Marine Safety Investigation Unit

Transport Malta

SIMPLIFIED SAFETY INVESTIGATION REPORT

201507/019 REPORT NO.: 13/2016 July 2016

MV *NORTH SEA ATLANTIC*

Serious injury to crew member
In position 60° 21.5'N 004° 04.5'W
22 July 2015

Background information

North Sea Atlantic, which was built in 2014, is a 144 m multipurpose offshore vessel, designed for survey, pipe lay and sub-sea construction projects. *North Sea Atlantic* sailed from Lerwic, UK on 16 July 2015 for an offshore construction site in BP Foinaven Oilfield, 150 km West of the Shetland Islands.

North Sea Atlantic was working on the Riser Pre-installation Project, involving the construction and deployment of 14 dynamic risers. The risers were loaded on the Opening Vertical Lay System (OVLS) table where buoyancy modules, *Duraguard*® riser protection and other ancillaries were stowed for the project.

In buoyancy module installation, a clump weight is used to assist with the lowering of the riser to the seabed for connection to the hold down pile. The clump weight is connected to the riser upper tether clamps on the OVLS table, and is lowered down on the seabed through the moon pool along with the riser. The tether clamps are then hooked up to the pre-installed driven pile and the clump weight is recovered to deck.

The associated rigging arrangement included a two leg bridal gear (Figure 1), connected to the clump weight. The hook-ends were fastened with messenger lines to remotely operate/open the hooks.

Figure 1: Two leg bridal gear with remotely operated hooks

Each leg of the bridal gear is joined to a shackle which in turn is linked to the OVLS winch wire leading to the forward port side winch. Schematic drawing of the two leg bridal gear and clump weight rigging arrangement is shown in Figure 2.

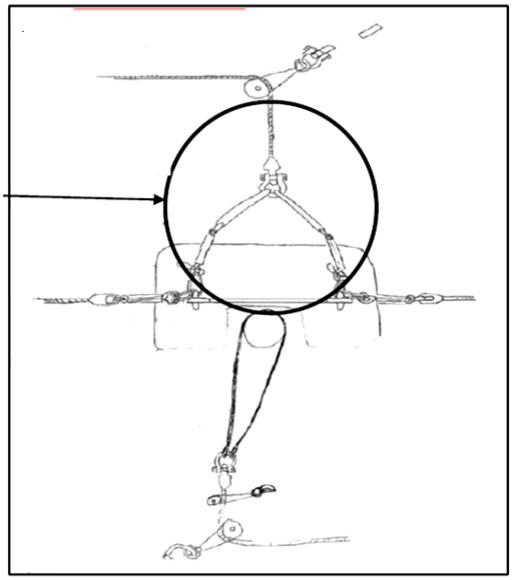

Figure 2: Schematic drawing of two leg bridal gear and rigging arrangement

The riser and the clump weight are held in constant tension to control any untoward movement. This arrangement allows the lowering of the clump weight into the moon pool through the OVLS doors without making contact with the riser (Figure 3). A 'management of change' carried out prior to the accident had introduced changes in the operational procedure relating to the clump weight deployment.

On 22 July 2015, the rigging crew was doing pre-installation work on 11th riser (W-5P). There was moderate to fresh breeze. The swell was Southwest with an average height of 1.0 m.

The work permit issued on 17 July 2015 was re-issued at 1148 and accepted for work carried out between the 1200 and 0000 work shift. Wires under tension were an identified risk, listed in this permit.

