.23 m, while the distance between her centre of gravity and her metacentre, after being corrected for free surface moments, (GM) was calculated as 2.38 m.

The calculations indicated that all except for one of her double-bottom ballast water tanks were full, while most of her wing ballast water tanks were empty.

1.8 Passage Plan

Euroferry Malta's voyage from Cagliari to Port Torres was planned along the Western coast of Sardegna. The vessel called at these ports frequently. The distance of the voyage along the Western coast is shorter than that along the Eastern coast, and reportedly was often followed by the vessel after taking into consideration the prevailing weather conditions along the route.

1.9 Environment

A weather forecast was received by the vessel on 07 October 2019, via INMARSAT-C, at around 0324. This forecast, which was valid until 1400, had predicted strong Northerly winds increasing from Beaufort force seven to nine, with severe gusts, for the area around Sardegna. The sea state was predicted to be rough or very rough. Rains / thundery showers were predicted for the eastern part of the area.

Around the time of the occurrence, heavy weather was being experienced by the vessel. Beaufort force eight winds were blowing from a Northwesterly direction with swell, measuring about five metres high, from the same direction. Reportedly, the skies were clear, the air temperature was about 21 °C and the visibility was eight nm.

1.10 Narrative³

On 06 October 2019, at 1954, *Euroferry Malta* departed from the port of Cagliari (Sardegna), Italy, bound for Porto Torres, located in the Northwestern region of the island of Sardegna, around the Western coast of the island (Figure 10). The weather was reported to be rough, following the vessel's departure from Cagliari.

On 07 October, at 0800, whilst the vessel was on a near-Northerly course, off the Northwestern coast of Sardegna, the conditions of the cargo lashings were recorded by the OOW as 'checked and retightened'.

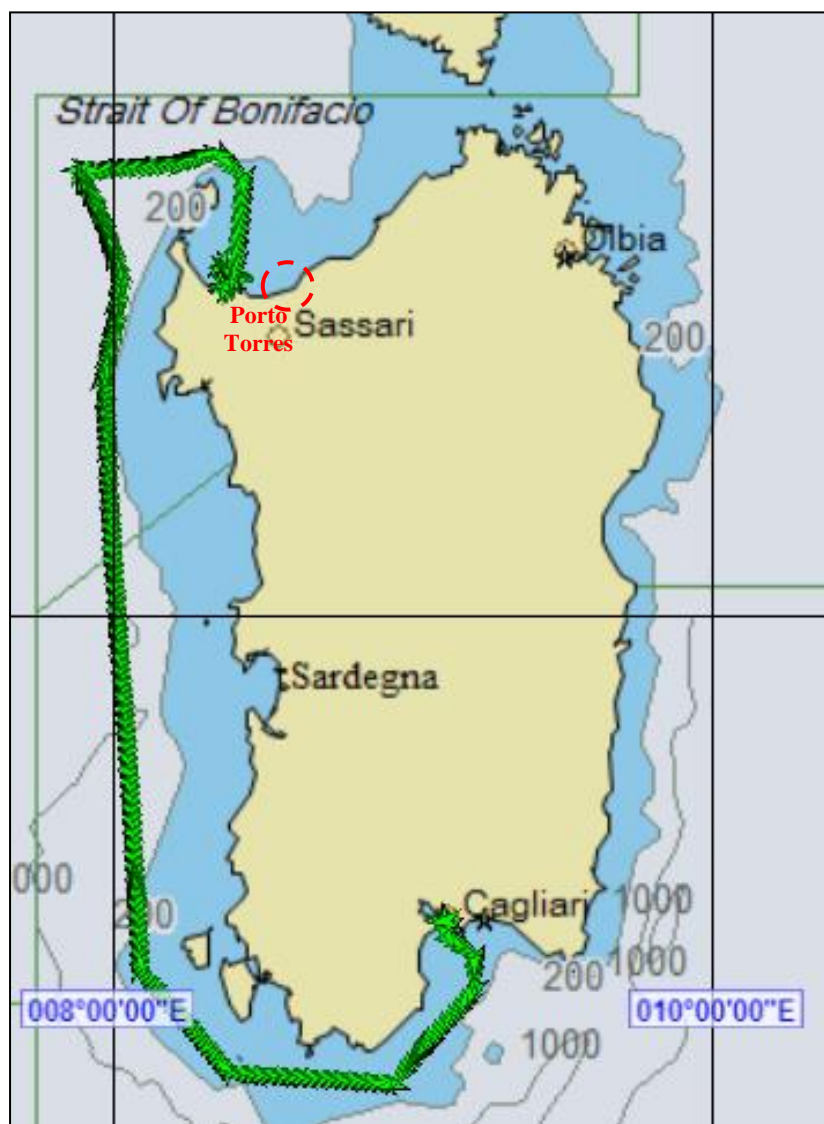


Figure 10: Map of Sardegna and *Euroferry Malta*'s track (in green)

Adapted from: IMDatE – EMSA

³ Unless stated otherwise, all times mentioned in this safety investigation report are in local time (UTC + 2).

