LESSONS LEARNED FROM MARINE SAFETY INVESTIGATION REPORTS

SUB – COMMITTEE ON IMPLEMENTATION OF IMO INSTRUMENTS
4TH SESSION
2017

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LESSONS LEARNED FROM MARINE SAFETY INVESTIGATION REPORTS

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01

FATALITY

Very serious marine casualty : Fall from platform in cargo hold

What happened?

A crew member was making repairs to the hand rails that surrounded the lowest of three intermediate platforms built into the cargo hold access ladder. The platform was designed as a landing to hold a single person while moving from one section of the cargo hold access ladder to the next. The ship was at sea and the cargo hatch covers were closed. The hand rails had been removed for repair and the crew member was about to refit them to the platform. The lower platform was five metres above the tank top. There was no eye witness to the accident, but it is likely that the crew member tripped or slipped from the platform and, as he was not wearing a safety harness, he fell to the tank top below. He died from multiple injuries.

Figure 1.1 Photo of the ship **SOURCE** Investigation report(ATSB, Australian Transport Safety Bureau)

Why did it happen?

- The platform was cluttered with equipment that the crew member was using to effect the repairs and was not guarded by hand rails, making the platform a congested and dangerous place to work.
- A single halogen light had been rigged about one metre above the platform. The light was another obstacle that the crew member had to work around.
- Although shipboard procedures required the crew member to use a safety harness for the task, he was not wearing one at the time. Wearing a safety harness and connecting it to a secure point would have arrested his fall.

M.E.M.O

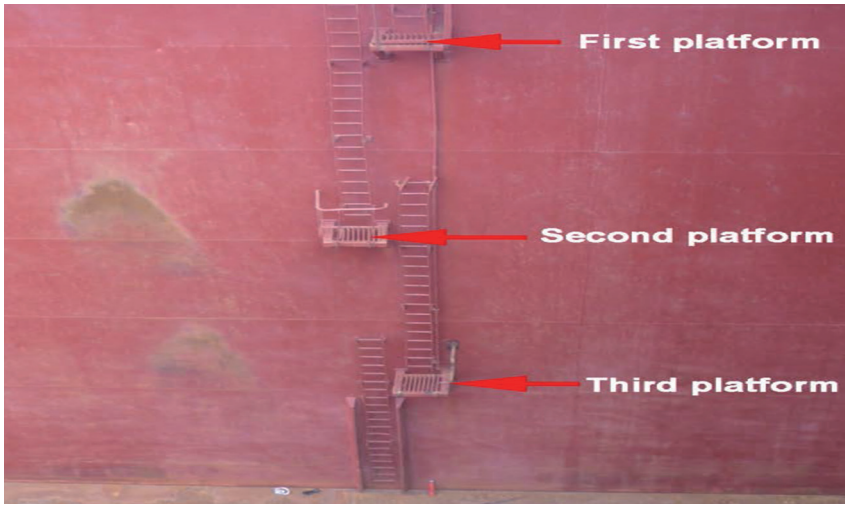
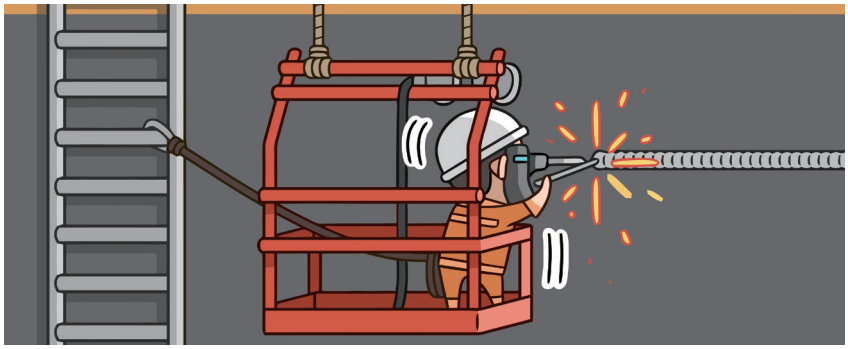


Figure 1.2 Number five cargo hold ladder: note that the handrails have been removed from around the third platform **SOURCE** Investigation report(ATSB)

What can we learn?

- Working at height without the protection of hand rails is a hazardous situation. It is important that seafarers follow industry best practice of using a safety harness when working at height.
- It is important when working in dark spaces that sufficient lighting is used to illuminate the immediate and general working area without obstructing the workers.



Who may benefit?

- Seafarers, shipowners, operators, providers of ship safety management systems.

Similar Casualty in Korea
Marine Casualty involving Cargo Vessel Haeyang (alias)
May 16, 2005 at around 09:20, outer anchorage of Dampier Port, Australia

Cargo Vessel Haeyang had arrived at the outer anchorage of the Port of Dampier in Australia. As it lay at anchor while waiting to berth at port, crew members were repairing a steam pipe in the middle deck of the engine room with the mesh plate on the floor of the upper passageway of the engine room open. A crew member who was running towards the elevator accidently stepped into the hole from where the mesh plate was and fell in without wearing a safety helmet. Although the crew member was sent to a nearby hospital, he died. At the time, the weather at sea was clear with the wind blowing southeast at 5 to 6 m/s. The wave height reached about 1m.

02

FATALITY

Very serious marine casualty : Fall while working over ship's side

What happened?

A crew member fell overboard when the rope of the Bosun's chair that he was sitting on parted. The man had been painting the amidships draught marks of a 41,000 GT bulk carrier while it was anchored off a port. He was wearing neither a lifejacket nor a flotation aid, and the lifeline attached to him was not properly tethered to the ship.

The accident occurred during daylight hours in the morning in good weather conditions. Crew members on deck threw a lifebuoy towards the man in the water but he could not reach it and quickly sank. The crew then launched the ship's rescue boat but were unable to start its engine. The search for the missing man was conducted by boats and a helicopter from the port. Despite searching for the rest of the day, his body was not recovered.

The task to paint the draught marks had been undertaken after the master had issued a permit to work over the side. The missing crew member was the only person working over the side while the other crew were on the ship's deck. The crew member supervising the task had agreed with the seafarer not to wear a lifejacket. The rope parted while the crew were heaving it up after the painting task had been completed.

Why did it happen?

- The rope holding the Bosun's chair was in poor condition - the main reason for its failure. Further, the crew were heaving the rope to recover the man sitting on the Bosun's chair instead of using a safer method, such as a rope ladder for the man to climb up to the deck.
- Although a permit to work over the side had been issued, basic precautions were not in place. These include using a personal flotation aid, effective fall prevention equipment and proper supervision.

  The person supervising on deck had agreed to dispense with the available lifejacket as it was inconvenient to work while wearing it. The lifeline was not properly secured to the ship, and other equipment, such as the rope that parted, had not been properly inspected to ensure it was fit for purpose.

M.E.M.O

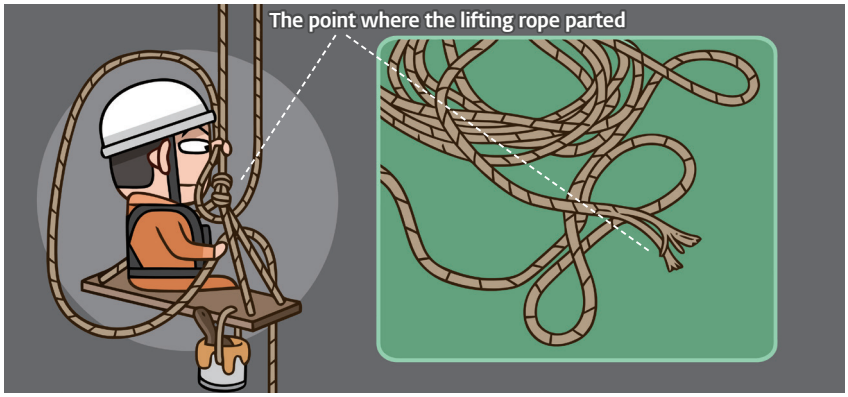


Figure 2.1 Damaged part of the lifting rope

What can we learn?

- Safely working over the side of a ship relies on an effective permit to work that ensures suitable precautions are in place, including the wearing of an appropriate flotation aid and proper use of fall prevention equipment.
- Work over the side must be properly supervised to ensure all measures identified in the permit to work are followed.
- Preventing a person falling overboard should always be a primary objective.
- Wearing a flotation aid significantly improves the chances of a person's survival and recovery, and its design should be appropriate for the work being undertaken.
- It is also essential to have effective man overboard recovery measures in place, including properly trained crew and maintained equipment such as rescue boats.

Who may benefit?

- Seafarers, shipowners, ship operators.

Similar Casualty in Korea
Marine Casualty involving Barge Gireogi (alias)
March 21, 2007 at around 11:45, distant 2 miles from Somodo Lighthouse, Wando Island

Towing ship Galmaegi (alias) had been towing Barge Gireogi by the stern with 2,700 tons of hull block. During the tow, a seafarer fell off the ship and went missing while painting the ship's side without wearing a life jacket. At the time, easterly wind was blowing lightly, the wave height reached 0.3m and visibility was fine at about 10 miles.

