Safety Flash

28/23 – December 2023

IMCA Safety Flashes summarise key safety matters and incidents, allowing lessons to be more easily learnt for the benefit of all. The effectiveness of the IMCA Safety Flash system depends on members sharing information and so avoiding repeat incidents. Please consider adding **safetyreports@imca-int.com** to your internal distribution list for safety alerts or manually submitting information on incidents you consider may be relevant. All information is anonymised or sanitised, as appropriate.

1 NTSB: Lithium-ion battery fire destroys vessel bridge

Applicable Life Saving Rule(s)

Energy Isolation

The National Transportation Safety Board of the United States (NTSB) has published report MIR-23-23 relating to a Lithium-ion battery fire aboard a tanker. This incident highlights some of the risks and hazards associated with modern battery technologies and is highlighted to members as a matter of importance requiring further attention and discussion. Members are encouraged to download and read the full report.

What happened

A fire started on the bridge of an oil tanker whilst alongside. Fire teams from the vessel extinguished the fire in less than half an hour after it had begun. There were no injuries, but the damage caused to the vessel was estimated at US$3 million. There was extensive smoke and heat damage, and the vessel's navigation systems, communication systems, and alarm systems were destroyed.

What went right

The emergency response of the vessel crew, including the Master who discovered the fire, was prompt and correct, including shutting the doors on a discovered fire, stopping all cargo operations, raising the alarm, isolating electrical power from the area on fire, and fighting the fire.

What went wrong

As the vessel was alongside, there was no bridge watch; no one was stationed on the bridge at the time the fire started. The first indication crewmembers had of a possible fire aboard was the loss of the CCTV feed to the monitor in the Master's office. Had the fire occurred while the vessel was underway, there would have been personnel on the bridge, and the fire would have been immediately detected.

The vessel's bridge did not have a smoke or fire detection system (nor was it required to), which also allowed the fire to grow undetected.

What was the cause of the fire

The NTSB investigation determined that the probable cause was a "thermal runaway" of one of the cells in a lithium-ion battery for a UHF handheld radio on the communications table on the bridge.

Thermal runaway

A thermal runaway occurs when a battery cell overheats and combusts; it is a chemical reaction that can occur to any type of battery cell if it is damaged, shorted, overheated, defective, or overcharged.

The heat produced from a thermal runaway of a lithium-ion battery cell can exceed 600° C, which can easily cause any nearby combustible material to ignite, including adjoining cells of the same battery.

Lessons learned

- Due to the potential for rapid expansion of a Lithium-ion battery fire, detection, containment, and extinguishment are essential to prevent damage to a vessel;
- Crews can help prevent thermal runaways and ensuing fires by doing the following:
  - follow manufacturers' instructions for the care and maintenance of Lithium-ion batteries;
  - properly dispose of damaged batteries;
  - avoid unsupervised charging of Lithium-ion batteries;
  - keep batteries and chargers away from heat sources and flammable materials.
- Ensure that Lithium-ion batteries, the devices using them, and particularly Lithium-ion battery chargers, are sourced only from reputable and recognised suppliers.

The NTSB concludes by noting that *crews can attempt to extinguish a Lithium-ion battery fire with water, foam, CO_2, or other dry chemical or powdered agents. However, if the battery fire cannot be extinguished, personnel should attempt to allow the pack to burn in a controlled manner; this includes watching for nearby cells that may also experience thermal runaway and extinguishing other combustibles that may catch on fire.*

IMCA notes that the potential for Lithium-ion battery fires, both in our members' work spaces and in our homes, is an increasingly topical and very serious issue. Members are encouraged to stimulate discussion about this in the workplace and to consider what appropriate steps might be taken to mitigate the risks.

