

LESSONS LEARNED FOR PRESENTATION TO SEAFARERS

(FSI 19)

The present set of Lessons Learned for presentation to the seafarers was approved by the Sub-Committee on Flag State Implementation at its nineteen session and reviewed through the process which the Sub-Committee had adopted at its eleventh session (FSI 11/23, paragraph 4.19), as follows:

"The Sub-Committee in considering the lessons learned from casualties, agreed to the summary of lessons learned from casualties for presentation to seafarers prepared by the group, as contained in annex 2 to document FSI 11/WP.2, for release on the IMO website. However, the Sub-Committee, noting that some of the advice provided in the aforementioned summary could be stated more clearly to avoid misunderstandings, instructed the Secretariat to review the summary of lessons learned in co-operation with the Chairmen of the relevant sub-committees, taking into account the concerns expressed in plenary, with a view to ensuring their accuracy before being released on the IMO website. "

1 FATALITY AND INJURY

Very serious casualty: fatality and injury caused by excessive rolling of a large container ship during a typhoon

What happened?

The about 95,000 gt, partially loaded, container ship rolled severely at sea during a typhoon. As a result, several crew members on the ship's bridge lost their footing, including the Master, the helmsman and the lookout. The helmsman managed to regain his footing, but the Master and lookout were thrown violently across the wheelhouse. The lookout subsequently died and the Master suffered serious injuries, necessitating in his medical evacuation. Four more seamen suffered minor injuries.

Why did it happen?

The vessel had to leave port rapidly due to an approaching typhoon. Consequently, it had not finished loading and had an exceptionally high GM (7.72 m). After departing the confines of the port, the ship encountered a violent wave from starboard just as it rolled to starboard. Due to the proximity of land, the Master was unable to take a heading which would have lessened the rolling effect of the swell. The vessel's design, coupled with its low speed at the time of the incident, resulted in poor roll damping. As a result, the ship rolled an estimated 44° over about 10 seconds. The size of the ship and the subsequent height of the wheelhouse contributed to the violent motions experienced in the wheelhouse. Furthermore, the wheelhouse was very large and there were few grab-rails or handholds for the crew to hang on to in the event of violent weather.

What can we learn?

- The dangers of operating a vessel with a high GM ("Stiff Ship"), especially in heavy weather conditions with limited sea room in which to navigate.
- Decreasing the vessel's speed below a critical value may lead to dangerous deterioration of the dynamic roll damping characteristics of the vessel.

- A risk assessment of working spaces and working areas, should take into account adverse weather conditions. Grab rails, lifelines and seat harnesses may need to be considered.
- Consider the use of hard hats and non-slip footwear, even in work areas such as wheelhouses, which may be considered "safe" – especially in severe weather conditions.
- Be aware of the hazards in heavy swells particularly in spaces located high in the vessel's structure, such as bridges on large container ships.

2 FATALITY

Very serious casualty: fatality to crew caused by accidental release of CO₂ gas into engine-room

What happened?

The about 35,000 gt container ship was in dry dock. A test of the fixed CO₂ extinguishing system for the engine-room and holds was planned by the shipyard, but was delayed. The Chief Engineer, assisted by the ship's electrician, decided to carry out the test of the CO₂ system himself. He did not inform anyone about the start of the test. He started blowing lines with air, but he forgot to disconnect the connection to the CO₂ bottles prior to opening the high pressure air valve. Shortly after starting the test, CO₂ bottles started discharging into the E/R. The Chief Engineer was unable to stop the discharge. He activated the CO₂ alarm and the electrician made an emergency announcement using the internal radio system. The Master, upon hearing the alarms and realizing the situation, announced emergency stations on the ship's public address system and ordered an evacuation of the engine-room. About 10 minutes after the accident, rescue operations were started and were conducted with the help of the shipyard rescue team. Several crew members and yard personnel were sent to the local hospital for medical treatment. Later, news of 3 crew member fatalities was received from the hospital.

Why did it happen?

Improper procedures were adopted to blow through the CO₂ system pipelines with air. Had the copper pipes connecting the selection valve to the CO₂ bottles been disconnected, CO₂ would not have been released. The work was planned in an improper way. Senior staff, such as the Engine Superintendents and the Master and Chief Officer, were unaware of the work being carried out by the Chief Engineer on the CO₂ system. The possible consequence of a CO₂ leak in the engine-room was not envisaged. Hence the personnel working in the engine-room were not asked to vacate the area during the testing. They were not even alerted to the operation.

The emergency escape route from the engine-room had been made inaccessible from the outside for security reasons. Had the escape route been made available to the rescue team, the rescue could have been still swifter.

What can we learn?