M.E.M.O

03

FATALITY

Very serious marine casualty :
Fall from a vertical ladder in a cargo oil tank

What happened?

A 30,000 GT chemical tanker anchored in an offshore anchorage with all cargo oil tanks (COTs) and the starboard slop tank having been cleaned and gas-freed for inspection of the condition of tank coatings.

The shipowner's technical consultant (the superintendent) and two paint supervisors from the cargo tank coating manufacturer boarded the vessel in the morning. The superintendent, who was in attendance to carry out an Environmental Audit, also intended to inspect the cargo oil tanks for tank coating condition and any deep suction well pitting. After all preparation work was completed, which included a risk assessment and issue of enclosed space entry permits, the tank inspection commenced.

During the day and prior to the accident, the superintendent entered three cargo oil tanks and spent a total of 73 minutes staying inside the tanks. In the afternoon, the Chief Officer entered 4S cargo oil tank followed by the superintendent. Firstly, the Chief Officer climbed down the vertical ladder and reached the landing platform. He stayed on the platform to wait for the superintendent. The superintendent then entered the tank and climbed down the vertical ladder. Suddenly, he fell from the vertical ladder to the bottom of the cargo oil tanks.

The Chief Officer immediately informed the Bosun, who was the responsible person at the entrance to the cargo oil tanks, by radio.

The Bosun immediately relayed the message to the duty officer on the bridge and the ship's Master. The superintendent was rescued and sent to hospital ashore for treatment. However, the superintendent was declared deceased by a local doctor.

Figure 3.1 Photo of the ship **SOURCE** Investigation report(HKSAR, The Hong Kong Special Administrative Region)

Why did it happen?

- At the time of the accident, the ambient temperatures on deck and inside the cargo oil tanks were about 33°c and 37°c respectively. The superintendent might have suffered from heat exhaustion that caused him to lose his grasp of the vertical ladder while he was entering 4S cargo oil tank in the afternoon under high ambient temperature.
- The vertical ladder had no guard rings, which could have prevented him from falling sideways after he lost his grasp of the ladder.

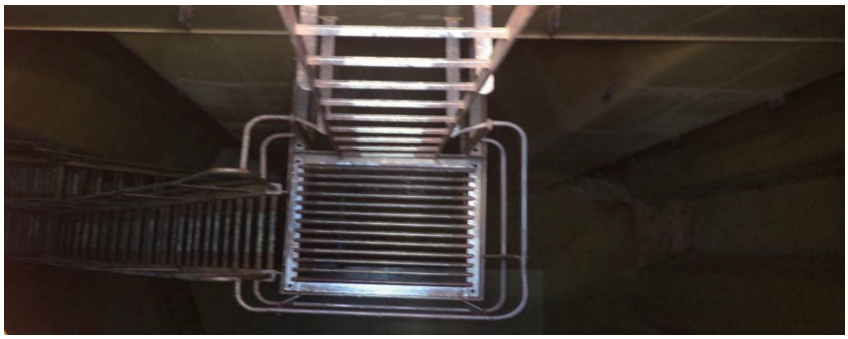


Figure 3.2 Access ladder inside 4S COT **SOURCE** Investigation report(HKSAR, The Hong Kong Special Administrative Region)

What can we learn?

- It is necessary to take extra precautions and to use fall arrestors as far as practicable to avoid falling when climbing on a vertical ladder that is not fitted with guard rings.
- Account should be taken of the impact of heat on the human body during prolonged periods of work in a hot climate.

Who may benefit?

- Seafarers, shipowners, ship managers.

Similar Casualty in Korea
Marine Casualty involving a pilot of LNG Carrier Gas (alias)
April 26, 2004 at around 15:44, distant 1.2 miles northwest from Janganseo Lighthouse

LNG Carrier installed the pilot ladder on port side to enter the Port of Incheon. The front of the starboard side of the pilot boat was closely stationed to the pilot ladder. The pilot who was not wearing a lifejacket tried to board the ship but he fell into the sea while climbing the pilot ladder with two hands. The pilot was pulled into the pilot boat but died on the way to the hospital. At the time of the casulaty, it was raining with the wind blowing east-northeast at 10-12 m/s. The wave height reached 1.5m.

04 FATALITY

Very serious marine casualty :
Crew member struck by waves on deck

What happened?

A crew member was seriously injured on the fore deck of a 7,000 GT oil tanker when he was struck by waves while going to the forecastle to close a weathertight door. The accident occurred about mid-afternoon in bad weather(gale force winds and 5-metre waves). Seas were being shipped on deck and the crew member was alone.

The officer of the watch had instructed the crew member to close the weathertight door but had not informed the master or anyone else.

The crew member did not inform anyone else and followed the officer's instruction. After the accident, the officer of the watch announced on the public address system that the injured man needed to be rescued but did not specifically inform the master. Crew members proceeded forward and rescued the injured man before the ship had been turned around and away from the weather.

The injured man was then provided first aid. The master diverted the ship to the nearest port, where it arrived that evening. The injured man was taken to a hospital ashore but was later declared deceased.

Figure 4.1 Photo of the vessel **SOURCE** Investigation report(HKSAR, The Hong Kong Special Administrative Region)

M.E.M.O

Why did it happen?

- The weathertight door opened in heavy weather because it had not been properly secured for sea or checked before the onset of bad weather.
- The crew member who died was on the fore deck with the ship heading into heavy weather. The officer of the watch did not consult or advise the master of his intentions and did not take sufficient account of the risk of sending a man forward in heavy weather without taking any precautions.
- The crew member also did not take sufficient account of the risk of going forward in the prevailing conditions or challenge the instructions of the officer of the watch.

Figure 4.2 The weather–tight door on the fore–castle deck **SOURCE** Investigation report(HKSAR)

Figure 4.3 Location where the crew member was found **SOURCE** Investigation report(HKSAR)

M.E.M.O

What can we learn?

- It is dangerous to go on a ship's deck in heavy weather. If going on deck is considered critical for the ship's safety, the master needs to risk assess the operation and take all precautions to minimize the risks.
- Turning the ship away from heavy weather to reduce rolling/pitching and the risk of shipping seas is an essential precaution to take before anyone goes on deck.
- It is essential to properly secure a ship for sea, including closing all weather/watertight doors and other openings on deck.
- Monitoring forecast weather at sea is essential so that necessary precautions, including checking that weather/watertight openings are securely closed, are taken before encountering heavy weather.

Who may benefit?

- Seafarers, shipowners, ship operators.

Similar Casualty in Korea
Marine Casualty involving Sand Carrier Bada (alias)
February 14, 2007 at around 16:30, about 10.5 miles to the northeast from Hongdo Lighthouse

While sailing towards Port of Mokpo after collecting sea sand off the coast of Haeju, the captain of Sand Carrier Bada was reported that the hatch tarpaulin had been ripped. The captain ordered the crew to cover the ripped hatch tarpaulin with a new one. Nine seafarers were working on deck when two seafarers were swept into the sea after being struck by a wave on the starboard side. They fell in the sea and went missing at about 10.5 miles northeast from Hoengdo Lighthouse. At the time of the casualty, it was cloudy with the wind blowing northwest at about 15 m/s. The wave height reached 3-4m.

M.E.M.O

05

FATALITY

Very serious marine casualty :
Crew members struck by wave on deck

What happened?

The Bosun of a 6,000 GT bulk carrier was swept overboard by a wave, and the Chief Mate and deck cadet were seriously injured, while they were returning from the ship's forecastle in heavy weather. The Bosun's body was recovered from the sea by search and rescue authorities about two hours later - he had drowned.

The master had anchored the ship the night before the accident after encountering winds of 50 to 60 knots. The ship's main engine was left running at minimum rpm. After breakfast the next day, the master instructed the three crew members to go to the forecastle and check the anchor cable. The weather was still poor with the wind more than 50 knots. The three men donned lifejackets and other personal protective equipment and went to the forecastle. When they reported the anchor cable had parted, the master instructed them to return from the forecastle. As the men were returning aft along the port side holding a lifeline near No.2 Cargo Hold, they were struck by a large wave that washed across the deck from the starboard side as the ship rolled to port. The Chief Mate, who was leading the group, reported to the Master that the Bosun, the last in the group, was missing and that he and the cadet had been injured. The Master raised the alarm and instructed other crew to rescue the injured men and search on deck for the missing Bosun. The injured men were taken to the ship's hospital but the Bosun remained missing. The Master then requested help from shore authorities, who recovered the Bosun's body from the sea. The injured crew were taken to a hospital ashore by helicopter.

Figure 5.1 Photo of the ship **SOURCE** Investigation report(Panama Maritime Authority)

Why did it happen?