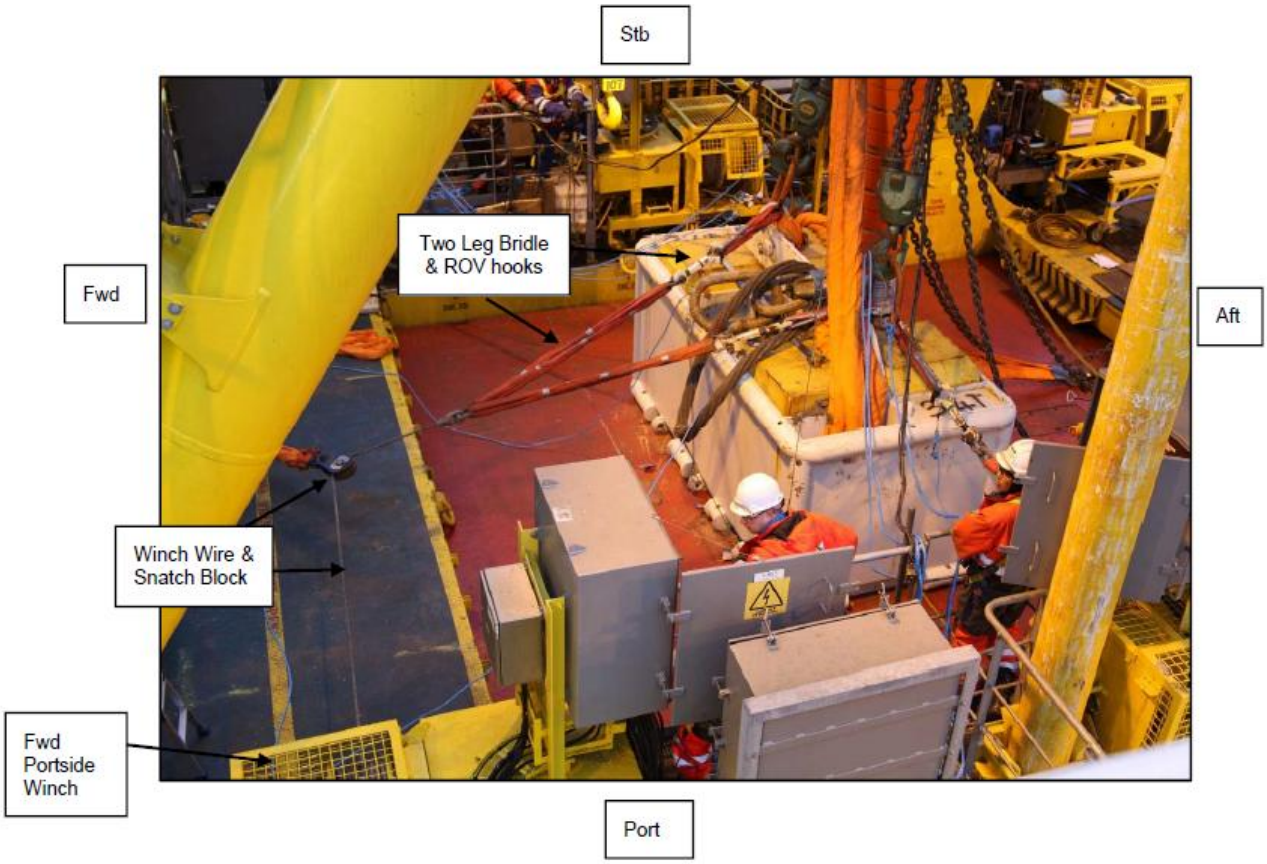

Figure 3: Two leg bridal gear connected to the clump weight

The deck foreman conducted a Toolbox talk on:

- loading and deployment of the clump weight;
- continuing the building of the riser; and
- general deck duties and housekeeping.

The Toolbox talk identified risks to riggers and simultaneous operation of winches. The riggers were reminded that anyone can call 'all stop' to break the operations in the event of witnessing an unsafe act or condition.

The crew manifest listed eleven riggers from the Philippines and two British deck foremen. The majority of riggers worked on the 1200 to 0000 shift. One of the rigger reported for duty at 1200 in his role as lead rigger. This crew member was an experienced lead rigger, having worked for 12 years on board the Company's off-shore vessels. He had been assigned for 12 months on board *North Sea Atlantic*, working on a rotation of 12 weeks on and 6 weeks off.

Course of events

The lead rigger, wearing his PPE and a fall arrest harness, was working forward of the moon pool while the clump weight and riser W-5P were lowered through the moon pool. The OVLS doors were open with about two metres of the forward and aft OVLS doors in the closed position. Only the central area of the moon pool was uncovered.