- Testing of fixed CO₂ systems should only be carried out by competent personnel.
- The procedure for testing of the fixed CO₂ system should be clearly detailed. Any testing of this system should ensure that the set of CO₂ cylinders is fully isolated from the cargo and machinery spaces.
- All jobs being undertaken must include a risk assessment/hazard identification system, where all hazards are identified and steps taken to eliminate, isolate or minimize the risks. These hazards must be further discussed at a meeting, before the job is carried out.

- The security benefits of locking of emergency escape routes must be carefully considered against the loss of the safety benefits that would have been available had the escape route not been locked.
- Senior staff should be well familiarized with fixed fire-fighting systems and of the dangers of accidental release.

3 FATALITY AND INJURY

Very serious casualty: fatality and injury to crew caused by hold cleaning rig

What happened?

The about 76,000 gt bulk carrier was at sea, the crew was cleaning cargo hold residues. The weather was good with light winds.

The crew was working with an unapproved, "home-made" lifting rig comprised of a portable boom with wooden blocks and nylon ropes to pick up cargo residues from the hold.

After several hours of work, the makeshift davit's boom failed due to over-heaving of the hoist rope by the winch and the boom struck two crew members who were attending to it on deck. Due to the tension of the hoist rope, the boom gave way at the welding seam and thus caused serious injuries to the attending crew.

First aid was administered on board. Medical help arrived on board by helicopter about 8 hours later. Fifteen hours after the accident, both the casualties were air lifted by naval helicopter to a naval hospital.

One of the crew died en route to hospital. The second crew member was successfully treated.

Why did it happen?

The gear and rigging used for the purpose of lifting cargo from the cargo hold was fabricated on board and unapproved. This made the job conditions unsafe and prone to accident. In addition, the davit was corroded. The winch operator lost attention momentarily and did not notice the marking on the rope. He over heaved the rope using the winch, resulting in the davit boom breaking from the weld and thus causing the casualty.

There was also a lack of attention on the part of the crew member giving signals by walkie-talkie to the winch operator, and the signal to stop heaving was not given in a timely manner. A qualified dedicated signal man was not assigned. There was lack of coordination on communication between the signalman at the lifting boom and the winch operator.

There was a poor situational awareness on the part of the crew who were making use of the unsafe lifting gear – not even knowing that they were working in unsafe conditions which could cause an accident. The risks involved in using the unapproved lifting gear were not identified or understood.

The lifting gear was not checked for any defects or damage prior bringing them into use.

What can we learn?

- Correct work procedures should be complied with.
- Appropriate and approved lifting gear should be used on board.
- Standard work practices involving proper safety regulations should be followed.
- In lifting operations, if the view is blocked, proper signal and communication between the operator and work should be provided.

4 FATALITY

Very serious casualty: serious injury and damage to ship/equipment

What happened?

The n° 1 crane of the 1997 built, about 200 m long 28,000 gt bulk carrier collapsed from its foundation, while the vessel was discharging steel scrap in port.

The estimated weight of the load lifted by the crane was 20 tonnes, including the grab.

The crane body suddenly collapsed onto the deck portside, damaging portside main deck railing and the crane house.

The ship's crew was not injured, but the crane operator was badly injured.

Why did it happen?

Due to improper/inadequate maintenance of the crane over an unspecified period of time, the accumulated old grease was not "washed out" prior to the lubrication. Due to this, and possibly influenced by the heavy grab duty, excessive wear of the outer ring of the slewing bearing occurred. The result was a violent separation of the slewing bearing under a heavy load operation.

The manufacturer's "washing procedure" was not followed by the crew.

What can we learn?

- There is a need to have a properly implemented and effective preventive maintenance plan.
- The importance of having in the vessel's ISM manual a specific procedure for all crew members involved in maintenance operations of cranes regarding the manufacturer's maintenance plan.
- Crane operators, preferably crew members, must be competent to safely perform their duties.
- All companies must implement a system of training of the operators.
- Also, port personnel should include properly certified individuals.

5 FATALITY AND INJURY

Very serious casualty: enclosed space entry causing death and personal injury

What happened?

An ordinary seaman (O/S) and a deck cadet serving on board an about 36,000 gt Panamax bulk carrier lost their lives inside a cargo-hold while undertaking routine cargo temperature measurements at sea. A third crew member, the bosun, seeing the two crew members were in trouble, lost consciousness when attempting to assist them. Shortly afterwards the Chief Officer discovered the three crewmen in the cargo hold and raised the alarm. Members of a rescue party wearing SCBAs recovered the three seamen, but only the bosun survived. The event occurred on a bulk carrier carrying a cargo of coal which was known to be oxygen-depleting and prone to self-heating.

