PETROLEUMSTILSYNET

Investigation report

Report	
Report title Investigation of an incident involving a dropped object on *West Venture* on 23 March 2015	Activity number 404005004

Security grading

☑ Public	☐ Restricted	☐ Strictly confidential
☐ Not publicly available	☐ Confidential	

Summary

An incident with a dropped object occurred on the semi-submersible drilling unit *West Venture* on 23 March 2015 while operating on the Troll field.

The incident had no serious consequences with regard to injury to people or damage to material assets, but the investigation's findings include deficiencies in risk assessments, planning, roles and responsibilities, management and compliance with procedures.

Involved	
Main group T-F	Approved by/date Leif J Dalsgaard 2 July 2015
Members of the investigation team Reidar Sune, Sigvart Zachariassen, Ola Heia	Investigation leader Ola Heia

Contents

1 Summary

A test plug belonging to a test tool for the blowout preventer (BOP) fell to the drill floor just before midnight on 23 March 2015, and continued through a spider work platform and the rotary table opening. It was halted after falling eight metres and hit the BOP before coming to rest between the kill-line hub and the BOP frame. The test plug weighed 90kg, and its kinetic energy just before impact was estimated at 5 297 Joules.

The direct cause of the incident was the entanglement of the test tool during lowering with one of several structures protruding into the opening in the work platform or the rotary table. This caused one of the unsecured test plugs to be pushed out of its slot, fall off the test tool and hit the BOP.

Under slightly different circumstances, this incident had the potential to cause serious personal injury to two workers standing on the BOP frame, or extensive material damage. The test plug could just as easily have fallen down on the same side of the BOP frame where the workers were standing.

The investigation found breaches to barriers, a lack of risk assessment, inadequate planning, unclear roles and responsibilities, deficiencies in the management and implementation of the mechanical handling operation, inadequate information, and insufficient compliance with procedures.

West Venture is pictured below.

Illustration 1: West Venture *(Source: Google.no)*

2 Introduction

An incident involving a dropped object occurred at 23.25 on 23 March 2015 while readying a BOP for use on well 31/2-M-11 for North Atlantic Drilling (NAD) on mobile drilling unit *West Venture*, operating for Statoil on the Troll field. The Petroleum Safety Authority Norway (PSA) resolved on 24 March 2015 to conduct its own investigation of the incident. The police decided on the same day to investigate the incident and requested the PSA's assistance with this.

Composition of the investigation team
Ola Heia, drilling and well – investigation leader
Reidar Sune, logistics and emergency preparedness
Sigvart Zachariassen, working environment

Approach taken
The investigation team arrived on *West Venture* at 08.00. Joint kick-off and concluding meetings were held with the police, and a total of five interviews were held with people who had been involved and/or who had responsibilities related to the incident. See appendix B. Documentation requested is listed in appendix A.

Mandate
The mandate for the PSA's investigation was established in accordance with section 4.1.2 of the procedure.

a. *Clarify the incident's scope and course of events, with an emphasis on safety, working environment and emergency preparedness aspects.*
b. *Assess the actual and potential consequences*
    1. *Harm caused to people, material assets and the environment.*
    2. *The potential of the incident to harm people, material assets and the environment.*
c. *Assess direct and underlying causes, with an emphasis on human, technology and organisation (HTO) aspects, from a barrier perspective.*
d. *Discuss and describe possible uncertainties/unclear aspects.*
e. *Identify nonconformities and improvement points related to the regulations (and internal requirements).*
f. *Assess the player's own investigation report.*
g. *Discuss barriers which have functioned (in other words, those which have helped to prevent a hazard from developing into an accident, or which have reduced the consequences of an accident).*

3 Course of events

In connection with bringing well 31/2-M-11 H on stream, the BOP was readied and work started to install it on the well. Pressure-testing of the BOP after installing two risers gave unsatisfactory results, and the BOP was retrieved to the facility. Improvements were carried out, and several unsuccessful attempts made to obtain a good BOP test. Before the incident, the BOP had been positioned immediately beneath the rotary table in order to be able to lower the top-mounted test tool for pressure testing after the repair. A spider for casing installation had been installed on the drill floor.

