Danish Maritime Accident Investigation Board

SUMMARY REPORT

April 2014

EUGEN MÆRSK

Fire on 18 June 2013

The Danish Maritime Accident Investigation Board
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Front page: EUGEN MÆRSK. Source: Maersk Line

The marine accident report is available from the webpage of the Danish Maritime Accident Investigation Board www.dmaib.com.

The Danish Maritime Accident Investigation Board

The Danish Maritime Accident Investigation Board is an independent unit under the Ministry of Business and Growth that carries out investigations with a view to preventing accidents and promoting initiatives that will enhance safety at sea.

The Danish Maritime Accident Investigation Board is an impartial unit which is, organizationally and legally, independent of other parties

Purpose

The purpose of the Danish Maritime Accident Investigation Board is to investigate maritime accidents and to make recommendations for improving safety, and it forms part of a collaboration with similar investigation bodies in other countries. The Danish Maritime Accident Investigation Board investigates maritime accidents and accidents to seafarers on Danish and Greenlandic merchant and fishing ships as well as accidents on foreign merchant ships in Danish and Greenlandic waters.

The investigations of the Danish Maritime Accident Investigation Board procure information about the actual circumstances of accidents and clarify the sequence of events and reasons leading to these accidents.

The investigations are carried out separate from the criminal investigation. The criminal and/or liability aspects of accidents are not considered.

Marine accident reports and summary reports

The Danish Maritime Accident Investigation Board investigates about 140 accidents annually. In case of very serious accidents, such as deaths and losses, or in case of other special circumstances, either a marine accident report or a summary report is published depending on the extent and complexity of the events.

Contents

1. SUMMARY

On the morning of 18 June 2013, the crew on the Danish flagged container ship EUGEN MÆRSK discovered a container fire on the aft cargo deck. At the time the ship was in the Gulf of Aden, underway from Tanjung Pelepas, Malaysia to Rotterdam, the Netherlands. In the days leading up to the fire, the ship had passed some rough weather resulting in substantial damage to cargo containers and their lashings.

The crew commenced the firefighting effort and managed to contain the fire. The vessel was allowed to enter the Port of Djibouti where they received assistance from local firefighters and Dutch salvage experts. The fire was extinguished on 23 June 2013.

No persons were injured in the fire. There was no pollution and only limited damage to the ship's structure. A total of 16 cargo containers were damaged or destroyed.

The DMAIB's main focus in this investigation has been the significance of learning from managing adverse situations, organizational flexibility and adaptability, and the challenges ship crews face when dealing with their everyday tasks. This report is a summary of these findings.

2. FACTUAL INFORMATION

2.1 Photo of the ship

Figure 1: EUGEN MÆRSK
Photo: Dave Van Spronsen/Shipspotting

2.2 Ship particulars

Name of vessel:	EUGEN MÆRSK
Type of vessel:	Container ship
Nationality/flag:	Denmark (DIS)
Port of registry:	Randers
IMO number:	9321550
Call sign:	OXOS2
DOC company:	A.P. Møller – Mærsk A/S
IMO company no. (DOC):	0309317
Year built:	2008
Shipyard/yard number:	Odense Steel Shipyard – Lindø/210
Classification society:	American Bureau of Shipping
Length overall:	397.71 m
Breadth overall:	56.40 m
Gross tonnage:	170,794
Deadweight:	158,200 t
Draught max.:	16.00 m
Engine rating:	80,905 kW
Service speed:	26.0 knots
Hull material:	Steel
Hull design:	Single hull

2.3 Voyage particulars

Port of departure:	Tanjung Pelepas, Malaysia
Port of call:	Rotterdam, Netherlands
Type of voyage:	Merchant shipping, international
Cargo information:	General cargo in containers
Manning:	23
Pilot on board:	No
Number of passengers	0

2.4 Weather data

Wind – direction and speed:	SW – 6-7 m/s
Wave height:	2 m
Visibility:	10 nm
Light/dark:	Daylight
Current:	Northeast, 1 knot

2.5 Marine casualty or incident information

Type of marine casualty/incident:	Fire
IMO classification:	Serious casualty
Date, time:	18 June 2013 at 0628 LMT
Location:	Gulf of Aden
Position:	12°57’ N – 048°18’ E
Ship’s operation, voyage segment:	En route
Place on board:	Cargo deck

Human factor data:	Yes
Consequences:	16 containers damaged, lashing gear damaged, minor damage to ship's structure.