Why did it happen?

The cargo-hold was oxygen depleted. Carbon monoxide may also have been present in the air space above the cargo. According to readings taken on arrival in port the oxygen content in the hold was 14.1%. The reason why the first person entered the cargo hold is unknown but it may be that the thermometer to measure the cargo temperature was dropped or became snagged and the seaman went into the hatch to retrieve it.

The three crew members who entered the space without SCBAs may have done so impulsively and possibly under the assumption that they could survive a brief presence in the cargo space.

The fact that the access hatch was open to enable the temperature readings to be taken must be considered a contributing factor.

What can we learn?

- When dangerous cargoes are loaded that require specific knowledge for the crew, a safety meeting should be held prior to departure, at which all crew should be present, when appropriate advice and instructions should be given. Attendance of each crew member should be acknowledged in writing. The dangers of entering enclosed spaces and the need for responding crew members to STOP, LOOK, LISTEN and EVALUATE the situation for existing dangerous conditions before taking emergency actions should be fully explained. Don't make a bad situation worse by becoming a casualty yourself!
- When intending to carry oxygen-depleting or noxious gas-producing cargoes that require temperature monitoring, provision should be made in advance to enable this to be done without opening personnel access hatches. Measurement of carbon monoxide levels may provide a faster and safer indication of a cargo self-heating than temperature monitoring.
- Prior to carrying out operations involving dangerous cargoes, crews must be informed and understand the proper procedures and preventative measures to be taken.

6 INJURY AND REPORTED MISSING

Very serious casualty: fire; after spill of highly flammable cargo causing multiple injury and people reported missing

What happened?

An about 4,000 gt chemical tanker in port was discharging highly flammable cargo when some of it leaked on deck. The leaked cargo, which could not be contained because there was also an overflow of ballast water on deck, spilled over the ship's side and was ignited by a launch moored alongside. The launch caught fire and drifted away. The fire spread to the chemical tanker before it was controlled by the ship's crew and a port tug. Several crew members of the launch and the chemical tanker suffered injuries. Three crew members on the launch were reported missing.

Why did it happen?

Crew without proper training and experience in chemical tanker operations resulted in non-compliance with safety regulations and industry best practice. Officers involved lacked competence in critical chemical tanker operations and carried out uncontrolled port operations. Insufficient on board pre-planning and communication of procedures between personnel involved in port operations, inhibited the detection and control of deviations from procedures during port operations.

What can we learn?

- Importance of cleaning/securing cargo spill without delay and of maintaining a "dry tank deck", and avoiding accumulation of water inside the gutter bar.
- Importance of a well pre-planned and well communicated cargo operation.
- Importance of proper competence of the crew when engaged in special trades.

7 INJURY

Serious casualty: personal injury with face and neck burns caused by auxiliary boiler explosion

What happened?

While exchanging the auxiliary boiler burner on board an about 39,000 gt bulk carrier at anchor there was a flashback from the boiler furnace. Flames engulfed the ship's engineer, burning his face and neck. The burner was being replaced to rectify misfires.

Why did it happen?

The ship's engineer was not aware of all the hazards associated with maintenance of the boiler burner, i.e. accumulated fuel oil at the furnace bottom resulting from burner misfiring while disconnecting the fuel line from the burner.

The boiler furnace was not sufficiently purged to remove the residual heat in order to avoid ignition of any flammable mixtures.

The ship's crew was not aware of previous flashbacks involving similar burners and the company had not ensured that such safety information was disseminated to the ship's crew.

The boiler manufacturer failed to inform the operators that the boiler burner could be replaced by one fitted with a diesel pilot burner to avoid burner misfires.

What can we learn?

- It is important that all ship's crews involved in the maintenance of boiler burners are aware and have an adequate understanding of all the hazards associated with the maintenance of the boiler burner.
- Information on flashbacks involving similar burners must be brought to the attention of the ship's crew without delay.
- Precautions must be taken to minimize the accumulation of fuel oil at the furnace bottom by avoiding repeated restarts following a burner misfire; it is imperative to sufficiently purge the furnace to remove the flammable mixtures as well as the residual heat.
- All ship crews must be aware of the appropriate first aid treatment required for burn injuries.

8 INJURY

Serious casualty: personal injury with broken leg and injuries to the groin caused by windlass hydraulic motor explosion

What happened?

While heaving in the anchor chain of the about 58,000 gt oil tanker anchoring under adverse weather and sea conditions, the windlass' hydraulic motor exploded. Fragments of the hydraulic motor and its casing seriously injured the windlass operator. He was treated at hospital for a broken leg and injuries to his groin.

Why did it happen?

