LESSONS LEARNED FROM CASUALTIES FOR PRESENTATION TO SEAFARERS (AS REVIEWED AND APPROVED BY THE SUB-COMMITTEE ON FLAG STATE IMPLEMENTATION AT ITS TWELFTH SESSION)

BACKGROUND

The Sub-Committee on Flag State Implementation (FSI) establishes a Correspondence Group on Casualty Analysis at every session. The Casualty Analysts review reports of investigation into casualties and prepare recommendations based on the findings and analysis thereof. The Members of the correspondence group also prepare a Summary of lessons learned to be made available to seafarers on the IMO website.

The FSI Sub-Committee agreed that the lessons learned should be disseminated to the industry to further encourage masters, ship owners and managers to introduce effective safety management procedures and instructed the Secretariat to publish the aforementioned information on the IMO website so that Member Governments, maritime associations and other interested parties may easily distribute the lessons learned.

FIRE

What happened?

While loading a cargo of benzene into 12 tanks, a vessel was boarded by a cargo surveyor. The pumpman observed the cargo surveyor taking samples from the aftermost tanks and working forward. Approximately 25 minutes after the last tank was loaded, an explosion occurred and fire developed near the forward part of the cargo area. The fire was extinguished in several minutes by the Master and another crewmember using deck monitors. The no. 1 port cargo tank lid was blown off and other damage was noted on nearby structures and pipework. The cargo surveyor was injured.

Why did it happen?

A static charge had developed in the cargo tank prior to the explosion. The cargo surveyor used a metallic can attached to a fiber rope to obtain samples which caused a discharge of static electricity within the tank. The cargo surveyor was not aware of the risks associated with the equipment he was using and had not followed established procedures. Vessel crewmembers did not confer with the cargo surveyor regarding his methods and equipment.

What can we learn?

Cargo surveyors may not understand the risks of their activities and may not employ safety procedures adequate for a particular cargo or vessel.

Deck officers should ensure that cargo surveyors equipment and procedures are safe.

What happened?

A fire broke out in the provision room of a general cargo ship having only a crew of five. The crew were unable to contain the fire and the fire spread to the accommodation. The Master was forced to abandon the ship and all crew were rescued by a helicopter. The whole accommodation block was subsequently burned out.

Why did it happen?

There was only one self-contained breathing apparatus (SCBA) set on board which inhibited the capability of the crew in fighting the fire. A CO_2 extinguisher was used to knock down the fire; however, it re-ignited as the space was not effectively sealed. The spread of the fire into the accommodation could not be controlled because the crew failed to follow boundary cooling techniques and monitor all sides of the provision room. Further, the senior officers had failed to take control of the fire party, to assess the situation and consider using different medium to fight the fire.

What can we learn?

CO_2 can knock down a fire quickly, however its cooling effect is limited. To prevent re-ignition, the space containing the seat of fire should be effectively sealed.

When applying boundary cooling to contain a fire, all sides of the space should be monitored.

Smoke helmets are not as effective as SCBA's for fire-fighting, especially on vessels with only a small number of crew. The Maritime Safety Committee has a circular highlighting problems associated with the use of smoke helmet-type breathing apparatus (MSC/Circ.1085).

The fire party should be led by a more senior officer, who should use his experience and knowledge to assess the situation and consider the most appropriate means to fight the fire.

What happened?

While at anchor, the crew was engaged in cleaning and painting the topside ballast tank as part of an ongoing maintenance program. The tank had been opened some days before and the Mate tested the tank for oxygen levels a few times and found them to be 21%. After approximately 2 hours of painting, using a spray gun to apply epoxy paint with thinners, there was an explosion which blew the tank apart. Five crew members died and three were missing.

Why did it happen?

The epoxy paint contained more than 30% thinners and spray painting using such a mixture can create vapour concentrations within the explosive range of the mixture's compounds. The tank was ventilated using a fan blowing air through a manhole and a compressed air line situated in the tank which was inadequate. A cargo light was used to illuminate the work area which was not intrinsically safe/explosion proof.

What can we learn?

The crew needs to appreciate the potential of an explosion when spray painting. The safety management system should set out procedures for painting in enclosed spaces and the material

safety data sheets which provide flash points, explosive limits and ignition points for the paint base, hardener and thinner should be onboard the vessel.

What Happened?

