Marine Safety Investigation Unit

Transport Malta

SAFETY INVESTIGATION REPORT

202005/005 REPORT NO.: 10/2021 May 2021

This safety investigation has been conducted with the assistance and cooperation of the Office of the Deputy Commissioner of Maritime Affairs, Republic of Liberia.

MT *MOUNT EVEREST*

Serious injury to a crew member, during mooring operations in the port of Marsaxlokk, Malta 08 May 2020

SUMMARY

Mount Everest was mooring at *Ħas-Saptan* Fuelling Dolphin, within the port limits of Marsaxlokk, Malta, with a pilot on board.

At the aft mooring station, the mooring team noticed that one of the lines was tight, while the other was still slack.

Whilst trying to equalize the tension on both lines, the taut line parted and struck the third officer. Consequently, he suffered from serious facial injuries and was transferred to a hospital ashore, as soon the vessel was safely moored alongside.

The safety investigaton revealed that the breaking strength of the mooring rope had decreased by more than 50% of its certified MBL. Moreover, the stresses in the rope, due to friction and the angles at which it was led during this mooring operation, contributed to the accident.

Considering the safety actions taken by the Company, the MSIU has issued no recommendations.

MT *Mount Everest*

FACTUAL INFORMATION

Vessel

Mount Everest was a 23,313 gt, double-hull oil / chemical tanker, registered in the Republic of Liberia. She was owned by Sparrow Shipping LLC and managed by Donnelly Tanker Management Ltd., Greece. She was built in 2010, by Hyundai Mipo Dockyard Co. Ltd. in the Republic of Korea. The vessel's classification society was Det Norske Veritas – Germanischer Lloyd (DNV-GL).

The vessel had a length overall of 184.32 m, a moulded breadth of 27.40 m and a moulded depth of 17.20 m. She had a summer draught of 11.52 m, which corresponded to a summer deadweight of 45,566 metric tonnes (mt). At the time of the accident, she was loaded with 30,030 mt of gas oil, which brought her to an even keel draught of 10.03 m.

Propulsive power was provided by a six-cylinder, two-stroke, single-acting, low speed Hyundai-B&W 6S46MC-C7 marine diesel engine, which produced 7,860 kW at 120 rpm. This drove a fixed-pitch propeller, which enabled *Mount Everest* to reach an estimated speed of 15 knots.

Crew

Mount Everest's Minimum Safe Manning Document stipulated a crew of 10. At the time of the accident, the vessel was manned by 22 crew members, all Polish or Filipino nationals, bar for one, who was a Montenegrin.

The master was a 55-year-old Polish national. He had about 27 years of seafaring experience, 13 of which served in the rank of master. The master held an STCW[1] II/2 qualification and his most recent Certificate of Competency was issued on 11 July 2019, by the Polish authorities. He had joined the vessel on 02 December 2019, at the port of Alexandria, Egypt.

The injured third officer was a 30-year-old Polish national. He had about 10 years of seafaring experience, 1.7 of which served in the rank of a third officer with an STCW II/1 qualification. His most recent Certificate of Competency was issued on 11 July 2019 by the Polish authorities. He had participated in an online learning course on safe mooring practices and procedures on 15 January 2016. The third officer had joined the vessel on 14 November 2019 from the port of Rotterdam, in The Netherlands.

The able seafarer (AB), who formed part of the aft mooring team, was a 22-year-old Montenegrin national. He had about 3.5 years of seafaring experience, 12 months of which served in the rank of an able seafarer – deck. He held an STCW II/1 qualification, and his Certificate of Competency was issued on 15 March 2018, by the Montenegrin authorities. He had joined the vessel on 15 October 2019, from the port of Ashdod, Israel.

The ordinary seafarer (OS), who was assigned to operate the aft mooring winch, was a 32-year-old Filipino national. He had about eight years of seafaring experience, three of which were served in the rank of an ordinary seafarer. He held STCW II/5 qualifications, and his Certificate of Proficiency was issued on 13 January 2016, by the Filipino authorities. He had also joined the vessel on 15 October 2019, from the port of Ashdod, Israel.

Aft mooring arrangements

The vessel's poop deck (Figure 1) was fitted with two hydraulic mooring winches, each of which had a twin split-drum and a warping drum (Figure 2).

[1] IMO. (2010). *The Manila amendments to the annex to the International convention on standards of training, certification and watchkeeping for seafarers (STCW), 1978*. London: Author.

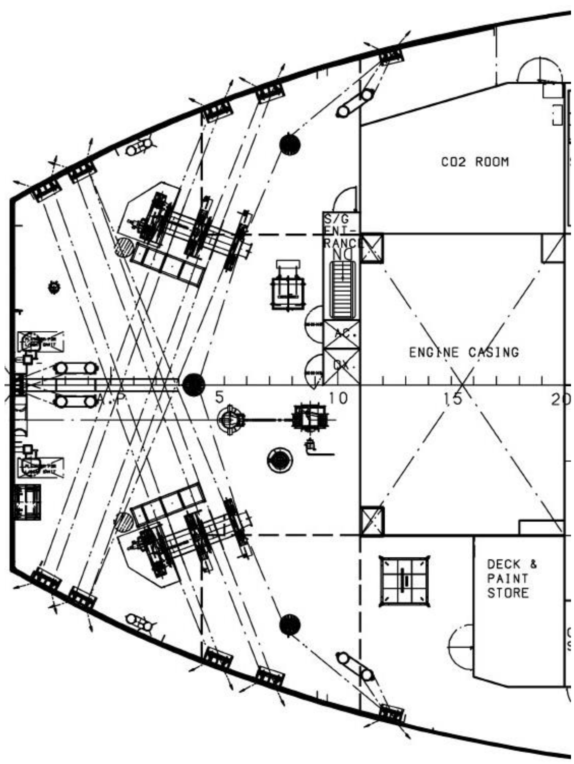

Figure 1: General Arrangement of *Mount Everest*'s poop deck

Figure 2: The aft, port side, twin split-drum mooring winch of *Mount Everest*

Each of the split-drums had their own brakes and could be disengaged from the winch, thus allowing for one to be isolated while operating the other. The vessel's records indicated that the brake holding capacity of each split-drum was 40.80 mt.