Gross over-pressurization of the windlass hydraulic cylinder block.

Ineffectiveness of the pressure relief valve, plus severely constricted pipes on the outlet side of the relief valve.

Main gear case and oil bath for splash lubrication of the gears had no oil change since installation.

The current industry requirements for windlass machinery failed to protect persons against injury in the event of failure.

The instruction from Master to heave in the anchor chain when it was slack was not followed.

Repeated attempts to heave in the anchor chain, despite its rendering.

Little guidance available on weighing anchor.

Seafarers are not aware of the limitations of the anchor windlass and the potential damage to the machinery when placed under excessive loads.

What can we learn?

- It is important that the pressure parts of the windlass are guarded against potential overpressure, under both instantaneous and continuous conditions.
- It is essential that the industry standards for windlasses are sufficient and adequate to protect persons against injury in the event of the equipment's design limitations being exceeded.
- It is important that clear guidance on weighing anchor is provided and seafarers be made aware of the limitations of anchor windlass systems and the risk of catastrophic failure of the machinery when it is placed under excessive loads.
- It is important that anchor chains are closely monitored when weighing, and that heaving in is stopped as soon as any significant tensioning is observed or any difficulty is experienced.
- It is important that technical data and information for windlass machinery be provided to allow it to be correctly maintained and operated.

9 INJURY

Serious casualty: personal injury following explosion

What happened?

There was an explosion in the steering gear compartment of an about 17.00 m fishing vessel. Shortly afterwards a deckhand appeared at the machinery space deck entrance. His overalls were burning. He jumped into the water and was later rescued. He was severely burned and had to be treated in a specialist burn clinic.

Why did it happen?

The deckhand had been preparing surfaces in the steering gear compartment for cleaning by wiping them down with a degreasing agent. Vapour from the cleaning agent was ignited when an automatic diesel oil heater started up.

Ventilation was inadequate for the work undertaken.

An unmarked open canister was found in the engine-room compartment. From the smell it appeared to have contained petrol. This was later confirmed by laboratory analysis. It was said to be used to assist the ignition of the diesel oil-fired heater. While it may not have contributed to the explosion it may well have done so.

Provisions laid down by the national Administration on the use of hazardous agents were not followed.

Personal protective equipment was not worn during the work, i.e. gloves, goggles or respirator.

What can we learn?

- Personal protective equipment necessary for specific jobs should be provided, maintained and utilized.
- The particular hazards of flammable and noxious fumes generated while chemically cleaning should be identified and where possible eliminated, e.g., isolation of electrical sources of ignition and provision of adequate ventilation.
- Volatile liquids such as petroleum should never be left lying around in open containers. If they have to be carried aboard they should be stored securely in accordance with national regulations.

10 FATALITY

Very serious casualty: fatality, resulting in grounding

What happened?

A small about 50 gt coastal ferry was just clearing port at half ahead speed when the master, alone on the bridge, suffered a heart attack and collapsed. The helm became set hard to starboard, possibly by the master as he collapsed, and the ferry turned towards the shore and grounded hard. Passengers provided medical assistance until the emergency services arrived. The ferry suffered only minor damage, but the master could not be revived.

Why did it happen?

The vessel was licensed to operate with crew of two, but the master was alone. He had allowed the other crewman to leave the ferry earlier in the day to attend to personal business. As a consequence, there was no other trained mariner on board who could have detected that the ferry was not behaving as expected in time to take effective action.

What can we learn?

- Manning should not be reduced below approved levels.
- Single-handed operations carry an increased risk in that if the lone mariner is incapacitated for some reason, there is no one left to navigate the vessel or deal with emergencies.

11 GROUNDING

Serious casualty: grounding caused by the failure to alter course when required

What happened?

The about 37,000 gt container ship ran aground early in the morning in May. The ship was travelling in a south-easterly direction at the southern limit of the traffic separation scheme at the time. The officer on watch, the chief mate, took over the watch at 0400 and subsequently did not carry out two course alterations required to keep the ship in the scheme. By the time the chief mate realized that the speed of the ship was dropping, it was too late to take effective corrective action and the ship grounded.

Why did it happen?

The chief mate was distracted from his watch-keeping duties because he was reading e-mails. These e-mails were of a disturbing personal nature and he was so absorbed by their content that he did not hear the VHF calls from VTS warning him that his ship was leaving the TSS and running into danger. He was alone on the bridge at the time of the grounding, having earlier dismissed the bridge lookout so that he could clean the

accommodation. Consequently there was no other crew member there to warn him of the dangers ahead or of the VHF calls.

The chief mate had a pre-existing medical condition which contributed to his state of mind at the time but no one on the ship was aware of it.