A utility winch was used to hoist the test tool up and down through the rotary table to the BOP. The tool was held by three one-tonne fibre straps attached to eyebolts and assembled in a shackle in the winch hook. Roustabout 1, who was operating the winch, began the operation in cooperation with roustabout 2, who was operating the tail-in machine (TIM). The gripper claws in the latter were crossed over and the lifting chain/steel rope laid in the crossover in order to centre the lift through the spider/rotary table. Roustabout 2 functioned both as operator of the TIM and as signaller. The passage through the rotary table was a blind lift.

The test tool had five test plugs (marked in different colours) which were installed in slots in the flange on top of the BOP. These were unsecured in the released position to avoid getting stuck during installation. A released position meant that each of the five plugs protruded a little above the edge of the test tool. One plug (yellow) was pushed out of the hole in the test tool when it snagged on or struck structure(s) while descending through the rotary table or spider because the tool was not properly centred. The plug then fell some six metres and hit the flange of the mud-seal hub, where it lost much of its energy, before falling another two metres and becoming wedged between the BOP frame and the kill-line hub.

The incident occurred around 23.25 on 23 March 2015. The dropped object weighed about 90kg. Its kinetic energy just before impact over six metres was calculated as 5 297 Joules.

During the lifting operation, two roustabouts were standing on the BOP frame about two metres from where the test plug hit the flange. Both were wearing safety harness and had a permit for working over the sea. Their job was to install the test tool on the BOP flange.

Work was halted after the incident, photographs were taken as documentation, and the platform management held a meeting with drill floor personnel to review what had occurred. The area was then cleared, the dropped object removed and operations resumed until the PSA and the police announced that they would investigate the incident. That occurred at 15.30 on 24 March.

The BOP was then restored to the position it was in when the incident occurred.

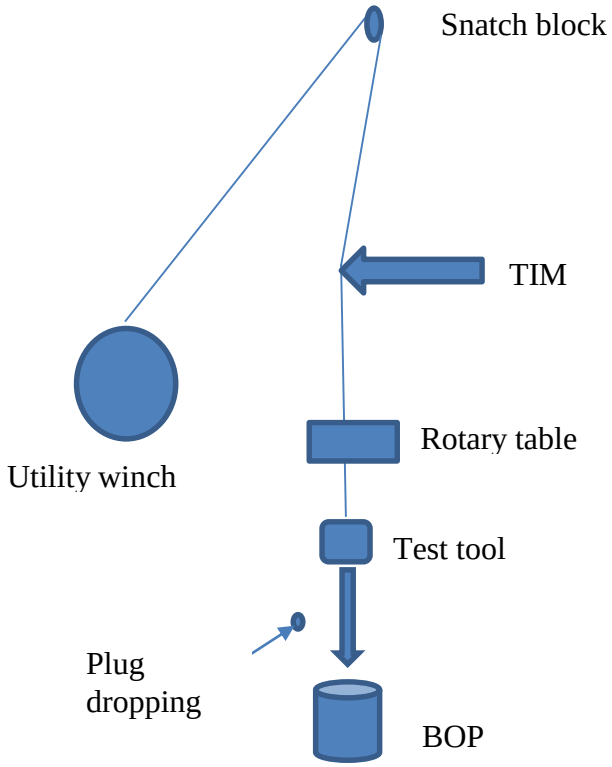

Figure 1: Diagram of the lowering operation.