A split drum mooring winch and its features are depicted in Figure 3.

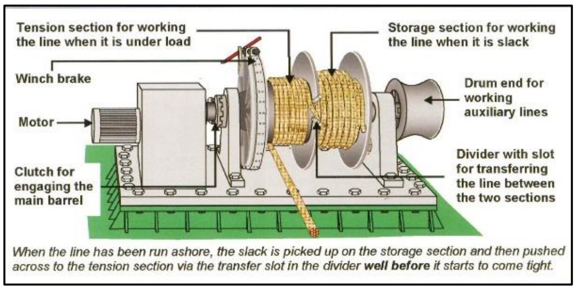

Figure 3: A typical split drum mooring winch

Source: Mooring and Anchoring Ships (Volume 1) – Principles and Practice
© The Nautical Institute 2009

Each split drum contained 220 m of ropes, of 56 mm diameter. In addition, five loose mooring ropes, of 52 mm diameter, were provided on board for additional mooring configurations, depending on the berth. The ropes were made up of 75% polysteel and 25% polyester.

The vessel's records indicated that some of the ropes had a minimum breaking load (MBL) of 55 mt while others had an MBL of 61.4 mt.

The berth

Mount Everest was designated to berth at *Ħas-Saptan* Fuelling Dolphin, at the port of Marsaxlokk, Malta. The dolphin was located offshore, approximately in the centre of Marsaxlokk Bay, and was equipped for the transfer of clean petroleum products.

This berth consisted of the dolphin and five mooring buoys, three South Southwest of the dolphin and two North Northeast of it, which were anchored to the seabed (Figure 4).

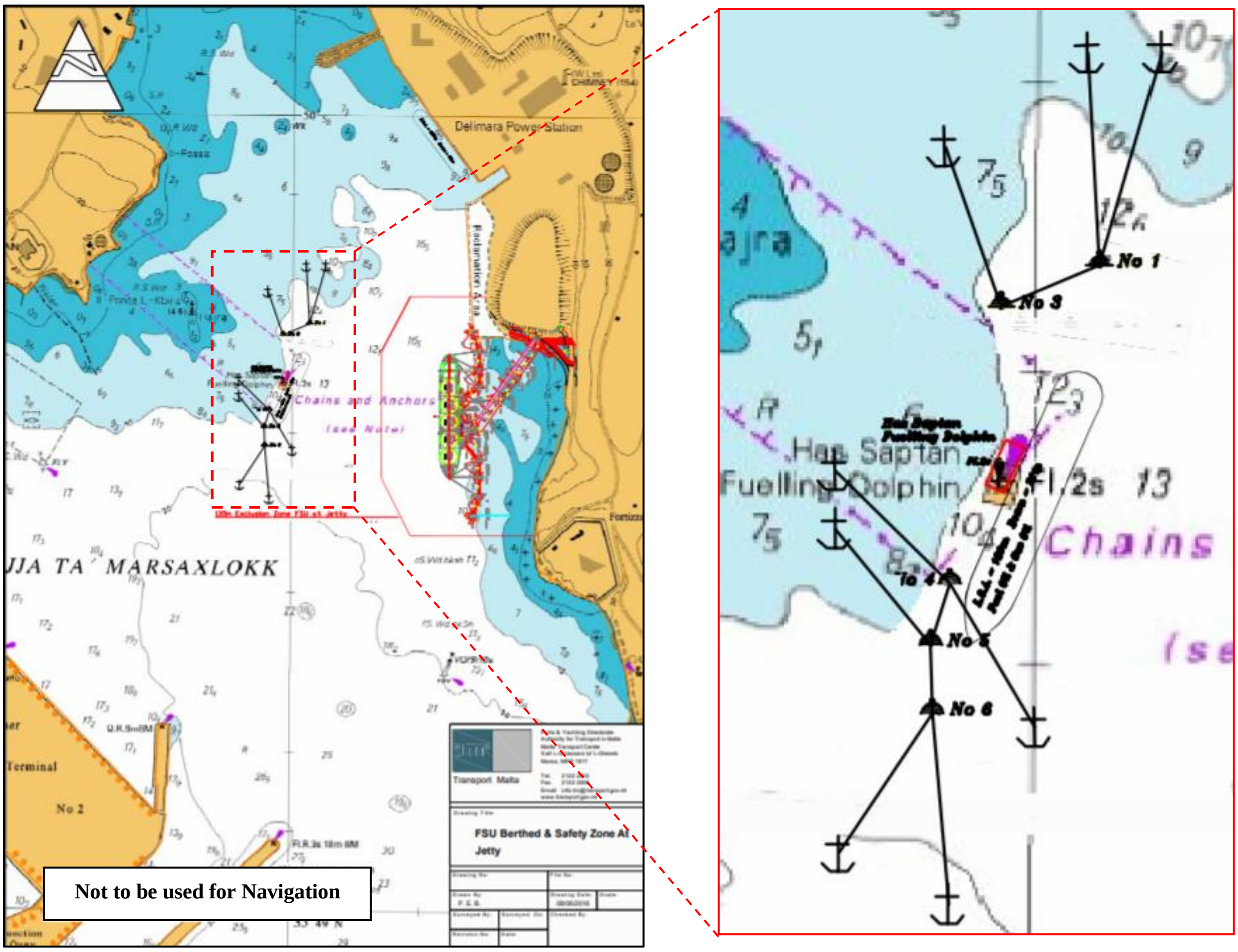

Figure 4: Location of *Ħas-Saptan* Fuelling Dolphin

Source: Notice to Mariners No. 05 of 2017 (Ports and Yachting Directorate – Transport Malta)

The dolphin was configured to have a vessel moored with her starboard side alongside, on a South Southwest heading.