At around 0900, the weather was reported to have worsened, which resulted in the vessel rolling and pitching heavily. At around 0924, the master altered the vessel's course to about 335°, with the intention of reducing the rolling motions of the vessel. At around 0930, the bosun went up to the bridge and reported that the trestles and landing gear of two trailers, located on the forward-starboard side of the vessel, were damaged and that consequently, these trailers had collapsed.

At around 0945, the master instructed the chief officer and the bosun to take some of the deck ratings and secure the damaged trailers with additional securing devices. The chief officer and the bosun, each carrying a portable radio, established radio communication with the bridge. The chief officer, the bosun, ABs 1, 2, 3 and 4, and the OS then proceeded to Deck 4.

The ABs and the OS waited in a sheltered area under the ramp (Figure 11) on the port side, while the chief officer and the bosun went forward to check the damaged trestles and landing gear of the trailers on the starboard side, in order to plan a further course of action. Whilst the chief officer was surveying the area, he realized that the bosun was not around.



Figure 11: Area where the crew members were waiting (inset – zoomed), before the accident.

Without notifying the chief officer or the bridge, the bosun had gone to the forecastle deck to check the anchors. On noticing that the anchor cables were 'loose', he started to walk back towards the ramp with the intention of calling for assistance in securing the anchors. While doing so, at around 1000, a wave washed over the vessel's bow.

The bosun lost his balance and fell onto the deck. He managed to get up again and called the other crew members for assistance to secure the anchors.

ABs 1, 2 and 3 responded to the bosun's call and went to the forecastle, while AB 4 and the OS stayed under the ramp. In the meantime, the chief officer had walked back towards the ramp, at which stage he saw three ABs almost reaching the forecastle.

AB 3 went to secure the port side anchor, while the bosun, and ABs 1 and 2 went to secure the starboard side anchor. AB 1 was lowering the chain stopper of the starboard side anchor, while the bosun and AB 2 were securing the anchor cable with the additional lashing arrangement. While they were doing so, at around 1010, another wave washed over the bow and struck all four crew members.

After sometime, the chief officer reached the forecastle and found the three ABs lying on the forecastle deck. At that time, the bosun was nowhere in sight. AB 3 called out to the chief officer to help him as his legs were injured. The chief officer helped AB 3 move to a safer location and then went to check on the others.

Eventually, the chief officer found AB 1 lying face down and unresponsive between the two windlasses (Figure 12). He checked for vital signs and, on not noticing any, he called for AB 4. The chief officer and AB 4 carried AB 1 towards the accommodation entrance. He then noticed that the bosun and the other two ABs had managed to walk back.

The OS went up to the bridge and notified the master that AB 1 was injured. The master called for an OOW to man the bridge, while he went down to Deck 4 to assess the situation. The master also checked for vital signs on AB 1, but found none. At around 1020, he returned to the bridge and notified both the local authorities and the Company. At around 1606, the vessel berthed at Porto Torres, where the body of AB 1, the bosun and the two injured ABs were transferred to a hospital ashore.



Figure 12: Area (red circle) where the fatally injured crew member was found

1.11 Injuries Suffered by the Crew Members

1.11.1 Fatal injuries suffered by AB 1

The autopsy conducted on the body of the fatally injured crew member revealed a fracture of the high cervical spine, including the medullary section (*i.e.*, a broken neck), fractures in the left ribs, a fracture of the left humerus, and internal bleeding in the thoracic and abdominal regions.

The cervical-medullary component of the injuries was stated to have played an important role in the fatality of the AB, as this injury, by itself, would be severe enough to cause death within a very short span of time.

1.11.2 Injuries suffered by the other crew members⁴

Besides the fatal injuries suffered by AB 1, the bosun had suffered fractured ribs, AB 2 had suffered a contusion close to his right eye and AB 3 had suffered fractures in both of his legs.

1.12 Damages

1.12.1 Damages to the cargo units

Three trailers (Figures 13 to 15), located on the starboard side, just aft of the deckhouse, were found to have sustained substantial damages.

