

## **LESSONS LEARNED FOR PRESENTATION TO SEAFARERS (III 1)**

### **1 FATALITY**

Very Serious Marine Casualty: Loss of life on board a fishing vessel

#### **What happened?**

A fishing vessel was preparing to shoot two nets over the stern when one of the nets became snagged. One of the crew members, wearing a hard hat and a waistcoat style buoyancy aid without a collar, climbed over the rail, walked across the trawl deck and freed the net. As the crew member crossed back over the trawl deck, he stumbled and fell on top of the other net. At that moment the vessel surged on the swell and the net ran out over the stern ramp, carrying the crew member overboard with it. He ended up in the water no longer wearing his hard hat and unconscious. The crew member was retrieved but, due to the vessel's movement in the swell, the crew was unable to bring him back on board using the boarding ladder and the scramble net. A liferaft was deployed and the crew member was pulled into the raft and given cardiopulmonary resuscitation. The crew member was later winched aboard a rescue helicopter and brought ashore, where he was pronounced dead.

#### **Why did it happen?**

The crew member was on the trawl deck when the nets were being shot, which was contrary to onboard practice.

The crew member's hard hat had been fitted with a chin strap, but it is not known if the hat had been properly secured with the strap.

Whether conscious or not, the personal flotation device worn by the crew member was of a design that did not keep his head out of the water.

There was no effective arrangement in place to recover a person from the water.

#### **What can we learn?**

- The importance of complying at all times with onboard policies and procedures.
- The use of appropriate personal protective equipment, including safety harnesses, by crew members.
- Having in place a recovery device suitable for retrieving an unconscious person from the water.
- The importance of carrying out practice drills for man overboard recovery.

#### **Who may benefit?**

Fishing vessel owners, operators and crews.

## **2 SINKING**

Very Serious Marine Casualty: Fishing vessel sinking with loss of life

### **What happened?**

The skipper of a fishing vessel was at the helm keeping the wind on the stern while the crew member was hauling crab pots. One of pots became snagged under the water and the fishing vessel, which was in proximity to shore, went broadside to the seas and ended up on its beam ends. The two men, who were likely thrown from the fishing vessel into the water, were found deceased several days later. Only one of them was wearing a personal flotation device.

### **Why did it happen?**

The fishing vessel was fishing in proximity to the shore in an area where large seas were breaking at the time. Winds in the area were gusting up to 30 knots and a maximum wave height of about 6 metres was recorded.

It is likely that the skipper became distracted when one of the pots became snagged and the vessel went broadside to seas before being knocked over on its beam ends by a large breaker.

The vessel's weight distribution raised its centre of gravity and decreased its stability.

### **What can we learn?**

- The importance of assessing the vessel's stability and knowing its operational limitations.
- Maintaining constant vigilance regarding vessel handling when fishing in poor weather.
- The importance of wearing personal flotation devices whenever there is a risk of falling overboard.

### **Who may benefit?**

Fishing vessel operators and crews.

## **3 EXPLOSION AND FIRE**

Very Serious Marine Casualty: Chemical tanker explosion and fire with loss of life

### **What happened?**

A 16,000 gross tonnes chemical tanker was en route to a port to load cargo and the crew were preparing the tanks for loading. The washing of one of the tanks, which had previously carried benzene, had just been completed and the next steps were to strip the tank, ventilate it for a few hours, and then carry out tests to determine the cleanliness of the tank. However, a crew member made known his intention to use steam prior to ventilating the tank. The crew member inserted a steam hose and began to steam the tank. He then indicated that he was going to increase the steam pressure and to start the cargo pump to remove any water collecting in the tank. A few minutes later, there was an explosion and a fire. Unable to contain the fire, the crew abandoned the ship. They were later rescued by another ship. One crew member went missing and was presumed deceased.

### **Why did it happen?**

The explosion was the result of the ignition of the tank atmosphere, which contained benzene gas that was within the flammable limit.

The source of the ignition was most likely an electrostatic discharge from the end of the steam hose coming into contact with the tank side or other structure. The steaming of the tank, which was performed immediately after washing and before ventilation, also likely gave rise to an electrostatically charged mist.

### **What can we learn?**

- Prior to tank cleaning, a pre-cleaning meeting should be held to ensure that crew members understand their duties and the proper procedures to be followed. Any deviation from the procedures must be reported immediately.
- After carrying a flammable cargo, always assume that the atmosphere within a tank is flammable.
- The extreme danger of using steam injection to clean flammable cargo tanks due to the risk of static electricity.
- At all times, take precautions to eliminate sources of ignition.

### **Who may benefit?**

Shipowners, operators and crews.

## **4 GROUNDING**

Serious Marine Casualty: Grounding of a chemical tanker

### **What happened?**

A chemical tanker was on passage with a small scaled paper chart in use. The second officer saw a target on the radar display, but deselected it from the ARPA before handing over the duty to the first officer. The first officer was not concerned in any way by the radar display or by the position of the ship on the ECDIS or on the paper chart. The ship then grounded.

### **Why did it happen?**

The officers did not use a proper scaled paper chart. The chief officer overlooked the target displayed on the radar and did not carry out a proper lookout.

### **What can we learn?**

- The need to maintain a proper navigation watch.
- A proper scaled chart must be used for navigation.
- The watch handover must be completed in detail and fully cover the prevailing circumstances.
- In accordance with regulation 5 of Collisions Regulations, every ship shall at all times maintain a proper lookout by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

### **Who may benefit?**

Ship operators and crews.

## **5 CAPSIZE**

Very Serious Marine Casualty: Capsize and foundering of a fishing vessel

### **What happened?**

A 14.94 metre long fishing vessel was lost while fishing approximately 6 nautical miles from the coast. While loading the catch, two waves swamped the deck, leading to flooding of the fish hold and eventual capsize, resulting in the loss of the skipper.

