IMCA Safety Flash 16/09

November 2009

These flashes summarise key safety matters and incidents, allowing wider dissemination of lessons learnt from them. The information below has been provided in good faith by members and should be reviewed individually by recipients, who will determine its relevance to their own operations.

The effectiveness of the IMCA safety flash system depends on receiving reports from members in order to pass on information and avoid repeat incidents. Please consider adding the IMCA secretariat (imca@imca-int.com) to your internal distribution list for safety alerts and/or manually submitting information on specific incidents you consider may be relevant. All information will be anonymised or sanitised, as appropriate.

A number of other organisations issue safety flashes and similar documents which may be of interest to IMCA members. Where these are particularly relevant, these may be summarised or highlighted here. Links to known relevant websites are provided at www.imca-int.com/links Additional links should be submitted to webmaster@imca-int.com

1 Near Miss: Unexpected Lowering of a Suspended Load

A member has reported an incident in which there was an unexpected lowering of a suspended load during a lifting operation which had the potential to cause significant injury. During maintenance of an ROV winch system, a yoke was being supported in position by a shore crane to allow a specific task to be conducted.

The shore-side crane was provided by the port authority which had sub-contracted it in, along with a rigging team from the port authority. As the end of the working day approached, the crane operator sounded the crane horn to indicate that time was running out. The vessel team agreed with the banksman that all persons would work for an extra thirty minutes to complete the task. However, this agreement was not communicated to the crane driver. Five minutes later the crane operator sounded the horn again as he wished to lower the load. The vessel team and banksman gave little acknowledgement to this. Shortly after this the crane operator lowered the load and shut down the crane as his working day was over.

At this time someone was threading a turnbuckle into the yoke. Due to the weight of the yoke this came out of his grasp prior to the yoke landing and his hands came clear. There were no injuries.

Site of yoke being supported by shore-side crane

Investigation of the incident revealed the following:

- The crane operator was under the impression that everyone understood his signalling and thought that all persons were clear from the work site;
- The crane operator could not see the work site;
- There was no verbal or radio communication with the crane driver either before (at the toolbox talk) or during the operation;
- There was no lift plan in place for this task, which meant guidance, roles and responsibilities were not well defined. Internal company procedures for lifting were not followed;

- The banksman had no authority from a working hierarchy over the crane operator to agree that he should work an extra thirty minutes. The working hierarchy also created poor team dynamics, as the crane operator was left out of all communications and decisions;
- A string of errors through poor communication almost resulted in a serious injury to personnel working on the winch.

The following actions were suggested:

- Teams conducting lifting operations should ensure that they are familiar with and follow their own company procedures for lifting operations;
- All lifts should have a lift plan – teams involved in lifting are to ensure that lift plans are in place prior to the lift starting;
- All persons involved in lifts should be included in the toolbox talk prior to the start of operations;
- Third-party contractors involved in members' operations, particularly lifting operations, should be fully briefed beforehand and personnel should be fully aware of the required level of subcontractor supervision;

IMCA guidelines covering this type of operation are as follows:

- IMCA SEL 019 – *Guidelines for lifting operations*
- IMCA M 175 – *Operational communications: Part 1 – Bridge and dive control*
- IMCA SEL 020/M 193 – *Guidance on operational communications: Part 2 – Lifting operations.*

2 Near Miss: Loss of a Small Crane ('Cherry Picker') Wire

A member has reported an incident in which a crane winch wire was lost during light subsea lifting work. The winch wire and the load dropped on to the seabed near to working divers.

A small crane, sometimes referred to offshore as a 'cherry picker', was being used to deploy a small tool basket to a diver working on a subsea manifold. It had been identified on the previous shift there was insufficient wire on the crane winch drum to reach the seabed; however there was sufficient winch wire to reach the roof of the manifold. The deck crew and dive supervisors had been briefed by the previous shift regarding the short length of wire.

During the operation to deploy the basket the deck crew was instructed to deploy the tool basket to the 'short mark' (rope marks fitted to the cherry picker wire). The diver spotted the tool basket and gave an 'all stop' signal. However, the tool basket continued to descend towards the seabed followed by the entire length of the winch wire which landed in close proximity to the divers. The divers were uninjured and returned unaided to the bell.