- The ship was anchored in heavy weather instead of being hove to or seeking shelter from the storm.
- The crew members were sent on deck in heavy weather.
- Neither the Master nor the Chief Mate and other crew who went on deck adequately considered the high risk of going on deck in heavy weather.

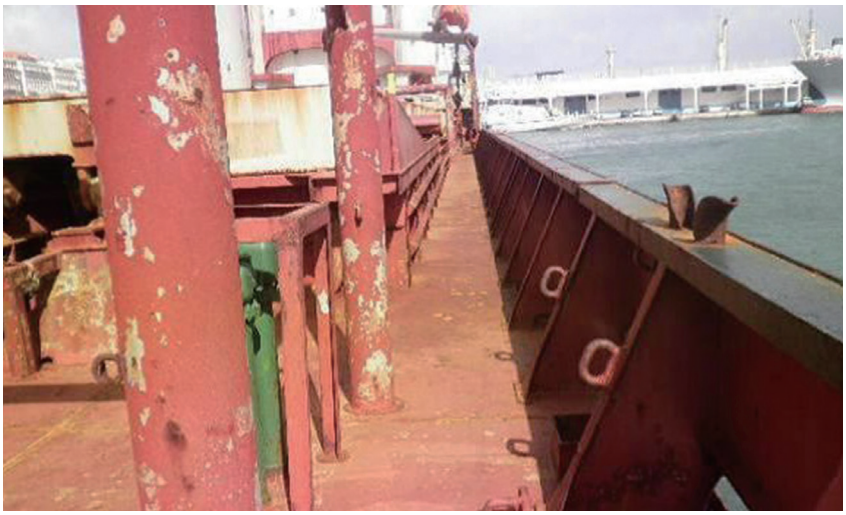


Figure 5.2 View on main deck in way of the hold No.2 **SOURCE** Investigation report(Panama Maritime Authority)

Figure 5.3 View from bridge **SOURCE** Investigation report(Panama Maritime Authority)

M.E.M.O

What can we learn?

- Anchoring a ship in heavy weather is hazardous and its anchoring equipment is not designed to be used in heavy weather.
- Good seamanship requires a Master encountering heavy weather at sea to consider all safe options, one of which must include the ship being hove to until the weather moderates.
- It is dangerous to go on a ship's deck in heavy weather. If going on deck is considered critical for the ship's safety, the Master needs to perform heavy weather risk assessment in advance and take all necessary precautions.

Who may benefit?

- Seafarers, shipowners, ship operators.

M.E.M.O

06

FATALITY

Very serious marine casualty :
Stevedore ashore struck by mooring rope

What happened?

An 8,500 GT general cargo ship was being moored alongside a wharf. A stevedore was standing near a slack mooring line, which was suddenly tensioned, knocking him into the water. The stevedore was not involved with the ship's mooring operations and had been on the wharf to attend to shore cargo cranes.

The accident occurred in the afternoon. About 15 minutes after the accident, the stevedore was sighted floating face down in the water. He was recovered from the water and given cardiopulmonary resuscitation but showed no signs of life. An ambulance then took his body to a hospital.

No one on the ship or on the wharf had noticed the stevedore move into a hazardous position near the mooring line that was heaved up. The ship's officer signalled the man operating the winch on the forecastle to heave in the mooring line. In order to signal him, the officer had moved to a position from where he could no longer see the mooring line on the wharf.

M.E.M.O

Why did it happen?

- The stevedore moved into a hazardous area, where mooring operations were still underway. The ship's crew on deck could not see him or the mooring line on the wharf from their positions, and no one on the bridge noticed him.
- The shore mooring linesmen did not prevent the stevedore from entering the hazardous area where they were still conducting mooring operations. The mooring gang company's safety management system did not have adequate procedures to prevent unauthorized entry to prohibited areas. There were neither warning signs for such areas nor other physical measures to prevent entry to them. The safety oversight of the company managing the wharf (with respect to supervision of the mooring gang company) was also inadequate.

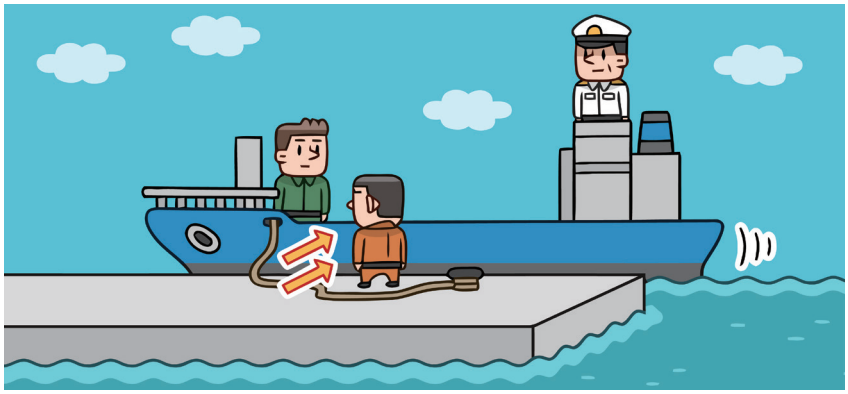


Figure 6.1 The Scene of the casualty **SOURCE** Investigation report(China MSA)

M.E.M.O

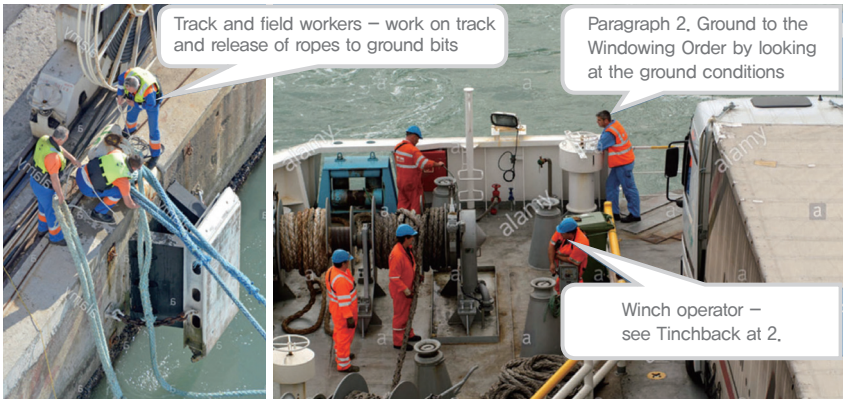
What can we learn?

- The person supervising or controlling the tension on the mooring line should always have the mooring line in sight to avoid accidents.
- Effective communication between the bridge and ship mooring stations can ensure safer mooring operations, including active monitoring of the operations.
- Only authorized persons should be permitted in areas where mooring operations are taking place both on board ships and on the wharf.

Who may benefit?

- Seafarers, shipowners, ship operators, port and terminal operators.

Communication such as delivery and understanding of signals for winch operation is important.



Shore Ship

M.E.M.O

07

FATALITY

Very serious marine casualty : Entry of an enclosed space

What happened?

A 35,000 GT bulk carrier with steaming coal in bulk arrived at a port and was moored. Able Seaman (AB)1 and Ordinary Seaman (OS)2 were instructed by the Bosun to access Cargo Hold No.3 to take a cargo sample. The cargo hold hatch covers and access hatch cover were closed. AB1 opened the access hatch cover and entered the cargo hold unaccompanied and without taking any safety precautions. OS2 saw AB1 fall from the access ladder and asked the Bosun to come. The Bosun arrived and accessed the cargo hold to help AB1, who was lying unconscious. AB2 then arrived and entered the cargo hold, followed by OS1, all three entering the hold without taking any safety precautions or considering the possible danger. They all then collapsed. The Chief Officer heard about the incident and went to the area, taking with him a breathing apparatus set. An ambulance was called via the agent and arrived within 15 minutes. The Bosun died as a result of the casualty.