Members may wish to review the following:

- USB power bank (Lithium battery) fire
- Lithium batteries: Fire following the failure of a helicopter start power unit
- Battery fire with subsequent gas explosion: Warning about lithium-ion power following ferry fire
- Fire in vessel accommodation – Overheating notebook computer
- Laptop battery fire
- LTI: Severe burn from short circuited Li-Ion battery

2 LTI: gangway collapsed

Applicable Life Saving Rule(s)

Bypassing Safety Controls

What happened

A person was badly injured when a gangway collapsed as he was using it. The incident occurred when the injured person requested permission to leave Vessel 2, which was moored outside of and alongside Vessel 1, which was alongside in a shipyard. The injured person was unaware that Vessel 1 was undergoing engine tests, and the gangway was not in use. However, the gangway had not been removed completely, due to scaffolding structure being in the way. There was no gangway watch nor were there any signs and barriers in place. As the injured person started to walk down the gangway, it collapsed causing the person to fall and break both heels. Medical evacuation was arranged and fracture of both heels was confirmed afterward.

What went wrong

- The vessel gangway was moved partially instead of fully and properly. This happened because scaffolding was installed on board the vessel, resulting in a lack of space to store the gangway;
- The partial removal of the gangway, though it was known to be incorrect, was left unchallenged by everyone involved;
- The removal of the gangways on both vessels (due to engine tests) had been announced and was recorded in the bridge logbooks, but the injured person was still granted permission to leave the vessel;
- There were no rigid barriers or safety signs at the access point (an open door) to dissuade or prevent persons from using the gangway;
- There was no gangway watch person present;
- There was no lighting over the gangway area (the event occurred in the hours of darkness).

Lessons to learn

- More “joined up thinking” needed – better communication of, and understanding of, what is going on;
- Ensure appropriate supervision of crew at all times;
- Ensure that there is a gangway watch – as mandated in ISPS – at all times, and ensure that access to and from the vessel is properly lit;
- Ensure barriers and signage indicating a hazard or dangerous area, are fit for purpose and cannot be got round in any way;
- **Stop and think! Take the time to think things through.**

Members may wish to refer to:

- LTI – crew person cracked shin bone
- LTI – crew member fell down open hatch

3 LTI: Fingers injured during fender lifting operation

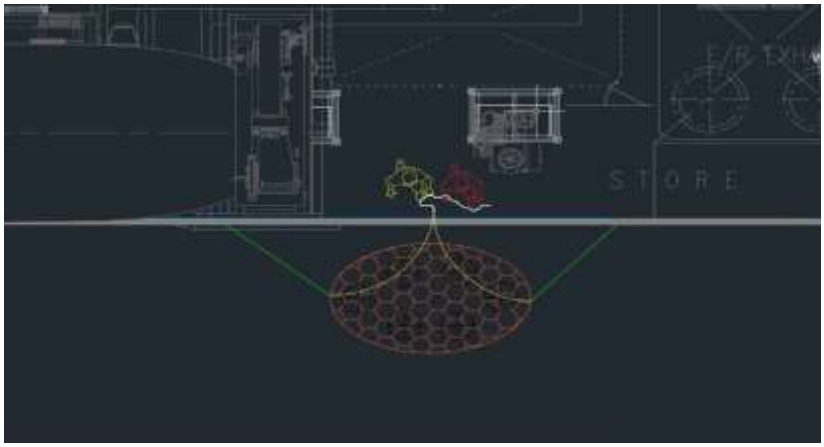
Applicable Life Saving Rule(s)

Line of Fire

What happened?

A crew member suffered severe injuries to two fingers during fender lifting operations. The injuries occurred while hauling up the webbing slings with a (13mm (half-inch) polypropylene rope so that a Yokohama fender, weighing approx. 415 kg, could be lifted to deck.

The crew member pulled the polypropylene rope to allow him to handle the webbing sling ends and untie the polypropylene rope from the railing. During this activity the swell caused the rope he was holding to slacken and then come under tension suddenly, and the rope jerked violently and was pulled out of his hand. He found he had badly injured two fingers of his hand; he was given first aid and then further treatment, and was medevaced ashore.



Sketch showing position of fender, the webbing strops and short hauling line

Glove prior to removal. Damage to thumb area was pre-existing

Final hand position (re-enactment).

What went right

- The crew person remained calm during the activity and injury; he went immediately to report the injury to the bridge who called the doctor to the bridge. Onboard medical care was excellent and arrangements were quickly made for medevac;
- The injured person and their co-worker were wearing full PPE as specified in company procedures;
- There was a Permit to Work in place, and a job safety analysis and toolbox talk had been conducted.