An investigation took place which, in addition to errors in lift planning, suitability of equipment and management of change, revealed the following:

- The divers were working directly under a suspended load;
- There were several 'short marks' identified on the winch wire;
- The pilot of the observing remotely operated vehicle (ROV) had not been instructed to watch the descending load;
- The 'lineout meter' giving details of how much winch wire had paid out was defective;
- A hydroacoustic position reference (HPR) beacon had not been fitted to the wire in order to confirm the depth.

The company involved implemented a number of control measures following this incident:

- A 'dropped object cone' protection procedure was implemented for divers where the diver(s) must be outside a minimum 30 degree dropped object cone for all subsea lifts; if this is not practical then they must at least retire under the bell. Certain loads being deployed and recovered will require the bell to be recovered.
- At least two independent depth reference devices should be in operation when deploying loads subsea. These can be:
  - a line out meter
  - an HPR transponder
  - rope marks
  - ROV observation should be regarded as secondary means of reference;
- The crane or 'cherry picker' operator should have suitable visual references to allow an accurate understanding of the position of the subsea load and the capabilities of the lifting equipment.

3 Hand Injury: Injection of Hydraulic Fluid

IMCA has received information about a hand injury caused by leaking pressurised hydraulic fluid on a drilling rig. A person was searching for the source of a small hydraulic leak. The leak was located and a request made for the hydraulic pump to be shut down so that the damaged hose could be replaced. The pump was duly shut down. Then the person involved placed his index finger (whilst wearing double gloves) over the damaged spot on the hose so as not to lose the location of the leak.

The person involved was unaware that hydraulic pressure remained on the system following shut down of the pump and that this pressure had actually increased for around two seconds after the pump shut down (owing to back pressure). Hydraulic fluid burst through the damaged spot on the hose and was injected through the double gloves into the person's index finger. Surgery was required to find and remove the injected oil from the finger and hand of the person.

This incident serves as a timely reminder to maintain vigilance and awareness of the very serious potential hazards and risks associated with working with pressurised hydraulic fluid.

Damaged spot on hydraulic hose

Major surgery was required to track and remove the injected hydraulic oil from the person's hand

4 Tumble Dryer Fire Onboard a Vessel

A member has reported an incident in which there was a small fire inside the drum of a tumble dryer on a vessel offshore. A burning smell was detected on the bridge of the vessel concerned and an investigation into the source was commenced. It was traced to the laundry where a small fire in the drum of a tumble dryer was observed. The fire was extinguished and the dryer contents removed and doused to cool.

Investigation revealed the following:

- The dryer had been filled with galley towels by a steward, who then started the drier on a 'normal +' temperature cycle and left the laundry to carry out other duties;
- Despite established operating procedures, the steward did not return to the laundry on completion of the cycle and it was around two hours later that the fire was detected;
- The towels were not the specific colour coded cleaning cloths designated to wipe down the galley surfaces but rather oven towels and dish towels;
- The towels placed in the dryer appear to have become contaminated with oils or fats which, after being through the drying cycle and then remaining in the drum for around an hour, allowed the heat to build up and led to the start of spontaneous combustion of the towels;
- The steward demonstrated lack of awareness of the established procedure for laundering galley towels/cloths and failed to realise the consequences of his actions;
- The third-party catering contractor had procedures for operating the tumble dryers but these had not been put into practice on the vessel, nor were the catering team fully aware of these procedures;

- Control measures and lessons learnt from a previous tumble dryer fire on the same vessel had not been retained owing to changes in catering personnel.

The following actions were taken:

- Vessel management should ensure that policy and procedures for laundry operations, particularly with regard to the drying of galley cloths, are fully understood by all catering personnel;
- Adequate and clear instructions for the operation of the laundry and any specific instructions such as for galley cloths, payloads and temperatures should be posted in the laundry.

5 Bell Bottom Door Hydraulic Operating System Failure

A member has reported the failure of a bell bottom door hydraulic operating system. The failure occurred while carrying out standard bell recovery operations using the port dive bell on a twin bell system.

While attempting to close the dive bell bottom door, it was noted that the bottom door did not fully close and that the bottom door had castellated. Further attempts were made to close the door fully which exacerbated the situation, resulting in the bottom hatch being jammed more solidly.

The divers carried out an internal dive bell inspection and found that the hydraulic control system had failed due to hydraulic system oil loss.

Several unsuccessful attempts to rotate the bottom door were made including topping up the hydraulic oil system tank and also removing sections of the internal hydraulic operating pipework in an attempt to rotate the bottom hatch manually.