The vessel was trawling for sprats and had loaded approximately 20 tonnes of fish into its fish hold via a flush deck scuttle. The fish hold hatch cover had been removed for access and two deck freeing ports on the vessel's starboard side had been closed. There was a significant catch still left in the net and, as the next portion of the catch was being lifted on board, a wave swamped the starboard quarter. The crew replaced the fish hold hatch cover and the skipper started pumping out the fish hold. A second wave then swamped the deck, leaving the vessel with a starboard list and substantial water on deck.

A rope securing the net to the starboard side was released and the vessel was steered slowly round into the wind. Shortly afterwards, it capsized to starboard. The mate and crewman managed to swim clear of the vessel and were rescued 20 minutes later by the crew of another fishing boat that was nearby. The skipper was lost with the vessel.

### **Why did it happen?**

The vessel capsized because in her loaded state it had an insufficient reserve of stability to withstand the sudden flooding and its associated free-surface effect.

The vessel's stability information booklet, approved in 1995, specified that catch should be limited to 17.08 tonnes, though modification to the vessel after 2007 would have reduced this limit. Routine landing of catches of this quantity without incident would have reinforced a belief that it was safe to carry such loads. However, when heavily laden, the vessel had a low freeboard aft, which increased the risk that waves might wash over the deck. As the weight of catch in the hold increased, so did the risk of down flooding should a wave wash over the deck while fish were being loaded into the fish hold through the open fish deck scuttle, and with the fish hold hatch cover also open.

### **What can we learn?**

- Skippers of fishing vessels need to be aware of the stability characteristics of their vessels and the hazards associated with poor or reduced stability.
- Fishing vessels should have their stability checked and assessed at regular intervals to take account of modifications.
- Skippers and crew of fishing vessels should be encouraged to wear lifejackets.
- The use of deck scuttles to load fish from the deck creates a significant down-flooding hazard.
- The closure of freeing ports restricts the ability of a vessel to shed water from its deck.

### **Who may benefit?**

Fishing vessel owners, operators and crews.

## **6 GROUNDING**

Serious Marine Casualty: Containership touched bottom and sustained damage

### **What happened?**

A large container vessel was sailing from port under pilotage during the hours of darkness.

While transiting from the inner harbour to the main entrance channel, the vessel failed to execute a turn successfully and was set to starboard towards the side of the channel. The ship made contact with rocks on the edge of the channel in way of the vessel's bunker and ballast tanks below the water line.

The vessel was holed in both the ballast tank and the bunker tank, resulting in flooding to the ballast tank and pollution from the bunker tank.

### **Why did it happen?**

- A lack of a detailed passage plan.
- A failure to use the turning basin to enable the vessel to line up for the main channel.
- A lack of appreciation of the handling characteristics of the vessel, such as effectiveness of the bow thruster, and shallow water effects.
- Over-reliance on the pilot.

### **What can we learn?**

- The importance of having a full understanding of the ship's handling characteristics and its limitations.
- The pilot and bridge team should have the same understanding as to how the voyage will progress.
- When operating in restricted waters and the margin of error is small, the passage plan should be sufficiently detailed to allow for the precise monitoring of the intended manoeuvres and the ship's progress.
- The importance of taking into consideration the hydrodynamic effects of narrow waterways and the depths of water on the handling characteristics of ships.

### **Who may benefit?**

Ship operators and crews, port authorities and pilots.

## **7 SINKING**

Very Serious Marine Casualty: Flooding and sinking of Ro-Ro cargo ship

### **What happened?**

A Ro-Ro cargo vessel sailed from port with a newly joined master and chief engineer. At about 2300 and at a distance of 42 nautical miles from the coast, the vessel started taking water in the engine-room. The chief engineer did not attempt to find the source of the water or start any bilge pumps. Power was lost and no attempt was made to restore emergency power.

At about 0130, a coastguard vessel came alongside and all crew disembarked safely via a pilot ladder.

The vessel was reported to have sunk by 1300 the following day.

### **Why did it happen?**

- An unexplained ingress of water to the engine-room.
- A failure to attempt to find the source of the flooding.
- A failure to attempt to pump the water out.
- A failure to restore emergency power.
- A failure to secure the watertight integrity of the engine-room.

### **What can we learn?**

- The importance of ensuring that equipment necessary to respond to emergencies is functioning properly and ready for use.
- Early detection of water ingress is important to take timely action before a developing situation becomes an emergency.
- When faced with an actual emergency, the response of those who have received training and practice is more automatic, coordinated and timely.
- The importance of new crew members gaining familiarity with a vessel and its critical system.

### **Who may benefit?**

Ship operators and crews.

## **8 EXPLOSION AND FIRE**

Less Serious Marine Casualty: Charging of Oxygen Breathing Apparatus by air compressor

### **What happened?**

A bulk carrier was equipped with self-contained breathing apparatus (BA), spare air cylinders and a portable air compressor for refilling the air cylinders. Despite not being a mandatory requirement, the vessel was provided with oxygen breathing apparatus (OBA) on board. During the voyage at sea, an officer found the pressure of one OBA cylinder low and he used the air compressor to re-charge it. First, he tried to connect the discharge hose connector of the air compressor directly to the OBA cylinder, but it did not fit. Then, he found an adaptor in a box next to the air compressor that could be used so he fitted it to the discharge hose connector of the air compressor and the OBA cylinder. He opened the valve of the OBA cylinder and, as he reached over the compressor to switch it on, the compressor discharge hose exploded. He was engulfed in a ball of flame and sustained serious skin burns. The fire was started on and around the air compressor. It was extinguished with the use of a portable fire extinguisher by another crew member. The injured officer was later winched off the vessel by helicopter and sent to hospital for treatment.