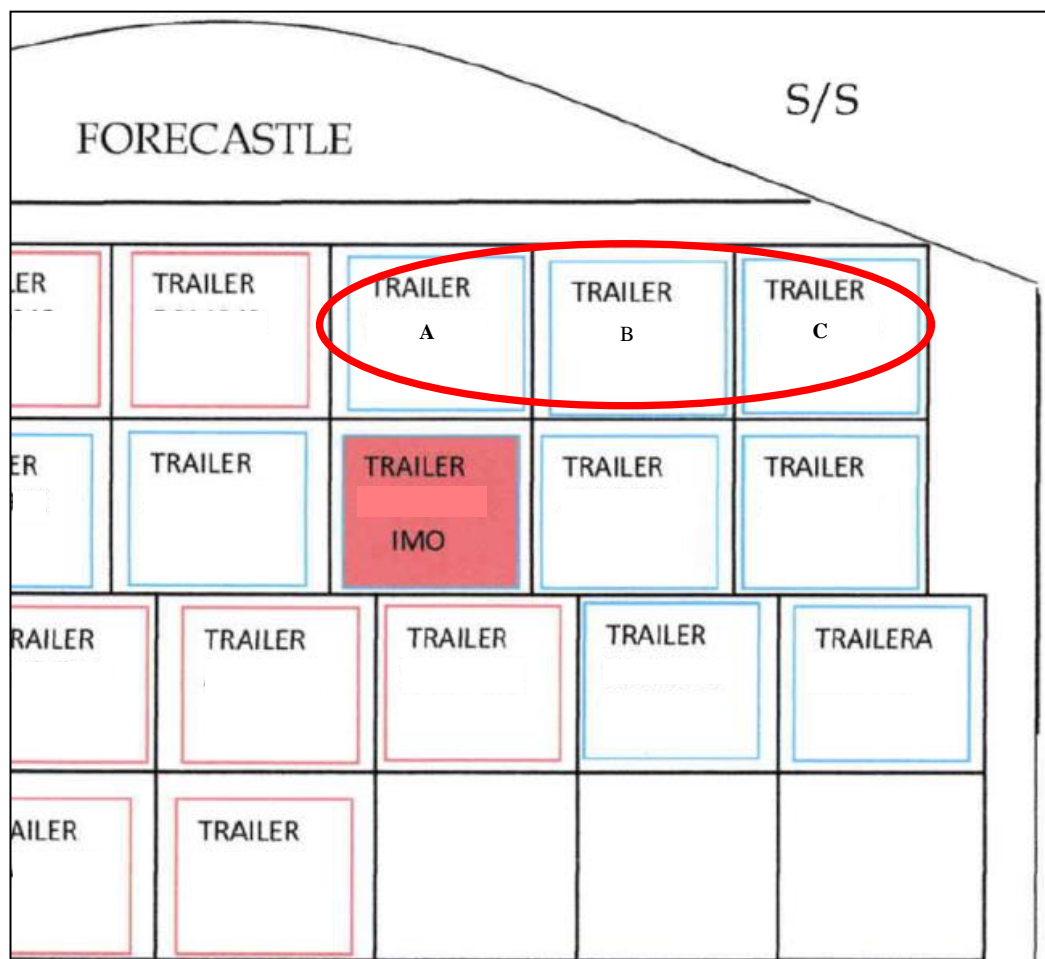


Figure 13: Location of damaged trailers (A, B and C)

⁴ A copy of the hospital report was not made available to the safety investigation. The injuries listed within this section were as advised by the Company.



Figure 14: Damaged trailers A, B and C, seen from aft



Figure 15: Trailers B and C, seen from forward

The trestles and landing gear of trailers A and B had failed, resulting in damages to the two trailers. The damages to trailer B were more pronounced (Figures 16 to 18).

Trailer C was pushed towards the vessel's bulwark and guard rails, causing the container on it to incline over the vessel's side (Figure 19).



