



# Investigation report

## Report

Report title Investigation of the incident on DSV <i>Skandi Arctic</i>	Activity number 015203026
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## Security grading

<input checked="" type="checkbox"/> Public	<input type="checkbox"/> Restricted	<input type="checkbox"/> Strictly confidential
<input type="checkbox"/> Not publicly available	<input type="checkbox"/> Confidential	

## Summary

A serious incident occurred during diving on Marathon's Kneler field on 22 June 2013. During deployment of a diving bell on DSV *Skandi Arctic*, the umbilical was torn off so that the bell lost pressure. After 11 minutes, the divers in the bell succeeded in closing all the valves to the leak points from within the bell, and pressure was restored with the aid of gas on board.

The total pressure drop was the equivalent of about 18 metres from an initial pressure of 110 metres in the bell.

While the incident had no known health consequences, material damage was caused to the bell and handling system.

The incident had the potential to cause serious injury to or the death of the three divers.

Diving contractor Technip and operator Marathon investigated the incident, and the investigation report from the Petroleum Safety Authority Norway (PSA) is largely based on their report.

## Involved

Main group T-3	Approved by/date Hilda Kjeldstad/13 September 2013
Members of the investigation team Bjarne Sandvik John Arne Ask	Investigation leader Olav Hauso

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### 1 Summary

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### 2 Introduction

An incident occurred on DSV *Skandi Arctic* in connection with diving on the Kneler field near Alvheim on 22 June 2013.

The Petroleum Safety Authority Norway (PSA) decided to conduct its own investigation of this incident, based largely on the investigations by the companies concerned.

Composition of the investigation team:

John Arne Ask	Logistics and emergency preparedness
Bjarne Sandvik	Logistics and emergency preparedness
Olav Hauso	Logistics and emergency preparedness (investigation leader)

The PSA's investigation team boarded *Skandi Arctic* on 26 June 2013 when the vessel came alongside the quay at Randaberg, and was given a presentation of the incident. An inspection of relevant parts of the diving spread was conducted in order to put clarifying questions to crew about the system's construction and function. Elements related to system design, function and operation were also clarified.

On the same occasion, the PSA investigation team had a separate meeting with Marathon to present its understanding of the incident at that time, and its expectations of operator Marathon's involvement in the investigation. The PSA also referred to the possible involvement of the company's specialists in the investigation ( eg, PLC technology expertise), since this could be significant for understanding causes.

The PSA notified the incident to the Rogaland police district, which decided to conduct an inspection of the DSV in Egersund on 27 June 2013. The PSA also participated on that occasion, and conducted interviews with personnel involved in order to conduct further investigations of incident-related conditions, while assisting the police in their work.

Marathon and Technip presented an investigation report and management review to the PSA on 4 September 2013.

### **3 Mandate**

The investigation team will conduct its investigation in accordance with the PSA's investigation procedure. Following a review of Marathon's investigation report, the team will consider the need for additional information, interviews and so forth. It will also provide support for the police in accordance with the same procedure

### **4 Course of events**

The divers who became involved in the incident went into saturation at 16.00 on 19 June 2013, and were pressurised to a storage depth corresponding to 110 metres of water.

The port diving bell was prepared for deployment on Saturday 22 June 2013 in order to relieve the diving team in the starboard bell, which was concluding its working shift on the seabed by Kneler A.

During deployment of the bell in the vessel's moonpool (the hull opening through which the bell is deployed and retrieved), an alarm indicated an error in a sensor intended to confirm that the handling system was correctly positioned for continued lowering of the bell in the moonpool.

An electrician/diving technician was called to deal with the problem. During the work, the handling system was set in a mode which made it possible to override this sensor. That was

possible because the operator could see from their position that the locking system was in the correct position.

The operation to deploy the diving bell through the moonpool began, but was halted when a minor settlement (an uncontrolled drop of about three metres) occurred. The electrician activated the emergency stop in the system, so that all motion ceased.

After a brief check of the facility and an assessment of system status, it was decided to continue bell handling. According to the company's report, the intention was to terminate the dive and seek to return the bell to the chamber system. Video footage from inside the bell can give the impression that the divers had not been informed or did not appreciate that the dive was to be terminated before the final uncontrolled lowering occurred. Recordings of communication do not suggest that the dive was to be terminated, either.