### **Why did it happen?**

The immediate cause of the explosion was probably the temperature of the oxygen-rich environment within the discharge hose of the air compressor which had dramatically increased by adiabatic compression. The heat of the oxygen rose beyond the auto-ignition temperature of the oil in the system and resulted in the explosion. The safety management system did not provide appropriate guidance on the operation and maintenance of OBA sets and the officer was not appropriately trained or drilled on the use of the equipment.

## What can we learn?

- It is important to properly implement the requirements of the ISM Code.
- Any safety and firefighting equipment placed on board in addition to the minimum mandatory requirements should be included in the management company's procedures regarding its safe operation, maintenance and training.
- Crew should be reminded that OBA cylinders, if provided on board, must not be charged using an air compressor.

## Who may benefit?

Shipowners, operators and crews, and equipment manufacturers.

## 9 EXPLOSION AND FIRE

Serious Marine Casualty: Ignition of gas from cargo

### What happened?

A general cargo ship, loaded with a cargo of Direct Reduced Iron Fines (DRI (C)), arrived and berthed at its discharge port. An explosion occurred when a crew member used a remote controller to jack up and open a hatch cover. Five crew members in the vicinity were injured by fire. The fire spread into the cargo holds. The vessel was attended by shore firemen and the fire was finally extinguished after injecting CO<sub>2</sub> into the cargo hold.

### Why did it happen?

DRI reacts with moisture to release hydrogen gas. The explosion was caused by ignition of hydrogen gas by an electric spark generated from a defective electric cable of the remote controller. Hydrogen gas had accumulated inside the deckhouse during the voyage.

Based on the master's voyage orders, the ship was to load Iron Ore Powder. The master of the vessel did not pay attention to the cargo loaded on board.

After loading the master was provided the cargo manifest, which indicated that the ship had been loaded with DRI (C). He had limited knowledge of the cargo and did not consult the IMSBC Code\*\* and carried the cargo as a non-regulated dry bulk cargo.

### What can we learn?

- Prior to loading DRI (C), shippers must provide masters with a certificate issued by a competent person recognized by the National Administration of the port of loading stating that the cargo meets the requirements of the IMSBC Code and is suitable for shipment.
- Masters who determine that DRI (C) was loaded without receiving a certificate issued by a competent person or that the requirements of the IMSBC Code have not been met should immediately contact their Designated Person Ashore.
- Ship's officers should be fully aware of cargo hazards.

### Who may benefit?

Shipowners, operators and crews, and shippers of dangerous cargoes.

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\*\* The individual schedule for DRI (C) in the IMSBC Code contains detailed provisions for the transportation of this cargo, including provisions regarding the maximum moisture limit, inerting and quantitative measurements of hydrogen and oxygen.

## 10 FATALITY

Very Serious Marine Casualty: Loss of two lives and two serious injuries during a lifeboat exercise

### What happened?

A lifeboat fitted with an on-load release mechanism was lowered into the water with four crew members on board. Its motor and spraying system was then tested without the davit falls being disconnected. After the testing, the lifeboat was hoisted, stopped at the one metre above the water for the crew members to check the hooks, and then hoisted again. Because of the lifeboat's oscillations, the hoisting was stopped with the lifeboat around two metres from the stowage deck platform. The davit fall connected to the forward hook then released, causing the lifeboat to be temporarily supported only by the aft hook. The aft davit fall then released. The lifeboat fell into the water from a height of approximately 30 metres. Two crew members died and two others suffered serious injuries.

### Why did it happen?

The forward davit fall lifting ring was able to pass between the forward hook and retainer because there was a gap between the hook and the retainer. The crew member in charge of maintenance of the on-load release mechanism did not know the required clearance between the hook and the retainer. This was partly because the on-load release mechanism operating and maintenance manual did not mention how to adjust the gap, and partly because the manufacturer did not give training to the crew members at the time of its installation on board.

The company, owner and crew members did not ask the manufacturer for the technical manual, which would have provided the required clearance and means for adjusting the gap between the hook and the retainer.

The company and owner did not ensure that an inspection of the lifeboats, including the on-load release mechanism, by the crew member in charge of the maintenance was conducted at appropriate intervals and that a non-conformity report was submitted to the company.

There was no safety barrier in the event of an inadvertent release of the on-load release hook.

### What can we learn?

- Crews need to be aware of the risks associated with crewmembers riding in lifeboats as they are lowered and hoisted during drills. Further guidelines on safety during abandon ships drills using lifeboat can be obtained in the IMO document MSC.1/Circ.1206/Rev.1.
- The company's SMS should consider the need for the use of a safety defence such as fall preventer device to address an inadvertent release of the on-load release mechanism during abandon ship drills.
- The operating and maintenance manual of a lifeboat needs to describe in detail the on-load release mechanism and means for adjusting the gap between the hook and the retainer.
- Special care needs to be taken by crew members to ensure the on-load release hooks are properly connected to the lifting rings and the operating mechanism is locked in place before starting to launch or hoist a lifeboat.



- It is important that a competent crew member is put in charge of maintenance conducts an inspection of the lifeboats, including the on-load release mechanism at regular intervals laid down in the SOLAS convention.
- Shipowners should ensure that the guidance in MSC.1/Circ.1206/Rev.1 is followed, including having on board the manufacturer's manuals and instructions for the equipment fitted.

### **Who may benefit?**

Shipowners, operators and crews, and lifeboat manufacturers.

## **11 CAPSIZE**

Very Serious Marine Casualty: Capsize of a fishing vessel during fishing activities

### **What happened?**

A 9-metre long fishing vessel with a skipper and a crew member on board was fishing in an estuary. The vessel had already harvested 58 of an intended 80 bags of mussels, weighing approximately 1,450 kg and stored on deck. The vessel turned to port and stopped in order to hoist the dredge and to ride over the wake created by a passing merchant vessel. A pump for washing the mussels was discharging water overboard. At the stern, the dredge was fully hoisted, and then the crew member tried to attach a line to the bottom of the dredge. The vessel suddenly rolled to starboard, and then flooded and sank. The skipper survived but the crew member was found dead after the accident; neither of them was wearing a life jacket.