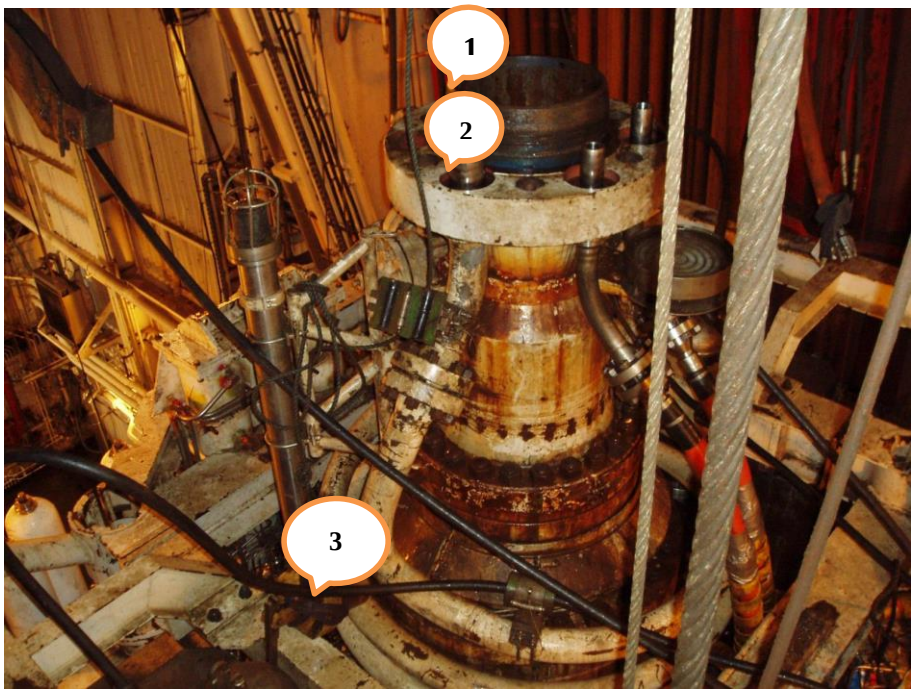

Illustration 2: Point of impact in the incident.

1. First point of impact on top of the mud-seal hub
2. Second point of impact on the kill-line hub
3. Third and final point of impact, where the dropped object came to rest.

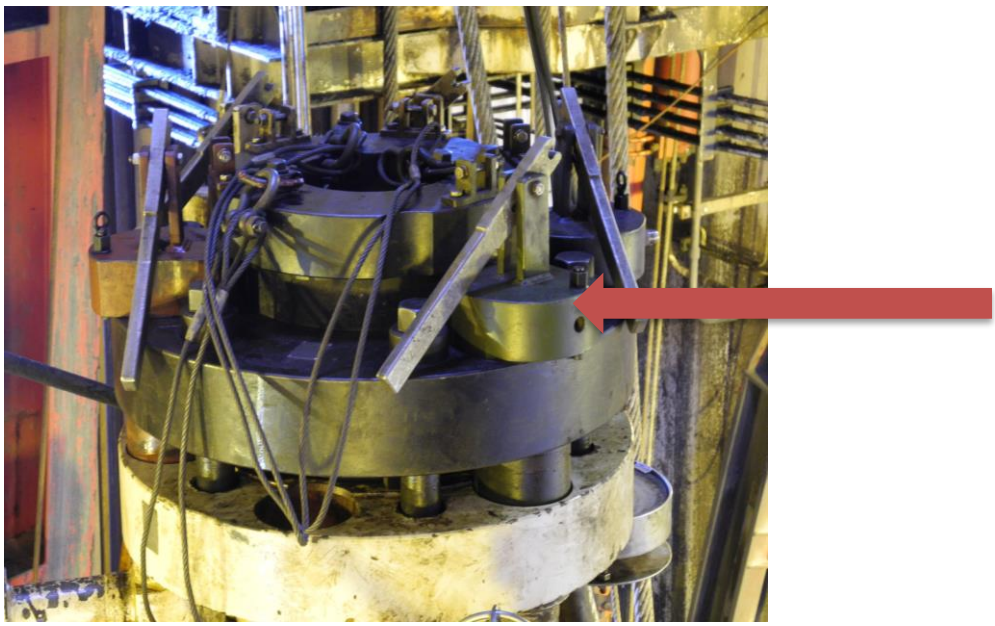

Illustration 3: The test tool.