2.6 Shore authority involvement and emergency response

Involved parties:	Port of Djibouti Fire Brigade, Svitzer Salvage.
Resources used:	Svitzer Salvage Firefighting Team. Firefighting tug KHAMSIN.
Actions taken:	Firefighting assistance from tug and on board.
Results achieved:	Fire extinguished.

2.7 The ship's crew

The ship's crew comprised 23 persons: Master, 9 officers, 2 catering, 9 rankings and 2 cadets.

2.8 Scene of the accident

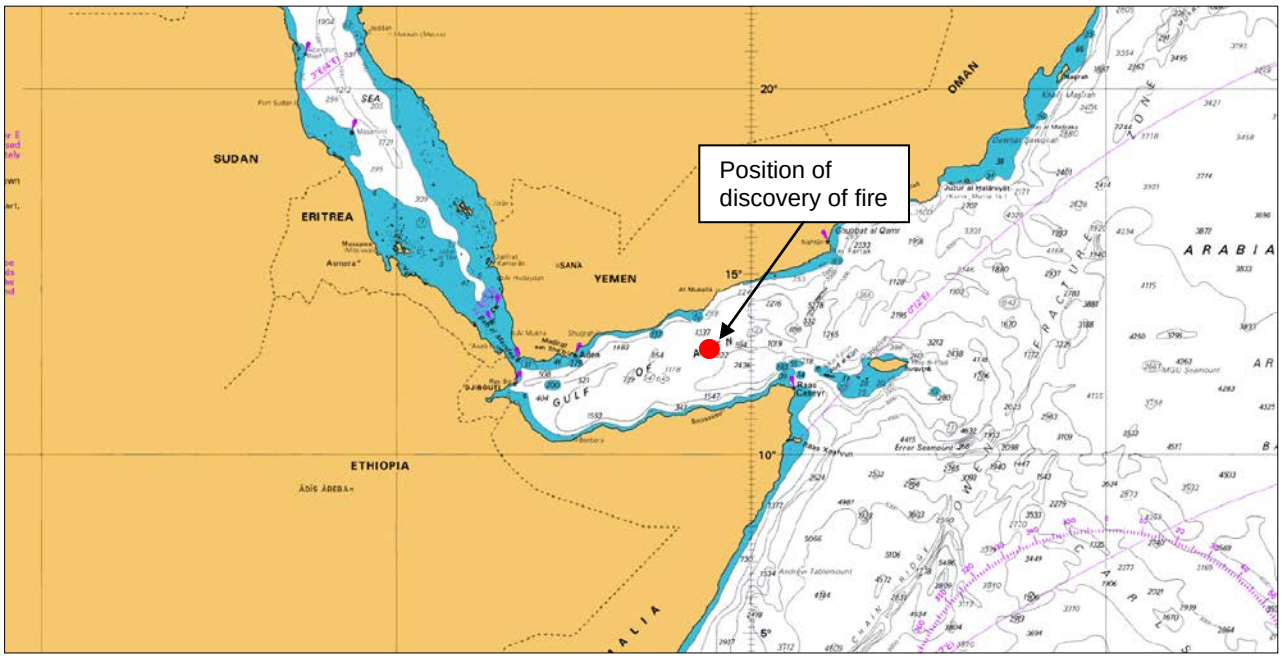

Figure 2: Approximate position of discovery of fire
Source: © Crown Copyright and/or database rights. Reproduced by permission of the Controller of Her Majesty's Stationery Office and the UK Hydrographic Office (www.ukho.gov.uk).

3. NARRATIVE

3.1 Sequence of events

On 18 June 2013, the Danish flagged container ship EUGEN MÆRSK was en route from Tanjung Pelepas, Malaysia to Rotterdam, the Netherlands. At 0628 the crew on board noticed thick smoke from the aftermost loading bay on the main cargo deck, bay 90. At this point in time the vessel was located in the Gulf of Aden (figure 2). Inspection confirmed a fire in two cargo containers, as well as considerable weather damage to containers and lashings in the area. The fire alarm was raised, the crew mustered accordingly and firefighting efforts were initiated.

In the days leading up to the discovery of the fire, the vessel had experienced heavy weather. Despite the crew's attempts to secure the safe lashing of the cargo, two container stacks on bay 90 started swaying and broke their lashings.

