Marine Safety Investigation Unit

Transport Malta

SAFETY INVESTIGATION REPORT

201810/004 REPORT NO.: 18/2019 October 2019

This safety investigation has been conducted with the assistance and cooperation of the United States Coast Guard Sector Anchorage.

MV *MAERSK JAIPUR*
Fatal accident in the Engine-room in position 54° 18.9' N 164° 26.9' W 08 October 2018

SUMMARY

On 08 October 2018, *Maersk Jaipur* was on passage through heavy weather conditions, bound for Dutch Harbor, Alaska. The vessel was rolling in the seaway. At around 0900 (LT), a heavy weather checklist was filled and all works were suspended. Shortly after commencing the passage through the Unimak Strait, with Southeasterly winds gusting to Beaufort Force 9, the engineer on duty informed the master and the chief engineer about loose equipment in the engine-room.

Most of the crew and officers went down to check the situation, when it was found that two spare auxiliary blowers broke free from their lashings and were moving freely on deck.

The fitter and the oiler were trying to secure the spare blowers in place, when both of them fell down. The oiler was pulled away by the second engineer just in time; however, no one could reach the fitter, and the blower crushed him against the bulkhead, resulting in fatal injuries.

Following the actions taken by the Company no recommendations have been made.

MV *Maersk Jaipur*

FACTUAL INFORMATION

Vessel

Maersk Jaipur was a container ship of 28,340 gt, 2,824 TEU, owned by Bellatrix Shipping Co. Ltd., and operated by Arkas Denizcilik Ve Nakliyat A.S., of Turkey. The vessel was built in the Hyundai Mipo Dockyard, South Korea, in 2008 and was classed with ABS. The vessel had a length overall of 222.15 m and a breadth of 30.00 m. The vessel's summer draft was 12.02 m, corresponding to a deadweight of 39,446 tonnes. At the time of the occurrence, the vessel was drawing a maximum draft of 8.0 m.

Propulsive power was provided by a Hyundai MAN B&W 7-cylinder, single acting, slow speed, two stroke internal combustion engine, which produced 25,270 kW at 104 rpm. This drove a single, fixed pitch propeller, to reach a service speed of 23 knots.

Crew

At the time of the accident, *Maersk Jaipur* had a crew complement of 23, which was in excess of the number stipulated in the Minimum Safe Manning Certificate. All crew members were Turkish nationals.

The master had spent 31 years at sea, seven of which were spent in the rank of a master mariner. He had obtained his Certificate of Competency 10 years prior to the occurrence and had been sailing with Arkas Denizcilik Ve Nakliyat A.S. for five years in the rank. The master joined *Maersk Jaipur* in Tanjung Pelepas on the 25 May 2018.

The chief engineer had obtained his STCW III/2 certificate of competence in 2006. He had been sailing as a chief engineer with the company for about a year and he had a total of 28 years at sea. He joined the vessel from Singapore, on 23 August 2018.

The fatally injured crew member, who was engaged on board in the capacity of a fitter, was 52 years old. He had been working with this Company for over three years in the same rank and held the certificate of an Able Seafarer Engine, STCW III/5, issued by the Turkish authorities. He had joined *Maersk Jaipur* on 16 April 2018, from Singapore.

Environment and Forecasts

Maersk Jaipur used multiple sources to obtain weather forecasts for the purpose of passage planning and for the safety of navigation, *i.e.*, Marine Safety Information (MSI) via the Inmarsat EGC system[1], NAVTEX[2] and the SPOS program[3] that was provided by the Company.

Weather synopsis reports for METAREA XII, in which the vessel was sailing, were received every six hours. Multiple storm warnings and gale warnings were transmitted for various locations of the METAREA, during the vessel's voyage from Kodiak to Dutch Harbor. The latest weather synopsis report relevant to the ship's passage was received approximately three hours before the accident; this indicated winds of 25 knots and seas of 3.65 m.

The meteorological reports received via NAVTEX were not saved for that voyage and therefore, were not available for the purpose of the safety investigation.

For that particular voyage, the SPOS programme was configured to receive

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1 The Enhanced Group Call (EGC) service is part of the GMDSS system, and is used for the transmission of messages to a group of ships or to ships in a specified area via the Inmarsat Satellites.

2 NAVTEX (Navigational Telex) is an information system for transmitting MSI and automatic reception of MSI by means of narrow-band direct-printing telegraphy. These transmissions are made and sent by Radio Telex transmitters from Coast Radio Stations.