Figure 7.1 Photo of the ship **SOURCE** Investigation report(Panama Maritime Authority)

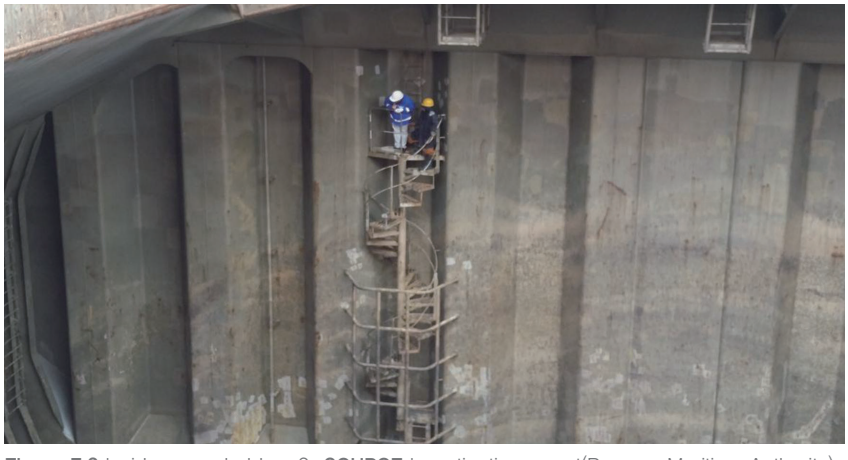


Figure 7.2 Inside cargo hold no.3 **SOURCE** Investigation report(Panama Maritime Authority)

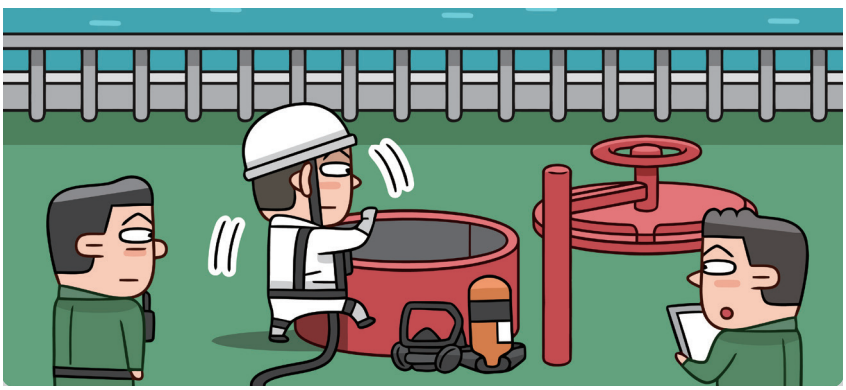
Why did it happen?

- AB1 was instructed by the Bosun to enter the cargo hold despite the access hatch being marked "NO UNAUTHORIZED ENTRY INTO CARGO HOLDS" and no crew members having been ordered by an officer to do so.
- None of the required precautions were taken to provide safe access when AB1 was instructed to enter the cargo hold.
- The Bosun, AB2 and OS1 all entered the cargo hold unaccompanied to provide help without first taking any safety precautions.

Figure 7.3 Manway Access to Cargo Hold No.3 **SOURCE** Investigation report(Panama Maritime Authority)

What can we learn?

- Access to enclosed spaces without required safety measures in place occurs frequently and leads to casualties.
- Self-contained breathing apparatus sets should be placed close to the entrances of enclosed spaces during entry, and be readily available for use in an emergency.
- The need for authorized entry of enclosed spaces, required precautionary safety measures and relevant training should be stipulated at safety meetings and during newcomer familiarization.
- Effective enclosed space entry training and drills should take into account the instinctive reaction of seafarers to provide assistance and highlight that doing so without appropriate safety equipment is hazardous and can result in additional casualties.



Who may benefit?

- Seafarers, shipowners, ship managers.

Each enclosed space entry and rescue drill shall include

- Checking and use of personal protective equipment required for entry;
- Checking and use of communication equipment and procedures;
- Checking and use of instruments for measuring the atmosphere in enclosed spaces;
- Checking and use of rescue equipment and procedures;
- Instructions in first aid and resuscitation techniques.

Relevant Regulations

- SOLAS 13Amend Reg.III/19
- Res.MSC.350(92)
- Res.A.1050(27), Revised Recommen dations for entering enclosed spaces aboard ships

M.E.M.O

08

FATALITY

Very serious marine casualty : Entry of an enclosed space

What happened?

The crew of a 9,000 GT bulk carrier with a cargo of sawn timber was practising a weekly emergency drill. When the Chief Officer did not appear at his muster station, a search was conducted. During the search, two junior ratings discovered that the access hatch cover to Cargo Hold No.3 was open and, looking inside, noticed the Chief Officer lying at the base of the stairway on platform No.2. The Chief Engineer then entered the enclosed space without taking adequate safety precautions, and subsequently collapsed on top of the Chief Officer on platform No.2. On hearing calls for help from the Chief Engineer, the second Officer then also entered the enclosed space without taking adequate safety precautions, and collapsed on top of the Chief Engineer. Four crew members wearing breathing apparatus sets entered the space to retrieve the three officers, taking with them equipment to assist the injured officers with their breathing. The three officers were lifted out of the cargo hold and given CPR. The second Officer was taken to a local hospital. However, the Chief Officer and Chief Engineer died.

Figure 8.1 Photo of the ship, Source **SOURCE** Investigation report(Isle of Man Ship Registry)

M.E.M.O

Why did it happen?

- The existing shipboard operational procedures did not take account of the carriage of timber cargoes and the danger posed by oxygen depletion.
- There were no warning notices at the point of entry to the cargo hold, on either the outside or inside of the access hatch cover.
- An enclosed space entry procedure had not been detailed as a key shipboard operation in the Safety Management System(SMS).
- The human instinct of wanting to save a colleague resulted in the Chief Engineer and second Officer entering an unsafe space without suitable precautions for their own individual safety.

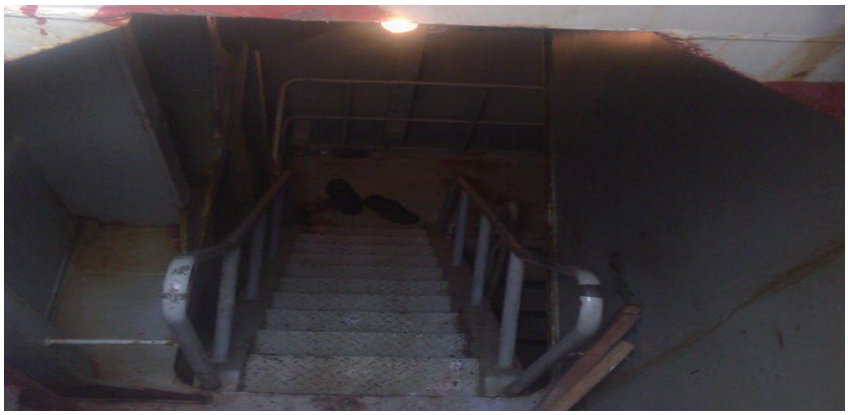


Figure 8.2 No.3 Cargo Hatch View from top looking down onto platform 2 at base of stairway
SOURCE Investigation report(Isle of Man Ship Registry)

What can we learn?

- There are inherent dangers associated with entry of enclosed spaces, particularly cargo holds, no matter what type of cargo they may contain, including those posed by oxygen depletion from the timber cargo.
- There is a need to ensure that all persons who are required to enter an enclosed space positively identify the atmospheric condition against parameters, which should be stated in the SMS together with procedures for safe entry.
- Effective enclosed space entry training and drills should take into account the instinctive reaction of seafarers to provide assistance and highlight that doing so without appropriate safety equipment is hazardous and can result in additional casualties.

Who may benefit?

- Seafarers, shipowners, ship managers.

Similar Casualty in Korea
Marine Casualty involving Oil Tanker Kirum (alias)
November 19, 2014 at around 11:30, bearing 030 degrees, distant 2 miles from Maemuldo Island, Heuksan-myun, Shinan-gun, South Jeolla Province

Kirum was sailing with 12 crew members and 1,500 tons of liquid chemicals on board. A seafarer who was transferring toluene in the drum of the fore storage to the plastic container in the lower deck near the bow was suffocated by toluene gas and lost his consciousness. Then, another seafarer who went into the storage to rescue the unconscious seafarer also experienced suffocation. Both of them were sent and treated at the hospital. One died but the other recovered and was discharged. At the time of the casualty, the weather was clear with little wind. Waves reached 1-1.5m and the visibility was fine at about 7 miles.

09

EXPLOSION AND FIRE

Very serious marine casualty : Explosion in the cargo compressor room while carrying out hot work on deck

What happened?

An LPG carrier was carrying a cargo of butane and propane. Two crew members were attempting to crop out and renew step ladders leading to the loading manifold. The activity was part of work addressing several deficiencies identified during a Port State Control(PSC) inspection. The gas feeding the cutting tool was butane, tapped off the gas compressor inlet pipe. It is reported that the cutting torch was also connected to the vessel's compressed air deck line. When the crew members lit up the cutting nozzle, there was a flashback along the hose connecting the torch to the cargo compressor inlet pipe resulting in an explosion and fire in the compressor room. The two crew members carrying out the cutting operation were killed, and two other crew members, who were also carrying out maintenance work on deck, were seriously injured. The compressor room, the re-liquefaction plant and other equipment were heavily damaged.

Figure 9.1 Photo of the accident(Fwd cargo compressor Room) **SOURCE** Investigation report(Panama Maritime Authority)

Figure 9.2 Photo of the accident(Out Side cargo compressor Room) **SOURCE** Investigation report(Panama Maritime Authority)

Why did it happen?