### **Why did it happen?**

The two fuel tanks were about 1/3 full and were interconnected, which allowed the fuel to flow to starboard when the fishing vessel rolled. The flow of fuel increased the list to starboard, and the free-surface effect decreased the GM.

The uneven distribution of accumulated bags of catch on deck probably increased the starboard list as the arrangement for washing the mussels restricted the number of bags that could be stowed on the port side.

The dredge was not hanging vertically from the gantry, but swinging freely above the deck and hanging to starboard. This situation probably increased the vessel's list to starboard.

The sea condition with wind force 3 to 5 might have increased the list to starboard.

Under normal conditions, the fishing vessel was not upright; her floating equilibrium was slightly to starboard.

The skipper and crew member were not wearing lifejackets.

### **What can we learn?**

- It is important for fishermen to have knowledge of stability; what happens if the fuel tank is not full, what happens if the accumulated bags or fishing nets are not distributed evenly on deck, what happens if the dredge is not hanging vertically but to either side.
- An authorized body needs to check whether a vessel's stability would be maintained when an alteration is intended that would affect the stability of a fishing vessel.

- While engaged in fishing activities, all crew members on board need to wear lifejackets.  
The value of and need for stability training for commercial fishing industry masters.
- Understanding the significant dangers of free surface effect on vessel stability.
- The serious hazardous and negative impact on vessel stability of hoisting heaving loads in a seaway.

### **Who may benefit?**

Fishing vessel owners, operators and crews, and authorized bodies.

## **12 GROUNDING**

Very Serious Marine Casualty: Grounding and subsequent break-up of a bulk carrier

### **What happened?**

A bulk carrier was on a passage following a great circle route on autopilot. The vessel was on the planned course. The chief officer saw a large echo on the radar screen, very close ahead. He assumed it was a heavy storm cloud, and thereafter he felt the vessel's impact of running aground. It was before sunrise and there were some light showers.

The vessel ran aground on an island and sustained severe bottom damage to almost all of her water ballast tanks. It developed a list to port and was eventually abandoned by its crew. Two days after the grounding, the vessel broke up into two sections; the forward section drifted away and the aft section capsized and sank, which resulted in widespread pollution around the island.

### **Why did it happen?**

The island was on the planned course, but neither the second officer nor the chief officer was aware of that.

Before departure, the second officer had calculated waypoints for every 10 degrees of longitude when following the great circle route. He then plotted them and drew course lines on a chart, but one of the waypoints was not plotted as calculated. As a result, the course line indicated that the vessel would clear the island by about 10 nautical miles.

The officers had not consulted the chart. Although the chart was of an unsatisfactory scale, it could have prompted them to adopt a precautionary approach when radar echoes were sighted on the radar.

The bridge team was aware that the vessel would be passing close to some islands, but was not aware as to when that event would take place. Both the second officer and the chief officer saw some echoes on the radar screen, but did not investigate them and dismissed them as rain clouds.

The chief officer's alertness may have been altered because he had a cold, took some medicine, and had trouble in sleeping before he took over the watch.

As part of the passage planning, the company required the second officer to plot "No Go" areas on the charts, draw the planned courses on the large scale navigation charts, and ensure that the passage did not pass closer than 10 nautical miles from a danger or "No Go" areas. This work was not carried out and the master did not ensure that the company's requirements had been complied with.

## **What can we learn?**

- Marking of critical areas on appropriate large scale charts would have assisted the bridge team in maintaining a good situational awareness of the hazards ahead.
- Position monitoring by consulting the charts could have prompted the officers to adopt a precautionary approach when large echoes were sighted on the radar.
- The master made no reference to the passing of the islands in his night orders. Reference to the islands could have alerted the officers to the significance of radar echoes.
- Holding a pre-sailing passage planning meeting along with effective BRM should reduce the risk of a single-person error of occurring.

## **Who may benefit?**

Shipowners, operators and crew.

## **13 FATALITY**

Very Serious Marine Casualty: Fatal accident of a crew member during an unmooring operation

### **What happened?**

A deckhand was working on board a river ferry to release lines that were securing the vessel overnight to a mooring buoy. He was dragged violently against the vessel's bulwark and was carried overboard by a mooring rope which had become entangled in the vessel's propeller and was being wound in. He suffered severe facial injuries and was almost certainly unconscious when he entered the water. He subsequently drowned although his lifejacket brought him to the surface and he was recovered by his colleagues to a workboat within minutes.

### **Why did it happen?**

The mooring rope could have become trapped between the vessel and the buoy because: the vessel came ahead further and faster than usual; the rope was being recovered more slowly than usual; or the rope became entangled with the wire pennants hanging from the buoy.

The master's view and line of sight towards the mooring deck and buoy were impaired by the vessel's structure. At that time, there was no one available to guide the master: the mate who should have supervised the deck operation and communicated with the master was late for work; and a senior deckhand who was temporarily filling the post went to the toilet after he relayed the master's signal to cast off the mooring rope. The master was waiting a signal from the senior deckhand that the rope had been retrieved not knowing that he had gone to the toilet.

The mooring rope was being recovered over the bulwark, not through the fairlead, and it is most likely that the deckhand was standing in a bight of the rope. The ferry crews had each developed their own systems for unmooring, and the deckhands had their own techniques for rope retrieval. There were no guidelines on whether ropes should be recovered by leading them over the bulwark or through fairleads.

A number of the working practices used on board clearly demonstrated an erosion of the best practices the crew members had been taught. The probable cause of this erosion of standards is likely to have been task familiarity and the repetitive nature of the work. The deckhand is likely to have complied with the custom and practice followed by his senior colleagues on board.