3 SPOS (Ship Performance Optimization System) Program is an onboard weather routeing tool.

updated weather forecasts every six hours. The forecast for the Unimak Pass area, at the time that the vessel was due to transit, gave the following data:

08 October 2018 1200 (LT)
- Pressure 1005 hPa[4]
- Wind SE 25 knot
- Wind Gusts 31 knot
- Waves 3.0 m
- Sea SE 6s - 2.5 m
- Swell S 9s - 1.7 m

08 October 2018 1300 (LT)
- Pressure 1004 hPa
- Wind SE 26 knot
- Wind Gusts 32 knot
- Waves 3.2 m
- Sea SE 7s - 2.6 m
- Swell S 9s - 1.8 m

On the morning of 08 October, heavy weather was experienced by the vessel and was noticed to intensify throughout the day. Southeasterly winds were blowing with Beaufort Force 6 at 0400 (LT), and subsequently were recorded to have reached Beaufort Force 9 at noon. The air temperature was 10 °C. Atmospheric pressure along the vessel's route had dropped steadily at a rate of 1 mbhr^{-1}, from 1008 mb at midnight to 1000 mb at 0900 (LT).

Visibility was moderate to poor and the sky was overcast. The swell was reported to have been coming from a Southeasterly direction, with a height of about 5.0 m, which caused the ship to roll more often and reach angles of 30^{o} to 35^{o} (Figure 1).

Figure 1: Vessel's rolling heavily to starboard – photo taken from the bridge's dome camera

[4] 1hPa = 1 mb.

Unimak Pass

'Areas To Be Avoided' (ATBA) have been established around the Aleutian Islands, in order to reduce the risk of marine casualties which may result in pollution and cause damage to the environment. Ships of 400 gt and upwards are instructed to avoid these areas and instead, use one of the designated safety fairways available, to transit from the Pacific Ocean to the Bering Sea or vice-versa.

The Unimak Pass's safety fairway lies in between Unalaska ATBA and East ATBA (Figure 2). At its narrowest point, the Unimak pass is nine to 10 nautical miles (nm) wide, while the safety fairway's width is approximately four nautical miles. The pass is frequently used by vessels transiting the great circle route between Asia and North America.

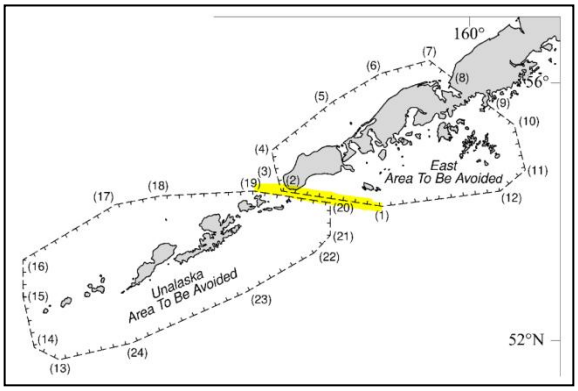

Figure 2: Unimak Pass's safety fairway (in yellow)

An Alternate Planning Criteria (APC) is required for vessels (tank / non-tank) calling or operating and transiting within 200 nm of Alaska when bound to or departing from a port or place in the United States (not on innocent passage). The vessel was contracted to 1-Call Alaska at the time of passage through the Aleutian Islands. 1-Call Alaska provides a USCG approved APC.

1-Call Alaska implements routeing measures in the areas and provides a 24-hour vessel monitoring/compliance verification programme. Vessels to which these ATBA apply must abide by 1-Call Alaska Vessel Operational Guidelines, which lay down procedures for transiting these areas. These

procedures also address the deviation of vessels from their intended course, or the entry into the ATBA for any reason. In such cases, Resolve Marine Services Alaska Coordination Centre[5] must be given a deviation notice indicating any course changes and the reason for deviation.

At the time of the accident, *Maersk Jaipur* was transiting through the safety fairway at a speed of 12 knots, and the closest distance from shallow waters was approximately 4.6 nm to starboard (Figure 3). The closest boundary of the safety fairway was lying on her starboard side at about one nautical mile distance.