What went wrong

Our member identified the following contributory factors:

- The fender surged a great deal with the swell, this caused the line to jerk in an uncontrolled manner, the rope line jerked out of the workers hand and this was enough to cause the injuries;
- There was a lack of risk perception, the task was seen as routine;
- STOP WORK Authority not used;
- The rope was handled from underneath so that the direction of energy was through the hand (rather than from above which would make release of the rope automatic); this may have contributed to the severity of the injury;

What was the cause

Our member summarised the root cause as follows: *procedure and JSA were not robust enough, nor did they adequately cover all steps of the activity. They should have been revisited in light of the changing conditions and the activity should have been stopped and reassessed when the surge of the fender was noted.*

Lessons and actions

- Although the PPE was inadequate to prevent the injury, substitution with Impact Resistant Gloves, or any other available glove options for this activity, would have been unlikely to have prevented it. The injury was to the palm side of the glove which is not an area where armour or thick padding is traditionally found.
- Watch out for complacency and "task seen as routine";
- Ensure everyone involved, supervisors and workers, feels empowered to **stop the job** when conditions change and/or become unsafe;
- PPE cannot always be relied on to prevent injury and is a last line of defence. In this case, our member considers that impact resistant gloves should have been worn because of the risk of pinch points and entrapment injuries;
- The rope that was tied to the handrail did not have sufficient slack to allow the rope to be easily untied, the snatching could have been avoided either by having extra slack in the rope, or by cutting it.

Members may wish to refer to:

- Tagline incident
- LTI finger injury during mooring operations
- Serious hand injury during mooring operations

4 MAIB: Electrician injured in explosion

Applicable Life Saving Rule(s)

Energy Isolation | Work Authorisation

The UK Marine Accident Investigation Branch has published Safety Digest 2/2023, consisting of lessons from recent Marine Accident Reports. IMCA has reviewed the report and passes on to members, as some of the incidents in the MAIB report will be of interest. This is one of them.

What happened

An electrician was badly injured while working on a switchboard. The circuit breaker was designed to be removed without the need to isolate the base unit (Figure 1); however, the electrician was unfamiliar with this arrangement and had loosened one of the live connections on the input to the base unit (Figure 2). The electrician used rubber gloves to insulate himself from the live 440 V alternating current terminals when working on the connections.

