

MA2014-2

**MARINE ACCIDENT
INVESTIGATION REPORT**

February 28, 2014



The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Norihiro Goto
Chairman,
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

MARINE ACCIDENT INVESTIGATION REPORT

January 16, 2014

Adopted by the Japan Transport Safety Board

Chairman	Norihiro Goto
Member	Tetsuo Yokoyama
Member	Kuniaki Shoji
Member	Toshiyuki Ishikawa
Member	Mina Nemoto

Accident type	Fatality and injury of crew members
Date and time	Around 11:15 on March 27, 2012 (local time, UTC+9 hours)
Location	Rokko Island Container Berth 5, Kobe Ku of Hanshin Port Around 040° true, 1400m from Kobe No. 7 breakwater west lighthouse located at Kobe City Hyogo Prefecture (approximately 34° 40.7' N, 135° 15.8' E)
Process and Progress of the Investigation	<p>The Japan Transport Safety Board appointed an investigator-in-charge and a marine accident investigator to investigate this accident on March 28, 2012.</p> <p>Comments on the draft report were invited from parties relevant to the cause of the accident.</p> <p>Comments on the draft report were invited from the flag State of ANNA MAERSK.</p>
Factual Information	<p>Vessel type and name: Container vessel ANNA MAERSK</p> <p>Gross tonnage: 93,496 tons</p> <p>IMO number: 9260421</p> <p>Port of registry: Aabenraa (the Kingdom of Denmark)</p> <p>Owner: A.P. Moller-Maersk A/S (the Kingdom of Denmark)</p> <p>Management company: MOLLER-MAERSK A/S (hereinafter referred to as “the Company A”) (the Kingdom of Denmark).</p> <p>Classification society: American Bureau of Shipping</p> <p>L × B × D: 352.1m × 42.8m × 21.0m</p> <p>Hull material: Steel</p> <p>Engine: Diesel engine</p> <p>Output: 63,000kW</p> <p>Date of keel laid: June 15, 2002</p> <p>Crane and Rescue boat Information</p> <p>(1) ANNA MAERSK (hereinafter referred to as “the Ship”) was equipped with one rescue boat and one crane used to lift and down the rescue boat and to load daily commodities on boat deck.</p> <p>(2) The safe working load (S.W.L) of the crane was 11kN and the breaking load of the wire-rope was about 96kN.</p> <p>(3) According to the specifications, the particulars of the rescue boat were as follows:</p>

	<p>a) L × B × D: 4.00m × 1.80m × 0.80m</p> <p>b) Material: FRP</p> <p>c) Hull weight: 540kg</p> <p>d) Weight of the rescue boat with six seating capacity: 970kg At the time of accident two persons were on board and their total body weight was 159kg.</p>
Crew Information	<p>Gender, age and certificate of competence</p> <p>(1) Master (Nationality: the Kingdom of Denmark), Male, Age: 67 Master certificate (Issued by the Kingdom of Denmark) Date of issue: February 10, 2009 (valid until February 10, 2014)</p> <p>(2) Chief officer (Nationality: the Kingdom of Denmark), Male, Age: 34 Master certificate (Issued by the Kingdom of Denmark) Date of issue: May 5, 2008 (valid until May 5, 2013)</p> <p>(3) Third officer (Nationality: the Republic of the Philippines), Male, Age:36, Competency certificate: unidentified Boarded on this Ship as a third officer on March 20, 2012.</p> <p>(4) Able seaman (Nationality: the Republic of the Philippines), Male, Age:36</p>
Injuries to Persons	<p>Death: one person (able seaman),</p> <p>Serious injury: one person (chief officer)</p>
Damage to Vessel (or Other Facilities)	<p>The Ship: none, The rescue boat: total loss</p>
Events Leading to the Accident	<p>The Ship with her master, a chief officer, an able seaman (hereinafter referred to as “the able seaman A”), and the other 23 persons (18 persons: nationality of the Republic of the Philippines, four persons: nationality of India, one person: nationality of Ukraine) on board berthed starboard side alongside Rokko Island Container Berth 5 in Kobe Ku of Hanshin Port to load/unload the container cargo around 08:00 on March 27, 2012. During cargo handling, the rescue boat launching training was to be carried out.</p> <div data-bbox="571 1532 1422 1951" data-label="Image"> </div> <p style="text-align: center;">Photo 1 Overview of the Ship</p>