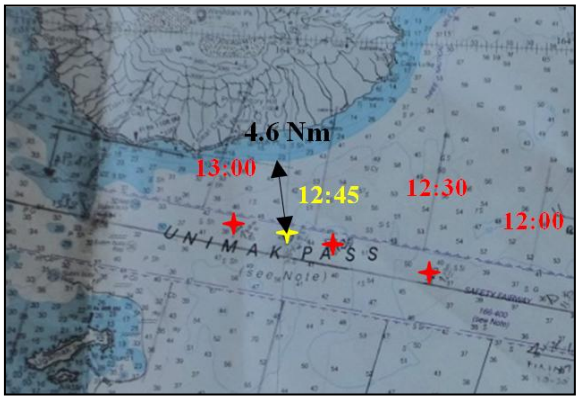

Figure 3: Extract from Nautical Chart in use, showing the positions of the vessel at the start of the Unimak Pass. Position indicated in yellow (12:45) is the time that the Fitter was fatally injured.

Two spare auxiliary blowers, each weighing approximately 1300 kg, were secured on the upper platform of the engine-room, which was level with the main deck. These units had a circular base, with a diameter of 67 cm, which made contact with the deck and were approximately 148 cm high (Figure 4).

Each blower was placed among four steel angles, each 6.35 mm thick, welded to the deck. In addition, each blower was secured to the deck using four plastic sheathed steel cables, each having 6.35 mm diameter, which were fastened with turnbuckles connected to floor eyebolts. All lashing wires led up at angles of more than 60° from the horizontal. No dunnage was placed under the blowers (Figures 5 and 6).

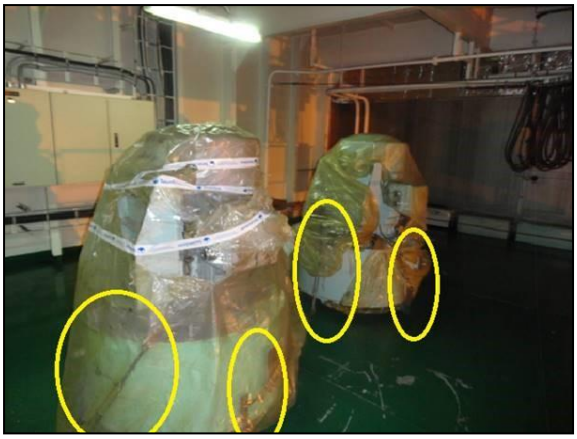

Figure 5: Lashed spare auxiliary blowers in the engine-room

Spare auxiliary blowers

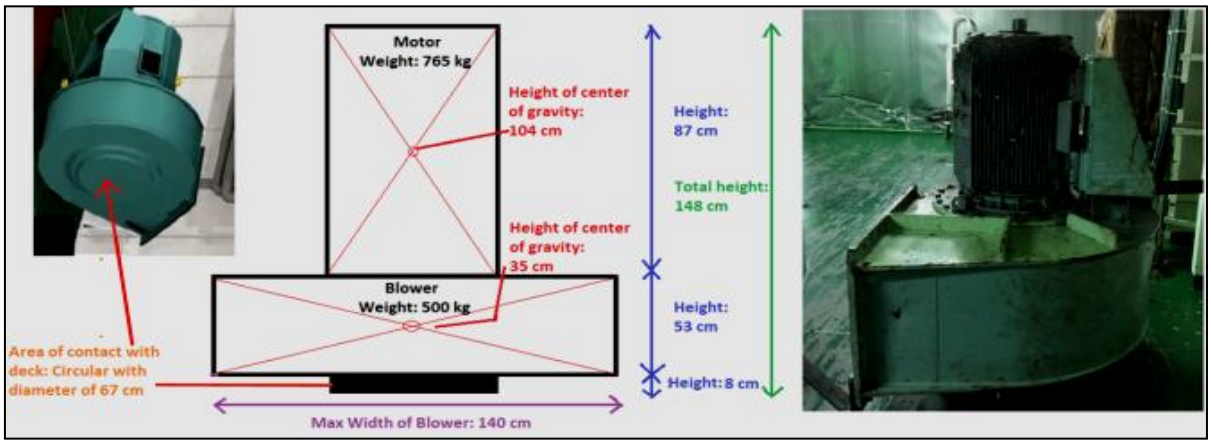

Figure 4: Dimensions of the auxiliary blower

[5] This Coordination centre is part of the Resolve Marine Group, which is engaged in a partnership with 1-Call Alaska.

Figure 6: Lashed spare auxiliary blowers in the engine-room

Stability

On departure from Kodiak, the vessel, which was carrying mostly empty containers, had a positive stability; in line with the 2008 IS Code[6] – with a fluid metacentric height[7] (GM_f) of 5.71 m. She had a total of 515 containers, having a total weight of 2888.6 metric tonnes. Her forward draft was 6.05 m, while her aft draft was 8.00 m.