- The ship's managers had not made arrangements for the work to be done while the ship was at a repair facility; instead, they allowed it to be carried out during a laden voyage. The facilities and equipment on board were not suitable for the work. No permit to work was issued; risks were not properly assessed and no specific safety precautions were planned. No officer had been assigned to supervise the work.
- The source of ignition was not established but it is believed to have caused a flashback from the cutting torch along the hose connecting it to a cargo compressor.
- Since most of the evidence was not available to the investigator, it is not known whether the cutting torch was a) suitable for the gases used or b) fitted with pressure regulators or flashback arresters.
- The safety culture did not encourage lower ranks to question instructions; the crew simply did as they were told.

What can we learn?

- A strong safety culture has to be cultivated; it will not develop of its own volition. The work starts from top management. Management ashore needs to lead by example. When PSC inspection deficiencies are identified, a careful analysis -including formal risk assessment - needs to be made as to whether the crew have the necessary abilities and equipment to carry out the work during the voyage or whether the work needs to be undertaken in a competent repair facility. This is particularly important in the case of ships carrying flammable cargoes. Ship's crew need to be given the confidence to approach line management for advice or assistance if an onboard risk assessment determines that they do not have the resources or competence to undertake repair work themselves. Shore management cannot assist if they are not aware of a problem.
- A properly developed and implemented approach to risk assessment can provide a company with a very valuable tool to help it manage safety.
- The ship's Safety Management System (SMS) and standing instructions should include clear and adequate guidance for "No Hot Work" in areas liable to be exposed to flammable gases, and should include adequate guidance on the control of flammable vapors in and around the cargo tanks or cargo compressor room.
- Whenever possible, hot work within the cargo area of a vessel carrying flammable cargoes should be carried out in a repair yard after all gas-freeing processes have been carried out and the area declared safe.
- If it is imperative that hot work has to be undertaken during the voyage, it should only be undertaken after a detailed risk assessment has identified ALL significant risks arising out of the work activity – including an evaluation of the suitability of the tools to be used – and suitable mitigation measures have been put in place. This should include procedures for any repairs or maintenance pertaining to any kind of hot work, particularly in areas exposed to hydrocarbons which would cause a serious accident, threatening life and property. The assessment should also take into account any existing precautions to control the risk, such as permits to work, agreed procedures as per SMS, use of personal protective equipment, use of safe tools, and a "Stop Work Policy."
- Under no circumstances should attempts be made by the crew to tap-off cargo gas to progress repair work. Any modification to cargo lines should be approved by the Administration and the vessel's classification society.

- While the practice leading to this unfortunate casualty cannot under any circumstances be condoned, flame-cutting using conventional set-ups such as oxy-acetylene, while commonplace, should always be carried out by competent operators and subject to a "permit-to -work." The danger of a flashback is nevertheless always present. The UK's Health and Safety Executive advises in its publication INDG297(rev1). "Flashbacks are commonly caused by a reverse flow of oxygen into the fuel gas hose(or fuel into the oxygen hose), producing an explosive mixture within the hose. The flame can then burn back through the torch, into the hose and may even reach the regulator and the cylinder. Flashbacks can result in damage or destruction of equipment, and could even cause the cylinder to explode.
  - Use the correct lighting-up procedure. Purge the hoses before lighting the torch to remove any potentially explosive gas mixtures. Use a spark igniter and light the gas quickly after turning it on.
  - Make sure the blowpipe is fitted with spring-loaded non-return valves.
  - Use the correct gas pressures and nozzle size for the job.
  - Maintain the equipment in good condition.

  These measures will reduce the risk of a flashback but will not completely eliminate it. Non-return valves will not stop a flashback once it has occurred."

Who may benefit?

- Seafarers, shipowners, ship operators.

Similar Casualty in Korea
Explosion involving Cargo Ship Wihummul (alias)
September 9, 2016 at around 18:40, about 30 miles to the south of the Port of Wakayama, Japan

Chemical Tanker Wiheommul had unloaded base oil in cargo holds number 1 and 3 at Shimotsu Port in Wakayama Prefecture and was sailing towards its next destination, Yokkaichi in Mie Prefecture. Crew was on the deck to clean and gas-free cargo holds. Suddenly, as some crew members were welding to hang the pressure gauge on the cargo hold, an explosion erupted. As a result of the explosion, the seafarer who had been welding died and two other crew members suffered an injury. The vessel could be sailed but was handled as total loss. At the time of the casualty, the weather was clear with wind blowing at 6-8m/s and waves reaching about 1.5m. The visibility was fine.

10 COLLISION

Very serious marine casualty : Collision between car carrier and fishing vessel

What happened?

A 60,000 GT car carrier was on passage in open sea with the officer on watch alone on the bridge. A 20 GT fishing vessel with a sole deckhand on watch was ahead of the ship, but was not observed by the officer on the car carrier. Heavy rain showers reduced visibility and affected the radars, but neither the officer on the car carrier nor the deckhand on the fishing vessel found any reason to call for assistance. They did not find any reason to start the fog signal. The officer on the car carrier observed no AIS tracks in the vicinity(the fishing vessel had no AIS).

The deckhand on the fishing vessel was not allowed to operate the radar, but merely checked the radar display and observed the car carrier 6 miles away on the fishing vessel's starboard quarter. He then went back to the watch room, which was just a tiny compartment above the steering room. From where he was sitting, there was a blind sector on starboard quarter. The ship subsequently collided with the fishing vessel, causing it to sink. One man was lost out of a crew of eight. The officer on the car carrier did not notice any collision.

Figure 10.1 Photo of the ship **SOURCE** Investigation report(JTSB, Japan Transport Safety Board)

Figure 10.2 Photo of a sister ship **SOURCE** Investigation report(JTSB)

Why did it happen?

- Heavy rain showers reduced visibility and adversely affected the ship's radar displays, preventing the officer on the car carrier to detect the fishing vessel.
- The officer of the car carrier relied on all other vessels having operational AIS, so he couldn't identify the fishing vessel, which had no AIS.
- The fishing vessel's deckhand was unable to monitor the car carrier's approach from his seated position in the watch compartment.
- Neither vessel sounded fog signals.
- The ship's officer on watch and the fishing vessel's deckhand had both noticed that the visibility had reduced. However, neither of them called for assistance prior to the collision.

External View of Steering Room and Watch Room

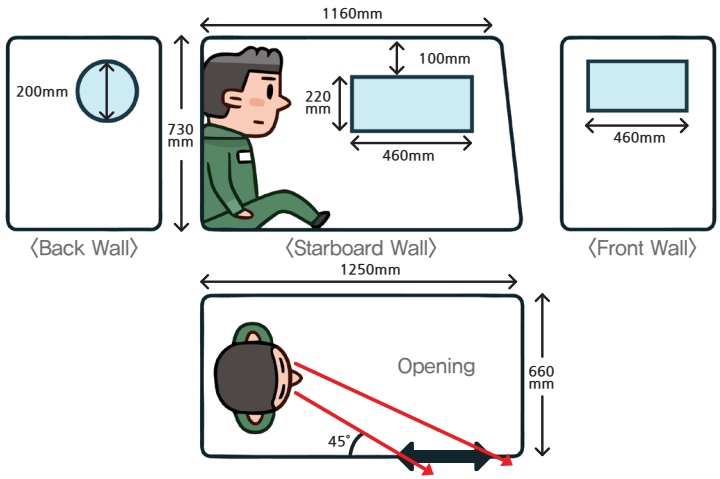


Figure 10.3 Watch room Dimensions Diagram **SOURCE** Investigation report(JTSB)

What can we learn?

- More than one person on watch is required in restricted visibility.
- Watchkeepers should be trained in the use of available equipment.
- Watchkeepers should not rely on vessels having operational AIS which may prevent vessels without operational AIS from being detected.
- Blind sectors should be taken into consideration when maintaining a proper lookout and may require a watchkeeper to continually move about.
- Sound signals should always be made in restricted visibility, even in open sea to provide an additional means for identifying a risk of collision.

Who may benefit?

- Seafarers, shipowners, ship operators.

Conduct of Vessels in Restricted Visibility

The captain should steer the ship in person in areas where danger is expected. It should be ordered that the captain be called at any time when dangerous situations or difficulties in navigation arise. Crew should abide by the watch-keeping system of having two-men (1 mate, 1 staff) on duty at a time. The speed should be maintained at a safe level that is appropriate for the situation and conditions at the time of the restricted visibility.

Relevant Regulations

· COLREG R.19(Conduct of Vessels in Restricted Visibility

M.E.M.O

11 COLLISION

Very serious marine casualty :
Collision between container ship and ro-ro car carrier

What happened?

A close-quarters situation developed in an area with heavy traffic. A 25,000 GT car carrier, which was the stand-on vessel in a crossing situation, called a 6,000 GT containership, which was the give-way vessel, to suggest that the car carrier turn to port and pass astern of the containership. This was agreed, but as the situation developed further, the container ship turned to starboard and finally ran into the starboard side of the car carrier. The bulbous bow caused sufficient damage to cause the car carrier to sink within 15 minutes. 11 seafarers were lost.