Environment

Around the time of the accident, the weather was clear with a visibility of about 12 nautical miles (nm) and Easterly winds blowing at 8 knots. The sea state was slight, with a 1.2 m high East Northeasterly swell. The air and sea temperatures were recorded as 18 °C and 16 °C, respectively.

Narrative[2]

On 30 April 2020, *Mount Everest* departed from the port of Fawley, in the United Kingdom, bound for the port of Marsaxlokk, Malta, with a cargo of gas oil.

The voyage was uneventful and on 08 May 2020, at around 1230, the vessel arrived off the port of Marsaxlokk. A pilot boarded the vessel at around 1312. The forward and aft mooring stations were manned by the vessel's crew members.

The aft mooring station was manned by the third officer, an AB, and an OS. The OS was assigned to operate the relevant mooring winches, the AB had to tend to the mooring

[2] Unless specified otherwise, all times mentioned in this report are in local time (LT = UTC + 2).

lines, while the third officer would supervise the operation.

At around 1324, a tug was made fast at the forward port shoulder of the vessel and another at her port quarter. The vessel's records indicated that an exchange of information, relating to the vessel's approach and mooring, was affected between the master and the pilot around the same time. Reportedly, this exchange was carried out in the presence of all deck officers.

The mooring configuration agreed during the master-pilot exchange, necessitated the use of the port anchor, three headlines, three stern lines and three breast lines each, from the forward and aft (Figure 5).

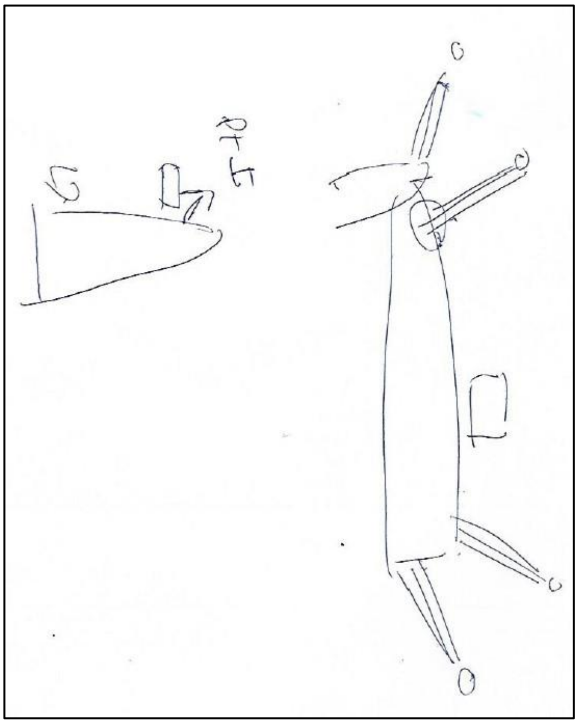

Figure 5: Sketch of the mooring configuration agreed during the master-pilot exchange

The master stated that he had advised the third officer to send two loose mooring ropes through the centre fairlead and one mooring rope from the port side mooring winch, through the starboard quarter fairlead, as stern lines (Figure 6).

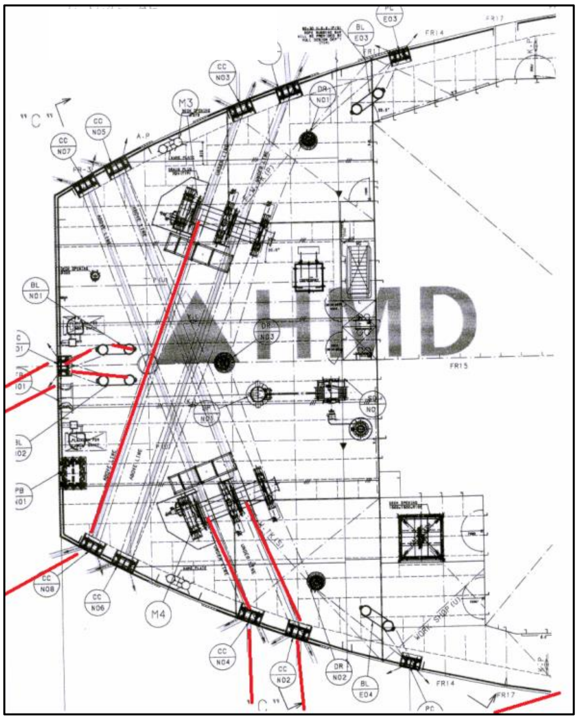

Figure 6: Aft mooring configuration intended by the master

At around 1342, the vessel approached the dolphin (Figure 7), dropped her port anchor to about seven shackles in the water, and the crew members passed the vessel's mooring ropes to be secured to the mooring buoys, beginning with the head and stern lines. At the same time, the vessel's engine was briefly kicked to 'dead slow ahead'.