During a short transit to the next port, the crew started tank cleaning operations. They fitted a water-driven fan to ventilate the tank with ducting extending to the lower portion of the tank. After completing the ventilation of the tank, two crew members entered the tank to remove residual oil. There was an explosion which tore away bulkheads to adjoining tanks and A-1 Jet Fuel and Kerosene slops were ignited. The hull was breached in way of the tanks and the engine room and the ship flooded rapidly, developed a starboard list and sank. The crew escaped by jumping into the sea and seven were recovered by passing ships, 3 died and 6 were missing.

Why did it happen?

The source of ignition was not identified; however, it was highly probable either due to a discharge of static electricity from winter clothing or from the ventilation ducting, or to an ordinary metal paint can that was used to carry tools into the tanks coming in contact with metal and causing a spark. The crew was under pressure to complete the tank cleaning operation due to the short duration of the transit.

What can we learn?

There is a need to ensure sufficient time for tank cleaning operations to minimise the possibility of missing steps or not paying adequate attention to the operation.

Crews are required to take training in tanker operations; however, there is a need to continually reinforce that training onboard and to ensure that it is properly applied.

What happened?

The ship was alongside with containers onboard containing explosives. An engineer was transferring heavy fuel oil and did not monitor the operation. The tank and vents filled resulted in the fuel oil becoming mixed with diesel fuel in another tank. The oily mixture continued up vent piping to a vent collection chamber where a flange was not connected and spilled on the deck and down into engine room spaces below. The oily mixture ignited, the fire developed rapidly and the engine room spaces filled with smoke. The crew and shore fire fighting personnel fought the fire but were hindered by the smoke. They tried to activate the CO_2 system twice and thought that it had discharged. After several hours of effort, the fire was brought under control and extinguished. Two crew members died.

Why did it happen?

The ignition source could not be determined but was probably as a result of some of the oily mixture coming in contact with an incinerator.

The engineer did not properly monitor the fuel transfer operation and the tank level monitoring systems were fitted with alarms which had been over-ridden by placing a pencil in a toggle switch used to acknowledge alarms.

The venting system was in the process of being cleared of blockages and several flanges had been disconnected at a collection chamber where several vents come together.

Fire and watertight doors were open which allowed the smoke to enter various spaces including the Fire Control Room and CO_2 room, hampering the response and an attempt to release the CO_2 manually.

What can we learn?

With the venting system being open to clear blockages, procedures with physical "lock-outs" were needed to ensure there is no transferring of fuel.

If automatic alarm systems are not functioning, a safe guard that was required is not being maintained. Appropriate actions by the company or officer responsible have to be taken to either repair the system or introduce procedures to ensure the safe-guard is maintained.

The ship's fire response plan should be followed. The less than adequate command and control of the response resulted in delays and uncoordinated actions such as the failure to establish fire boundaries and communications and to activate the CO_2 system.

A lack of training and awareness of the operation of certain fitted fire-fighting systems underlines the need to be able to demonstrate their ability to function through drills and exercises.

Awareness of possible means to evacuate an engine room may have allowed the crew members to consider alternative escape routes.

What happened?

The ship was alongside undergoing repairs following a period of time that it had been laid up. During the process of replacing an expansion joint in one of the tanks, it was realized there was a quantity of Premium Motor Spirit in the tank. An electrical submersible pump was to be used to pump the oily water mixture. The pump was lowered in the tanks and soon after it was started, an explosion occurred severely rupturing the cargo tanks. As a result of the explosion, 6 shore workers and one of the ship's officers died. As well, 1 shore worker and another of the ship's officers were admitted to hospital.

Why did it happen?

There was an explosive meter on board and tanks had been tested some time before; however, there is nothing to indicate that the atmosphere in the tank had been tested on the day of the explosion.

The ship's eduction pump was not used and the electrical submersible pump that was used was faulty or not intrinsically safe to be used in such conditions.

What can we learn?

When working with oily water mixtures in tanks, ship's crew members should not assume that the tank is gas free and should only use equipment designed for such purposes.

LOSS OF LIFE AND PERSONAL INJURY

What happened?

The Chief Officer and five crewmembers were checking the anchor securing arrangement during a heavy weather passage. The ship began pitching and two waves swept over the bow. One seaman was able to obtain cover from the seas. The Chief Officer and other four crewmembers, who were facing aft at the time, were unaware of the approaching seas. The impact of the waves tossed them from the forecastle to various locations on the forward deck. The Chief Officer and one seaman died as a result of their injuries. The remaining injured seamen were ultimately air lifted to a hospital.