The next attempt to deploy the bell in the moonpool began with the diving supervisor pressing a "dead man's button" on the deployment package. This meant that the winch brakes were deactivated, and a further settlement or drop of about four metres occurred with the bell. The result was that the umbilical was torn off the bell and gas flowed out. The communication and video link cable remained intact.

The bell now stood some way down in the ship's moonpool, but had not reached the water.

The diving supervisor checked that the divers in the bell were unharmed, and ordered all valves which could leak gas through the pressure hull to be closed. At roughly the same time, he ordered the use of on-board gas to compensate for the pressure drop.

About 11 minutes passed before all the valves which leaked gas to the outside had been closed and pressure could be restored. The PLC technician identified the fault and placed the handling system in a status which allowed the bell to be retrieved from the moonpool and returned to the chamber system.

## **5 Potential of the incident**

### Actual consequences

Nobody suffered physical injury from this incident. The umbilical to the bell was damaged, and damage was also caused to the shock absorber component in the deployment system.

### Potential consequences

In the worst case, a failure to stop the leak from within the bell could have caused the deaths of the three people inside it.

## **6 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: used where conformity with the regulations has been established.

The PSA has largely based its investigation on the work done by Marathon and Technip in their joint investigation. Our impression is that a detailed investigation has been carried out into the incident and the conditions which allowed it to happen. We have accordingly found no grounds for making further inquiries or providing a more detailed description of the course of events than is to be found in the Marathon/Technip report.

The PSA also agrees with Marathon's description of the measures which are required before diving operations can resume.

## 6.1 Nonconformities

Inadequate management in Technip.

### Grounds

The investigation has uncovered serious deficiencies in Technip's overall management of operations by DSV *Skandi Arctic*.

Deficiencies identified in the investigation report from the companies and the PSA's own observations include the following areas:

- technical issues (design, modification and follow-up), see section 53 of the activities regulations on organisation of work
- maintenance (compliance – entering data in the maintenance system), see section 23, paragraph 1, of the framework regulations on general requirements for material and information
- competence (definition of requirements, expertise development and maintenance), see section 21, paragraph 1, of the activities regulations on competence
- handling of emergencies (identification, training and drills), see section 23 of the activities regulations on training and drills

### Requirement

Section 6 of the management regulations on management of health, safety and the environment:

*The responsible party shall ensure that the management of health, safety and the environment comprises the activities, resources, processes and organisation necessary to ensure prudent activities and continuous improvement, see section 17 of the framework regulations.*

*Responsibility and authority shall be unambiguously defined and coordinated at all times.*

*The necessary governing documents shall be prepared, and the necessary reporting lines shall be established.*

## 6.2 Improvement point

The Marathon/Technip report identifies positive elements which refer to conditions on the DSV, but pays less attention to conditions in the landbased organisation of the activities which could have been significant in relation to the incident. Safety in diving operations could

be improved by assessing whether elements in the company's management might have influenced opportunities for the incident occurring. These include:

- management of technical conditions on board, including maintenance
- requirements for the technical expertise of personnel (diving supervisor, technicians, etc)
- training of personnel in accordance with identified and specified requirements
- terms of employment viewed in relation to the company's documented commitment to and funding of expertise development.

A number of these conditions are being or will be addressed through measures outlined in the report from the companies.

#### Requirement

Section 6 of the management regulations on management of health, safety and the environment.

### **7 Barriers which have functioned**

An emergency stop of the deployment system was activated twice during the incident. This functioned on both occasions.

The bell was provided with sufficient stored gas, and the divers could reduce the pressure loss in the bell by using it as a compensatory measure. This could also be used to restore pressure within the bell to the right level.

### **8 Discussion of uncertainties**

The PSA takes the view that the investigation report from the companies has clarified the direct and underlying causes of the incident. Data storage capabilities in the diving spread have helped to chart the course of events, giving the times when elements in the incident occurred.

According to the company's report, there was an intent to terminate the dive after the first uncontrolled drop and seek to return the bell to the chamber system. This was on the basis that that the position had been assessed and the facility checked (about 2.5 minutes).

Video footage from inside the bell can give the impression that the divers had not been informed or did not understand that the dive was to be terminated before the final uncontrolled lowering occurred. Recordings of communication do not suggest that the dive was to be terminated, either. The PSA mentions this in order to illustrate the uncertainty related to the risk assessments made between the first and second uncontrolled lowering of the bell.