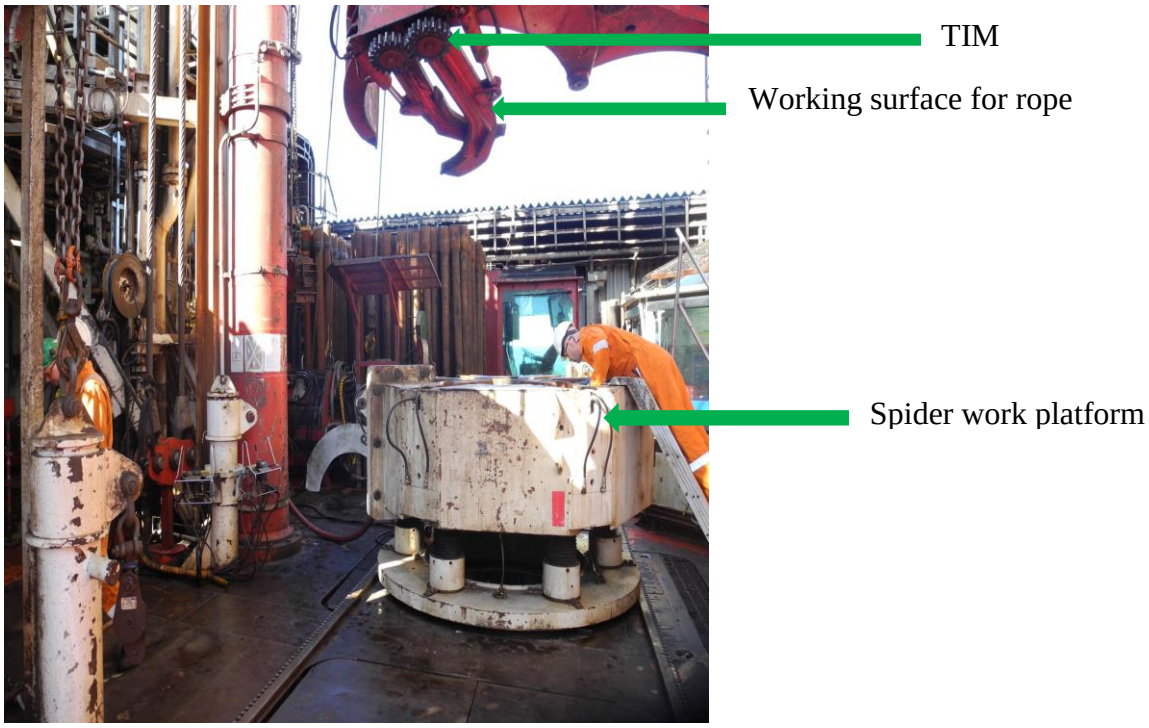

Illustration 4: Spider.