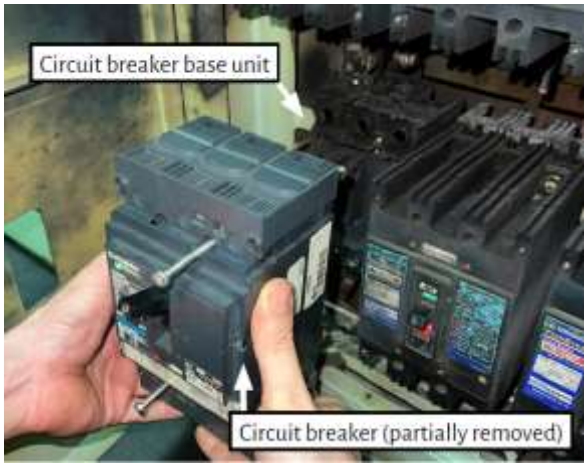


Figure 1: The circuit breaker arrangement

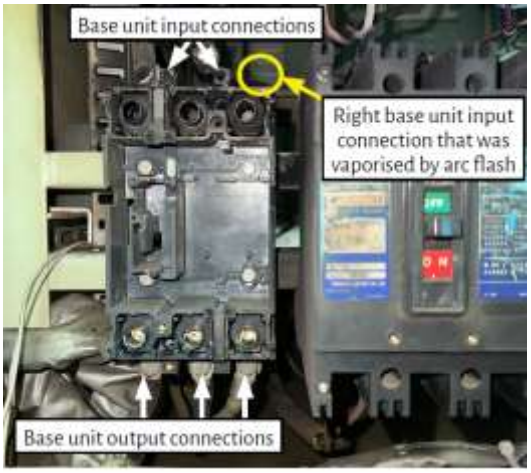


Figure 2: The base unit connections

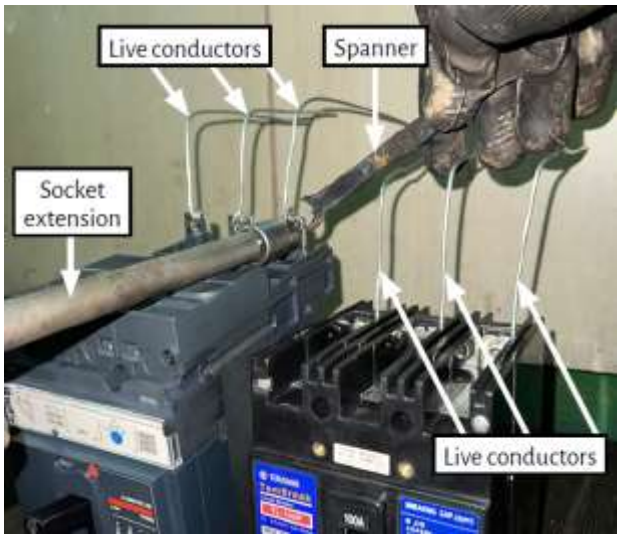


Figure 3: Reconstruction of the accident

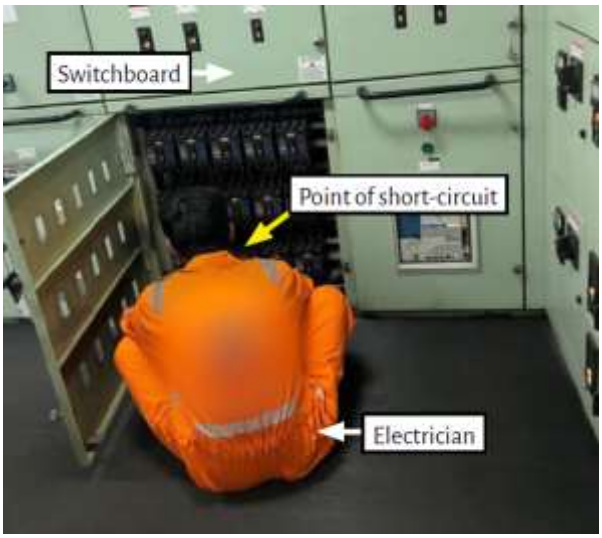


Figure 4: Position of the electrician

The electrician tried to reconnect the cables to the base unit using a socket extension on the head of the bolt and a spanner to hold the nut in position at the rear of the connections. As the electrician tightened the bolt on the live input connection, the nut rotated and the steel spanner touched an uninsulated copper conductor on the adjacent circuit breaker base unit. This caused a short-circuit between two phases of the switchboard (Figure 3).

The short-circuit caused a high current to flow, vaporising the copper conductor and part of the spanner in an arc flash creating extreme heat and blinding light. A burst of hot gas and molten metal exploded from the panel onto the electrician's face and chest (Figure 4).

The ship's engineers were alerted to a problem with the switchboard when the remote machinery alarm system sounded in the mess room. As the engineers headed to the engine room, the electrician arrived on the ship's bridge with serious burns to the face and chest. The following day, the electrician was transferred to hospital for medical treatment and later sent home. There was significant damage to the ship's main switchboard.

What went wrong

- The electrician twice disobeyed clear instructions from the Chief Engineer, to not work in the switchboard;
- The electrician was not familiar with the arrangements within the switchboard – had he took the time to fully understand the arrangement of the circuit breaker and base unit assembly that would have enabled the electrician to safely remove the circuit breaker and reduce the risk.
- The electrician was working alone without a Permit to Work, lock-out/tag-out arrangement or a safe system of work. The work was unexpected and therefore not included in the day's planning meeting. New work requires a new plan, regardless of time pressures;
- Working near live electrical equipment requires specific tools and PPE. The use of uninsulated tools while working in a live switchboard invited a short-circuit and the electrician, who was not wearing face protection, was lucky not to lose his eyesight.