Figure 16: Damaged landing gear of trailer A



Figure 17: Damaged landing gear of trailer B



Figure 18: Damaged trailer B

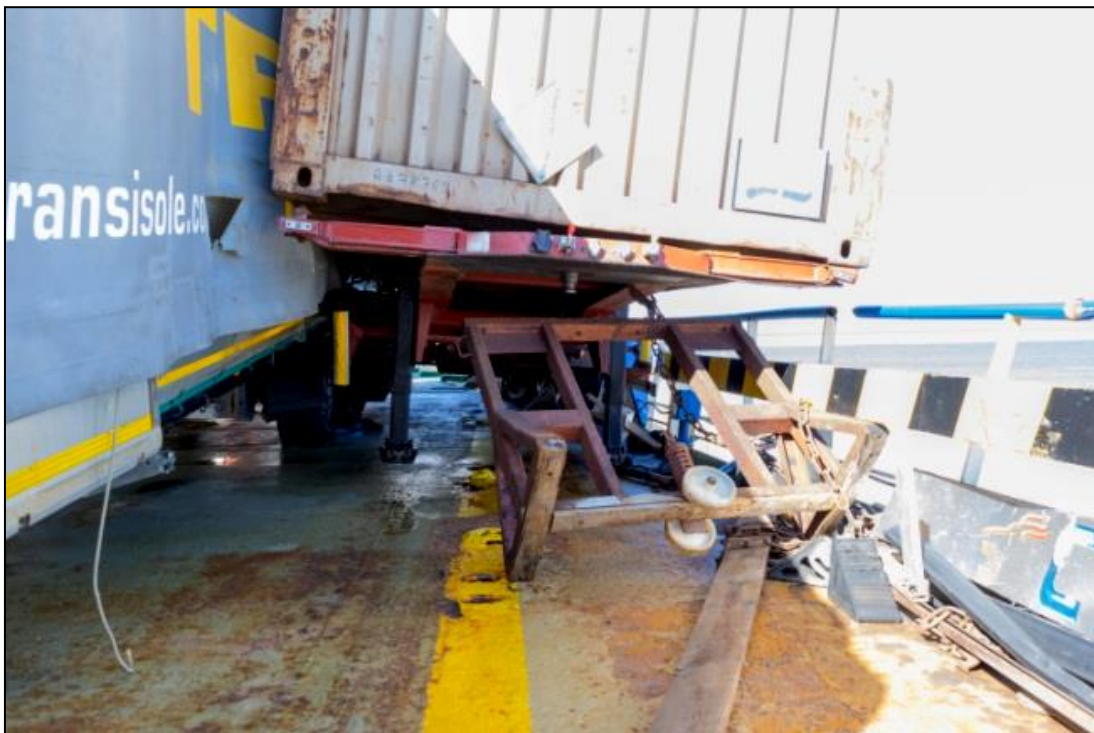


Figure 19: Damaged trailer C

In addition to the above, these trailers, as well as several others, sustained other minor damages, including deflated tyres, distorted wheels, deformation of the trailers' sides, *etc.* None of these trailers had experienced a longitudinal shift.

1.12.2 Damages sustained by the vessel's cargo securing devices

Due to the heavy weather and the subsequent cargo movements, it was reported that two of the vessel's trestles (Figure 20), four securing chains and four shackles were damaged.



Figure 20: A damaged trestle

1.12.3 Damages sustained by the vessel

The vessel sustained minor structural damages to her gunwale, bulwark stiffeners, guard rails and an air vent in the vicinity of trailer C (Figures 21 to 24).