The bottom door was found to have jammed to such an extent that the divers were unable to produce sufficient torque, using the manual tools available in the dive bell, to turn it.

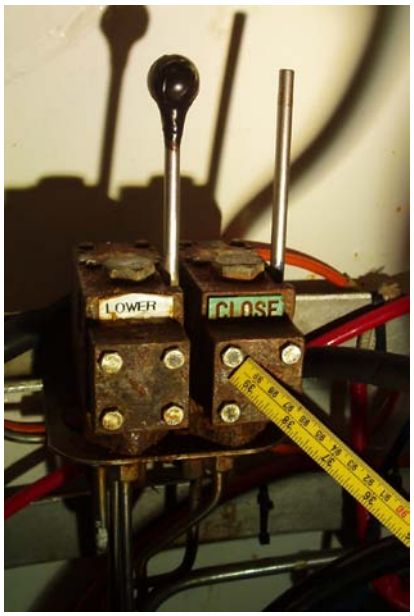
The decision was made to launch the starboard dive bell and effect diver recovery using the member's 'through water transfer' procedure to the starboard bell which went without incident with all divers successfully returned to the system.

The cause of the failure was found to be a ferrule which had become detached from a hydraulic pipe in the control system, rendering the bottom door hydraulic system inoperable.

The member noted that the individual operations of opening/closing and rotation of the bottom door were controlled by directional control valves (DCVs) and that both valves could be operated simultaneously, so that in essence both opening/closing and rotation could be carried out at the same time.

The following corrective actions were taken:

- visual system designed inside the dive bell to show that castellations are in line, to allow for better control by the diver;
- interlock between directional control valves fitted;
- procedure for operating bottom hatch posted locally in bell and in dive control;
- familiarisation, training and exercises improved for dive bell bottom door operation;
- technical description and emergency procedures prepared and posted in dive bell and dive control;
- failure modes and effects analysis (FMEA) reviewed with regard to bottom hatch operation;
- maintenance plan reviewed.



Direction control valves (DCVs) to select raiser/lower or rotate

Actual ferrule and nut from the bell

6 Near Miss: ROV Fuse Bolt Failure

A member has reported an incident in which a crew member was narrowly missed by the head of a fuse bolt which had been shot out of a remotely operated vehicle (ROV) manipulator arm at high speed. It occurred as normal pre-dive checks were being completed on the ROV. The manipulator arm being tested was cycled and, during the test, the fuse bolt securing the jaws of the manipulator failed. This caused the head of the bolt to shoot out of the manipulator arm at high speed. The head of the bolt passed close to an ROV technician who could have been severely injured had it hit him. There were no injuries.

The manufacturer's operating procedures recommend that personnel stay clear of the operational envelope of the manipulator during functional testing on deck. However, owing to the high levels of kinetic energy shown in this failure, additional caution should be exercised, for example, standing further back, cordoning off the area and ensuring that non-essential personnel are clear.

Further investigation revealed the following:

- The fuse bolt had failed under water during the previous dive;
- The manipulator had been exposed to heavy work during the previous dive and this had led to other components in the arm and wrist assembly being damaged sufficiently to lead to this second fuse bolt failure on deck.

The following actions were taken:

- The ejected fuse bolt was recovered and the manipulator and ROV made ready for dive;
- Additional controls were identified which would prevent a recurrence of this type of incident;
- CCTV footage of the failure was prepared as a safety presentation;
- The manufacturer of the manipulator arm (Schilling Robotics) was informed;
- The manufacturer developed and published a safety bulletin (attached);
- The fuse bolt was subjected to failure analysis to better understand why it failed so dramatically.

The following further actions are recommended:

- Manual operation of manipulator jaws to be conducted prior to energising hydraulics;
- ROV personnel should ensure when completing deck checks on ROV manipulators that the arm is pointing away (or even outboard) from personnel and assets in the immediate area;
- Access to the area immediately around ROV should be controlled during pre-dive deck checks.

Schilling Safety Bulletin

SAFETY BULLETIN 012 – 0016

Fused Jaw Bolt May Shear at High Velocity

Status: **SAFETY CRITICAL***

SCHILLING ROBOTICS

ISSUE DATE

August 26, 2009

AFFECTED PRODUCTS

All Rigmaster, Conan, and Orion slave arms and manipulator systems, Titan Manipulator Systems

AFFECTED COMPONENTS

Fuse-type jaw bolts 001-5382 and 001-5397 (based on jaw type). They have a machined hole in the bolt head and are located as shown in Figure 1 on the following page.