The lifejacket worn by the deckhand, but unsecured, was not fully supporting his face from the water. Recovery of the deckhand from the water was extremely difficult due to unavailability of suitable equipment for the recovery, and the height of the workboat's freeboard and bulwark.

The unmooring operation was a routine task but it had not been captured by the company's safety management system. Consequently, the very real hazard posed by the rotating propeller blades during the task had not been formally recognized. A review of the risk assessments and operational procedures had been conducted by managers who had been deck crew and masters on the ferries in the past, which might have hampered their ability to carry out an impartial evaluation of the work systems.

### **What can we learn?**

- Detailed procedures for unmooring should be included in the safety management system, and the possible hazards during unmooring operation should be identified.
- A vigilant supervisor, monitoring the situation and giving appropriate guidance to the master and deckhands, could have prevented the rope from becoming jammed and have warned the deckhand about standing in a bight.
- Without adequate supervision, the unmooring process was inherently unsafe and should have been recognized as such through the company's risk assessment process.
- Communications would have been improved by the use of hand-held radios, and the master handing a radio to a nominated acting mate would have removed ambiguity as to their role.
- There are benefits to having independent marine experts assist with the review of the vessel's risk assessments and operational procedures to identify the risks of the prevailing shipboard customs and work practices.
- All workboats on the river could be called upon to assist in water rescue, and therefore should carry suitable equipment for this task.
- The dangers of rushing to get underway before critical crewmembers are stationed at their designated post.
- The dangers of a vessel operator mooring a vessel without a direct line of sight to the mooring crew.
- The dangers of vessel operators mooring a vessel without establishing an effective and positive means of communicating with the mooring crew.

### **Who may benefit?**

Shipowners, operators and crews.

## **14 GROUNDING**

Serious Marine Casualty: Grounding of a cargo vessel on an island in a narrow channel

## **What happened?**

A cargo vessel was proceeding in a narrow channel in the early morning. The bridge was manned by a pilot, the officer of the watch and an able seaman. The vessel passed a waypoint where the course should have been altered. The pilot did not alter the course until the officer of the watch called out to him, and it was too late to avoid grounding on an island. The vessel initially continued the voyage but it was then decided to beach it because a large part of the vessel was about to be flooded. The crew and the pilot were evacuated from the vessel without any injuries. An oil-spill response action was taken and the impact on the environment was minimal.

## **Why did it happen?**

It is highly probable that sleepiness, as a result of insufficient sleep and an unfavourable time of day, was an important factor in the accident. The pilot had been on duty for a week and, during this period, his workload had been heavy. Although in accordance with the applicable regulations, the pilot's workload had involved much night work and few opportunities to get rest and sleep.

The officer of the watch had to prepare for the vessel's arrival and organize mooring operations, without another navigator being added to the bridge crew. Hence, his full attention was not on the navigation. In addition, the capacity of the officer of the watch to keep track of the vessel's exact position was reduced because the navigational aids in the area had been changed and the related temporary and preliminary corrections for the charts on board were not readily available.

The vessel's watertight integrity was not maintained. It was necessary for the crew to pass through the engine-room bulkhead in order to access some parts of the bilge and ballast equipment that required regular maintenance and control. The arrangement is considered to be within class rules, and international and statutory regulations, but a manhole cover in the engine-room floor, which was a part of the watertight bulkhead, was loosely fastened with two or three out of a total of 24 bolts, which allowed water to flow into the engine-room through a pipe trunk leading to the bow thruster room.

## **What can we learn?**

- Steps should be taken to prevent distractions to watchkeeping, during periods requiring increased vigilance.
- When navigating a narrow channel, the bridge team should have been reinforced with an additional navigator, preferably the master. Owners should implement measures to ensure the presence of sufficient bridge resources at all times for the vessel's crew to be able to navigate the vessel safely and monitor the pilot's navigation.
- Authorities should ensure that the work schedules for pilots allow for sufficient periods of sleep and rest.
- Operational issues should be taken into account when construction drawings of watertight bulkheads are examined.
- The need to ensure watertight closures are properly closed to ensure watertight integrity.

## **Who may benefit?**

Shipowners, operators and crews, pilots, pilotage authorities, and classification societies.

## **15 SINKING**

Very Serious Marine Casualty: Flooding and sinking of a dive support vessel

## **What happened?**

A 7,000 gross tonnes dive support vessel was docked in a floating dry dock for class renewal survey, repair and maintenance work. Access holes were produced by cutting the shell plating in order to facilitate work around a tank. Ten access holes were made approximately 0.3 metre above the waterline. Even though the work had not been completed, the vessel was refloated and moored alongside another vessel. Some days later, the vessel suddenly listed to starboard and sank. Crew members in the cabins noticed the flooding and evacuated the vessel. There were no injuries.

## **Why did it happen?**

The vessel, alongside which the dive support vessel was moored, discharged water overboard and into the dive support vessel through the access holes that had been cut into its shell plating.

Because the manholes doors to the engine-room were not secured shut, the flood water flowed into the engine-room.

After the access holes had been cut into the shell plating, no protective measures to prevent the ingress of seawater had been taken both by either the shipyard workers or the vessel's crew members.

Communication about the work to be done between the shipyard workers and the crew members was insufficient. Crew members did not recognize that the access holes were vulnerable to the ingress of seawater.

There was no responsible officer on watch to monitor any change of the vessel's condition when it left the floating dry dock.

## **What can we learn?**

- The situation surrounding the vessel changed after it shifted from a floating dry dock, the shipyard needed to consider new hazards and take measures to reduce the level of risk incurred by the shifting.
- Communication between shipyard workers and crew members is important since sharing information about the work to be conducted would provide awareness about the risk they might encounter. A meeting on the day's work between shipyard workers and crew members is encouraged to share information.
- Whenever any change of plan at the shipyard is made, the shipyard needs to evaluate a new hazard or control that is no longer effective by the change. In this case, a change happened when the vessel was shifted out of the floating dock, but no risk assessment was carried out. The control taken during the work at the floating dry dock had become ineffective.
- A responsible officer needs to monitor the safety situation of the vessel to identify any risk incurred by a change of work plan.