Narrative[8]

The vessel left Kodiak, Alaska, on 06 October. On the morning of 08 October, the weather worsened, the vessel was experiencing rolls of 20° to 25° and at around 0900, the Company's heavy weather checklist was completed. The master ordered all works to be suspended, except for watch keeping duties.

By noon, the wind was blowing steadily from Southeast and had reached Force 9[9] on the Beaufort scale. The vessel was on a course of 278° (T), with sea and swell coming from her port quarter causing *Maersk Jaipur* to reach roll angles of 30° to 35°.

At 1225, as the vessel commenced her passage through the Unimak Pass, the second engineer, who was on duty, heard a very loud noise coming from the engine-room and he went to inspect its source. He soon realised that a spare auxiliary blower, amongst other items, had broken from its lashing and was moving freely on deck.

Before leaving the engine-room to report this matter, the second engineer took advantage of the momentary periods where the vessel was comparatively steady, and he placed some chocks under the blower.

Around the same time, the chief officer, who was in the messroom, claimed to have heard a noise and immediately called the bridge to advise the second officer to check the containers from the bridge level. The chief officer then proceeded to the cargo office to check the situation at various positions on deck, by using the ISPS cameras.

At 1235, while most of the crew and officers were in the messrooms for lunch, the second engineer discussed the unfolding situation in the engine-room. Shortly after, the master, chief engineer, third engineer, chief officer and several of the engine crew members proceeded to the engine-room to find out what had happened.

It was discovered that the free, spare auxiliary blower had ruptured the sterntube gravity tank, from where oil had spilled, causing the deck to become slippery. Furthermore, they noticed that the second spare auxiliary blower had also broken loose

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6 2008 IS Code: IMO International Code on Intact Stability, 2008 – detailing mandatory and recommendatory measures on stability criteria to ensure safe operations of ships.

7 The GM is the distance between the ship's Centre of Gravity and the initial transverse metacentre (the point from which the ship's buoyancy acts vertically upwards). The fluid metacentric height refers to the Vessel's GM corrected for Free Surface Moments (GM_f).

8 Unless otherwise stated, all times in this Safety Investigation Report are local times.

9 Wind speed 41 to 47 knots, high waves. Dense streaks of foam along direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray might affect visibility. – NP 100 The Mariner's Handbook.

from its lashing and was moving freely on deck.

Besides the spare auxiliary blowers, a fire extinguisher and a spare main engine exhaust valve had also broken loose from their securing arrangements. In addition, a large amount of spare items in the engine-room were loose and rolling on deck, leaving behind debris and creating obstacles for the crew.

The chief engineer went towards the site with the intention of stopping the oil leak from the sterntube gravity tank. After the inspection, he left the area to find suitable material to stop the leak.

The third engineer and one of the oilers temporarily secured the spare main engine exhaust valve, while the second engineer secured the fire extinguisher that was rolling on deck and eventually proceeded to the site where the blowers were moving freely.

The fitter and another oiler, having reached the site of the blowers, attempted to secure the items with synthetic rope, when the parts stopped moving in short time periods. While on site, the second engineer endeavoured to remove some of the debris, which were posing hazard to the crew. The other crew members observed that the fitter and the oiler had succeeded in temporarily securing one of the spare auxiliary blowers to the sterntube gravity tank.

Shortly thereafter, the spare auxiliary blower that was temporarily secured, again broke off from its temporary lashings, due to the vessel's violent movements. The chief engineer ordered the engine-room crew to move out of the dangerous area. At this time, the master started to make his way to the bridge. The rolling motion caused the blowers to move across the deck and towards the engine-room crew.

At one point in time, both the fitter and the oiler slipped while trying to leave the area. The oiler was pulled by the second engineer who also slipped in the process. The reefer technician pulled both, the second engineer and the oiler, to safety. However, the fitter, who was the furthest away from anyone's reach, was crushed between the bulkhead and one of the blowers, which rolled in his direction (Figure 7).

Figure 7: Location of the accident marked in red

As a result of the blunt blow, the fitter sustained multiple crushing injuries to his trunk and extremities and succumbed to his injuries soon after.

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.

Co-operation

During the course of this safety investigation, MSIU received all the necessary assistance and cooperation from the USCG.

Weather conditions

The weather, as recorded in the deck logbook for that day, can be seen intensifying throughout the succeeding entries. The winds were steady from a Southeasterly direction. However, from Force 6 on the Beaufort scale at the early hours of that day,

the winds increased steadily to Force 9, peaking at around noon time. Pressure in the area was down to 1000 mb.