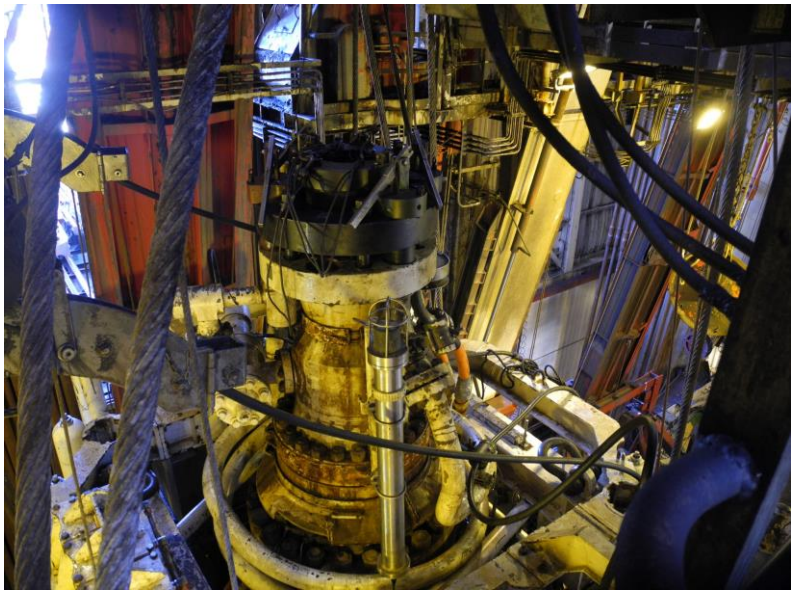

Illustration 5: BOP with test tool in released position.

