SEACALF® MKV Launch and Recovery Procedure onboard Normand Mermaid

Procedure | EUAF-FNLM-NMM-PR-003 | Issue 05

Responsible Person: Service Line Director Marine Geotechnical Europe & Africa

Contents

1. Objectives

The Fugro SEACALF® MKV 20T system with 38 mm Coiler weighs approximately 32.800 kgs in air (approx. 28,500 kgs in water) and consequently, during deployment and recovery the SEACALF® MKV must be controlled against unexpected swinging due to the motions of the vessel.

2. Scope

This procedure has been prepared in order to conduct safe operations using the Fugro SEACALF® MKV 20T system with 38 mm Coiler onboard Normand Mermaid.

3. Responsibilities

Table 3.1: Responsibilities of given roles for the activities described in this document

Role	Responsibility
Master	Has overriding authority and ultimate responsibility for the safe execution of all vessel operations, including DP operations. Ensures the vessel will be set on DP and grants permission to start operation. Ensures the Bridge team keep in communication with deck operations
Officer on Watch	Representative of the Master. Ensures the Bridge team keep in communication with deck operations when on duty. Responsible for safe navigation and control of the vessel when on watch along with the safety for all those onboard
Party Chief	Responsible for producing LARPs and TRA procedures in line with project requirements. Overall responsibility for the FNLM personnel and ensuring personnel are complying with company HSE policies
Senior Operator / Shift Lead Operator	Responsible for directing and supervising all deck operations. CPT Operators will be the main point of contact between the deck and the Bridge. Responsible for site clearance. Responsible for communications with the Crane Operator (as Banksman). Responsible for safe execution of the geotechnical operations on the deck. Prior to launch and when safely deployed on the seabed, the Senior Operator/Operator will control the operation of the unit.
Surveyor	Responsible for the correct and safe positioning of the vessel and the underwater equipment.
Crane Operator	Operates the vessel compensated crane (100T). Responsible for lifting operations during lowering & recovery.
Geotechnical Engineer	Responsible for processing of the data acquired with the SEACALF® MKV 20T
Assistant Operators	Responsible for preparing and dismantling Seabed SEACALF® under supervision of SO/Operator. SO/Operator will instruct Winch Operator during deployment and recovery and ensures safe use of winches.

4. Personnel

A team of minimum five personnel is required during operations. All team members shall be appropriately qualified and adequately trained to carry out their delegated tasks and responsibilities safely.

Table 4.1 Shift Team composition

1	Bridge Officer	Vessel bridge
1	Senior Operator / Shift Lead Operator	Deck
1	100T Crane Operator	Deck
1	Surveyor	Online Room
1	Assistant Operator	Deck
1	Geotechnical Engineer	Online Room

5. Related Documents

Procedures

- In-Office Mobilisation EUAF-FNLM-OPL-PR-034
- Management of Change FS-01-IMS03-001 Ch 17
- Guidelines for Safe Working of Site Investigation Vessel in Marginally Shallow Water EUAF-FNLM-OPL-PR-032
- Procedure Lost Frame or Power to Frame EUAF-FNLM-OPL-PR-035
- Seabed and downhole operations within the 500 m zone & near man-made structures EUAF-FNLM-OPL-PR-038
- Working on a ship with an open aft-deck or in a moon pool EUAF-FNLM-OPL-PR-036
- Mobilisation (Process)
- SEACALF® 38mm Coil Change on Single Wire Seacalf MKV Onboard Normand Mermaid EUAF-FNLM-NMM-PR-002

Technical manuals

- Discovery Offshore Application M15146XX.SHE
- Discovery Configuration Manager M15121XX.SHE
- Seabed CPT test log M55001XX.OP0
- SEACALF® Operational Manual M55035XX.OHE
- Seabed Power System 1 kV Generic Electric Manual M54505XX.EHE
- Operational Manual Coiler 38 mm M52029XX.OHE

Risk Assessment

- SEACALF® Operations onboard Normand Mermaid EUAF-FNLM-NMM-RA-001
- SEACALF® Launch and Recovery onboard Normand Mermaid EUAF-FNLM-NMM-RA-002
- SEACALF® Operations EUAF-FNLM-OPL-RA-026
- General Moon Pool Operations EUAF-FNLM-OPL-RA-005
- Handling of Frames through moon pool EUAF-FNLM-OPL-RA-006
- Mobilisation/Demobilisation EUAF-FNLM-OPL-RA-001
- Moving between locations with SEACALF® MK V frame down EUAF-FNLM-OPL-RA-008
- Lifting Operations (General) EUAF-FNLM-OPL-RA-002

6. Definitions and Abbreviations

An overview of the definitions and or abbreviations used in this document.