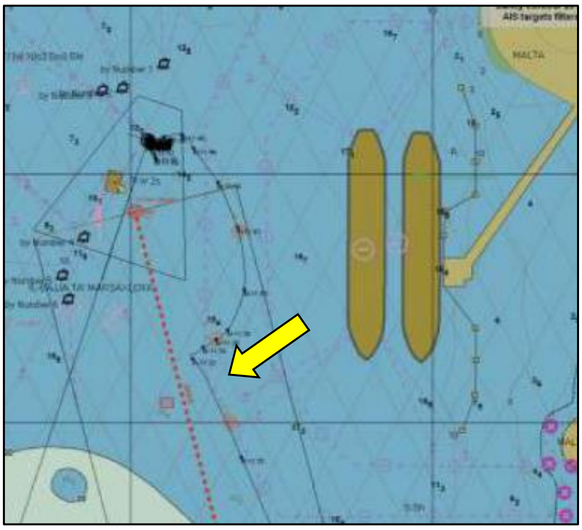

Figure 7: Screenshot of *Mount Everest*'s ECDIS showing the vessel's approach to *Ħas-Saptan* Fuelling Dolphin

Two of the three stern lines were passed from the port mooring winch (Figure 8), while the third stern line was a loose mooring rope, which was lightly wound around a mooring bitt (dashed green line in Figure 8), after it was secured on the mooring buoy. All three lines were passed through the centre fairlead on the vessel's poop deck (Figure 9). The master was not aware of the stern lines' configuration since it was neither visible from the bridge, nor was it reported to him by the third officer.

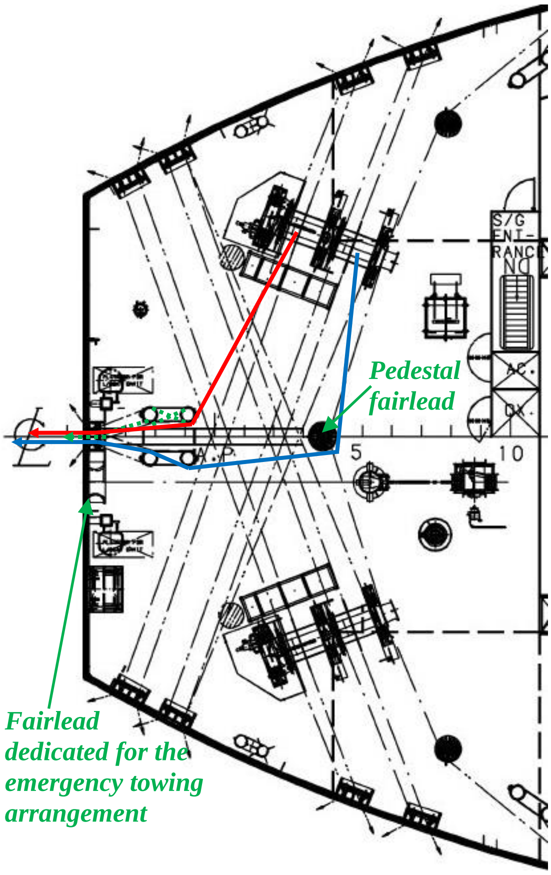

Figure 8: The stern lines (red, blue, and dashed green), as passed to the mooring buoys prior to the accident

Since the vessel still had a slight headway, the master instructed the mooring teams to leave the headlines slack and heave up on the stern lines. His intention was to control the vessel's headway, using the stern lines.

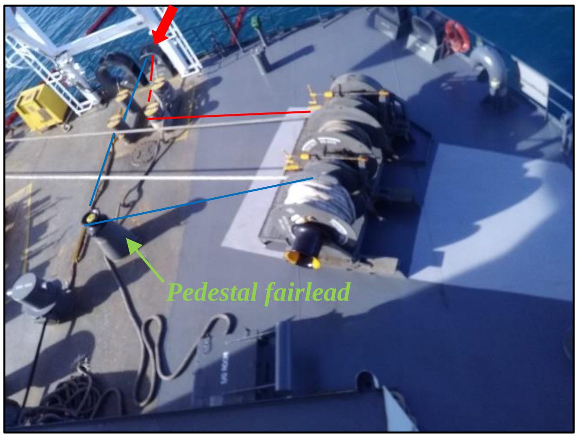

Figure 9: The centre fairlead (red arrow) through which all three stern lines were passed

Whilst the crew members at the aft mooring station were heaving up on the two stern lines, which were on the twin split-drums, they noticed that these two lines bore unequal tension, with the aftermost line (red line in Figure 8) being tighter than the forward line (blue line in Figure 8).

The AB then shifted the aftermost line from the storage section to the tension section of the split-drum, following which, the crew members continued to heave up the two lines.

At this stage, the master advised the third officer that he needed to hold on to the stern lines as the vessel was in the required berthing position. Once the aftermost line was taut, the third officer tightened its brake and disengaged it from the winch. Thereafter, they continued to heave up the forward line onto the storage section of its split-drum.

As the tension on the forward line increased, the crew members noticed that it was time to shift this line to the tension section. However, the AB found it difficult to shift the line and, therefore, the third officer proceeded to assist him.

Whilst the third officer and the AB were standing forward of the line, trying to shift the rope, the master observed the vessel experiencing a sudden surge ahead. Soon thereafter, he was informed that the aftermost line parted in way of its point of contact with the mooring bitts.

At around 1355, the section of the parted rope, which was spooled on the split-drum, snapped back towards the third officer (Figure 10), striking him first on his left forearm, followed by the left side of his head.