Figure 11.1 Photo of the ship in the collision **SOURCE** Investigation report(Bahamas Maritime Authority)

Figure 11.2 Photo of the ship in the collision(Before) **SOURCE** Investigation report(Bahamas Maritime Authority)

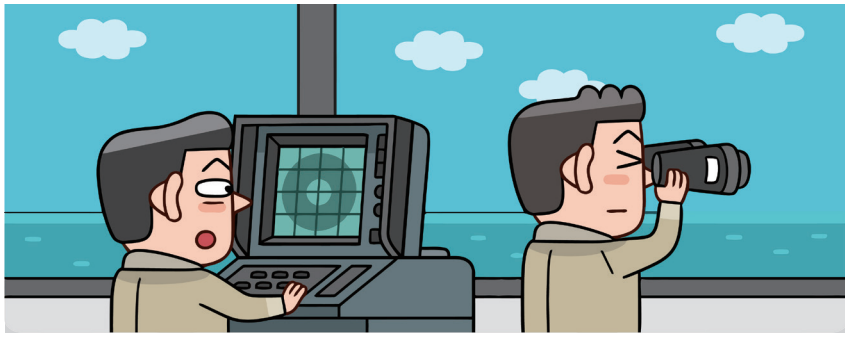
Figure 11.3 Photo of the ship in the collision(After) **SOURCE** Investigation report(Bahamas Maritime Authority)

Why did it happen?

- The vessels did not maneuver as agreed.
- The officers on both vessels relied solely on ARPA radar data. A lack of visual monitoring resulted in a delayed recognition of the actual situation.
- No lookout was posted on the container ship. The officer was alone on the bridge despite the heavy traffic and darkness.
- The car carrier did not take early avoiding action. Neither vessel took bold and definitive action in time to avoid collision.
- Immersion suits were difficult to reach on the car carrier due to the vessels list and only two persons wore them.

What can we learn?

- The most effective way to avoid a collision is to maneuver in accordance with the COLREGs. However, if other arrangements are made, they should be made in ample time, with due regard to observance of good seamanship and should be clear, followed and closely monitored by all vessels involved.
- A proper lookout should be kept visually, not only with instruments, at all times.
- Early and definitive action avoids dangerous situations from developing.
- Survival equipment should be sited where it is most likely to be reached.



Who may benefit?

- Seafarers, shipowners, ship operators.

Diverse functions of advanced electronic devices were added to conventional radars to provide comprehensive information on a target with computational function of the built-in CPU. It can track several targets simultaneously and analyze movements of each target. The data is shown automatically on the screen in a manner that can be easily understood.

Installation Standard

· Ship constructed before 1 September 1984 For tankers, 10,000 tons gross tonnage and upwards For ships other than tankers, 15,000 tons gross tonnage and upwards
· Ship of 10,000 tons gross tonnage and upwards, constructed on or after 1 September 1984

Caution

· Make a decision on the risk of collision by checking the CPA (Closest Point Approach) and the TCPA (Time to CPA).
· When there is a risk, either give way or cooperate by communicating with approaching vessel.
· Do not blindly trust the value displayed on the ARPA RADAR.

ARPA, Automatic Radar Plotting Aid

12

COLLISION

Very Serious marine casualty :
Collision of a bulk carrier with a coaster moored alongside a jetty

What happened?

A 25,000 GT bulk carrier was proceeding to a jetty with a pilot on board. The ship used its anchor and a tug to turn around and berth alongside a jetty. In doing so, the ship's bow collided with the port side of a coaster, which was moored alongside the jetty, breaching the hull of the coaster severely. The coaster left the jetty and was beached in shallow water to prevent it from sinking. There was no pollution and no one was injured. The damage to the bulk carrier was minor.

Figure 12.1 Photo of the ship after collision(Bulk Carrier) **SOURCE** Investigation reportInvestigation report (Panama Maritime Authority)

Figure 12.2 Photo of the ship after collision(Coaster Barge) **SOURCE** Investigation report (Panama Maritime Authority)

Why did it happen?

- The speed of the bulk carrier was too high to turn it around at the turning basin.
- After the engine was stopped, there was a delay in executing the engine astern order to further reducing the ship's speed.
- There was no detailed discussion between the master and pilot about maneuvering the vessel and the master was not aware of what the pilot intended to do.
- The ship's passage plan to the jetty did not take the starboard turn at the basin into consideration.
- The pilot was tired and not feeling well. Fatigue might have adversely affected his performance.

Figure 12.3 Positions of ship and her approximate heading during transit(Collision 1759LT)
SOURCE Investigation report(Panama Maritime Authority)

M.E.M.O

What can we learn?

- The speed should be lowered to the minimum necessary to manoeuvre the ship while approaching a jetty.
- The passage plan should be detailed from berth to berth, taking into consideration the vessel's manoeuvring characteristics and the local conditions.
- The master and pilot should fully discuss the passage plan and have the same understanding on what they intend to do.
- Bridge Resource Management(BRM) should be effective to facilitate coordination and information exchange between the bridge team and the pilot. Crew members and pilots should be well trained in BRM.

Who may benefit?

- Seafarers, shipowners, ship managers, pilots.

Contact with Floodgate Facilities of a Bulk Carrier "Bada"
14:29. August 29, 2012. Reading Pier on the Side of the Floodgate of 10 thousand tons at Incheon Port, Incheon Metropolitan City

Bada, a bulk carrier, was approaching a floodgate of 50 thousand tons with a pilot on board to enter Incheon Port. The pilot did not reduce the speed of the ship until it came very close to the reading pier which was in front of the bow. The ship lost control over the forward movement with its astern engine and crashed its bulbous bow into the reading pier on the side of the outer port of the floodgate of about 10 thousand tons at Incheon Port. It damaged the curve of the bulbous bow and fractured a part of the reading pier structure.

M.E.M.O

13 COLLISION

Very serious marine casualty : Capsize of a tug while assisting a ship

What happened?

A tug had been engaged to assist a passenger/ro-ro ship to berth in high winds. There was no harbour pilot on board the ship because the master held a pilot exemption certificate for the port. The tug was manoeuvring close to the port bow of the ship while attempting to establish the tow, when the stern of the tug collided with the ship's bulbous bow. As a result of the collision the tug came broadside on in front of the ship, heeled dangerously to port and took on water. The tug capsized and two of its crew died.

Figure 13.1 picture of passenger/ro–ro ship **SOURCE** Stena, Investigation report(The Dutch Safety Board)

Figure 13.2 The capsized tug **SOURCE** www. tugspotters.com, Investigation report(The Dutch Safety Board)

M.E.M.O

Why did it happen?

- The tug was forced to leave the "safe zone" and manoeuvre close to the bow of the ship in order to establish the tow, whereupon hydrodynamic interaction between the hulls of the ship and tug drew the tug inwards to collide with the ship's bulbous bow.
- The speed of the ship through the water at the time was too fast to safely establish the tow. The relatively high speed through the water meant the "safe zone" in which the tug must remain was further away from the ship, making it more difficult to establish the tow.
- The relatively high speed through the water also meant the tug was using a high percentage of its available engine power to match the speed of the ship, leaving minimal reserve power to manoeuvre.
- The pilot-exempt master of the ship was not required to have undergone additional training for tug assistance. Tug assistance was usually requested during adverse and difficult weather conditions.
- Water entered the tug through an open door and open engine-room ventilation duct when the tug turned broadside on and heeled over. This allowed down-flooding to occur, further reducing stability and ultimately causing the capsize.
- The tug crew were unable to close the engine-room ventilation duct during operations because it was required to be open in order to supply air for the tug's engines.
- The tug did not comply with the required stability parameters, which meant it was prone to excessive heeling during operations and down-flooding.