When the underside of the clump weight reached the sea level, the deck foreman briefly paused the operation. He instructed the forward port side winch operator to ease out the winch wire in order to release the bridal gear. The lead rigger approached the OVLS table and tugged on the messenger lines to disconnect the two hooks from the clump weight (Figure 4). Once released, the associated rigging was suspended over the edge of the forward OVLS door and into the area of the moon pool.

Figure 4: The lead rigger pulling on the messenger line to release bridal hook

The deck foreman was positioned behind the forward port side winch operator and could directly observe the bridal gear and the lower lip of the OVLS table doors. Soon after, the deck foreman instructed the winch operator to hoist in the associated rigging. As the bridal gear came up, one of the hooks' extension 'beak' snagged on the underside of the OVLS door (Figure 5).

Figure 5: Image showing the snagging of the hook and position of the lead rigger right above the area

The bridal gear momentarily came under tension until the extension 'beak' broke away from the hook (Figure 6) and the entire bridal rigging was instantly freed with tremendous force.

Figure 6: Hook with damaged extension 'beak' after the accident

At the time, the lead rigger was standing at the edge of the OVLS door, looking down into the moon pool (Figure 5). The bridal gear flung outward and struck the lead rigger's left arm. The accident occurred at 1438 (LT) in position 60° 21.5´ N 004° 04.5´ W.

Post accident action

The riser pre-installation operations were immediately stopped and the ship's medic was called to attend and treat the lead rigger. The medic examined the injured rigger and found fracture of the Ulna and Radius bones of the left arm. The lead rigger was subsequently evacuated ashore by helicopter for urgent medical treatment.

Immediate cause of the accident[1]

The immediate cause of the accident was the momentarily snagging of the hook and uncontrolled release of the bridal gear under tension.

Hazard identification and risk assessment

Hazards and risks of tasks involved in the Riser Pre-installation Project were addressed, approved and documented in the Hazard Identification Risk Assessment (HIRA) Report. The report covered the steps that had to be followed to accomplish the riser pre-installation project on board *North Sea Atlantic*.

However, a job risk assessment (JRA) was required at the work site when tasks had either not been risk assessed, the task conditions would have changed, or the work site personnel considered the need for an additional risk assessment. The JRA would then be formally documented as part of the 'management of change' process.

With respect to the 'clump weight deployment/recover to OVLS table', additional control measures were documented in the HIRA report and implemented at the work site. Changes in operational procedures were also addressed with the introduction of a bridal gear and soft sling. However, the probability of hooks' 'beaks' snagging on the underside of the OVLS door was not foreseen and therefore remained outside the scope of specific risk assessment.

Nonetheless, evidence submitted to the MSIU affirmed the crew's observations of the lead rigger's lack of awareness of the potential line of fire of the bridal rigging both during W-5P and previous snagging event at S-5P riser installation. Moreover, the lead rigger who was aware of the snagging event from S-5P did not bring the matter up at the W-5P Toolbox talk. The snagging event at S-5P was not raised by the rigging crew either and no formal risk assessment had been undertaken. As a result, no documented corrective action formed part of the subsequent riser installation work.

[1] The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, and to prevent further marine casualties and incidents from occurring in the future.

The deck foreman, who was overseeing the operations, anticipated no obstruction of the bridal gear. In any case, the snagging and subsequent release of the bridal gear happened instantly, leaving no time to stop the winch or warn the lead rigger who, after releasing the hooks, was allowed to remain on the OVLS table.

Risk perception

The HIRA report emphasised risk assessment at the work site, where personnel involved in the operation considered it necessary. The winch operators and riggers were thus expected to be continuously aware of whether the operation was running within safe limits, or whether there was something wrong and required their intervention.

As already noted, the rigging crew was influenced by the prevailing context and their immediate concern was the safe deployment of the clump weight. Analysis of the available evidence indicated that there was limited focus on the retrieval of the bridal gear. When the snagging event occurred during the S-5P riser installation, the rigging crew had neither effectively recognized the hazard, nor its probability and severity.

It has to be pointed out, however, that human rationality is bounded; the capacity of the human mind to formulate and solve problems is limited when compared to the potential size of the problem itself. Moreover, it was not excluded that the crew was influenced by the 'normalization of deviance' phenomenon where past success involving similar operations is taken as guarantee of future safety; with crew members departing from formal, original rules on the basis of past success, establishing new norms.