Figure 21: Dented gunwale



Figure 22: Damaged bulwark stiffener



Figure 23: Damaged guard rails

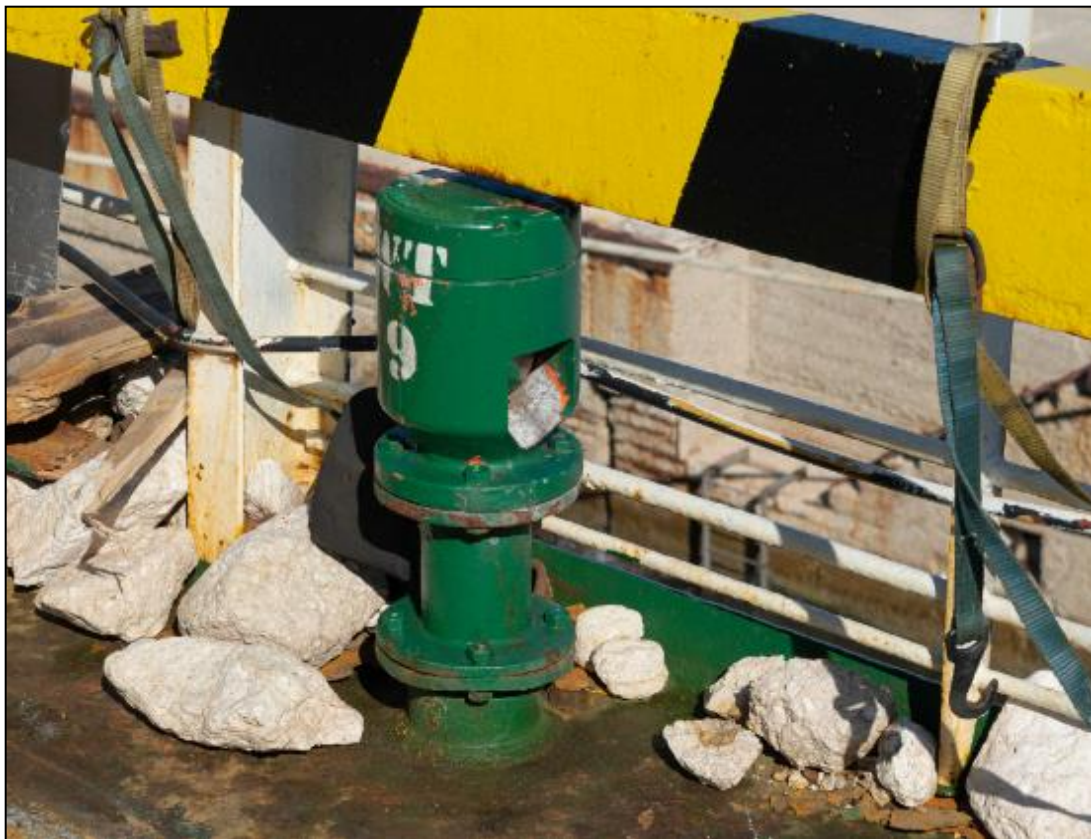


Figure 24: Damaged water ballast tank air vent, and cargo which escaped from trailer B

1.13 Subsequent Port State Control Inspection

On 09 October, an inspection was conducted by the port State control authorities at Porto Torres, whereby six deficiencies were identified. Amongst the identified deficiencies were three detainable items.

The identified deficiencies included:

- the crew members were not familiar with on board procedures for safety and accident prevention – detainable deficiency relating to the four crew members going onto the forecastle deck without the master's approval and without using safety equipment;
- some semi-trailers on Deck 3 were not stowed and secured in accordance with the CSM; and
- lack of familiarity with bridge installations / equipment – detainable deficiency relating to the incorrect procedures followed to save the VDR data.

Since the above were noted as ISM-related deficiencies, their rectification had to be verified by an auditor of the RO on 11 October, following which the detention was lifted.

1.14 Company's Procedures for Navigation in Heavy Weather

The vessel's SMS Manual contained procedures to guide the vessel's staff when navigating in heavy weather conditions. Checklists for navigation in heavy weather were included in the Manual, and these were to be completed and verified by crew members within the relevant departments of the deck, engine-room and hotel.

The checklist for the deck department included, amongst others, the establishment of routines for checking lashings (cargo securing arrangements) and shell doors, the adjustment of the vessel's course and speed, as necessary, the requirements for additional lashings on the anchors, and the monitoring of meteorological information.

Two of these checklists forms had been completed for this voyage – one at 2000, on 06 October, signed by the master and an officer of the watch (OOW), and one at 0800,

on 07 October 2019, signed by the master and another OOW. Both checklists had the aforementioned points ticked off as checked or completed.

1.15 Data from the Voyage Data Recorder

The vessel was fitted with a VDR, which met the relevant international requirements. Following the occurrence, it was reported that the Master had saved the VDR data.

However, upon the arrival of a VDR technician at Porto Torres, at around 0730 on 08 October, it was noted that the correct procedure for saving the VDR data had not been followed. As the VDR supported recording of data only for a period of 12 hours, the data covering the period of the accident had been overwritten by the time the VDR technician had boarded the vessel.

Due to this, the VDR data covering the period of the accident was unavailable to the safety investigation.

1.16 Consumption of Drugs and/or Alcohol

Following the accident, at around noon while the vessel was still at sea, an alcohol test was conducted on the master, chief officer, bosun, AB 2, AB 3, AB 4 and OS. All the test on these crew members returned a negative result.

It was reported that toxicological tests were conducted on the fatally injured crew member, which also did not reveal any signs of drug or alcohol use.

1.17 Work/Rest Hour Records

The crew members' work/rest hour records were found to be in compliance with the relevant requirements of the STCW Code and MLC, 2006.

2 ANALYSIS

2.1 Purpose

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, to prevent further marine casualties or incidents from occurring in the future.

2.2 Cooperation

During the course of this safety investigation, MSIU received all the necessary assistance and cooperation from the Italian Ministry of Infrastructure and Transport.

2.3 Safety Investigation Actions

On 07 October 2019, at around 1050, the MSIU was notified on this accident by the managers of the vessel. Thereafter, contact was maintained with the managers for further updates.

A representative of the MSIU visited the vessel on 10 October 2019 and commenced gathering evidence for the safety investigation. The injured crew members were interviewed on 16 October 2019, prior to their repatriation, followed by a second visit on board the vessel to gather further evidence.

2.4 Cause of the Injuries Suffered

Interviews with the injured crew members revealed that they were all struck by the wave that washed over the vessel's bow, while they were engaged in securing the anchors. The wave caused them to be violently pushed onto the various structures and fittings on the forecastle deck, which led to the various injuries suffered by them.

Furthermore, the autopsy report of AB 1 indicated that his fatal injuries were compatible with a violent projection and collision against fixed structures on the forecastle deck of the vessel, under the thrust of sea waves.