While there were no records of swell in the deck logbook, it was confirmed by the master that the vessel was experiencing Southeasterly swell with heights of about 5 m.

The weather reports received via the EGC system, during the time leading to the accident, indicated a number of low pressure systems in the respective METAREA. These were highlighted with a relevant storm or gale warning, as appropriate. The warnings were for areas south of the vessel's route and all of them were affecting areas of the Pacific Ocean, at least 100 nm away.

The latest weather report, before the accident, was received at 0931 on that day. This indicated that the weather condition (synopsis) along the vessel's route at 1200 UTC *i.e.*, 0400 LT, was recorded to be: wind 25 Knots (Force 6) and seas 12 feet high (approximately 3.5 m). This corresponds with the weather data that was recorded in the deck logbook at 0400.

No specific forecast for the area along the vessel's route was received via EGC at 0931. Approximately five and a half hours had elapsed from the time of the weather synopsis to the time that the vessel received the report. In this period, the deck officers recorded a marked increase in wind's strength and a fall of atmospheric pressure in the deck logbook.

The weather updates received and uploaded on the SPOS program, during the vessel's voyage to Dutch Harbor, indicated less severe weather than the one recorded in the logbook. At noon time, the wind was recorded as Southeast Force 9, while the SPOS forecast indicated that the wind would be SE 25 knots (Force 6). The swell, as reported by the master, was from the SE and 5 m high, while the SPOS forecast indicated the swell to be 1.7 m from a Southerly direction.

Over a period of 12 hours, starting from midnight between 07 and 08 October, the SPOS forecast indicated a substantial drop in atmospheric pressure, from 1020 mb reaching 1005 mb at noon time. Records from the deck logbook indicated a steady fall of 1 $mbhr^{-1}$ from 0000 of 08 October and finally steadying at 1000 mb at 0900. At sea, such a drop in atmospheric pressure commonly indicates the onset of inclement weather.

The weather reports received did not give cues to the master of the actual inclement weather that was developing in the vessel's intended path. The fall in atmospheric pressure, which ensued during the early hours of 08 October, may have been the only indication of such development. In fact, the master requested that all works are suspended and all precautions in accordance with the Company's heavy weather checklist were taken, when it became apparent that the weather was progressively deteriorating.

Securing of Blowers

The CSS Code[10] provides general principles on the stowage and securing of cargoes, with the aim of dealing with the problems and hazards arising from improper stowage and securing. Although the CSS Code deals with cargo, the principles of securing can easily be applied to other equipment and stores as well.

The CSS Code Annex 5 / 5, deals with the securing of items against sliding and tipping. It states that:

- whenever possible, timber should be used between the stowage surface and the bottom of the unit in order to increase friction;

[10] IMO Code of Safe Practice for Cargo Stowage and Securing.

- the securing devices should be arranged in a way to withstand transverse and longitudinal forces which may give rise to sliding or tipping;
- the optimum lashing angle against sliding is about 25°, while the optimum lashing angle against tipping is generally found between 45° and 60° (figure 8); and
- if, owing to circumstances, lashings can be set at large angles only, sliding must be prevented by timber shoring, welded fittings or other appropriate means.

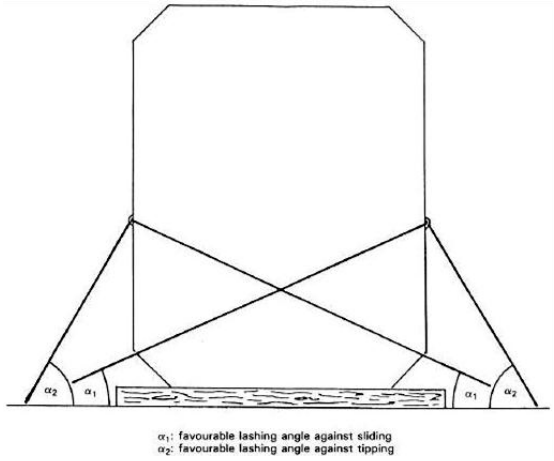

Figure 8: Extract from the CSS code - Principles of securing heavy items against sliding and tipping

As mentioned in the factual information section of this safety investigation report, dunnage was not placed below the blowers. Apart from the protection from moisture, dunnage provides an increase in friction.

The blowers were secured with wires fastened using turnbuckles, at angles of more than 60° to the horizontal. This did not provide any opposing force to prevent them from sliding in adverse weather conditions. The safety investigation hypothesizes that the blowers broke off from their lashings, during one of the violent rolling motions experienced by the vessel, as the lashing in use at the time did not prevent them from sliding. The turnbuckle, shown in Figure 9, may give an indication that the physical damage to it was caused due to the sliding movement of the blower, as it broke free.