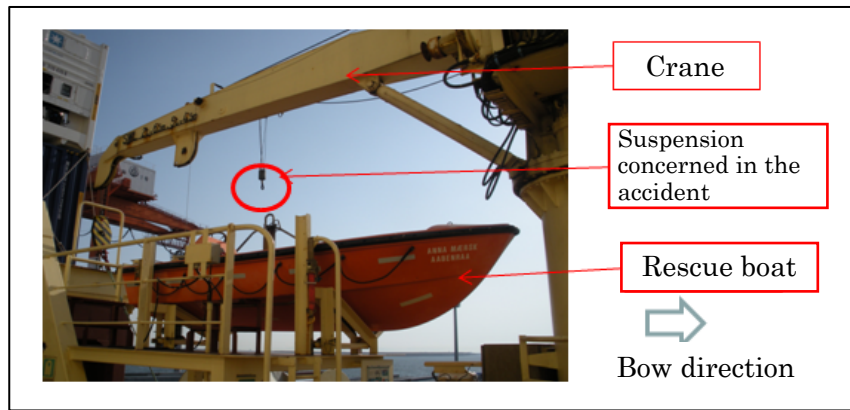


Photo 2 Overview of the crane and rescue boat

Around 11:00, the chief officer gave a briefing about the training and took command of the training, confirming the rescue boat connected with the hook, swinging the rescue boat out and testing limit switches. He assigned the third engineer to the crane operation, the able seaman A to the work to release the hook of the hook assembly (hereinafter referred to as “the Suspension”) which was set in connection between the crane wire-rope and the rescue boat and assistant to the chief officer as well, and another able seaman to the painter operation of the rescue boat on the deck.

The chief officer gave a direction to the third engineer; accordingly, the third engineer hoisted the rescue boat from the cradle and swung it outside of the Ship by turning the crane boom and lowered it down to the same level of the boat deck.

After the able seaman A boarded the rescue boat from the starboard bow of the rescue boat and moved to the port bow, the chief officer boarded it from the starboard bow; at that time the able seaman A moved to port quarter to keep balance.

Around 11:15 - one or two seconds after boarding of the chief officer, the hook of the Suspension came off from the swivel, and then the chief officer and the able seaman A fell to the sea surface 18m below together with the rescue boat.

Seeing the chief officer and the able seaman A fell on the rescue boat floor, the third engineer reported this accident to the master, and then the mater reported it to the agent accordingly.

Seeing the outbreak of this accident, the crew members moved down near the rescue boat through the gangway to rescue two persons; and then they hoisted the rescue boat together with two persons boarded onto the boat deck of the Ship using the crane by connecting the other hook used for loading daily commodities with the rescue boat.

Upon receiving the report of this accident, Kobe City fire department reported this accident to the Coast Guard Office at 11:54.

	<p>The chief officer and the able seaman A were taken to the hospital by ambulances. The able seaman A was confirmed dead at the hospital. According to the autopsy, the cause of his death was skull base fracture, traumatic subarachnoid hemorrhage and aeroembolism. Chief officer's injury was diagnosed as right brachial region fracture. The chief officer and the able seaman A were wearing helmets and life jackets.</p>
Weather and Sea Conditions	<p>Weather conditions: clear, wind direction south-southwest, wind-force 3, visibility good Sea conditions: ocean calm</p>
Other Matters	<p>(1) According to chief officer's statement, the lowering procedure of the rescue boat was as follows:</p> <ol style="list-style-type: none"> a) To confirm that the rescue boat is connected with the hook. b) To hoist the rescue boat from the cradle by winding up the wire rope by the crane winch, and then to swing it outside of the Ship by turning the crane boom. c) To lower the rescue boat to the same level of the deck by extending the wire rope. d) Able seaman is to board. e) Chief officer is to board. f) To lower the rescue boat onto the sea surface by extending the wire rope. g) Able seaman is to release the Suspension from the rescue boat. <p>(2) On March 25, 2008, the crane and the Suspension passed the load tests carried out by Keppel Shipyard Limited every five years.</p> <p>(3) American Bureau of Shipping carried out examinations (intermediate examination) of the life-saving appliances, and other equipment including the rescue boat of the Ship on January 6, 2011 under the authority of the Denmark government and issued a cargo ship safety equipment certificate. In addition, the Company A carried out an internal audit on December 13, 2011; however, there was no indication concerning the Suspension.</p> <p>(4) The crew of the Ship underwent the risk assessment on safety in the case of lowering the rescue boat by using the crane in 2011; however, they did not consider the safety measures in case of failure of the Suspension.</p> <p>(5) According to the design drawing of the Suspension, the swivel to be connected with the wire rope, the shackle, and the hook to be connected with the rescue boat were arranged in this order; a straight shackle was used in the shackle part of the swivel and a bow shackle was used for the shackle. (see Figure 1)</p>