What can we learn?

- The importance of maintaining situational awareness while keeping a navigational watch.
- The dangers of using bridge equipment, especially computers, for non-work related issues.
- The importance of maintaining a look-out on the bridge.

12 GROUNDING

Serious casualty: grounding caused by lack of effective bridge team management

What happened?

The vessel was under way on a scheduled crossing in severe weather. During this crossing the vessel was informed that the port of destination would be temporarily closed due to severe weather conditions and seas. Under the instructions of the Master the vessel proceeded to an area of safe open water and commenced "slow steaming" while waiting for the port to reopen.

The vessel had been in the area for about four hours when, while approaching a turn at the northern extremity there was a fire alarm and a number of telephone calls to the bridge of a non-navigational nature. The electronic navigation system was not being used effectively, with the consequence that a wreck near the area was not detected. Because of the distractions, the vessel overshot the northern limit of the safe area before the turn was started and struck the wreck. The vessel was able to safely berth under her own power.

Why did it happen?

The bridge team was distracted several times, including a request from a driver of a refrigerated truck to run his engine so the truck could run its cooling plant. The exhaust from the truck led to the activation of the fire detection system, which then cascaded into further distractions to the bridge team, including discussions on starting up the ventilation system so that the truck's exhaust does not keep setting off the fire alarm. A series of telephone calls to the bridge took place and the Master himself took another four telephone calls to the bridge, before returning to the important aspect of navigating the vessel.

What can we learn?

- The lack of proper training in the use of the **Electronic Chart Display and Information System** (ECDIS) possibly led to the wreck being undetected, and the paper chart, which was marked with "no go" areas, was never re-assessed or amended. All OOWs must receive training on all bridge equipment related to vessel navigation.
- The Master influenced the OOW's actions even though the OOW had officially got the con. Therefore the OOW and the Master must communicate effectively as a part of the bridge team. Also the bridge team was never on standby or "red bridge" operating condition. During coastal manoeuvring or slow steaming, the bridge team must be extra vigilant and be in stand by or red bridge condition with all distractions kept to a minimum.
- No alternative passage plan had been made after the vessel deviated. Any deviations from previous passage plans should be made in writing and communicated to bridge team members.

13 GROUNDING

Serious casualty: grounding caused by lack of effective bridge team management

What happened?

While moored at night, an about 78,000 gt bulk carrier broke away from the pier. At the time the vessel was almost fully laden and under the influence of a strong ebb tide. Despite the use of at least seven tugs under the guidance of a pilot and use of the vessel's main engine, it was not possible to manoeuvre the vessel back to the pier and bring her alongside. Attempts to hold the vessel in the deepest part of the port's entrance channel also failed and the vessel grounded during the morning hours. The vessel was subsequently refloated during the forenoon.

Why did it happen?

Neither the Port Authority nor the vessel's Master had not identified the risks of a vessel breaking free from its berth and the potential consequences. The effective holding capacity of the vessel's mooring winch was reduced by (a) the number of layers of mooring line on the winch drum; and (b) poor condition of the brakes. There is also the possibility that the brakes were not sufficiently tightened. In addition the mooring winches were not effectively monitored in the time leading up to the incident.

What can we learn?

- Safety Management System (SMS) of vessels must address procedures for mooring the ship, tending mooring lines and any of the associated risks. This includes assessing the vagaries of various ports including the tide or river current variances.
- Contingency Planning is very important. Ports and vessels should develop contingency plans or manuals and training.
- Maintenance of the mooring winches, especially of items like brake drums and linings, should be carefully carried out at regular intervals as prescribed by the manufacturer. If there are strong eddy currents in ports, especially at wharfs, these should be reflected in the charts and port entry documents.
- Sufficient manpower on board to tend to mooring lines, especially in strong tide areas must be considered.
- There should be established means of monitoring winches when required.

14 GROUNDING

Serious casualty: grounding caused by lack of effective bridge team management

What happened?

The about 15,000 gt passenger vessel was leaving port. Within 7 minutes she grounded briefly. She was refloated within 3 minutes and continued on her voyage. At the time of the incident the vessel was under the influence of a strong ebb tide and fresh water outflow. The vessel was equipped with a bow thruster and twin controllable pitch propellers and a single rudder. No tugs were used.

The master controlled the engines and bow thruster to move the vessel off the berth and under a pre-determined agreement the pilot took control of the vessel once it was off the berth. The passenger vessel narrowly avoided a collision with a berthed vessel and gained speed and steerage. However, due to an apparent miscommunication resulting from a foreign language being spoken on the bridge, the vessel grounded.

Why did it happen?