## **Who may benefit?**

Shipyards, classification societies, shipowners, operators and crews.

## 16 FATALITY

Very Serious Marine Casualty: Fatality during a rescue boat exercise

### What happened?

A rescue boat exercise was planned as a monthly drill. Prior to launching, launching procedures were discussed among the participants of the drill. The hook arrangement was checked. The crane and its limit switch were tested by lifting and slewing the rescue boat. The rescue boat was suspended by the hook arrangement consisting of an off-load hook and a swivel. The swivel was composed of a fork end shackle and a green pin shackle. The fork end shackle was secured by a shackle pin and a split pin. An AB embarked the forward starboard side of the rescue boat. Then he moved to its forward port side, positioning himself in the boat. The chief officer embarked, took two steps forward, and passed to the port side. Suddenly, the rescue boat fell approximately 18 metres to the water.

The chief officer was seriously injured and the AB was found dead. After the accident, it was found that the split pin was broken off and the actual way in which the swivel was mounted was different from that designed.

### Why did it happen?

The visible part of the split pin on the shackle pin had broken off, and the shackle pin came free from the fork end shackle of the swivel, resulting in the fall of the rescue boat. Safety of the rescue boat during its launching and recovery from the water relied exclusively on the condition of the split pin.

An approval of the rescue boat crane arrangement was delegated to the classification society by the flag State. The classification society did not take into consideration the design of the system of the rescue boat crane and the appropriateness of its individual parts. There were no controls to reduce the level of risk associated with the failure of the split pin.

Although weekly inspection of rescue boats, including the condition of the hook, is regulated by SOLAS, the deck officer in charge might not have checked the swivel or the split pin. The ship's SOLAS Maintenance Manual did not mention weekly inspection of the swivel or the split pin.

### What can we learn?

- Crews need to be aware of the risks associated with crewmembers riding in rescue boat as they are lowered and hoisted during drills. Further guidelines on safety during similar type drills can be obtained in the IMO document MSC.1/Circ.1206/Rev.1.
- All hazards associated with the hook arrangement of a rescue boat should be identified at the design phase because it is difficult to take into consideration any non-identified hazards through the subsequent risk management process.
- The risk management process should continuously aim to reduce the level of risk identified with regard to the hook arrangement until it becomes acceptable to the management company.
- Since the hook arrangement is a very important safety item, it is essential to confirm that the actual arrangement remains in line with that designed.
- The management company should give shipboard personnel instructions to ensure the weekly inspection of a rescue boat, including the condition of the hook.

## **Who may benefit?**

Flag States, recognized organizations, crane and rescue boat manufacturers, ship builders, shipowners, operators and crew.

## **17 COLLISION**

Very Serious Marine Casualty: Collision between a bulk carrier and a fishing vessel berthed in a port

### **What happened?**

A bulk carrier hit a moored fishing vessel when the ship's main engine went ahead and not astern as ordered by the pilot. The fishing vessel was crushed against the wharf and sank when the ship pulled clear. There was nobody on board the fishing vessel at the time. The bulk carrier sustained several small holes in its bow shell plating.

The collision occurred as the pilot was manoeuvring the ship in a turn following an uneventful passage from the pilot boarding ground. The ship's main engine was in engine-room control mode, with the ship's electrical engineer acknowledging the bridge telegraph movements on the engine-room control telegraph. The chief engineer was controlling the main engine start/fuel lever to action the bridge orders.

In order to stop the ship's movement towards the wharf, the pilot ordered a number of successive astern main engine movements and tug orders. However, the ship did not respond as he expected it to. Despite the fact that the main engine was not going astern, no one on the ship's bridge or in the engine control room were aware of the fact.

### **Why did it happen?**

The chief engineer did not allow sufficient time for the starting air to brake the main engine before re-admitting fuel. Consequently, the main engine, which was still turning ahead, started the "wrong way" and ran in the ahead direction rather than astern.

When the main engine was operated in engine-room control mode, the only system protections to warn the crew of "wrong way" running of the engine were the bridge and engine control room console-mounted flashing light indicators. There was no automatic interlock to prevent 'wrong way' operation of the engine and no audible alarm to indicate when it was running the "wrong way".

The ship manager had not implemented any procedures or guidance to inform the crew that extra vigilance was required when operating the main engine in engine-room control mode.

The passage plan for the port contained general information, such as depths and navigation/channel marks, but it did not contain actual passage specific information, such as courses and speeds to be followed.

The port operator had not undertaken a risk assessment, or developed contingency plans for this specific ship handling manoeuvre in the port. Consequently, the pilot had no guidance regarding what actions to take if the berthing manoeuvre did not progress as he had planned.

The participation of the two tug masters in the pilotage process was not actively encouraged. Consequently, it was not until after the collision that one of the tug masters advised the pilot that the ship's main engine was still running ahead.



## What can we learn?

- The crew should be actively monitoring the main engine movement indicators in order to rapidly detect any differences between the telegraphed engine order and the actual engine movement.
- To help the crew to be at their most vigilant, some form of guidance and/or instructions should have been provided in the ship's safety management system.
- Having a passage plan for pilotage is critical for effective BRM to avoid a situation that none of the bridge team knows when to alert the pilot if any limits are being reached or if any error is being made.
- The ship's speed approaching the wharf may not allow enough time to implement any contingency plan. The issue of speed during pilotages should form an important part of any port risk assessment and associated control measure.
- Tug masters can be part of a pilot's early warning system and form a valuable defence against a single-person error.

## Who may benefit?

Shipowners, operators and crews, pilots, port operators and tug masters.