BACKGROUND

A fuse-type jaw bolt was designed to shear when overloaded in order to prevent damage to other jaw components. As noted in Service Bulletin 011-7155, the use of fuse-type bolts was discontinued beginning in November of 2005 because field users found the shear rate unacceptable. Because fuse-type jaw bolts are in many older spares kits and could have been used as replacements, they may be on slave arms of any age, old or new.

SERVICE ISSUE

We have been informed that a fused jaw bolt sheared as the jaw function was being tested on-deck. Part of the bolt was ejected from the jaw at a high velocity, narrowly missing a crew member. This incident highlights the importance of always using PPE and staying clear of the slave arm's range of motion at all times to avoid risk of injury.

FIELD ACTION

Inspect each slave arm jaw to determine if a fuse-type bolt is used in the jaw. Fused jaw bolts have a machined hole in the bolt head as shown in Figure 1 on the following page.

1. Slave arms that use fused jaw bolts can continued to be operated under the following conditions:

! WARNING

Use extreme caution when testing a slave arm on deck:

- **Move all personnel outside the slave arm's range of motion when hydraulic pressure is applied and functions are tested.**
- **Direct the slave arm to point away from personnel and critical or sensitive areas while testing jaw functions.**
- **Do not stand in front of the jaw assembly while testing jaw functions.**

*BULLETIN STATUS LEVELS	
SAFETY CRITICAL	Field action is CRITICAL to ensure the SAFETY of personnel and must be performed IMMEDIATELY

If you have any questions about this service bulletin, contact the Schilling Customer Service Department at:
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2. If you decide to replace a fuse bolt, use the slave arm or manipulator system technical manual to determine the part number for the existing fused jaw bolt. Then determine if a non-fused, replacement jaw bolt is available in spares:

- Fused jaw bolt 001-5397 (shaft length 3.123-in.): Replace with jaw bolt 001-7520.
- Fused jaw bolt 001-5382 (shaft length 2.116-in.): Replace with jaw bolt 001-7519.

Jaw bolts 001-7519 and 001-7520 can be found in many slave arm, manipulator system, and Schilling ROV system spares kits issued since 2005.

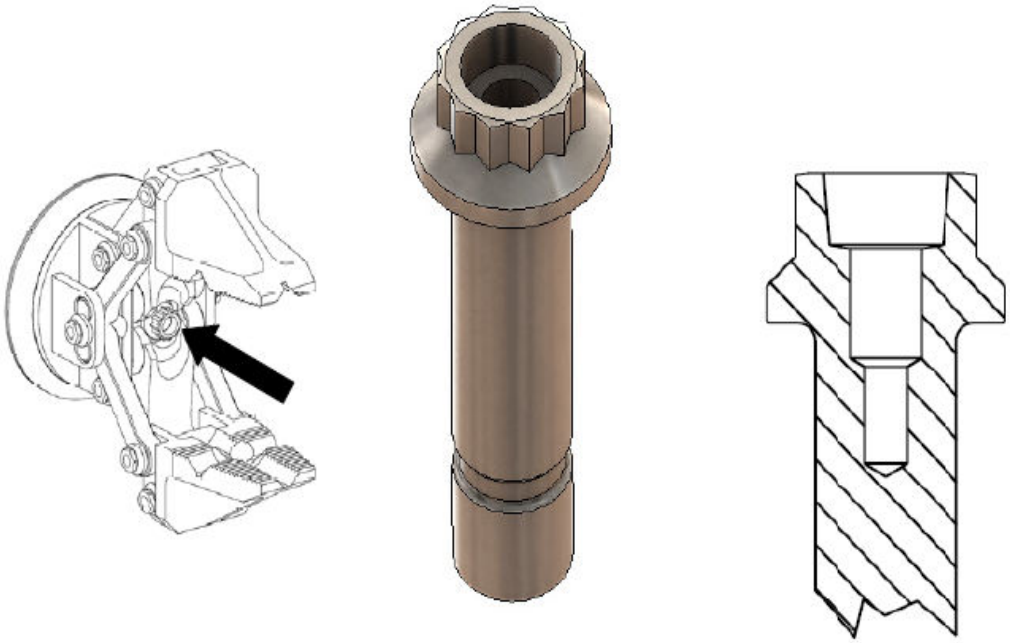

Figure 1 Fuse-type jaw bolt: location (left), machined hole in head (center, right)