2.5 Effects of the Prevailing Weather

Evidence revealed that following the vessel's departure from Cagliari, she had experienced inclement weather. An entry in the vessel's deck log book, at 0800 on 07 October, indicated that the vessel was rolling and pitching, while experiencing Northwesterly winds of Beaufort force eight. The vessel was on a Northerly course at this time.

As a result of the vessel's course alteration to 335°, the vessel's rolling was reduced. The reduction in the rolling motions (and lateral accelerations) of the vessel must have facilitated the planned increase in securing arrangements on deck, as it was likely that the lateral movement of the cargo on board would have been reduced. However, on this course, the winds were taken closer to the vessel's stem, resulting in waves washing over the forecastle deck, which was not sheltered from the effects of the prevailing weather conditions.. The master therefore must have found himself in two situations which were less than ideal and therefore the safety investigation believes that the decision to alter course to 335° was considered to be the most appropriate to allow the crew members to increase the cargo lashings on deck.

2.6 Securing of the Anchors

As mentioned elsewhere in this safety investigation report, the checklist provided on board for navigation in heavy weather included a check for the requirements of additional lashings on the anchors. This point was ticked-off on the checklist which was completed following the vessel's departure from Cagliari, as well as on the checklist which was filled up the next day, at 0800.

However, evidence indicated that the chain stoppers of both anchors were in the open position when the crew members had gone to the forecastle to secure the anchors. Furthermore, the anchors were not lashed with the additional securing arrangements, which suggested that the anchors were neither secured after the vessel's departure from Cagliari nor at 0800 of the next day.

The safety investigation hypothesized on two possible scenarios. Although procedures required the anchors to be secured upon the vessel's departure from every

port, the crew members may have believed that the time taken to complete the voyage would not justify the effort and time required to secure the anchors. In fact, evidence indicated that securing of the anchors for such voyages was not common practice on board *Euroferry Malta*. A second scenario, which was considered by the safety investigation, was the possibility of a tacit acceptance approach whereby given that anchors had to be secured upon departure from every port, the task was assumed to have been done. That would have meant, however, that the (last) verification step of the anchor securing procedure would have been missed.

Diane Vaughan, a sociologist, researcher and academic, classifies this phenomenon as ‘normalisation of deviance’, defined as “the gradual process through which unacceptable practice or standards become acceptable.”⁵ This is a very typical approach in safety-critical domains whereby repetition of this ‘behaviour’ without adverse outcomes may, eventually and gradually, result in it becoming a social norm (in this case, on board *Euroferry Malta*).

2.7 Acceptance of Risk

As mentioned earlier in this safety investigation report, when the bosun had initially gone to the forecastle deck to check on the anchors, a wave washed over the forecastle deck, knocking him to the deck. Nonetheless, the bosun went on to call the other crew members to assist with securing the anchors.

It is likely that, on seeing the damages sustained by the trailers and the portable supports, the bosun may have been concerned that the anchors would also be damaged and/or cause damages to the vessel. Therefore, the safety investigation believes that the bosun may have considered the urgency to have both anchors secured. Most probably, the four crew members perceived the risk of damages to outweigh the risk of injury, leading them to accept the risk. It also meant that the crew members would have had to expose themselves to green seas on deck.

As mentioned earlier in this safety investigation report, it was reported that neither the master nor the chief officer was aware of the bosun’s intentions. Considering that the

⁵ Vaughan, D. (2004). Theorizing disaster: analogy, historical ethnography, and the Challenger accident.

portable radio, which was carried by the bosun, had not been used during this time, was suggestive of a situation which, all of a sudden may have been seen as very critical and required immediate action. It may have been at this time that the risk of damages may have not been a perception any longer given that on the forecastle deck, experiencing the heavy seas, the crew members could actually visualise the damages which resulted from the shipped green seas.

2.8 Cause of Damages Sustained by the Cargo

The rolling and the pitching motions of the vessel under the heavy weather conditions caused the cargo within the trailers, especially those loaded on Deck 4, to shift. This resulted in bulging of the sides of some of the trailers (Figures 26a and 26b).



Figures 26a and 26b: Bulging of the sides due to internal cargo shift

Cargo shifts in curtain-sided semi-trailers would lead to a centre of gravity shift towards the bulging side and upward to the side curtain top rail. The MSIU is aware that it is not unusual for vessels to experience problems with curtain-sided units, such as the one in Figures 26a and 26b. Although it is recommended that vehicles with high centres of gravity are stowed in positions of minimal roll, it is not always possible to accommodate this arrangement.

It is highly likely that the shifting of the cargo within the trailers added to the strain already being exerted onto the cargo securing devices, by the rolling and pitching motions of the vessel.