## 18 GROUNDING

Very Serious Marine Casualty: Grounding of a bulk carrier in adverse weather

## What happened?

A bulk carrier left port in adverse weather. Due to its ballast condition, it did not have power enough to steer against wind and sea, and subsequently drifted along the coastline. An attempt was made to drop anchor, but the vessel still drifted to the shore, and broke up. Ten of her 21 crew members were lost.

## Why did it happen?

- Lack of detailed planning for departure.
- No risk assessment of the decision to leave port in adverse weather was made.
- The vessel was in ballast but not fully ballasted. Hence, its propeller power was not optimal.
- Lack of knowledge or understanding of the limitations of the anchoring system led to an attempt to anchor the vessel in vain.
- An authoritative leadership resulted in crew members accepting without assessment the master's decision to leave port.

## What can we learn?

- There was a lack of understanding of the vessel's limitations in such severe weather conditions. Simulator training might have enhanced the master's ability to understand vessel's performance.
- A proper risk assessment would have given the master a better basis for decision-making.
- Training in crew cooperation (like Bridge Resource Management or Maritime Resource Management) might have resulted in the master and crew making a proper risk assessment together (i.e. less authoritative management).
- The crew was tired which might have affected its performance.

### **Who may benefit?**

Shipowners, operators and crews.

## **19 COLLISION**

Very Serious Marine Casualty: Collision between a containership and a general cargo vessel

### **What happened?**

A containership and a general cargo vessel approached each other in dense fog. One turned to port towards the other, while the other turned to starboard. The latter reduced speed, but not until the very last moment. After the collision, the latter vessel sank and everyone was lost.

### **Why did it happen?**

- It was dense fog at the time of the collision.
- Actions taken by the officers on both vessels were inadequate or too late.
- There was a lack of understanding of how to act in restricted visibility.

### **What can we learn?**

- Restricted visibility needs special attention, and appropriate actions in accordance with the Collision Regulations.
- The officers of both vessels realized very late that a dangerous situation was developing. They might have acted differently with better training and understanding of how to act in restricted visibility and other potentially dangerous situations.

### **Who may benefit?**

Flag States, training institutions, and shipowners, operators and crews.

## **20 FATALITY**

Very Serious Marine Casualty: Fatal accident in personnel lift (elevator) shaft

### **What happened?**

To inspect the lift shaft pit, crew members tried to open the lift door while the lift was parked and disengaged on an upper deck. They did not succeed, so the chief engineer climbed onto the top of the lift through the top hatch, probably to find out how the doors were to be opened. He then closed the hatch after him. The second engineer reset the emergency stop because he thought, incorrectly, that the chief engineer had taken manual control of the lift. Hence, the lift went to normal operation, and started. The chief engineer was subsequently trapped and killed.

### **Why did it happen?**

- Lack of knowledge about the system. The crew members did not know how to operate the lift doors.
- Lack of communication. The second engineer did not know the intention of the chief engineer. He reset the emergency stop which he thought would allow the chief engineer to manually operate the lift.
- The fact that the hatch on top of the lift was closed removed a safety barrier.

- The company had not successfully implemented the safety management system: a risk assessment had not been completed; safe systems of work had not been established; work permits were not used appropriately.

### **What can we learn?**

- The SMS should be implemented in practice (and not only in theory). If it had been, this accident might have been prevented. Proper implementation of the SMS needs to be considered seriously by companies and designated persons. To succeed in implementing an SMS, there has to be commitment from the top.
- A risk assessment conducted before doing a job identifies the risks and makes it possible to prevent accidents.
- Communication between crew members may prevent many accidents.
- Technical safety barriers should not be by-passed.
- When the SMS is substandard, the risks of individual unsafe acts increase.

### **Who may benefit?**

Shipowners, operators and crews.

## **21 EXPLOSION AND FIRE**

Very Serious Marine Casualty: Explosion of gas in forecastle

### **What happened?**

A tanker was undertaking a scheduled passage loaded with Naptha. An explosion was heard and smoke was seen on the forecastle. Immediately after the explosion, the crew was mustered and accounted for with the bosun reported missing. After checking vessel's stability, the master decided to flood the forecastle area with water to avoid the spread of smoke and fire. The fire was subsequently extinguished but the bosun was not found.

### **Why did it happen?**

A number of tanks were losing pressure at a considerable rate so it was decided to top up the pressure with the nitrogen system. Cargo vapour, which was the only possible source to cause the explosion, had leaked through the de-humidifier system located in the forecastle. The de-humidifier system had not been shut down properly before the cargo had been loaded. The work had not been properly supervised by an officer.

### **What can we learn?**

- Consider the need to include forecastle areas containing de-humidifier units within the fixed gas detection system.
- Crew members should report to master or OOW when they notice any smell of gas from the cargo.
- The ship's Planned Maintenance System should be reviewed to ensure it adequately covers the de-humidifier system.

### **Who may benefit?**

Shipowners, operators and crews.

## **22 COLLISION**

Very Serious Marine Casualty: Collision between a cargo ship and a fishing vessel

### **What happened?**

A cargo ship was on passage with the second officer alone on watch. At 1500 local time, the second officer noticed a fishing vessel at 30 degrees on the ship's port bow at about 8 to 9 nautical miles range. He then started to fill in the bridge log book. On completing the log book at 1530, he checked visually for possible traffic and noted no vessels on the ship's port or starboard side. At 1535, he saw a fishing vessel on the port side after the ship had collided with its starboard bow. The master ordered the rescue boat to be lowered, and 14 crew members were rescued from the fishing vessel, including one injured man and one fatality.

### **Why did it happen?**

There was no additional watchman on the bridge from 1300 until the time of the collision. The OOW was distracted from keeping a proper lookout and was not using navigation equipment, such as radar, to perform adequate watchkeeping. The OOW did not detect the imminent danger.