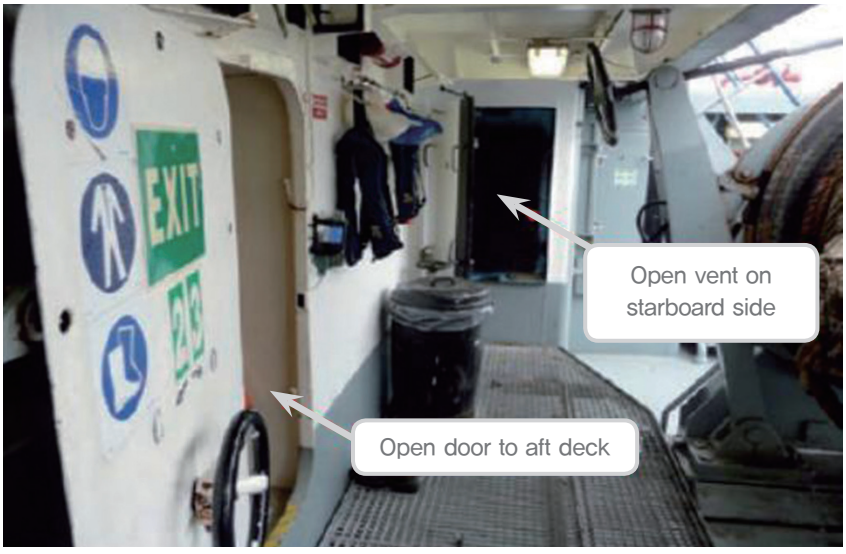
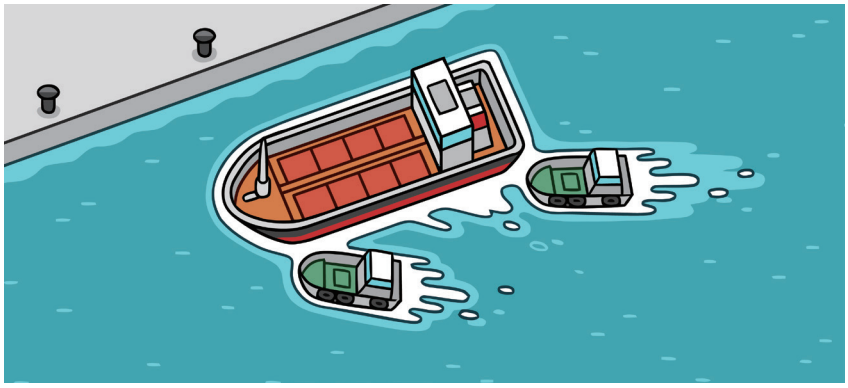


Figure 13.3 The door leading to the after deck on the tug(sister ship)
SOURCE Investigation report(The Dutch Safety Board)

What can we learn?

- Establishing a tow between a tug and ship should be conducted at safe speed in order to give the tug greater manoeuvrability and avoid it having to depart from the "safe zone" where dynamic interaction is less likely to occur.
- Ship masters(especially those holding a pilot exemption certificate) and tug masters must have a thorough understanding of both the theoretical and practical aspects of safe tug/ship operations.
- Tugs should be fit for the purpose they are being used. They require good stability and sufficient power and manoeuvrability for the intended operation.
- Down-flooding will quickly erode any reserves of stability and will be a major factor contributing to a capsize. During critical or high-risk operations all doors and other openings that need not be open should be securely closed.



Who may benefit?

- Seafarers, shipowners and operators, designers and operators of vessels engaged in towing.

Similar Casualty in Korea
Dolphin Collision involving Oil Tanker Seogyu (alias)
September 30, 1996 at around 11:00, M-oil dolphin of the Port of Incheon

After departing the Port of Gwangyang and laying anchor at C-7 anchorage of the Port of Incheon, the captain of Oil Tanker Seogyu, who had been exempted from piloting, was steering the ship herself by holding on to the towing rope of the tugboat Hangman (alias) near the port side of the bow. While approaching the N-oil dolphin, a strong current of about 2 knots from the port side swept the hull towards the dolphin, which resulted in a collision. A part of the ship was damaged with a hole and about 7 tons of oil leaked into the sea. At the time, the weather was clear with winds blowing from northwest at 3-4 m/s. The sea was calm with waves reaching about 0.3m.

M.E.M.O

14

FIRE

Very serious marine casualty : Engine-room fire

What happened?

A fire broke out in the engine-room of a passenger/ro-ro ship. As a result, the Chief Engineer and an engineer apprentice died and two other crew members suffered serious injuries. The seat of the fire was concluded to be in the vicinity of the starboard main engine No.5 fuel injector pump.

When the fire broke out, the First Engineer, the engineer apprentice and a repairman were in the engine-room workshop, located outboard of the starboard main engine at cylinder head level. They saw thick black smoke and flames at the forward part of the starboard main engine. They left the workshop via the foremost of two doors but had to pass close by the fire to make their escape through the engine-room. The First Engineer and the repairman left the engine-room via a watertight door on the port side of the forward bulkhead. They do not remember seeing the engineer apprentice as they evacuated the engine-room. They made their way through the corridor and up the stairwell to the reception area on deck 3. It was concluded that the engineer apprentice probably followed the same escape route, but instead of stopping on deck 3, he continued to deck 4, where his body was found just inside the door to the stairwell. All three sustained major burn injuries.

The Chief Engineer and a motorman were in the separator room, located outboard of the port main engine at cylinder head level. The Chief Engineer had just left the adjoining incinerator room and had been talking to the motorman for about a minute when he realized that the incinerator room had filled with dense black smoke. He returned to the incinerator room to investigate. The motorman initially looked into the engine-room from the aft door of the separator room and then went back to look for the Chief Engineer. Since he could not find him, he made his escape via the after door of the separator room, down to the engine-room floor plates, and into the auxiliary room through the watertight door located port aft of the engine-room. From there he was able to reach the control room where he called the bridge. The Chief Engineer's body was subsequently found in the separator room.

The vessel lost all main and auxiliary engine power. The emergency generator started but overheated and failed shortly afterwards. Consequently, the ship's fire pumps and other electrical equipment became inoperative. Fortunately, the ship was close to shore and was taken under tow to a berth where firefighters attended. Meanwhile, all 207 passengers and 55 crew had been evacuated by the two port side lifeboats.

Figure 14.1 Photo of the ship on fire **SOURCE** Thomas Molnes, Investigation report(AIBN, Accident Investigation Board Norway)

Why did it happen?

- After the fire, two different leakages were found in the fuel system, one from fuel injector pump No.5 fuel return pipe – which was completely fractured just below the pump flange - and one from the shared fuel return line drainage ball valve at the forward end of the starboard engine at floor plate level. The body of this valve was found detached from the pipe and lying on the floor plates. The indicator cock adjacent to No.5 fuel pump was not insulated, and it was concluded that the hot surface had ignited the escaping fuel.
- All four fastening bolts for the fuel injector pump were found to be loose, allowing the pump housing to move. Subsequent examination of the fracture surfaces showed that the fuel return pipe most probably broke as a result of fatigue fracturing, caused by the cyclical vertical loads caused by the movement of the pump body. The pump body was moving because the holding down bolts had not been correctly secured after the pump had been replaced twelve days previously. The fire spread to vital control equipment. Spray shields/covers were originally fitted by the engine manufacturer in front of each range of fuel pumps. These were not in place at the time of the fire. Had they been in place, they might have prevented fuel and flames impinging on the control equipment.
- A fixed local application firefighting system was fitted but it was set to manual instead of automatic operation and was not activated manually until sometime after the fire had started. When it was eventually activated, the absence of the spray shields/covers might have rendered the local application fire system less effective since the water nozzles were arranged on the basis that the spray shields were kept in place. Had the water spray system activated automatically, it might have provided a degree of protection to the personnel evacuating the workshop.

- The fixed carbon dioxide fire extinguishing system was not activated because the Master was uncertain whether the engine-room had been fully evacuated.
- The quick closing fuel supply valves were not operated. (The fire procedure contained no instructions for shutting off the fuel supply. This instruction was contained in the procedure for activating the carbon dioxide fire extinguishing system).
- The engine-room air inlets were not closed.

Figure 14.2 Starboard side of the main engine room **SOURCE** The police, Investigation report(AIBN)

Figure 14.3 The interior of the workshop on the starboard side **SOURCE** The police, Investigation report(AIBN)

M.E.M.O

What can we learn?

- A fuel fire in the main engine-room can develop extremely rapidly; in this case the engine-room filled with dense black smoke and both main engines failed within about four minutes of the fire alarm sounding. This highlights the importance of fire prevention – maintaining insulation etc., and keeping on top of leaks. It also demonstrates the importance of thorough emergency planning and regular, meaningful firefighting and evacuation drills.
- Correctly secure components subject to vibration and/or pulsating loads. When carrying out maintenance, it is essential that all manufacturer's instructions are available to, and understood by, maintenance personnel. In this case, the manufacturer required the holding down bolts to be secured to a specified torque; this information had not been included in the ship's job description for overhauling injector pumps, and a torque wrench had not been used to secure the bolts. Even had a torque wrench been used, it is beneficial to first ensure that threads run freely, that the component is properly seated and the specified torque is correctly applied; it is also worth considering the application of positive locking devices such as tab washers in addition to applying the specified torque in accordance with manufacturer's recommendations.
- Ensure spray shields and covers are in place and secure after maintenance.
- Ensure all hot surfaces are insulated and/or shielded in accordance with IMO MSC.1/Circ.1321 Guidelines for measures to prevent fires in engine-rooms and cargo pump-rooms.
- Carry out periodic checks while machinery is running under full load to identify any hot spots, and insulate or shield them from possible fuel sprays. Infra-red heat detectors are useful to establish surface temperatures.
- Consider establishing a record of all surfaces required to be insulated and the degree of insulation required.
- Deal with any fuel leaks immediately.
- Where automatic fixed local application fire-fighting systems are installed, ensure that the operating system is normally set to automatic. [Consider introducing an advisory system to clearly show when the system has been temporarily switched to manual to carry out maintenance e.g. a large warning notice in the control room and/or on the system control panel]

M.E.M.O

- It is important to provide training to deal with situations in which key personnel are put out of action. A lack of training and a lack of awareness about the responsibilities of stand-ins were among the factors that led to inadequate handling of the situation as it developed, especially since the Chief Engineer and First Engineer could not fulfil their assigned emergency duties.
- Where prepared job specifications are an established part of the company's safety management system, essential manufacturer's information necessary for completing the task safely (e.g. torque values for tightening securing bolts) should be included. While underpinning knowledge might have led one or more of the ship's engineers to query the absence of this information, the casualty demonstrates that, where a strategy of relying on documented work instructions is being used, it is essential that all necessary steps and data are included.
- Administrations and classification societies should consider introducing thermal imaging in their annual inspections to identify any non-compliant insulation.