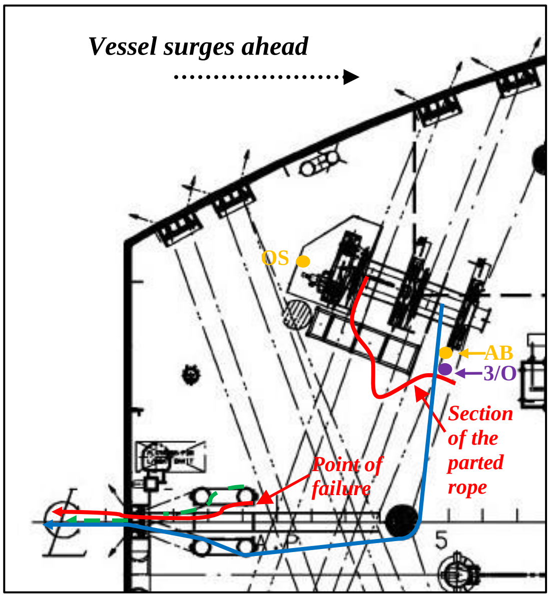

Figure 10: Dynamics of the accident

The injured third officer remained conscious. Other crew members took action to arrest the bleeding and immobilize the third officer's arm.

In the meantime, the pilot notified the vessel traffic services (Marsaxlokk VTS) on the accident and requested medical assistance to be organised and deployed. At around 1448, the vessel was moored with a different configuration (Figure 11) and the gangway was finally lowered at about 1518.

Thereafter, the injured crew member was disembarked and taken ashore, by the pilot boat and transferred to a local hospital by ambulance.

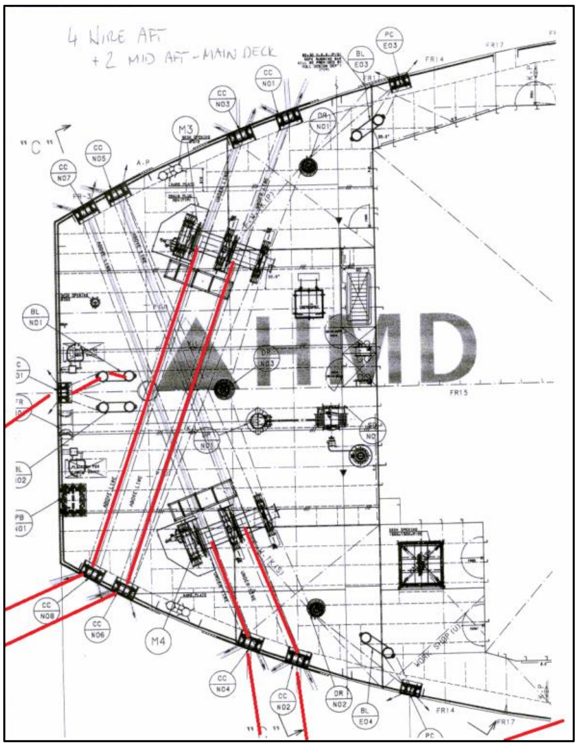

Figure 11: Mooring configuration after the accident

Sustained injuries

It was reported that the third officer had suffered serious injuries to his left jaw, which required surgery and post-surgical treatment, as well as minor bruises to his face, chest and left forearm.

Personal protective equipment

Several crew members recalled that the third officer was wearing a safety helmet, coveralls, leather gloves and safety shoes, all of which were in good condition.

The parted mooring rope

The mooring rope which had parted (Figure 12) had been received on board *Mount Everest* on 05 March 2015. The safety investigation was informed that following the receipt, this rope was stored in the vessel's forecastle storage space (Figure 13) and was first used in October 2019. It was kept on the same split drum of the aft mooring winch, until it parted.

Figure 12: A section of the failed mooring rope

Figure 13: Storage space of the mooring ropes

The vessel's safety management system (SMS) procedures required that mooring ropes be inspected along their entire length, monthly. The rope was last inspected by the crew members on 30 April 2020 and its condition was reported to have been deteriorated by 16% at that time[3].

The certificate of the parted mooring rope had been issued on 17 February 2015 and confirmed that it was a type-approved, 24-strand rope, made of 25% polyester and 75% polysteel, with a diameter of 56 mm, a length of 220 m and an MBL of 61.4 mt. It was also certified that the rope had a web protection sleeve at both ends. It should be noted that the MBL provided by the rope manufacturers referred to a new rope under a straight pull, which would reduce if the rope were passed around a fairlead[4].

Following the accident, a 15-metre-long section was sent to the rope's manufacturer for a breaking strength test. The test results revealed that this section of the rope had parted after approximately 188 seconds, when the test load had reached about 302 kN (30.8 mt).

No additional tests were carried out on the rope. The MSIU was informed that the crew members had disposed of the remaining section of the rope.

Records of hours of work / rest

The records of hours of work / rest of the master and all crew members of the aft mooring team indicated that their rest periods were in accordance with the relevant requirements of the STCW Code and MLC, 2006.

The injured third officer's records indicated that he had rested for 7.5 hours in one stretch, prior to commencing a navigational watch at 0800, on the day of the accident.

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3 This matter will be addressed in more detail in the 'Analysis' section of this safety investigation report.

4 Clark, I. C. (2009). *Mooring and anchoring ships: principles and practice* (Vol. 1). London: The Nautical Institute.

Consumption of drugs / alcohol

The Company's drug and alcohol policy prohibited the use and / or carriage of any form of drugs and alcoholic beverages and food which may contain drugs and alcohol, except for prescribed drugs. This requirement applied on board and ashore.