Risk response behaviour

Empirical research and other literature on the subject matter demonstrate the effect of the working environment on cognition, as well as their behaviour and individual decisions. The obstruction of the bridal gear during the S-5P installation had not gone unnoticed. Yet, it was not formally risk assessed or raised at the subsequent Toolbox talk.

The lead rigger, skilled with many years of experience in similar projects, may have perceived the obstruction either with some degree of acceptable risk or as a low risk event. His behaviour on deck suggested that he was not particularly threatened by the event. There are numerous empirical studies which analysed similar behaviours.

One such study referred to the *risk homeostasis* theory, which claims that people may accept a higher level of risk when they do not feel threatened by the circumstances. The CCTV footage of the bridal gear recovery during the W-5P installation and which was submitted to the MSIU, substantiated this kind of behaviour. The crew member is seen making (naturalistic) decisions in a very dynamic environment.

After releasing the hooks, the lead rigger made no attempt to walk away to a safe place. Instead, he swiftly picked up the messenger lines and approached the moon pool. His subsequent action of tugging the messenger lines suggested an attempt to deflect the hook fouling on the underside of the OVLS door. It would appear that he had clearly overestimated his ability to mitigate the obstruction, which on previous occasions may have given favourable results and strengthened his preferred decision.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION[2]

Following the accident, the Company carried out an internal investigation and took the following safety actions as part of a holistic action plan to avoid similar accidents in the future:

1. Safety information was issued for fleet wide distribution;
2. Snag potential assessments carried out in order to establish 'no go' snap back zones;
3. In consultation with the manufacturer, the ROV hook has been modified to remove the extension beak;
4. Toolbox training was facilitated for all crew members serving on the vessel;
5. Time out for safety meetings is being held across the fleet to assess equipment, procedures, risk and on board activities;
6. A training package on Toolbox talk has been developed by the Company and is being implemented across the fleet;
7. A working group has been established to revise internal procedures and the Company's risk assessment process;
8. Procedures were adopted to ensure that feedback on the operations are analysed and lessons learned captured;
9. A PUWER[3] assessment was carried out on the winches in order to assess ergonomic design;
10. An exercise was adopted to raise awareness of fire hazards;
11. The on board management team has embarked on a 'Stop the Job' campaign;
12. An internal Safety Notice has been drafted and issued to all vessels in the fleet; and
13. The internal investigation findings were reviewed from a 'just culture' perspective so as not to apportion blame.

RECOMMENDATIONS

In view of the safety actions taken by the Company, no recommendations were made.

[2] **Safety actions should not create a presumption of blame and / or liability.**

[3] Provision and Use of Work Equipment Regulations, 1998.

SHIP PARTICULARS

Vessel Name:	*North Sea Atlantic*
Flag:	Malta
Classification Society:	DNV GL
IMO Number:	9665073
Type:	Multi-purpose offshore vessel
Registered Owner:	North Atlantic AS
Managers:	North Atlantic Shipping AS, Norway
Construction:	Steel
Length Overall:	143.75 m
Registered Length:	127.51 m
Gross Tonnage:	15701
Minimum Safe Manning:	15
Authorised Cargo:	Not applicable

VOYAGE PARTICULARS

Port of Departure:	Lerwick, Shetland Islands, UK
Port of Arrival:	Not Applicable (BP Foinaven Oilfield)
Type of Voyage:	Short International
Cargo Information:	Not Applicable
Manning:	101

MARINE OCCURRENCE INFORMATION

Date and Time:	22 July 2015 at 1438 (LT)
Classification of Occurrence:	Serious Marine Casualty
Location of Occurrence:	60° 21.5'N 004° 04.5'W
Place on Board	OVLS Table (freeboard deck)
Injuries / Fatalities:	One serious injury
Damage / Environmental Impact:	None reported
Ship Operation:	Other
Voyage Segment:	Arrival
External & Internal Environment:	Clear weather with good visibility. Southwesterly moderate breeze and calm sea. There was a 1.0 m Southwesterly swell and an air temperature of 8°C.
Persons on board:	101