Figure 9: Damaged lashings of auxiliary blowers. Bent turnbuckle shown by the red arrow.
(Photo courtesy of the USCG)

To help prevent sliding, each blower was placed in between four pieces of 6.35 mm thick, steel angles welded to the deck. These angle bars, however, seemed to have failed during one of the violent rolling motions of the vessel (Figure 10), and the first blower broke free from its lashings. The CSS Code recognizes that welded fittings may be used to prevent sliding, when lashings can only be set at large angles. However, the safety investigation was unable to determine which of the lashing equipment / items gave way first.

Figure 10: The base of one of the failed welded angle bars

From the evidence provided, it can be seen that the use of the wire lashings was set up in a manner to hold the blowers down to the deck and prevent them from tipping over.

The safety investigation was not aware as to when the blowers were lashed[11]. The vessel was taken over by the current owners in May 2017, and it was confirmed that, since then, the lashings on the blowers were as described elsewhere in this safety investigation report.

Safety management system

The SMS of the vessel identified bad weather and heavy sea conditions as a hazard to the integrity of the vessel, the cargo on board, the environment, and the crew. It goes on to list the safety actions expected to be followed on board, should bad weather be anticipated and/or encountered. The listed items, amongst other things, highlight the requirement for the chief officer to: control unlashed materials within the accommodation, to carry out extra lashing for deck cargo, and to perform lashing for free equipment/stores on deck and in store rooms.

It also emphasizes the need of controlling and securing all materials which were free. However, the SMS did not seem to address the engine-room space and the need to re-check and/or re-tighten items that are already lashed.

Furthermore, the heavy weather checklist EM-12-H appeared to be more focused on informing all parties of the onset of heavy weather, than in the preparation of the vessel for heavy weather.

The spare auxiliary blowers were already lashed by the previous crew, and the present crew seemed to be of the understanding that these spares were adequately lashed.

The vessel's stability

The vessel's rolling characteristics in still water are mainly determined by the vessel's GM and the distribution of weight in relation to the vessel's centre of gravity (G). As a matter of fact, when the GM increases the rolling period reduces. However, in a dynamic scenario (at sea), the vessel will have external influences acting upon it such as the wind and waves, which have to be taken into account to determine the vessel's motion in a seaway.

Maersk Jaipur's departure stability condition included almost three times as much, ballast than cargo. The relatively small amount of cargo being transported had restricted the crew from adjusting the final GM departure condition to a more suitable one. As per the In accordance with the requirements of the IS Code, the initial metacentric height, shall not be less than 0.15 m. *Maersk Jaipur* was well above this minimum limit, with a GM of 5.71 m.

A vessel with a large GM is said to be a stiff ship, with righting moments being so large that it causes the ship to return to the upright very quickly when heeled. In such conditions, when the angular velocity of the roll is excessive, violent rolling motions are experienced and excessive acceleration stresses are exerted on lashings. This condition could also be very uncomfortable for the crew.

Following the accident, the Company carried out an exercise by using the cargo available at the time of occurrence and adjusting the ballast quantity in various tanks, with the aim to determine how the GM of 5.71 m could have been reduced. It was evaluated that stability could not be improved with the quantities of cargo on board.

Parametric rolling

At 0650, the vessel had altered course to 278° in preparation to transit through the Unimak Pass. This was placing the vessel's port quarter open to the oncoming sea and swell.

As stated elsewhere in this safety investigation report, the vessel experienced violent rolling motions of between 30° and 35°, at times reaching 40° (Figure 11).

[11] Information on the lashing material and the related certification were not available to the safety investigation.

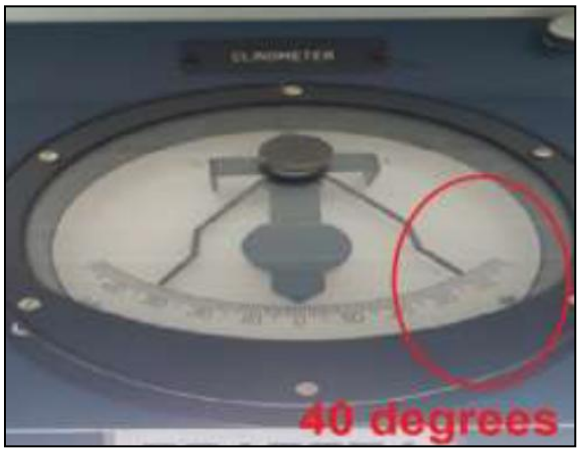

Figure 11: Clinometer on the bridge indicating a roll of almost 40°

The fact that the vessel was exposed to stern quartering seas, and that these violent motions had developed quickly was indicative that the vessel might have experienced parametric rolling.