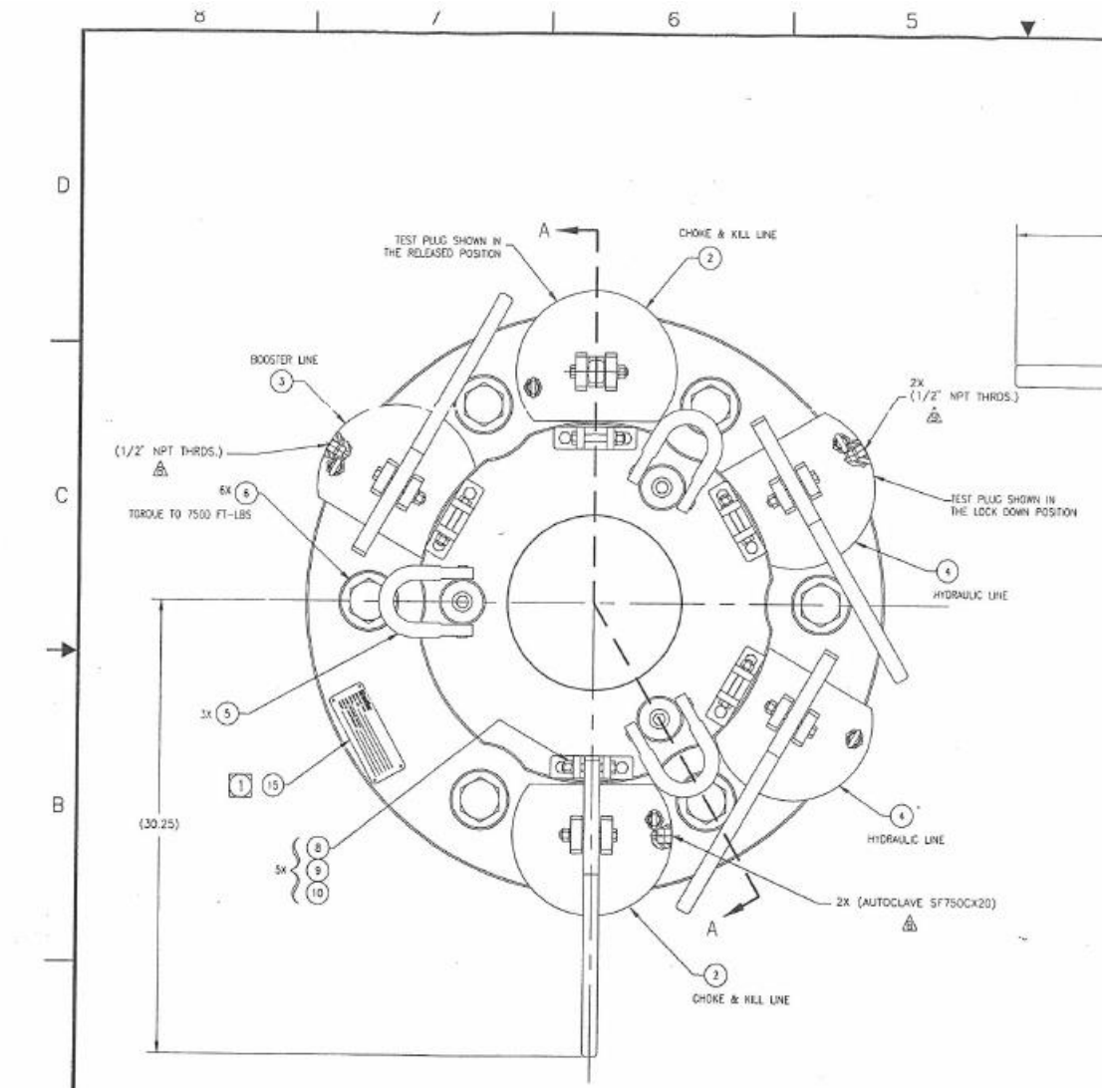

Illustration 6: Diagram of test tool.

4 Potential of the incident

Actual consequences
The incident caused minor material damage to the BOP flange and the test plug.

No other damage was caused to material assets or injury to personnel.

Potential consequences
Under slightly different circumstances, the dropped test plug had the potential to cause serious personal injury. The plug had an equal likelihood of falling on the side where personnel were present. Its kinetic energy just before impact was sufficient to cause serious personal injury or death from a direct hit. The position of the personnel in this case meant they could not have suffered a direct hit, but the plug might have hit the BOP in such a way that it changed direction and thereby struck one of the people beneath the drill floor.

Alternatively, the plug could have fallen further and damaged equipment on the BOP or in the moonpool area or landed in the sea. Damage to or loss of the plug could have caused delays to the operations under way on the relevant well.

Observations

The PSA's observations fall generally into three categories.
- Nonconformities: observations where the PSA believes that regulations have been breached
- Improvement points: observations where deficiencies are found, but insufficient information is available to establish a breach of the regulations
- Conformities/barriers which have functioned: observations which confirm conformity with the regulations.

4.1 Nonconformities

4.1.1 Inadequate preparations for lowering the test tool through the rotary table/spider

Description
The lowering operation was conducted with an unsuitable combination of equipment for the relevant job.

Grounds
The utility winch used was not centred over the rotary table. To compensate for this, an available piece of equipment (the TIM) was used to alter the direction of the steel rope so that the lift was diverted to the centre of the rotary table.

- The TIM is only designed to handle large-diameter pipes, and is not intended to alter the direction of steel rope or designed for that. The working surface in contact with the steel rope was small and could have damaged the rope. A snatch block should normally be used for this purpose.

In addition, the operation was conducted in a blind zone for the winch operator, since the load was being lowered into and through the rotary table/spider. The signaller had limited opportunities to occupy a safe position for directing the load down through the rotary table.

No hazards which might arise during the lowering operation were identified before it started. See nonconformity 4.1.2. Nor were there any deficiencies in the equipment used.

Requirements
Section 25 of the activities regulations on the use of facilities
Section 92, first paragraph of the activities regulations on lifting operations

4.1.2 Inadequate planning and leadership

Description
Inadequate preparation of a non-routine mechanical handling operation.

Grounds
Lowering the test tool onto the BOP was assessed to be a routine operation, which would have been the case if the handling equipment had been appropriate for the job. During the relevant lowering operation, however, equipment used was not tailored to the job and this should accordingly have been assessed as non-routine. As a minimum for such an operation, a safe job analysis (SJA) should have been conducted and/or a handling instruction or plan developed for the equipment and methods being used to carry out the operation.

- It emerged from the conversations that the management did not become involved in the handling operation because this was regarded as a routine job.
- It emerged from the conversations that no joint review of the operation was conducted with the four people involved before work began. Only a four-point check was carried out separately with the two on the drill floor and the two down on the BOP frame.
- Important contributors to risk were not identified before and as part of the planning of the activities, and the latter were not managed and conducted so that the incident was prevented.
- No handling instructions or plan existed for the operation, or any assessment of where the personnel should be positioned when lowering the test tool.
- It emerged from the conversations that those involved in the handling operation were not aware that the test plug could come loose, fall out of its slot in the test tool and present a hazard for lifting/moving the tool.
- Nor were user instructions available, and these probably did not exist either. It transpired that only a diagram of the test tool was available, and that this was in a file held by the toolpusher.