Furthermore, evidence suggested that the actual axle weights of trailer B (Figure 17) and another trailer (Figure 26a) were, in all probability, higher than that declared on the cargo manifest⁶. If so, this would have resulted in the crew being unable to determine the appropriate type of securing arrangements for these trailers, which most probably would have led to further strain on their respective cargo securing devices.

Taking into account that only four of the cargo securing devices (chains and shackles) were noted to have been damaged and that the damaged trailers had not experienced any longitudinal shift, the safety investigation is of the view that while most of the cargo securing devices could withstand the loads exerted onto them, the trestles and landing gear could not.

The motions of the vessel, shifting of the cargo within the trailers, strain on the cargo securing devices (due to these factors as well as due to some possibly overweight trailers), may have led to the failure of the trestles and landing gear. In turn, this may have led to further cargo shifting and subsequent damages to the trailers, particularly trailers A, B and C.

2.9 Cause of Damages Sustained by the Vessel

Most of the damages sustained by the vessel were directly in way of trailer C. The shifting of trailers A, B and C caused the container loaded on trailer C to be pushed

⁶ The safety investigation was able to view the contents of these trailers, which allowed for simple calculations to be made whereby it was found that the weight of these trailers was higher. However, there were no means to verify the exact axle weight of these trailers.

against the starboard gunwale of the vessel (Figure 21). Trailer C was pushed to the extent that its landing gear was lifted off the deck and the corner socket of the container on the trailer was lifted off the securing twist lock (Figure 19). It is highly likely that the lateral acceleration on this trailer, acting towards the starboard side of the vessel, in addition to its instability after its landing gear was lifted off the deck, resulted in damages to the gunwale, bulwark stiffeners and guard rails around the area of possible contact.

The damages to the water ballast tank air vent (Figure 24) most likely seemed to be the result of cargo falling out from trailer B and striking this air vent.

2.10 Fatigue and Consumption of Drugs / Alcohol

As mentioned earlier in this safety investigation report, the crew members' records of work/rest hours indicated that they were in compliance with the relevant legislation.

The safety investigation was unable to take into account that the heavy weather, experienced during the vessel's voyage and which could have had an impact on the quality of their rest⁷. Therefore, the safety investigation could not determine the extent to which the quality of their rest may have been affected. However, the reported actions and behaviours of the crew members, did not appear to suggest that they had been affected by their quality of rest. In the absence of such information, fatigue was not considered as a contributory factor to this occurrence.

From the results of the alcohol tests conducted on board, following the occurrence, and from the reported results of the toxicology conducted on the fatally injured seafarer, the safety investigation did not consider consumption of drugs and / or alcohol as being a contributory factor to this accident.

2.11 Passage Plan

As mentioned earlier in this safety investigation report, *Euroferry Malta* departed from Cagliari and proceeded along the Western coast of Sardegna towards Porto Torres. Reportedly, the weather was rough at the time of departure and, taking into

⁷ MSC.1/Circ.1598 *Guidelines on Fatigue*

account that the weather forecast had predicted it to worsen in the form of strong Northerly winds around Sardegna, rough seas and swell would have been encountered by the vessel, irrespective of the route followed.

The voyage along the Eastern coast was longer, which would leave the vessel exposed to weather conditions for a longer time. Furthermore, the voyage along the Eastern coast would have required the vessel to pass through the Bonifacio strait, where, in the opinion of the safety investigation, traffic density and swell would most probably be higher. Therefore, the safety investigation concluded that the passage plan of the vessel was not considered as a contributory factor to this accident.

2.12 Stability of the Vessel

It has already been determined that the vessel met the relevant stability requirements.

However, in ro-ro vessels, the cargo is stowed higher up in the vessel, as compared to, say, a bulk carrier or a tanker. Due to this, the KG of such vessels tends to be large while their GM tends to be small, which results in the vessels being ‘tender’. A tender vessel afloat, although stable (as ‘M’ would still be above ‘G’), will respond sluggishly to return to the upright condition when heeled. As the righting moments of such vessels are small, due to the small distance between ‘G’ and ‘M’, the vessel will offer low resistance to heeling and the period of roll will be long. This increases the chances of water being shipped onto the vessel’s deck. It also can cause the cargo units, as well as the contents of the cargo units, to shift and will prolong the strain exerted on the cargo securing devices.

As almost all of *Euroferry Malta*’s ballast tanks were full, and most of her wing tanks were empty, the crew members were not in a position to increase the vessel’s GM by taking in any more ballast water or pumping out ballast water from her wing tanks, so as to lower the position of the vessel’s G.

Taking into account the above, the safety investigation concluded that, while the stability conditions of *Euroferry Malta* did not directly cause the accident, the events surrounding the accident were a result of the inherent stability conditions of the vessel.