"Parametric rolling is a critical phenomenon that leads a ship, under certain conditions, to quickly develop large roll amplitudes, due to parametric excitations. Hulls with large bow and stern flares, such as container and ro-ro vessels, are especially sensitive to this phenomenon."[12] The vessel experiences varying underwater hull geometries as the waves pass her, which effects her righting moments and thus her rolling periods.

MSC.1 Circ. 1228[13] discusses the complex, dynamic behaviour of a vessel in following and quartering seas. Various detrimental effects, such as - additional heeling moments due to deck-edge submerging, water shipping, cargo shifts, *etc.*, that may occur in combination with other dangerous phenomena, may create extremely dangerous circumstances and eventually capsize the vessel.

Altering course

The weather forecasts for the region, which were received prior to the vessel's departure and during the vessel's voyage to Dutch Harbor, did not indicate the need to take alternative routes. To this effect, the vessel proceeded on the planned voyage from Kodiak to Dutch Harbor.

From the time the second engineer raised his concern on the situation in the messroom to the time of the fatal injuries sustained by the fitter, 15 minutes had elapsed. During this period, most of the crew members were concerned with the securing of loose items in the engine-room.

It seems that only when the violent rolling motions had commenced once again, that the crew members had appreciated the situation. By the time the master arrived on the bridge to assess the possibility of altering course to reduce rolling, the crew member had already sustained the fatal injuries.

The timing of the master's decision to assess the possibility of altering course has to be analyzed within the context of a larger situation. At the time, *Maersk Jaipur* was navigating the Unimak Pass. At 1233, when the master was advised of the loose items in the engine-room, the vessel was proceeding along the Unimak fairway, with ATBAs close to port and starboard sides.

Altering course could have placed the vessel within an ATBA, obliging the master to report and give a deviation notice indicating the course changes and the reasons for doing so. It was not excluded that the master was hopeful that the freely moving spares would have been secured, without any additional intervention from his side.

In addition, the proximity to the shoreline and the prevailing weather conditions, as the vessel approached the narrowest part of the pass, may have influenced the master's decision not to alter course earlier and

[12] http://www.shipstab.org/index.php/conference-workshop-proceedings/issw2014-kuala-lumpur.

[13] Revised Guidance to the master for avoiding dangerous situations in adverse weather and sea condition.

potentially place the vessel in an extremely dangerous situation.

There may be considerable risk in attempting to turn a vessel about in a heavy sea; during the turn, the vessel tends to roll very heavily to leeward when beam-on to the sea, causing considerable stress on the vessel and her equipment.

Heavy seas and swell were coming from a Southeasterly direction. In order to heave-to[14], the vessel would have had to alter her course by approximately 140° to port. This manoeuvre alone would have put the vessel at a risk of experiencing even worse rolling motions, until she could settle with her head into the wind.

While it may be acknowledged that heaving-to would have allowed the crew to secure the freely moving blowers, the possibility that additional stress on the vessel would be incurred while turning about, cannot be dismissed. Neither can it be dismissed, that the hazard of the freely moving blowers could have caused even further damage while the vessel would be turning.

Taking shelter

Maersk Jaipur was exposed to predominantly Southerly weather throughout her passage from Kodiak to Dutch Harbor. The vessel could have taken shelter only after altering around Ugamak Island and, thereafter, proceeding North of Tigalda Island (Figure 12). This would have only been possible after approximately three to four hours of steaming, from the time that the blowers broke free from their lashings. The option of taking temporary shelter from the weather, until the blowers could be secured into place, was not available to the master.

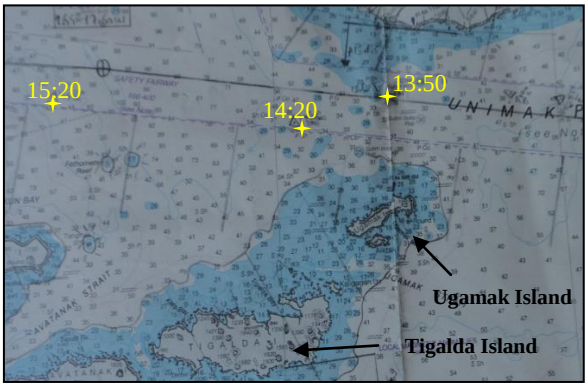

Figure 12: An extract from the Nautical Chart, showing the vessel's passage after occurrence.