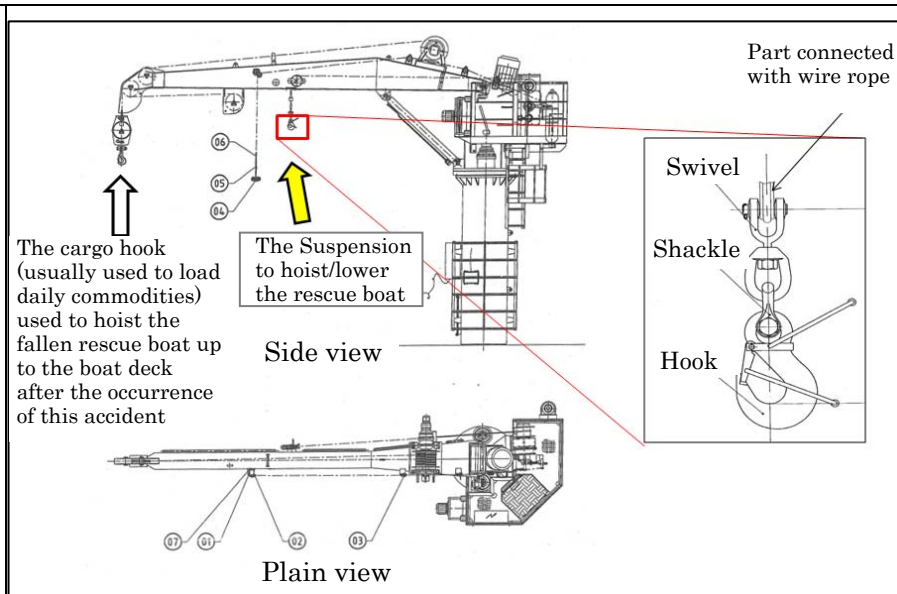


Figure 1 Design drawing of the crane and the Suspension (extract)

(6) At the time of this accident, the arrangement of the shackle and swivel of the Suspension was different from that of design drawing; they were arranged in order of the shackle, swivel, and hook to be connected with the rescue boat. The time and reasons of different arrangement were unknown. (see Photo 3)

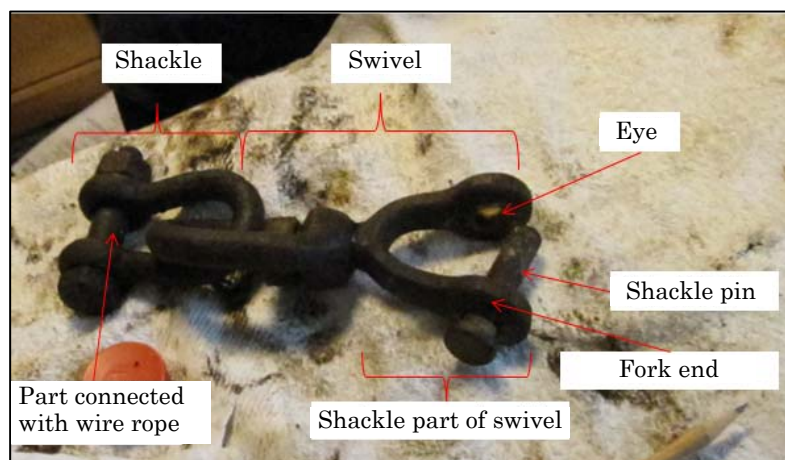


Photo 3 Overview of the Suspension

(7) The shackle pin of the swivel was equipped with the split pin to prevent the shackle pin from coming off. (see Photo 4)

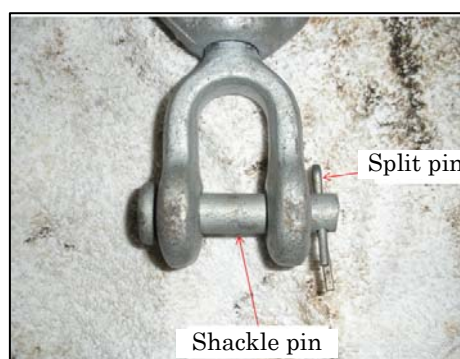


Photo 4 Shackle part of the swivel (spare part)