Requirements
Section 30, first paragraph of the activities regulations on safety-clearance of activities
Section 92, first paragraph of the activities regulations on lifting operations
Section 21, first paragraph of the activities regulations on competence

4.1.3 Lack of compliance with the management system for mechanical handling operations

Description
The company's procedure for safe use of mechanical handling equipment was not followed for the lowering operation.

Grounds
The handling operation was not conducted in accordance with the company's procedures. That included the following.

- Inadequate planning.
- Inadequate knowledge of the mechanical handling equipment and load (test tool)
- Inadequate handling instructions or plan
- Inadequate identification of restrictions with the equipment
- Inadequate identification of hazards
- Inadequate staffing for a blind lowering operation
- Inadequate signalling when direct visual checks became unavailable after the test tool was lowered through the spider/rotary table. The roustabout responsible for signalling also operated the TIM. These tasks were irreconcilable with each other. The applicable procedure for the handling operation requires continuous signalling.

Failure to observe the procedure was also confirmed during interviews.

Requirements
Section 24 of the activities regulations on procedures

5 Discussion of uncertainties

5.1.1 Downtime – pressed for time

This was an operation which resulted in downtime for the facility. That could make people feel pressed for time, which in turn could lay the basis for mistakes and inaccuracies. Based on interviews, we have no reason to conclude that this influenced the course of events. It appeared generally that operational personnel were shielded from the consequences of downtime, and that the organisation had a built-in robustness and understanding that people should take the time required to conduct an operation safely.

5.1.2 Working time – workload – night work

The incident occurred during the last night shift before those concerned would move to the day shift. Personnel had become accustomed to night work, and we consider it very unlikely that tiredness and inattention were significant for the incident. Moreover, two people were working together both on and below deck. According to personnel interviewed, activity had recently been normal, with routine operations and no special conditions with a particularly heavy workload for individuals or groups.

5.1.3 Uncertainty

The people conducting the operation had fairly long rig experience and had done similar jobs on a number of occasions. How far market changes, uncertainties over future contacts for the rig and employment conditions for the person concerned could provide a relevant backdrop to the incident was discussed in several of the interviews. The question was whether this could have led to a lack of concentration and inattention. However, our assessment is that it was not significant for the course of events.

5.1.4 Acceptable practice fails to meet requirements in the procedure

It was emphasised that the operation which led up to the incident was conducted in line with working practice. However, it emerged that an alternative practice involved the use of a cherry-picker to centre the steel rope, and that this eliminated such problems as a chain which often created difficulties by snagging on an edge. This alternative practice meant that the person on the drill floor could perform the role of signaller. No safety assessment had been made of these two approaches, and choosing between them was up to the personnel involved.

5.2 Comments on NAD's investigation report

The report is both detailed and extensive, and identifies a number of the same causes as the PSA's report with regard to the course of events and causes, but gives less weight to other outcomes or potentials than the actual course of events.

However, the NAD report failed to note that the operation should not have been regarded as routine since suitable mechanical handling equipment was not used. Nonconformities are not assessed in the NAD report in relation to the petroleum regulations, but only in terms of the company's own routines and procedures.

6 Appendices

A The following documents have been used in the investigation

- Mechanical handling procedure: PRO-00-0103 Procedure – safe use of mechanical handling equipment on the Norwegian continental shelf, version 5
- Operating rules for 06. Winch – rev 3 10 November 2013
- Daily drilling report 23 April 2015
- Experience log 23 March 2015 – evening shift
- Work permit 23 March 2015 for work over the open sea when testing BOP
- Requirement document for execution of task B, risk assessment – undated with corrections in red
- WEL-25-0030 DDI 080 Run BOP D-5 – detailed drilling instructions
- Investigation report, Synergi no: 1138241, date: 23 March 2015, North Atlantic Drilling AS

B Overview of personnel interviewed