The lack of effective Bridge Team Management was a causal factor in the grounding. This is evidenced from the fact that the handling characteristics of the vessel were not discussed by the pilot and master during the pre-departure information exchange. These included the poor handling at low speed and the practice on board to use the engines independently during pilotages. The use of a foreign language resulted in miscommunication and misunderstandings on the bridge.

What can we learn?

- Where there are strong tidal streams during both flooding and ebbing, Port Authorities must inform Pilots and Masters of the situation and these items should be discussed by the Bridge Management Team.
- Passage Plans must be followed.
- Contingency Planning must be done, especially on vessels with poor handling characteristics at low speeds.
- Where the pilot and master do not both share a common mother tongue, then communications on the bridge must be carried out in English.
- Safety considerations should be paramount in the decision to use harbour tugs. Commercial conditions should come after safety.
- Master and pilot information exchange must ensure a safe passage.

15 COLLISION

Serious casualty: engine control failure leading to collision with quay and moored vessel

What happened?

When the about 8,000 gt container ship passed in a canal, the mate was about to switch the CPP from centre control to the bridge wing. To do that he had to press one button on a set out of five. The mate by mistake pressed the button for back up control instead of the button for response change. The CPP then turned to full astern and the ship collided with the quay and a moored ship (which started to drift) before the ship was under control again.

Why did it happen?

Since the press buttons looked the same (same design and colour, placed close to each other) it was possible to mix the buttons up without realizing that until it was too late. Also, a short circuit on bridge wing due to moisture made the electrical system fail, causing the CPP to go astern. Confusion delayed the correct action to regain control.

What can we learn?

- It is important to know the technical systems very well if you use them. When the time comes and you need to take correct action, it is too late to learn.
- Sometimes, the systems are not very well designed for operators and there might be reason to consider if it is possible for the crew to make arrangements to prevent unintentional use.
- Electrical systems need good maintenance to work appropriately.

16 COLLISION

Very serious casualty: collision between a sport fishing vessel and a drifting pleasure craft

What happened?

An about 70 gt sport fishing vessel sailing for a deep sea fishing trip collided with a 8.4 m long pleasure craft which was stopped for temporary repair work on a cooling water leak in the engine compartment. The skipper of the sport fishing vessel, who was alone on the bridge, did not notice the pleasure craft until it was too late to avoid the collision. The crew of the pleasure craft saw the sport fishing vessel and tried to draw its attention by shouting, waving and sounding a signal horn, but were unsuccessful. They jumped overboard just before the support fishing vessel struck the craft causing the aft section to split apart. The crew of the pleasure craft were rescued by the sport fishing vessel.

Why did it happen?

The skipper of the sport fishing vessel decided to release the deckhand from his task of lookout despite visibility being restricted to 300 m.

The skipper of the sport fishing vessel was using a radar, but did not detect the pleasure craft.

The navigation lights of the pleasure craft were off.

The signal horn of the pleasure craft was barely audible.

What can we learn?

- Proper lookout, by all means available, specially under conditions of restricted visibility is essential for collision avoidance.
- That radar reflectors can enhance the radar echo of small craft.

17 COLLISION

Serious casualty: collision between disabled ship and salvage tug

What happened?

The about 2,000 gt salvage tug was attempting to connect a tow to the disabled 8,896 gt reefer carrier on a river estuary anchorage during heavy weather conditions. The reefer had regained limited use of its main engine shortly before the tow was to be connected. The ship dropped one anchor to slow its rate of drift and was still using its main engine when it was occasionally available to arrest the rate of drift.

The master of the salvage tug was unsure of the status of the reefer's main engine and was unaware that the ship was still steaming ahead in spite of having one anchor down. When the salvage tug made a second approach to establish the tow, the bow of the ship collided with the port side stern region of the tug.

The tug sustained heavy damage to its bulwarks, and a fuel tank and a store room were breached. Thirty cubic metres of diesel oil were lost overboard and seawater entered the storeroom with the consequent loss of the automatic steering function. The reefer's forepeak tank was breached with consequent loss of ballast water. Two crew members on the salvage tug were injured by seas breaking over the deck while trying to establish the tow.

Why did it happen?

The master of the salvage tug was not aware that the reefer was steaming ahead on its engine while the salvage tug closed with its bow to establish the tow. The ship, the vessel traffic control, and salvage tug were not engaged in closed-loop communication and did not share the same mental concept of how the tow would be established.

The master of the salvage tug was operating from a second aft-facing bridge while trying to connect the tow, and had the use of only one VHF radio set, with most of the communications equipment being located on the main bridge. The officer-of-the-watch on the salvage tug had a high work load and was not able to relay to the master all information coming from the ship and vessel traffic control. The ergonomics of the communications system on the salvage tug made effective communication difficult.