- (8) Check and maintenance of the life-saving appliances
According to the regulation 20 of the part B in Chapter 3 of the SOLAS Convention (Articles of the Protocol of 1988 relating to the International Convention for the Safety of Life at Sea, 1974), it was provided that the condition of the hook and other things for the rescue boat is to be visually inspected weekly and inspected using the check list every month; the results of the weekly and monthly inspection are to be recorded on the log-book.
- (9) The chief officer was in charge of check and maintenance of the equipment on the deck; under the supervision of the chief officer, the third officer had carried out check and maintenance of the wire rope of the crane and the Suspension.
- (10) On the Ship, the swivel of the Suspension was not subject to the check; however, visual check of the crane and rescue boat was carried out based on the SOLAS Convention on March 24, 2012 and results were recorded on the SOLAS Maintenance Manual-Log-book as good.
- (11) According to the analytical investigation in the Suspension carried out by FORCE Technology, a non-profit organization in the Kingdom of Denmark, on September 11, 2012, the results were as follows:

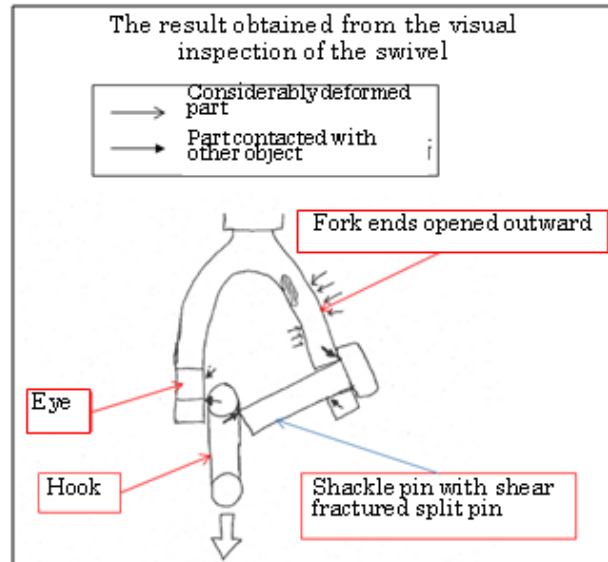



Figure 2 Results obtained from the visual inspection
(Source and issuer: FORCE Technology, issued on September 11, 2012)

- a) The galvanized swivel and shackle were mounted upside down in the Suspension compared to the design drawing; however, there were no indications that the strength of the fork ends of the swivel was inferior and there were no signs of

	<p>material defects being contributory to this accident.</p> <p>b) As shown in Figure 2, the fork end leg of the swivel in the Suspension was deformed in bending. The same factor responsible for this bending has also sheared off the split pin in the swivel thus allowing the fork to open up and let the hook eye slip out of engagement with the shackle pin.</p> <p>c) The split pin of the swivel was sheared off and the fresh metallic appearances of the sheared surfaces indicate that this happened in connection with the accident.</p> <p>(12) As to the crane installation and the Suspension structure used for lifting and lowering the rescue boat, the following comments were obtained from shipyards (40 companies) and rescue boat manufacturers (three companies) in Japan:</p> <p>a) In the past, two companies handled the same type of cranes as that of the Ship; they were installed on seven ocean-going ships, but today no company handles this type of crane.</p> <p>b) As shown in Figure 3 and Photo 5, no swivel is used for a release hook currently handled in Japan; the JIS standard SB shackle composed of a bolt, nut, and split pin is used instead and the release hook is used.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div data-bbox="564 1010 1075 1310" style="border: 1px solid black; padding: 5px;"> </div> <div data-bbox="1139 1021 1442 1408" style="border: 1px solid black; padding: 5px;"> </div> </div> <p style="text-align: center;">Figure 3 Example of a shackle handled by shipyards in Japan</p> <p style="text-align: right;">Photo 5 Example of a release hook</p>
<p>Analysis</p> <p>Involvement of crew members</p> <p>Involvement of vessel, engine, etc.</p> <p>Involvement of weather and sea conditions</p> <p>Analysis of the findings</p>	<p>Yes</p> <p>Yes</p> <p>None</p> <p>(1) The cause of death of the able seaman A was skull base fracture, traumatic subarachnoid hemorrhage and aeroembolism. The chief officer was seriously injured by right brachial region fracture.</p> <p>(2) It is probable that the Ship was berthing alongside Rokko</p>

Island Container Berth 5 in Kobe Ku of Hanshin Port, and during the rescue boat launching training, after hoisting the rescue boat from the cradle, the rescue boat was swung outside of the Ship by turning the crane boom, and then it was lowered to the level of the boat deck.