At around 1500, after the vessel was moored, alcohol tests were conducted on board, on the master and all deck crew members, including the injured third officer. All tests returned negative results.

Tests for drugs were not carried out on board; however, the hospital report did not indicate the presence of any drugs in the injured crew member's system.

VDR data

The VDR data was not saved, following the accident. Furthermore, the vessel's SMS procedures did not require VDR data to be saved in cases of occupational accidents.

ANALYSIS

Aim

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

Cooperation

During this safety investigation, the MSIU received all the necessary assistance and cooperation from Office of the Deputy Commissioner of Maritime Affairs, Republic of Liberia.

Safety investigation actions

On receiving the initial notification on the accident, the MSIU contacted the vessel's local agents to obtain further information on the accident and its severity. At that stage, the MSIU requested for samples of the parted mooring rope to be preserved on board for the purposes of tests and analysis. Subsequently, communication with the vessel's managers were established through the assistance of the vessel's flag State Administration.

The safety investigation was later advised by the Company, that the intention was to forward a section of the parted mooring rope to the manufacturers for a breaking strength test. Since the results of this test did not identify the cause(s) of the rope's failure, the MSIU requested for samples of the parted rope to allow the MSIU to conduct further analysis. However, it was reported that the manufacturers, as well as the vessel, had disposed the rest of the mooring rope.

Immediate cause of the accident

The third officer suffered serious injuries after one of the stern mooring lines parted and struck him during its snap-back.

The mooring rope in question was on the tension section of the aftermost split-drum of the mooring winch. This split-drum was secured by its brake and disengaged from the winch.

Cause of the mooring rope failure

As mentioned earlier in this safety investigation report, the brake holding capacity of each split-drum was recorded as 40.8 mt. Any load exceeding this would have caused the brake of the split-drum to slip, thereby minimizing the possibility of parting of the rope on it.

The breaking test conducted on a section of the parted mooring rope indicated that its strength was reduced to less than 50% of its certified MBL, *i.e.*, 30.8 mt. This suggested that the rope had parted before the split-drum's brake holding capacity was reached.

Since no further tests or analysis (say, a microscopic analysis) were conducted on the failed mooring rope, the safety investigation was unable to ascertain the exact cause(s) of its failure. Nonetheless, the MSIU hypothesized that the strength of the mooring rope may have been reduced due to eventual deterioration of its external and/or internal fibres.

A mooring rope's fibres would be prone to deterioration, and thus a reduction in the overall strength (MBL) due to:

- regular abrasion of the rope's external fibres caused by rubbing against hard surfaces, or even other ropes (chafing);
- abrasion of the rope's internal fibres caused by friction between rope strands, generating heat and causing the fibres to melt[5];
- exposure to environmental factors, such as sea water, rainwater and ultraviolet radiation over a period of time, which would affect both the external as well as internal fibres;
- contamination of the ropes internal and external fibres by chemicals, such as acids, alkalis, paint, thinners, *etc*.;
- tensile fatigue, which is caused by regular friction between the rope's internal fibres, over a long period of use within the rope's limits. Tensile fatigue may be accelerated by the salt in sea water[6]; and
- shock loads experienced during a particular mooring operation.

Given that the failed mooring rope of *Mount Everest* was put into use in October 2019, it would have been exposed to environmental factors for just about seven months. The safety investigation, therefore, did not consider exposure to environmental factors and tensile fatigue as contributory factors to this accident.

Deterioration of the rope's external fibres

The external fibres of a mooring rope are susceptible to abrasion during mooring operations, when the rope rubs against deck fittings, such as fairleads, mooring bitts, the hull, *etc*., as well as other ropes, especially under tension. Considering the construction of a vessel and the nature of mooring operations (critical, time-bound and conducted under the influence of the external environmental conditions), such abrasion can only be minimized but not avoided.

Contamination by chemicals, whether combined with abrasion or not, may also deteriorate the condition of the rope's external fibres, resulting in reduction of the rope's strength. While the storage space on board
Mount Everest may have been free from such contaminants, it cannot be excluded that the rope may have been exposed to them while on the winch drum, running on deck or on the pier, as well as on the water surface of a port, during mooring operations.

As mentioned earlier in this safety investigation report, shipboard records indicated that the failed mooring rope was inspected on 30 April 2020, where a deterioration of 16% was recorded. The safety investigation observed that this inspection was a visual one conducted on the rope's external fibres, by the crew members on board.

As much as the figure of '16%' seemed to suggest a certain degree of accuracy (as compared to a rounded figure), through the experience gained from previous safety investigations, the MSIU believes that results of such inspections may be significantly subjective, based on the crew members' experience and perceptions, and could differ

5 Oland, E., Schlanbusch, R., & Falconer, S. (2017). Condition monitoring technologies for synthetic fiber ropes - a review. *International Journal of Prognostics and Health Management, 8*(2), 1-14.

6 *Vide* Footnote 5.

from one person to another. Furthermore, unlike personnel representing the manufacturers, crew members are not specifically trained to accurately assess the physical conditions of a mooring rope.

In view of the above, the MSIU is of the opinion that the deterioration of the mooring rope's external fibres may have not been accurately assessed by the crew members on board *Mount Everest*. Hence, it was not excluded that the extent of deterioration of the mooring rope's external fibres (probably miscalculated by the crew members) due to abrasion, contamination, or a combination of both, may have contributed to this accident.

Deterioration of the rope's internal fibres

Deterioration of a mooring rope's internal fibres and strands is even more difficult to detect and identify during a visual inspection on board.