Members may wish to refer to:

- Electrician suffered flash burn to hand
- Near-miss: Inadequate insulation of 690V bus bars
- Short circuit on 440v AC bus bars – arc flash

5 MAIB: Shifting of centre-of-gravity of load

Applicable Life Saving Rule(s)

Line of Fire

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What happened

A research vessel was unloading in port and crew had made a plan to offload a 20ft open-top container, which was filled with various pieces of equipment. A mobile crane on the jetty was being used to unload the ship; the crew prepared the lifting gear and attached four chains to the crane hook from the lifting lugs at each corner of the base of the container.

Three crew members were involved in the lift: the lift supervisor and banksman were positioned at the aft end of the container and the slinger was standing at the forward end. As the container was lifted it came clear of the twist locks that were securing it to the deck and rapidly swung aft and inboard. The lift supervisor was able to move out of the way, but the banksman suffered crush injuries when pinned between the container and the ship's handrails.

What went wrong

The cargo was not secured properly and it shifted. Nearly 8 tonnes of weights had been stacked in the back corner of the container when the equipment was originally loaded into the container (Figure 1). When an unbalanced load is lifted, it will naturally swing to put its centre of gravity directly under the suspension point. Such a load will also alter the share of the weight that each part of the lifting gear bears. In this case, the imbalance from the stowed weights caused the container, which weighed more than 16t in total, to swing towards the banksman.

Figure 1: Weights loaded in container

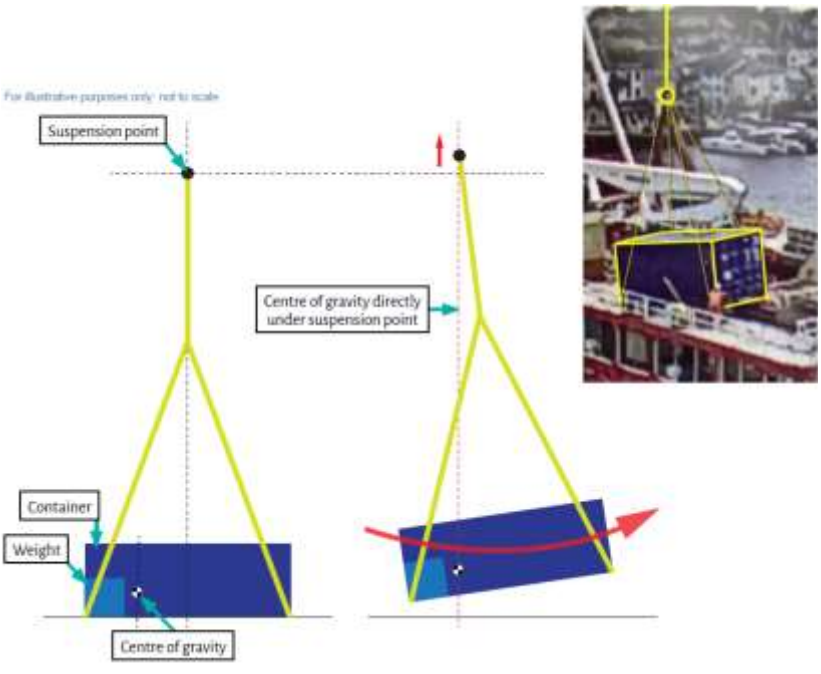

Figure 2: Effect of unbalanced load on lifting operation and (inset) CCTV still, showing container position following lift

Lessons

The MAIB drew the following lessons:

- The distribution of load is as important as the total weight when preparing a lift and its effect on the lifting operation should be carefully considered in the total lifting plan. In this case, neither the crew on board nor the crane driver were prepared for the swing that the unbalanced load caused when the container was lifted;
- Always have an escape route. Stay alert and keep well clear of any suspended load just in case something goes wrong;
- Sometimes an unbalanced load will need to be lifted. To facilitate this, use slings of different lengths to lift the load directly above its centre of gravity or a spreader beam to evenly distribute the weight and make sure the load is lifted vertically.

Members may wish to refer to:

- IMCA HSSE 019 *Guidelines for lifting operations*
- Loading and securing of containers
- Unsafe backloading of equipment
- Uncontrolled rotation of 9.6m reel
- Lifting complex loads – offloading third party equipment