The salvage tug was not ideally suited to manoeuvring close to a ship in the weather conditions at the time. The view of the aft deck from the salvage tug's aft facing bridge was restricted by the deck crane.

The deck crew members on the salvage tug not wearing protective helmets contributed to their injuries.

What can we learn?

- Effective planning for salvage operations, as well as any other operational task, is essential so that everyone involved shares the same mental concept of the plan.
- Good communications between all parties involved in salvage operations, or any other operational task, are essential for the successful implementation of the plan.
- The ergonomics of bridge design should be compatible with the purpose of the vessel.
- Personal safety equipment such as head protection should be worn at all times in designated work areas.

18 COLLISION

Serious casualty: collision between ro-ro passenger ship and fishing boat

What happened?

The about 24,000 gt ro-ro passenger ferry collided with the 16.7 m long fishing boat that, because of a failure of the main engine, had anchored 13 nm offshore. The anchorage was close to a ferry route that was marked on a chart.

Why did it happen?

Watchkeeping personnel on both ships did not observe several COLREG '72 rules applicable to lookouts, use of anchor lights, appropriate use of the radar, and communication between vessels.

What can we learn?

- Even when not expecting to encounter traffic on a marked route, the need to maintain an effective lookout by all means available is of the utmost importance.
- The crew of the fishing boat was not aware that they had anchored close to the marked ferry route.
- It would be appropriate to attract the attention of another vessel by flashing lights (Aldis), radio communications and/or sounding the whistle.

19 COLLISION

Less serious casualty: Collision; between salvage tug and suction dredger

What happened?

The about 2,000 gt salvage tug was leaving port and about to enter the river fairway. The master of the tug held the con for casting off from its berth. A river pilot was on board for the river transit. At the time of the tug's departure, a 5,339 gt suction dredger was working the

channel close downriver from the point of exit into the river. The dredger was heading slowly upstream towards the exit.

The pilot and master agreed on a plan to exit the harbour ahead of the dredger, then turn upstream to maintain adequate distance to cross ahead of the dredger before turning downriver and passing the dredger port-to-port. The river pilot discussed the plan with the master of the dredger, who indicated that his dredger was working and travelling upriver at about 0.8 knots.

As the salvage tug entered the river she was affected by the river flow and did not achieve the rate of turn planned by the bridge team. The river pilot was surprised by the forward progress of the dredger, and all the bridge team soon realized that a collision was possible.

From that point on there was a divergence of views between the pilot and the master of the tug as to the best course of action to take. As a result, the pilot's engine orders and the master's application of engine movements were dissimilar.

The bow of the dredger collided with the port stern area of the salvage tug. The dredger was holed above the waterline at the bow and the salvage tug sustained damage to its bulwarks. There were no injuries and no pollution.

Why did it happen?

The pilot made a decision to enter the river fairway ahead of the dredger without first discussing with the bridge team the manoeuvrability of the tug, the effect of the tide on turning performance and the speed of the dredger.

The members of the bridge team did not all have the same mental concept of the plan and did not challenge the pilot when the possibility of a collision became known.

The master of the tug made engine movements in an attempt to improve the turning performance without the knowledge of the pilot.

What have we learned?

- Effective crew resource management means the entire bridge team taking part in the planning and pre-departure briefing so that they all understand the plan and openly challenge any deviation from the plan using a closed-loop form of communication.
- The importance of ensuring good communication of all activities among bridge team members.

20 LISTING AND SINKING

Very serious casualty: listing due to heavy weather, loss of steering capability and sinking of an anchor handling tug leading to the death of one crew member

What happened?

After departing port in fair weather, the about 460 gt ocean going anchor handling/towing tug encountered increased wind, seas of approximately 4-5 metres and heavy swells. In the bad weather some of the cargo broke loose and the tug listed to starboard. The list increased as waves and swell continued to break over the deck.

The steering gear failed and the ship turned abeam on to the wind and swell worsening the situation considerably.

A distress call was made and answered by a large motor yacht in the area. The yacht immediately headed for the disabled ship.

Shortly after the broadcast the ship sank.

Three crew members managed to enter a liferaft and the other eight were scattered in the water by wind and swell.

The crew members in the liferaft were rescued by helicopter and the seven in the water were rescued by the motor yacht under the most difficult conditions. The last of the crew members in the water was rescued by helicopter. He died subsequently.

Why did it happen?

The cargo (one container) on the deck broke loose due to ineffective securing arrangements, causing the cargo to shift and dislodging other deck cargo. The container was damaged and filled with water adding a large weight on the deck. This reduced the stability. The integrity of the hull was breached, and due to the bad weather and the additional submersion, water ingressed into the ship causing a loss of stability and buoyancy, which resulted in the foundering and sinking of the vessel.