Who may benefit?

- Seafarers, shipowners, classification societies, Administrations.

Fixed Local Application Fire-Fighting Systems

Purpose of Installation

To extinguish fire in its early stages without stopping the engine, evacuating crew, stopping ventilation fans and closing the engine room for fire in the machinery space of category A

Relevant Regulations

· SOLAS 00Amend Reg. II -2/10.5.6
· MSC/Circ.913(Guidelines for the Approval)
· MSC/Circ.1120(Unified linterpretations of SOLAS CHAPTER II-2)


Fixed Local Application Fire-Fighting Systems

15 MACHINERY FAILURE

Very serious marine casualty : Engine-room fire

What happened?

As a result of a severe engine-room fire, this passenger/ro-ro passenger ship lost all main and auxiliary power. In the resulting blackout, the emergency generator started up and went on line but stopped shortly afterwards.

When the engine was examined after the accident, it showed signs of overheating. The dampers that are meant to ensure that the engine has access to fresh air for cooling and combustion were found in the closed position, and a cooling water hose was found to be broken. The hose showed clear signs of fatigue, with both interior and exterior crack formations.

Why did it happen?

- The dampers either opened and quickly closed again, or failed to open, and the temperature in the emergency generator room increased as a result of insufficient air cooling. This then caused a rapid increase in the cooling water temperature, so that the cooling water line was exposed to high temperatures and probably a considerable increase in pressure when the cooling water reached boiling point. The hose probably ruptured under the strain and cut off the last remaining cooling effect for the engine, which then seized.
- The dampers were arranged to be normally closed and held closed by springs. They were dependent on a supply of compressed air from an accumulator to open them automatically when the generator started. The compressed air is produced by a working air compressor placed in the auxiliary engine-room and powered from the main switchboard. After weaknesses in this system had been identified in connection with the grounding of a sister ship two-years previously, a check valve was installed on the air supply line in the emergency generator room, so as to prevent loss of air pressure in the event that the power supply failed. The maintenance system on board the ship required the periodic testing of the automatic air dampers. This test was carried out about two months prior to the fire and the following comment entered: "the check valve does not work as intended – the damper goes in closed position after a while. Working on getting hold of new air cyl. with opposite action. Until then, the dampers are to be set blocked open at black-out". [sic] This information was neither shared with the shore-based management or sister ships in the fleet nor were effective temporary measures put in place to ensure the air supply in the event of an emergency situation.


Figure 15.1 Damper of the emergency generator **SOURCE** Investigation report(AIBN)

What can we learn?

- From a design point of view, the means for ensuring the air supply dampers to the emergency generator function should be completely independent of the ship's main power supply.
- When non-conformities are found on essential systems and spares are not readily available, suitable and effective contingency measures need to be implemented. If the non-conformity affects essential safety equipment – such as the emergency generator – and effective contingency measures cannot be implemented, then the relevant authorities should be advised.
- Such non-conformities should be shared with shore management, who, in turn, should consider whether the information should be shared with the fleet.

Who may benefit?

- Seafarers, shipowners, ship managers.

Emergency Generator

It must start automatically in the event of main power supply failure. When the emergency generator is in operation, it needs to automatically connect to the Emergency Switch Board (ESBD*). It should be regularly checked for a test run, status of starting system, and the level of fuel tank.

E.S.B.D.(Emergency Switch Board)

It is the emergency switchboard on vessel. Under normal conditions, it distributes power from the main switchboard but when power cannot be supplied from the main switchboard due to failure of main power supply then, it distributes electrical energy from the emergency generator to devices that are essential for the operation of the vessel.

Relevant Regulations

· SOLAS 00Amend Reg. II -1/42,43

16 CONTACT

Very serious marine casualty :
Engine-room fire and subsequent contact

What happened?

As a result of a severe engine-room fire, this passenger/ro-ro ship lost all main and auxiliary power and had to be taken under tow to a nearby berth. The stabiliser fins remained extended and, when coming up against the quay, the ship's side was penetrated by the starboard fin. The hull damage led to water ingress in No.2 Cargo Hold. The water also entered No.1 Cargo Hold, probably through the watertight doorway between the cargo holds. The door was not watertight due to a worn seal along the underside of the door. It took quite some time to locate and temporarily repair the hull damage, and to establish sufficient pumping capacity. The situation escalated and became critical in that the ship was close to capsizing alongside the quay.

Figure 16.1 damage sustained on the starboard stabiliser fin **SOURCE** DNV, Investigation report(AIBN)

M.E.M.O

Why did it happen?

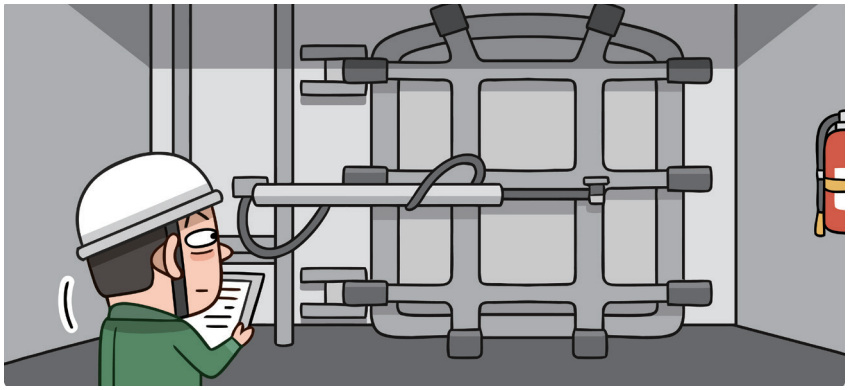
- Normally, the stabilizer fins retracted automatically when the bow thrusters were started. Since the bow thrusters could not be used on this occasion (no power), this did not happen.
- There was a checklist to be used when approaching port and this included retraction of the fins. Various means of retracting the fins were provided, including the provision of a manual hydraulic pump, but none of the systems were used. It is not clear from the casualty report whether the checklist was referred to during the berthing operation or whether an attempt was made to retract the fins using the emergency manual pump. The seal on the underside of the watertight door between No.1 and No.2 Cargo Holds was found to be severely worn, leaving a gap of 8-10mm across the width of the door, an opening of about 200cm^2.

Figure 16.2 The watertight sliding door between cargo hold no 1 and cargo hold no.2
SOURCE Investigation report(AIBN)

M.E.M.O

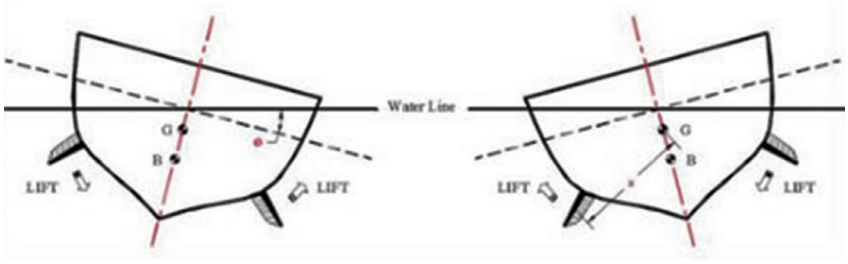
What can we learn?

- When working under duress – e.g. trying to berth a dead ship while there is a fire in the engine-room – it is particularly important to stand back and be sure that all appropriate steps are taken to achieve a safe berthing. It is under such circumstances that checklists have particular value.
- The owners of this ship have since had dry tanks built around the stabilizer fins so that if there is a major leakage it will be contained within the dry tank.
- Watertight doors should be examined periodically to ensure that they function correctly and the seals are in good order.



Who may benefit?

- Seafarers, shipowners, ship managers.



Fin stabilizer

It is an installation to reduce rolling of a vessel. They are located near the bilge on both sides, close to the central part of the vessel. The fins are shaped like a rudder of 3m in length and 1.5m in width. It creates a momentum that reduces rolling by changing the angle of the fins in turn in line with the rolling cycle. When they are not being used or when there are obstacles, they can be tucked inside the vessel.

M.E.M.O