2.13 VDR Data

The safety investigation revealed that the correct procedures to save the VDR data were not followed. Consequently, potentially vital data was not available to the safety investigation.

The technician's visit on board confirmed that the procedures posted near the VDR display panel did not reflect the procedures contained within the VDR Manual. For instance, the posted procedures missed crucial steps to back-up the VDR data and prevent it from being overwritten.

Further investigation into the matter revealed that the discrepancy between the posted procedures and the correct procedures contained in the Manual was not identified during any of the internal audits conducted by the Company, external audits conducted by the recognized organization, surveys conducted by the classification society, flag State inspections or port State control inspections.

While noting that the VDR data would not be as crucial for this safety investigation as compared to a safety investigation into a different type of occurrence, such as a collision, grounding, *etc.*, the safety investigation is of the opinion that the VDR data from *Euroferry Malta* could have facilitated a better understanding of the dynamics and circumstances surrounding this accident.

Navigational data, for instance, could have shed some light on the exact courses and speeds followed by the vessel, leading up to the accident, while the microphones could have picked up the extent and contents of communication⁸ between the bridge and the crew members on deck.

⁸ The safety investigation, however, did not exclude the possibility that this communication, even if it was available to the safety investigation, could have been in Bulgarian.

THE FOLLOWING CONCLUSIONS, SAFETY ACTIONS AND RECOMMENDATIONS SHALL IN NO CASE CREATE A PRESUMPTION OF BLAME OR LIABILITY. NEITHER ARE THEY BINDING NOR LISTED IN ANY ORDER OF PRIORITY.

3 CONCLUSIONS

Findings and safety factors are not listed in any order of priority.

3.1 Immediate Safety Factor

- .1 One crew member was fatally injured when a wave washed over the forecastle deck, while he was securing the vessel's anchors.

3.2 Latent Conditions and Other Safety Factors

- .1 The anchors were not secured, following the vessel's departure from Cagliari, contrary to what was indicated on the two heavy weather checklists completed prior to the accident.
- .2 Securing of the anchors for such voyages was not common practice on board *Euroferry Malta*.
- .3 Most probably, the securing of the anchors was viewed as an urgent and necessary task by the crew members, which led them to accept the risks associated with conducting this task in the prevailing weather conditions.
- .4 On seeing the damages sustained by the trailers and the portable supports, the bosun may have been concerned that the anchors would also be damaged and/or cause damages to the vessel.
- .5 The vessel, inherently being 'tender', was susceptible to water being shipped onto her deck.
- .6 The master therefore must have found himself in two situations which were less than ideal and the decision to alter course to 335° was considered to be the most appropriate to allow the crew members to increase the cargo lashings on deck.

3.3 Other Findings

- .1 The vessel's VDR data was not saved, following the accident, as the instructions posted for this purpose were incorrect.

- .2 Available information suggested that the actual axle weights of two trailers were probably higher than the declared weights of these trailers.
- .3 The motions of the vessel in heavy weather conditions, shifting of the cargo within the trailers due to the same and the subsequent strain on the cargo securing devices, along with the probability of an overweight trailer, was likely to have resulted in the failure of some trailer supports which, in turn, led to further cargo shifting and subsequent damages to some trailers.
- .4 It is highly likely that the minor damages sustained by the vessel's bulwark, gunwale, guard rails and an air vent were caused by shifting of the trailers and cargo that escaped from one the trailers.

4 ACTIONS TAKEN

4.1 Safety Actions Taken During the Course of the Safety Investigation

Following the accident, the Company took the following actions to prevent recurrence of similar accidents:

1. A safety meeting was conducted on board *Euroferry Malta*, whereby all crew members were informed that the Company's procedures and checklists for heavy weather had to be strictly complied with and that no tasks were to be initiated in heavy weather conditions without the master's consent.
2. A Fleet Circular, related to this accident, was promulgated amongst the Company's fleet, which stressed the importance of following the Company's procedures contained in the SMS manual.
3. The correct procedures for saving the VDR data, as contained in the Manual, were posted next to the VDR display.
4. A Fleet Circular was promulgated amongst the vessel's fleet, requesting confirmation that the operating procedures posted near the VDR were in accordance with the manufacturer's manual.
5. The Company's procedures were revised, to ensure that a cross-check of the posted VDR operating procedures is conducted whenever a master hands over command of the vessel to another master.

5 RECOMMENDATIONS

In view of the conclusions reached and taking into consideration the safety actions taken during the course of the safety investigation,

Valiant Shipping S.A. is recommended to:

17/2020_R1 review its cargo operations procedures with the aim of minimizing the possibility of under-declared cargo being loaded on board.

The flag State Administration is recommended to:

17/2020_R2 instruct the ROs to verify that VDR instructions posted on board are correct.