The vessel changed its course to head into the wind and reduced its speed. The fire was attacked from the stern area and considerable efforts were made to keep the fire away from dangerous cargo[1] located at bay 86, just forward of the burning containers. The trim was changed from 2 metres by head to 2 metres by stern to prevent burning containers from falling onto the dangerous cargo containers in case further collapses should occur. Throughout the operation the crew adjusted watch keeping schedules and division of work in order to optimize the firefighting and prepare for a prolonged effort.

Firefighting operations continued for the remainder of the day and the following night but despite the crew's swift and efficient efforts the fire could not be extinguished, only contained.

At 0040 on 19 June 2013, the ship anchored off Djibouti. The local fire brigade chief came on board to assess the fire. A firefighting tug arrived to assist with the continued efforts to extinguish the fire. Based on the assessment, the harbour master decided to allow the vessel to berth at Doraleh Terminal, Djibouti.

At noon on 19 June 2013, the ship was alongside and the firefighting continued. At 1600, firefighters from Svitzer Salvage, called in by the shipowner, arrived and joined the operation. All dangerous cargo from bay 86 was discharged. The firefighting at bay 90 continued until 23 June 2013 when the Svitzer team reported that all fires were extinguished.

Nobody was injured during the operation, no pollution occurred and there was only limited structural damage to the ship. In total 16 loaded cargo containers were damaged or destroyed.

3.2 Cargo operations

All containers involved in the initial fire were loaded on 2-3 June 2013 in Shanghai, China. As per normal procedure, all load planning was carried out from shore. Data was then entered into the ship's loading computer and was checked by the chief officer with regards to dangerous cargo categories and positions, lashing loads and forces, and stack weights.

For this voyage all stack weights were shown to be within the acceptable limits, however several stacks on bay 90 were in the region of 97-99% of the maximum allowable load.

As far as could be established, this was the first voyage since the vessel was built where loaded containers were carried on bay 90 stacked eight tiers high[2]. A few weeks prior to this incident a sister vessel had experienced similar mechanical damage to containers and/or lashings. For the sister vessel it was the first voyage in years where loaded containers were carried eight tiers high on bay 86.

[1] Ref. International Maritime Dangerous Goods Code (IMDG Code). The dangerous cargo on bay 86 consisted of 12 containers of explosives (fire crackers).

[2] *For general details on container stowage positions, please refer to DMAIB Marine Accident Report on the fire on board CHARLOTTE MÆRSK, pages 7-9. Available for download here: http://www.dmaib.com/Ulykkesrapporter/CHARLOTTE_MAERSK_FIRE_0702011.pdf)*

Two days prior to the fire, as the vessel sailed through rough weather, the lashings of at least two containers on bay 90 came loose. A twistlock was found broken and the corner castings of some containers were found cracked and damaged. A container stack on bay 90 was observed as it was swaying approximately 1.5 metres from side to side. The crew re-established missing lashing rods and re-tightened the loose lashings but the effect was not satisfactory as the container stack was still moving too much. Extra chain lashings were established and the ship's course and speed were adjusted to reduce movements.

Several containers in the relevant area showed some signs of damage and/or deterioration prior to the fire. The maintenance records for these containers show that they had been subject of regular maintenance and recent repairs.

According to the cargo manifests, the containers in which the fire originated contained clothing and slippers. In general it is not possible for either the port or the ship's crew to verify the contents of each individual container before loading.

3.3 Firefighting

Figure 4: View of bay 90 seen from aft. Containers where fire originated marked in red. Area most affected by fire/firefighting marked in yellow.
Source: DMAIB

The location of the origin of fire was inside containers MSKU 4534864 at pos. 900886 and MSKU 4535290 at pos. 900884 (figure 4).

The crew experienced limitations in the range of water from the fire nozzles during the attempt to extinguish the fire in the containers. It was noted that, should a fire occur in higher container positions, the crew would have no real chance of effectively fighting it with the present equipment.

As the ship was proceeding through a piracy area, most of the firefighting equipment was laid out around the deck area as a piracy countermeasure. This meant that when the crew needed it for firefighting they had to spend a significant amount of time collecting the equipment and closing all the fire hydrants that were left open.

Due to lessons learned from a previous incident on board CHARLOTTE MÆRSK, the vessel was carrying more firefighting equipment than required by rules and regulations. This proved beneficial as much of the extra equipment was used in the operation.