Friction between the internal fibres of the rope is quite common (and expected) in mooring ropes. Often, mooring ropes are worked at angles against the vessel's hull, through fairleads, and, as much as it is not recommended, against mooring bitts.

Under tension, a mooring rope bends around a surface at an angle, leading to compression at the bend. Even the expected, slight movements of a moored vessel may lead to high friction between the internal fibres of the rope, which lie within the region of this compression. This may have well been the case with the parted mooring rope of *Mount Everest*, which was leading around mooring bitts and was taut.

The safety investigation also did not exclude the possibility that the internal fibres may have been subjected to high frictional stresses over time, during previous mooring operations, which subsequently compromised the rope's breaking strength.

As mentioned earlier in this safety investigation report, it cannot be excluded that the parted mooring rope had either come into contact, or was exposed to chemicals while being used, which may have affected the rope's internal fibres, compromising the rope's strength.

Stresses encountered during the mooring operation

The aft mooring team passed two mooring ropes from the port side mooring winch's twin split-drum and one loose rope, all from the centre fairlead, as stern lines.

The mooring equipment of the vessel was not arranged to allow for mooring lines to be passed from any of the twin split-drums through the aft centre fairlead. Lines from the split-drum were meant to pass in a straight line, directly through the fairleads on the port and starboard quarters of the vessel[7].

With the applied mooring configuration, the aftermost stern line[8] was constantly rubbing against the mooring bitts, while being heaved in at a sharp angle. Most probably, this resulted in a section of the rope being chaffed against the mooring bitts, as well as experiencing high friction between its internal fibres, once the rope was under tension.

After the brake was applied, the general movements of a vessel afloat would have tended to further increase the chaffing and internal friction problem. Furthermore, this mooring line bore all the force required to keep the vessel from drifting ahead once it was under tension.

The safety investigation concluded that due to the deployed mooring configuration, the stresses in the aftermost mooring rope were a contributing factor to this accident.

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7 Black intermittent lines and arrows in Figure 8.

8 Red line in Figure 8.

Focus of the aft mooring team
As mentioned earlier in this safety investigation report, the third officer and the AB were trying to shift the forward rope onto the tension section of the forward split-drum.

The MSIU noted that the fleeting angle[9] created by the lead of this rope, from the storage section of the split-drum to the pedestal roller, was approximately 14°. A Nautical Institute's publication[10] recommended a maximum fleeting angle of 3° for fibre ropes, which would allow stowage of a slack rope on a winch drum without serious difficulty.

The MSIU had previously published a safety investigation report[11] which highlighted the difficulty in handling mooring ropes leading at large fleeting angles.

Furthermore, the height of the pedestal fairlead (1.05 m above the deck) was almost equal to the centre of the winch drum barrel, thereby causing the section of the rope between the winch drum and the pedestal fairlead to lie closer to the horizontal (and thereby tauter) when compared to the section of the rope after the pedestal fairlead.

Considering the large fleeting angle, and the height of the pedestal fairlead, it was highly likely that the crew members faced difficulty while trying to shift the rope onto the tension section of the split-drum. This, in turn, would most probably have caused the aft mooring team to shift their foci on the forward mooring line, thereby losing track of the amount of time for which the aft mooring line bore all the weight of the vessel's forward drift.

Surge of the vessel ahead
The master stated that the vessel had experienced a sudden surge ahead, following which, he was informed that the aft mooring rope had parted. It is possible that this sudden surge may have exerted a shock load on the single mooring rope that was holding the vessel from moving ahead, resulting in its failure.

In the absence of data from the vessel's VDR, the safety investigation was unable to ascertain the moment when this sudden surge occurred (which would have confirmed whether the parted mooring rope had experienced a shock load or not) and its cause. However, considering that the currents within Marsaxlokk Bay are negligible and that a gentle breeze was blowing from the East, the safety investigation concluded that this surge was not due to environmental factors.

Nonetheless, since this sudden movement was only reported by the master who was on the bridge, the safety investigation did not exclude the possibility that the surge may have occurred after the mooring rope had parted.

Communication on the agreed, intended and executed mooring plans
The agreed mooring configuration sketch indicated that three stern lines were meant to be passed from the stern of the vessel (Figure 5). However, the intended mooring configuration (Figure 6), which was reportedly conveyed to the third officer, did not reflect this configuration.

Furthermore, the mooring configuration executed at the poop deck (Figure 8), although notably different from the intended mooring configuration, seemed to reflect the agreed mooring configuration sketch. The statement by the injured third officer did not suggest an awareness of the intended mooring configuration; rather, it indicated

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9 The fleeting angle is the angle between the mooring rope and a plane, perpendicular to the axis of the mooring winch drum.

10 Clark, I. C. (2009). *Mooring and anchoring ships: principles and practice* (Vol. 1). London: The Nautical Institute.

11 Marine Safety Investigation Report No. 20/2014.

that he was following the agreed mooring configuration.

Taking into consideration the above, the safety investigation believes that there was a breakdown in communication during the discussion between the master, the pilot and the deck officers, whereby the agreed mooring configuration was not amended, at that time, to reflect the fact that three mooring lines could not be passed from the vessel's stern.

The MSIU considered this communication issue to be a contributory factor to this accident.

Fatigue and consumption of drugs / alcohol

The work / rest hour records of all crew members of the aft mooring team were compliant with relevant requirements. The safety investigation, however, could not confirm the quality of their rest hours.

Nonetheless, in the absence of any evidence which could have indicated that the actions or behaviour of the crew members were symptomatic of fatigue, the latter was not considered contributory to this accident.