What can we learn?

- On ships not specially fitted for carrying deck cargo thorough assessment shall be made whenever carrying cargo on the deck.
- Emphasis on route planning and taking meteorological information into account at the time of departure and continuously during the voyage.
- The importance of making an early distress call.

21 FLOODING AND SINKING

Very serious casualty: flooding and sinking of a trawler

What happened?

An about 10 m long, wooden-built trawler departed with two persons on board to trawl for shellfish. After hauling in the trawl net, it was noticed that it had been damaged. As another trawl net was being deployed the master heard an unusual noise coming from the engine. An inspection of the engine compartment revealed that it was flooding. The master turned on the pump and alerted the authorities, who issued a MAYDAY RELAY. The master and crew member abandoned the vessel into the inflatable liferaft. They were rescued by another fishing vessel that was in the area. The vessel later sank.

Why did it happen?

To eliminate "nuisance" alarms, the master turned off the bilge pump and water level alarms. The pump and alarm system was of a type used on pleasure craft and small fishing vessels. The sensor for the alarm was installed near to the floor of the compartment and would frequently sound.

The wooden-hull vessel was over thirty years old and subject to water ingress.

What can we learn?

- The importance of installing water level alarm systems that are appropriate for the type of vessel and that are set up to reduce the number of nuisance alarms and maximize the opportunity to detect impending dangers.
- The importance of carrying out adequate maintenance of the hull and through-hull fittings.
- The importance of an early distress call.

22 CAPSIZING AND SINKING

Very serious casualty: sinking of a fishing vessel caused by failure of the shipside connection of the fish chute

What happened?

The about 400 gt fishing vessel capsized and sank about 170 miles offshore. Capsizing occurred about one hour after flooding started and about 30 minutes after flooding was first noticed by the crew.

Why did it happen?

All weathertight doors and hatches in the fishing station were not closed. Though capsizing would have eventually occurred, the time to capsizing would have been about 2 hours after water ingress was first discovered.

The owners and crew did not pay sufficient attention to the condition of the fish chute's shipside connection. Furthermore; the vessel left port with a negative freeboard, thus the main deck and the shipside connection of the fish chute were below water.

The abandon ship was incorrectly done. The crew had poor competency in the English language and therefore poor communication with rescuers.

What can we learn?

- Procedures for familiarization with a particular vessel need to be understood and followed.
- Emergency drills must be carried out prior to departure and periodically as outlined in Rules and Regulations for vessels.
- The importance of maintaining watertight integrity of the vessel and the importance of early detection of a flooding condition in order to afford the crew sufficient time to take early and appropriate action before a developing flooding situation becomes an emergency situation.
- The rescuers had difficulty in communicating with the crew since the crew had difficulty with the English language.

23 ENGINE FAILURE

Serious casualty: engine failure and subsequent collision with fairway buoy

What happened?

The about 9,000 gt reefer carrier had just departed port and was transiting the river fairway when it suffered a main engine failure. The bridge team carried out an emergency anchoring routine with the ship being brought up on a single anchor in the vicinity of a channel marker buoy. The engine was restarted about 20 minutes later and the anchor was recovered. During the recovery of the anchor, the ship, under the influence of the wind and tide, struck and moved the channel buoy about 120 metres.

The ship completed temporary repairs to its engine and, under the guidance of the vessel traffic service authorities, began making its approach to enter the river fairway again. The sea conditions meant it was not possible for tugs to put a towline onto the ship. After a series of miscommunications the ship sailed under its own power into the river without tug assistance. Once in the river, the engine failed again and the ship was eventually towed to a safe haven.

Why did it happen?

The seriousness of the engine malfunction was either not understood or ignored by the crew. The ship continued its voyage in restricted waters and into deteriorating weather that was forecast to reach storm force.

Poor communication between the ship, pilot and vessel traffic service authorities resulted in a poor understanding of the serious nature of the main engine failure, and of the risks that the continued operation posed to the ship, its crew and other traffic.

Poor communication and a lack of formal handover of the disabled ship between the participating vessel traffic services resulted in the ship re-entering enclosed waters without sufficient tug capability for the prevailing sea conditions.

What can we learn?

- Masters must fully understand the operating status of the ship's machinery so that a proper assessment of the risk to the ship can be made before continuing with the next phase of a voyage.
 - Masters and harbour pilots should consider early use of tug assistance during a developing casualty sequence to allow more options for providing assistance.
 - Consideration of the manoeuvring capabilities and environmental conditions when selecting tugs for marine casualty response is important.
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