Further, the vessel was equipped with devices, comprising a power drill and a special spear/nozzle, specifically intended for firefighting within containers; however, it was not used. The main reasons for this were, firstly, that the heat from the fire hindered the crew from getting close enough and, secondly, that the equipment provided was too weak to effectively pierce the container sides.

In the crew's opinion it was essential for the outcome of the firefighting operation that the ship was allowed to enter the Port of Djibouti and thus had access to assistance from the firefighting tug, crew baskets, cranes and the port fire brigade.

4. ANALYSIS & CONCLUSIONS

4.1 Cause and origin of fire

Investigations into the causes and origin of the fire have revealed two likely main scenarios:

1) The fire started as a result of friction heat created by the collapse of the container stacks. This ignited the contents of the containers and the fire developed from there.

2) The fire was initiated at an early stage, perhaps even before the containers were loaded on board. After having slowly smouldered for a long time, the collapse of the containers created a sudden burst of oxygen which made the fire flare up and develop.

In both scenarios the collapse of containers is considered a major contributing factor to the fire.

The DMAIB's investigation has revealed nothing to significantly support one of the analyses of the direct cause of fire in favour of the other. However, the collapse of container stacks contributed to the fire starting or developing. The reason for the collapse of containers leading up to the fire was most likely a combination of multiple factors, including the structural integrity of the containers, the weather conditions, the stack weights, the lashings and dynamic forces acting on the ship.

As containers are not weighed upon loading, it is uncertain whether some stack loads exceeded the maximum acceptable load and thus could have contributed to the collapse of the container stacks. Given the fact that a deck officer normally does not know the criteria based on which the loading computer gives its results, he or she has no reason to question the output unless, of course, there is physical evidence to suggest problems.

It is within the responsible deck officer's authority to request changes to the stowage of the ship. Given the normal operating circumstances on a container ship – time constraints, financial considerations, social factors and mechanisms – it is doubtful, however, that he or she would actually do this, even if he or she felt uncertain that the stowage was entirely safe. Especially in cases where everything was shown to be within acceptable limits.

The combination of the position of these containers, at the very aft of the ship, and the ship's motions and the resulting dynamic forces may have contributed to the collapse of containers before the fire.

There is nothing to suggest the containers contained goods other than those declared in the manifests.

4.2 The outcome

Investigating what went well will provide useful information to enhance learning about how to manage recovery from accidental events.

Besides finding the initial causes of accidents, it is equally important to understand how the consequences of the accidental events were contained and how the recovery efforts were managed.

The outcome of the events on board EUGEN MÆRSK can be ascribed to a number of factors among which the DMAIB would like to underline the following:

Contributing to the successful outcome of the firefighting were the crew's efforts, and the fact that Djibouti Harbour was willing to assist and allow the vessel to enter the port, and the availability of specialized personnel and their equipment.

In the crew's opinion there was no doubt about the importance of getting water *inside* the burning containers. However, the special equipment provided on board for this purpose proved to be of little or no use.

One very important factor was the crew's ability to adapt to the situation at hand. By showing the willingness and capability to exercise organizational flexibility, i.e. delegating responsibilities, deploying crewmembers where they were most needed, changing watch keeping schedules, etc. as opposed to strictly following muster list procedures, the crew put themselves in the best possible position for a successful outcome.

A number of parallel conclusions were drawn from the DMAIB's investigation of the container fire on board the Danish container ship CHARLOTTE MÆRSK. Among these were:

- *The calm and determined management of the critical situation had a positive influence on the crew members and their determination to fight the fire.*

- *It is the assessment of the Danish Maritime Accident Investigation Board that a wide variety of safety considerations and decisions were made and actions taken within a short timeframe and under critical circumstances. Furthermore, that the shipboard organization was able to function effectively even when its main structure was changed in response to the unfolding events. These elements were decisive for the development and outcome of the accident which resulted in relatively minor damages to the ship and crew members.*

In a current investigation into a fire on board the Danish ro-ro cargo ship BRITANNIA SEAWAYS, the DMAIB will address the significance of shipboard management, organizational flexibility and adaptability to the successful handling of fires.

5. PREVENTIVE MEASURES TAKEN

Following this and other similar incidents, the company has equipped vessels with specially designed tools/fittings that ease fixing of fire hoses and nozzles. Compared to either holding the hoses manually or improvising fixtures, these devices are considered by crews to be quite an improvement for prolonged firefighting operations and anti-piracy measures alike.