Why did this happen?

The Chief Officer, acting on his own initiative, placed himself and those assisting him in a high risk situation by checking the anchor securing arrangement in heavy weather without first assessing the risks. He did not notify the Master or the Officer of the Watch that personnel would be working on the forecastle deck and they were both unaware of the task being performed. The Chief Officer underestimated the weather conditions and the potential effects on the mission being attempted. He, and the five crew members assisting him, all failed to wear safety harnesses with lifelines.

What can we learn?

Lifelines attached to the railings may have prevented the mariners from being washed from the forecastle deck and could have reduced the extent of the injuries.

It is important to notify the Master and Officer of the Watch when work is being performed on deck, especially during adverse weather.

It is easy for even experienced personnel to underestimate the potential effects that adverse weather may have on the jobs being performed.

What happened?

The Bosun, with the assistance of a Deck Cadet, two Ordinary Seamen, and three Able Bodied Seamen, had just completed changing the cargo wire on No. 2 crane. They worked from 10:00 hours until 17:45 hours with approximately 45 minutes for lunch. The sun set at 16:53 hours and it was getting dark when the job was finished. It was now time to ensure that the wires were running freely. The Bosun, standing on top of a small platform on top of the crane, unclipped his safety belt from the platform rails and directed the Deck Cadet to operate the crane. The Bosun was unaware that his unclipped safety belt had become entangled with the moving luffing wire of the crane. Moments later he was drawn into the crane between the sheaves and the luffing wire. The crane was stopped and he was freed; however, his leg was nearly severed and he was hemorrhaging. He died of massive traumatic injuries shortly after the paramedics arrived.

Why did it happen?

The Bosun was concentrating on the operation of the renewed cargo wire and he did not notice that his unclipped safety belt had become entangled with the luffing wire. This may have been

due to a lapse after the completion of the physically and mentally demanding task of renewing the cargo wire. It is also possible that darkness contributed to the casualty.

What can we learn?

Personnel involved with mentally and/or physically demanding tasks may encounter periods where they have a loss of concentration.

The Bosun might have been more aware of hazards associated with his disconnected safety line if warnings had been given regarding the dangers of loose clothing and personal safety equipment becoming entangled with moving objects.

The onset of darkness changed the working environment and may have contributed to the casualty.

What happened?

While transferring a tow from one ship to another, a crew member was killed by a tugger wire. The tugger wire was being used to transfer a heavy towing wire from the ship picking up the tow to the towing ship. The tugger wire had been attached to the towing wire, which was lying on the deck of the ship picking up the tow. The deceased crew member was in the process of leading the tugger wire around a towing pin at the stern of the towing ship when the crew of the other vessel dropped the tow wire off their deck prematurely. The tugger wire became rapidly taut under the weight of the towing wire and swept across the deck of the towing ship. The crew member, who was working inside the bight of the tugger wire, was thrown 4-5 m in the air by the wire and then landed heavily on the deck. He sustained serious internal and external injuries and died before he could be evacuated by helicopter.

Why did it happen?

The crew on the ship picking up the tow had fastened the tugger wire to their towing wire prematurely before it had been led around the towing pin on the other ship. There was a failure of communication, which led to the crew releasing the towing wire from their deck in contravention of instructions from their Master. The crew of the towing ship were working inside the bight of the tugger wire and consequently in the path of the sweeping tugger wire.

What can we learn?

Operations involving heavy wires or wires under load are risky and need to be carefully planned and carried out.

All crew involved in these operations need to fully understand the procedure and maintain good communications particularly when there is more than one ship involved.

Do not take unnecessary risks by working inside the bight of a wire or mooring line.

What happened?

While at anchor, the crew of a ship were in the process of removing and stowing tween deck hatch covers. They were using the ship's crane to lift the hatch covers and move them to the

stowage position forward of the accommodation. The ship was moving in the sea which was causing the suspended hatch covers to swing. The chief officer placed himself in a narrow space between a suspended hatch cover and the accommodation's forward bulkhead. The hatch cover began to swing and trapped the chief officer against the accommodation bulkhead. His pelvis was crushed and he sustained serious internal injuries. He died before he could be evacuated by helicopter.

Why did it happen?