Since the results of the alcohol tests conducted were negative and considering that the hospital report did not indicate the presence of drugs, the same were not considered as contributory factors to this accident.

Other findings

It was not excluded that the crew members would have found it difficult to execute the intended mooring configuration.

Since the vessel was fitted with a single pedestal fairlead along its centre line on the poop deck, the crew members would not have been able to heave up and tighten the two loose mooring ropes, simultaneously.

An assessment of the vessel's mooring equipment layout and plan further suggested that, if the aft mooring team were to heave up any one of the two loose mooring ropes, along with the rope passed from the mooring winch, they would have faced difficulty in equalizing the tension in these two ropes. The two ropes (one loose rope and one from the winch) would cross each other at near equal heights which, besides increasing the risk of friction between them, would have made it difficult to tighten them equally.

The VDR data had not been saved. The vessel's SMS procedures did not require that VDR data is saved following occupational accidents. The VDR data would have provided the safety investigation with crucial information on this occurrence, including details of the discussions on the mooring configuration, communication between the bridge and the mooring teams, and the moment and cause(s) of the experienced surge of the vessel.

CONCLUSIONS

1. The accident occurred when one of the stern lines parted and struck the third officer on the poop deck.
2. A breaking test of the rope, conducted after the accident, revealed that its strength had decreased by more than 50 % of its certified MBL.
3. It was hypothesized that the rope's external and internal fibres may have deteriorated due to abrasion / friction and / or chemical contamination.
4. It is also highly likely that the stresses induced in the rope, due to internal friction and chaffing during this mooring operation, were contributory factors to this accident.
5. The aft mooring configuration deployed for this operation was not

supported by the vessel's mooring design.

6. The crew members found it difficult to shift the mooring rope passed from the forward split-drum onto its tension section due to the large fleeting angle of the rope and the height of the pedestal fairlead around which it was passed.
7. The crew members' attention was shifted on the mooring rope passed from the forward split-drum, which was not yet under tension. During this time, the rope passed from the aftermost split-drum took all the weight generated by the forward drift of the vessel.
8. It is very likely that there was a breakdown in communication during the discussion on the mooring configuration.
9. It is also likely that the intended mooring configuration would have been difficult to apply, considering the heights and distances between the mooring equipment on the poop deck.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION[12]

During the safety investigation, the Company took the following safety actions, intended to prevent similar accident on board its fleet, as follows:

1. Amended its internal shipboard audit procedures to include a mooring operations audit.
2. Circulated its internal investigation report and issued a Fleet Safety Bulletin on safe mooring operations.
3. The generic risk assessment for mooring operations was revised to emphasize clear communication procedures, minimum number of mooring team members required, and the importance of supervision and overview.
4. The Company's procurement procedures were revised so that only mooring ropes with the latest snap-back-arrestor technology[13] would be ordered.
5. Procedures were introduced to have one rope per ship tested for residual strength on an annual basis.
6. Conducted additional training for mooring operation on board its fleet.
7. Moreover, the following preventive measures have been adopted:
   a. A minimum manning requirement has been introduced at the mooring stations, depending on the complexity of the mooring operation, the outcome of the risk assessment exercise, available experience and / or port requirements;
   b. A maximum lifespan of five years has been established for soft mooring ropes, with a turnover end-to-end requirement of 2.5 years;
   c. Snapback arrestor ropes have been introduced;
   d. Initiated and performed campaigns on safe mooring operations and introduced a 'stop work authority' programme;
   e. Initiated training for shore and onboard personnel on the inspection and maintenance of mooring ropes.

[12] **Safety actions and recommendations shall not create a presumption of blame and / or liability**.

[13] The core of these ropes has energy absorption properties whereby, if the rope parts, the core absorbs the snap-back forces, leading to a reduction in the snap-back.

8. Amended Company procedures to ensure that VDR data is also saved following similar accidents.
9. The SMS Manual has been amended to include references to industry standards concerning the inspection of mooring ropes.

RECOMMENDATIONS

No safety recommendations have been issued as a result of this safety investigation.

SHIP PARTICULARS	
Vessel Name:	*Mount Everest*
Flag:	Liberia
Classification Society:	Det Norske Veritas – Germanischer Lloyd
IMO Number:	9470985
Type:	Oil / Chemical Tanker
Registered Owner:	Sparrow Shipping LLC
Managers:	Donnelly Tank Management Ltd., Greece
Construction:	Steel
Length Overall:	184.32 m
Registered Length:	177.46 m
Gross Tonnage:	23,313
Minimum Safe Manning:	10
Authorised Cargo:	Liquid in bulk

VOYAGE PARTICULARS	
Port of Departure:	Fawley, U.K.
Port of Arrival:	Marsaxlokk, Malta
Type of Voyage:	International
Cargo Information:	30,030.33 mt of Gas Oil
Manning:	22

MARINE OCCURRENCE INFORMATION	
Date and Time:	08 May 2020 at 1455 (LT)
Classification of Occurrence:	Serious Marine Casualty
Location of Occurrence:	Port of Marsaxlokk, Malta
Place on Board	Poop deck
Injuries / Fatalities:	One serious injury
Damage / Environmental Impact:	One damaged mooring rope / None
Ship Operation:	Berthing
Voyage Segment:	Arrival
External & Internal Environment:	Clear weather with a visibility of about 12 nm. Easterly gentle breeze; slights seas with 1.2 m high East Northeasterly swell. Air temperature: 18 ℃; sea temperature: 16 ℃.
Persons on board:	22