### **What can we learn?**

- Crew members should understand that, while they are watch, they need to perform fully their watchkeeping duties without being distracted by other activities like paperwork.
- Crew members should maintain a proper lookout throughout the watch, including the use of navigation equipment.

### **Who may benefit?**

Shipowners, operators and crews.

## **23 HEAVY WEATHER DAMAGE**

Very Serious Marine Casualty: Damage to wheelhouse resulting in a fatality

### **What happened?**

A standby safety vessel was on station off an offshore platform. It was struck head-on by a large wave, which shattered the navigating bridge windows and dislodged the protective shutters that were in place. The damage that was sustained from the impact rendered both the vessel's navigation systems and propulsion controls ineffective. Large quantities of sea water entered the accommodation spaces, causing widespread flooding. Damage to the vessel's navigation and radio communication equipment rendered it inoperable. Distress communication was achieved using VHF radio microphones in the helmets of the FRC crew. The deceased body of the chief officer was discovered beneath a pile of damaged bridge equipment. Two rescue helicopters were dispatched to evacuate the survivors. The vessel was left as a dead ship to drift until a tow could be connected.

### **Why did it happen?**

Abnormally large waves can occur in the area in which the casualty occurred.

## **What can we learn?**

- A standby safety vessel should expect to encounter extreme weather conditions as a consequence of its operating area.
- Emergency exercises should incorporate unexpected factors to ensure crew members are fully prepared for the worst case scenario.

## **Who may benefit?**

Shipowners, operators and crews.

## **24 CAPSIZE AND SINKING**

Very Serious Marine Casualty: Capsize and sinking of a livestock carrier

### **What happened?**

A livestock carrier, fully loaded with cattle and sheep, was waiting to berth at its destination port when deteriorating weather and winds of up to force 9 caused it to proceed out of the anchorage area. At that time, the ship had a list of 5 degrees to starboard and was rolling in the seas. Following the master's order, the crew began using hoses to clean cargo decks 1 through 6 and the side shell doors on deck 6 were opened to help with the clearing of water from that deck. As the list increased to 14 degrees, the master ordered that the cause for the increase be investigated. As the list increased to 24 degrees, the master ordered the abandonment of the ship, altered the ship's heading to port and stopped engines. Not all crew members heard the abandon ship alarm. At around the same time, the chief officer, who was supervising the deck washing operations, went to deck 6 and observed water entering through the open side shell doors. Approximately 20 minutes after the engines were stopped, the ship capsized. It then sank in about 3 minutes. Of the 83 crew members on board, 40 were rescued, 11 died, and 32 were unaccounted for and presumed deceased. Many of the deceased crew were on board for the handling and welfare of the livestock.

### **Why did it happen?**

The crew was cleaning cargo decks using hoses and with the side shell doors in the opened position.

The scuppers may have become blocked by solid wastes from the livestock, resulting in an accumulation of water on deck.

As the heel increased to about 20 degrees, additional water from the surrounding sea was seen to enter deck 6 through the side shell openings with each roll of the ship, increasing the free surface effect on board.

Watertight doors were noted to have been left open to ease the movement of the cleaning crew.

The vessel lost stability due to the accumulation of water on deck 6, the partially filled tanks, and a shift in cargo (as a result of the possible failures of the pen gates and rails), among others. There was a lack of coordination during the abandonment of the ship, possibly as a result of a lack of basic safety training and ineffective conduct of drills, and not all crew heard the abandon ship alarm.

## What can we learn?

The importance of monitoring vessel stability at all phases of a voyage while considering all relevant factors before starting an operation which poses a risk to stability.

The importance of ensuring that all crew on board, certified and un-certified, are familiar with and competent to carry out emergency procedures.

## Who may benefit?

Ship operators, officers and crew.

## 25 STRUCTURAL FAILURE RESULTING IN FOUNDERING WITH LOSS OF LIFE

Very Serious Marine Casualty:

### What happened?

A general cargo ship loaded with limestone have a bulk density \*\*\* of 1850 kg/m<sup>3</sup> experienced a structural failure when heading directly into rough seas and gale force winds. The vessel sank approximately 15 minutes later. Two of the vessel's eight crew managed to swim clear of the foundering vessel and were subsequently rescued from a liferaft.

### Why did it happen?

The cargo, which was high density, had been loaded as a single pile within the central section of the hold. As a result, significant stresses were generated in the vessel's midship section. These were exacerbated by the rough seas in which the wavelength was similar to the length of the vessel.

The ship's hull strength had likely weakened significantly over the previous 2½ years through corrosion and wastage. The maintenance and repair of the vessel had lacked focus and oversight; no structural repairs had been undertaken recently.

Other contributing factors included: non-compliance with the International Maritime Solid Bulk Cargo Code, ineffective safety management, poor quality of survey and audit, lack of oversight of the classification society by the Flag State. The investigation also identified several safety issues concerning the immersion suits and lifejackets available on board the vessel.

## What can we learn?

- Dry bulk cargoes should be loaded and carried in accordance with the International Maritime Solid Bulk Cargoes Code (IMSBC Code) in order to ensure a vessel's structural integrity is maintained at all times.
- A vessel's course and speed should be adjusted to reduce placing undue stress on the vessel's hull.
- Lifesaving appliances provided on a vessel should be compatible and fit for purpose as well as the need for regular drills that should include the donning of immersion suits.

## Who may benefit?

Flag States, port States, shipowners, operators, crews and classification society surveyors

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\*\*\* According to the IMSBC Code, a high density solid bulk cargo is a solid bulk cargo with a stowage factor of 0.56 m<sup>3</sup>/t or less, i.e. bulk density of 1780 kg/m<sup>3</sup> or more. The bulk density range on the individual schedule for limestone in the IMSBC Code is 1190 to 1493 kg/m<sup>3</sup>.