- (3) It is probable that when the rescue boat was let down to the boat deck level, it was connected with the hook of the Suspension, and the hook was connected with the shackle part of the swivel of the Suspension through the shackle pin, and the wire rope of the crane was connected with the shackle which was connected with the swivel, thereby they were suspended by the crane.
- (4) It is probable that the rescue boat dropped to the sea surface 18m below around 11:15 one or two seconds after boarding of the chief officer following the able seaman A because the hook of the Suspension came off from the shackle part of the swivel, and then the chief officer and the able seaman A fell onto the rescue boat floor to be injured and dead respectively.
- (5) It is probable that because the split pin in the shackle pin in the shackle part of the swivel of the Suspension was shear fractured, the shackle pin came off from the fork end eye and then the hook slipped out of the shackle part of the swivel and the rescue boat dropped eventually.
- (6) It is somewhat likely that judging from the fact that fresh metallic surface appearance was observed on the split pin in the shackle pin of the shackle part of the swivel of the Suspension, when the chief officer and the able seaman A boarded the rescue boat being in the suspended state, the load was applied to one fork end of the swivel; therefore, the fork end was deformed and the split pin was sheared off eventually.
- (7) It is probable that as the swivel structure of the Suspension was designed so that preventive measures for coming off of the shackle pin in the shackle part solely depended on the split pin, the consideration and the safety measures to prevent the shackle pin from coming off due to shear fracture of the split pin were not good enough.
- (8) It is highly probable that the strength deterioration of the fork ends was not observed and material defects being contributory to this accident were not found.
- (9) The arrangement of the shackle and swivel of the Suspension was different from that of design drawing; they were arranged in order of the shackle, swivel, and hook to be connected with the rescue boat. The time and reasons of the upside down arrangement were not made clear.
- (10) As to the point whether suspending the rescue boat by the

	<p>Suspension of the different arrangement of the shackle and swivel from that in the design drawing was responsible for the shear fracture of the split pin, there was no description in the analytical investigation carried out by the non-profit organization in the Kingdom of Denmark, and also the analytical investigation could not be carried out in Japan. Therefore, this point was not made clear.</p> <p>(11) It is probable that before this accident the check of the swivel of the Suspension was not carried out by the crew on the Ship.</p> <p>(12) It is somewhat likely that the accident could have been prevented if the following measures had been taken.</p> <p>a) To use the shackle composed of a bolt, nut, and split pin.</p> <p>b) To carry out visual check of the swivel.</p>
<p>Probable Causes</p>	<p>It is probable that the Ship was berthing alongside Rokko Island Container Berth 5 in Kobe Ku of Hanshin Port and during the rescue boat launching training, the chief officer and the able seaman A boarded the rescue boat lowered to the level of the boat deck, and at that time the split pin in the shackle pin of the shackle part of the swivel of the Suspension was shear fractured; therefore, the shackle pin came off and the hook slipped out of the shackle part; consequently, the rescue boat dropped to the sea surface 18m below, and thus this accident occurred.</p>
<p>Safety Actions</p>	<p>After this accident, the Company A took the following measures:</p> <ul style="list-style-type: none"> • Gave instructions to all ships under its control to remove the swivel if the same swivel as that of the Ship is used. • As shown in Figure 4, the swivel of the Suspension was replaced by the bow shackle composed of a bolt, nut and split pin. • Reviewed the procedures and work instructions concerning the repair, design, procurement, maintenance system, and safety system. <div style="text-align: center;">  </div> <p>Figure 4 New bow shackle adopted by the Company A after the accident</p> <p>The following measures are considered helpful to prevent the recurrence of similar accidents hereafter.</p> <ul style="list-style-type: none"> • Generally the shackle composed of a bolt, nut and split pin is used for the off-load release hook of a rescue boat. Accordingly,

	<p>the classification society which carries out the inspection of the crane used to hoist and lower a rescue boat needs to give a guidance to the ship owners to replace the conventional swivel by the new swivel composed of a bolt, nut and split pin if the swivel composed of the shackle pin and split pin is used in the release hook for suspending the rescue boat.</p>
--	--