It was accepted practice on the ship to conduct the hatch cover operation while the ship was at sea or at anchor and subject to sea motion. There was little consideration of the dangers associated with moving the hatch covers at sea and no instructions from the company regarding the operation. The chief officer had placed himself in the restricted space between the hatch cover and the accommodation bulkhead. He may have been misled by the ease with which the suspended hatch covers could be rotated by hand and thought that he could control the 17 ton hatch cover when it was swinging.

What can we learn?

Operations at sea that involve heavy lifts are risky and should be avoided when the vessel is rolling.

If these operations must be performed, ensure that the suspended weights are adequately restrained from swinging.

Never place yourself in a restricted position adjacent to a suspended weight without leaving a means of escape.

While heavy weights suspended from a single point may be rotated easily, they exert a large force when swinging.

What happened?

While a ship was alongside a jetty in poor weather the Mate fell between the ship and the jetty fenders. The ship had just finished loading and was lying with the top of its bulwarks some 2 m below the jetty deck. The Mate was on deck and was trying to pass some documentation to a person standing on the jetty when he slipped and fell. His pelvis was crushed and he sustained serious internal injuries when the swell caused the ship to close on the fenders. Two crew members, who were working on deck, saw the mate trapped between the ship and the fenders and assisted him back on board. The Mate lost consciousness and died a short time later.

Why did it happen?

There was no safe means of access between the ship and the jetty in the form of a gangway and the ship was moving substantially in the prevailing weather conditions. The relative levels of the jetty and the ship's bulwarks meant that the Mate had to stand on the slippery bulwark and reach up to pass the documentation. He was in a hurry as the weather was getting worse and there was concern that the ship may be damaged by its movement alongside the jetty.

What can we learn?

Ensure that there is a safe method of access between ship and shore when people need to move from one place to the other. Alternatively, ensure a safe method of exchanging documents in all foreseeable conditions when there is no need to for people to move between ship and shore.

Always ensure you have adequate handholds when moving about on a moving ship.

Do not take dangerous “short cuts” to save time.

COLLISION

What happened?

An overtaking vessel collided with a stand-on vessel at a speed of about 6 knots faster than the stand-on vessel in the southwest (SW) traffic lane of the Dover Strait Traffic Separation Scheme (TSS). Consequently, the stand-on vessel foundered and its master died.

Why did it happen?

The officer of watch (OOW) of the overtaking vessel did not notice the stand-on vessel, either visually or by radar until the collision was imminent and therefore was not keeping a proper lookout. The OOW of the stand-on vessel was distracted from lookout duties by a mobile telephone call. He was therefore unaware of the developing situation and, as the stand-on vessel, was unable to fulfil his obligations under the collision regulations.

Dedicated lookouts were not posted on either vessels.

What can we learn?

A fundamental basis for collision avoidance is a good lookout.

In heavy traffic situations like those that exist in the Dover Strait TSS, the posting of a dedicated lookout is a sensible and seamanlike precaution.

Dangerously close overtaking has become commonplace in the SW lane of the Dover Strait TSS. Dangerous situations arise where vessels of markedly different speeds are travelling on coincident tracks.

Vessels should always be guided by Rule 5 of the COLREGs relating to Lookout (PART B - STEERING AND SAILING RULES, Section I - Conduct of vessels in any condition of visibility), which states that :

> **Every vessel shall at all times maintain a proper look-out 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.**

CAPSIZE

What happened?

A stern trawler fishing vessel of 24 m in length was trawling in heavy weather, in following seas, when the trawl was caught on a seabed obstruction. The Skipper used the engine power to free the trawl, without success. During this operation, a large amount of water flooded the freeboard deck (working deck) through the superstructure aft doors which were open. The Skipper changed the course, the vessel was hit by 2 or 3 waves, capsized, and sank. Consequences of the casualty were two fatalities, two persons missing, one person seriously injured, total loss of the vessel and minor pollution.

Why did it happen?

The Skipper didn't release the winch brakes or run the trawl warps off. The trawler capsized due to a combination of factors, such as water on the freeboard deck, free surface of liquids, increased loads in the warps caused by the increased engine power, asymmetric and transverse loads on the trawl cables, and the impact of waves.

What can we learn?

Skippers/operators of stern trawlers should be aware of the procedures to free the trawl from a seabed obstruction and related basic principles of stability considering bad weather conditions and following and quartering seas.

During fishing operations the vessel superstructure weathertightness shall be kept by all means.

Sea state thresholds beyond which fishing work should be avoided or extra-caution taken should be established.