Acceptance of risk

The place where the blowers were stowed was on a platform overlooking the engine-room that was level with the main deck (Figure 13).

Figure 13: Platform where blowers were stowed (red)

It would appear that the concern that the loose items could damage the railings, fall to the lower decks, and potentially cause further damages to the equipment and machinery below, convinced the crew members to intervene very quickly, in a bid to regain control of the situation. That condition exposed them to further risks as it necessitated that they approach the hazard on the platform.

[14] Heave-to is to lie with the sea on the bow and steam ahead at a minimum speed to maintain steerage way. In this position, rolling effects are greatly reduced; however, heavy pitching and pounding may occur.

CONCLUSIONS

1. The immediate cause of the accident was the failure of the lashing securing the spare equipment.
2. The weather reports received did not give cues to the master of the actual inclement weather that was developing in the vessel's intended path.
3. Dunnage was not placed below the blowers.
4. The blowers were secured with wires at angles of more than 60° to the horizontal. This did not provide adequate opposing force to prevent them from sliding.
5. The SMS did not seem to address the engine-room space and the need to re-check and/or re-tighten items that are already lashed.
6. Stability of the vessel could not be further improved.
7. The vessel, having a large GM, had suffered from excessive angular velocity, causing violent rolling motions and excessive acceleration stresses on lashings.
8. Safe Working Loads of the lashings were not known and, possibly not appropriate for securing the blowers.
9. Considering the fact that the vessel was exposed to stern quartering seas and that violent motions quickly developed, is indicative that the vessel might have experienced parametric rolling.
10. The crew were of the understanding that at the time it was important to intervene at the scene as quickly as possible for fear that the moving blowers could damage the railings, fall onto the decks below, and cause further damage.
11. Alteration of course was not an available option to the master as this would have placed the vessel closer to danger of grounding and it also could have resulted in even more violent motions, until the vessel could settle with her head into the wind.
12. Shelter was not an option at the time of occurrence as it would have only been available about three to four hours after the accident.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION[15]

Following the accident, the Company adopted a number of safety actions with the aim of preventing similar future accidents. These included:

- In-house training on lashings to all seafarers and office personnel conducting ship visits, and additionally for all seafarers, trainings on stowage and securing;
- A fleet-wide check of all engine-room spares to be adequately secured;
- Navigation in heavy weather checklist was revised to include the engine-room space, the lashing of cargo and other movable objects;
- The shipboard SMS section on heavy weather precautions was revised to include amongst other topics: parametric rolling;
- The development of a risk assessment library that will be included in the Shipboard SMS;
- Create a controlled document to record condition of lashing equipment used for other objects besides containers;
- Lessons learnt have been shared with the fleet;

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

- An additional ISM internal audit was conducted;
- Review of the Occupational Safety chapter and the Occupational Safety Training content in the Shipboard SMS;
- A meeting with the charterer, responsible for the commercial management of the vessel was planned to discuss actions to be taken when similar situations are encountered in the future.

RECOMMENDATIONS

In view of the safety actions taken by the Company, no safety recommendations were made.

SHIP PARTICULARS

Vessel Name:	*Maersk Jaipur*
Flag:	Malta
Classification Society:	ABS
IMO Number:	9343974
Type:	Container Ship
Registered Owner:	Bellatrix Shipping Co. Ltd.
Managers:	Arkas Denzicilik Ve Nakliyat A.S.
Construction:	Steel
Length Overall:	222.2 m
Registered Length:	212.2 m
Gross Tonnage:	28,340
Minimum Safe Manning:	15
Authorised Cargo:	Containers

VOYAGE PARTICULARS

Port of Departure:	Kodiak, Alaska
Port of Arrival:	Dutch Harbor, Alaska
Type of Voyage:	Short International
Cargo Information:	3112 mt of Containers
Manning:	23

MARINE OCCURRENCE INFORMATION

Date and Time:	08 October 2018
Classification of Occurrence:	Very Serious Marine Casualty
Location of Occurrence:	54^{o} 18.9’ N 164^{o} 26.9’ W
Place on Board	Engine Room
Injuries / Fatalities:	One Fatality
Damage / Environmental Impact:	None
Ship Operation:	In passage
Voyage Segment:	Transit
External & Internal Environment:	SE’ly winds Force 8/9, rough seas, rolling motion
Persons on board:	23