Table 6.1: Definitions and abbreviations

CAN	Controller Area Network
CPT	Cone Penetration Test
CTD	Conductivity, Temperature and Depth
CDS	Continuous Drive System
DP	Dynamic Positioning
ERP	Emergency Response Plan
FNLM	Fugro Netherlands Marine
kPa	Kilo Pascal
MOC	Management of Change
OOW	Officer On Watch
PC	Party Chief
PPE	Personal Protective Equipment
SEACALF®	Seabed Cone Penetration Test System
SO	Senior Operator
LAR	Launch and Recovery
SWL	Safe Working Load
TBT	Toolbox talk
TRA	Task Risk Assessment

7. Safety Management Interface Matrix

Please reference the MV Normand Mermaid HSE Bridging document between Fugro and Solstad to understand when the vessel or Fugro procedures take precedence. In general, Fugro procedures will apply when it relates to the survey equipment, for all other activities the vessel procedures are to be followed.

8. Approximate duration of Operation

- Pre-deployment: 15 minutes
- Deployment of SEACALF® with CDS: Depending on water depth and winch speed
- CPT duration: Depending on Target Depth
- Penetration speed: approx. 2 cm/sec
- Recovery of SEACALF® with CDS: Depending on water depth and winch speed

9. Known Limitations

Item	Details (SWL, MBL, Weight)
SEACALF®	32.8T [incl. Coiler with rod]
SEACALF® Lift Winch	Crane
SEACALF® Lift Wire	Depending on vessel

10. Equipment Specification

SEACALF® MKV 20T (SU)	Weight 32.8 Tons; Dimensions: L 3.0 m x W 3.0 m footprint
Crane	SWL 100T

11. Communications

Good communications are essential to both the efficiency and safety of the operation. The primary means of communication between the Deck, Bridge, Crane and Survey will be by the use of handheld UHF radios. The primary means of communication on deck will be verbal, well defined hand signals and UHF radios. The hand signals to be used must be fully discussed at the Toolbox Talk stage. Correct use of both the radios and hand signals will be fully understood before commencement of the operation and correct radio procedures adopted.

Communication links between the deck and the Bridge will be established before the start of any deck operation. A clear link must be established and all commands replied to in clear concise manner. If there is a communications break or any uncertainty the job must be **STOPPED** immediately before operations can commence.

It is good practice under all circumstances to count down the last 10 meters from the seabed in order to obtain a controlled descent to the seabed.

All communications are to be in the English language.

As per flow diagram the SO/Operator will be the prime and common point of contact between the parties during operations.

The Surveyor has contact directly with the SO/Operator, but also with the Crane Operator and the Bridge.

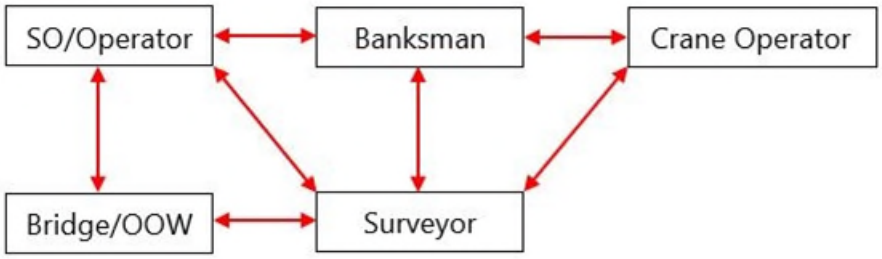

Figure 11.1: Communication flow diagram

12. General Statements

If there is any doubt as to the safety of the operation, the operation shall be stopped until the situation is assessed, potential hazards have been removed and the site is under control.

NON-ESSENTIAL PERSONNEL SHALL NOT BE ON DECK DURING OPERATIONS.

13. Personnel Safety

A Toolbox Talk will be held before the start of any operation and must be attended by all personnel involved. Subsequently, only personnel who have attended the Toolbox Talk can be involved in the operation.

Each crewmember involved is required to take care of themselves and others who may be affected by their acts or omissions in the operation.

All persons involved with the deployment of the equipment will be required to know their function and position on deck. Personnel will remain alert, follow instructions carefully and be prepared to carry out urgent, immediate instructions should these be given.

All personnel should have an approval from the SO prior entering the CPT restricted access zone.

IF THERE IS ANY DOUBT AS TO THE SAFETY OF THE OPERATIONS, ALL OPERATIONS SHOULD BE STOPPED UNTIL POTENTIAL HAZARDS HAVE BEEN REMOVED AND THE SITUATION HAS BEEN FULLY ASSESSED.

14. Personal Protection Equipment

All personnel involved with the deck operation will wear appropriate and mandatory personal protection equipment (PPE) as defined in the task risk assessment (TRA) and enforced during the Toolbox Talk.

REMEMBER PPE IS THE LAST LINE OF DEFENCE.

Personnel directly involved with work near the vessel moon pool when the safety rails are removed must wear safety harnesses. These harnesses must be connected to a suitable and certified anchoring point by fall restrictors.

If equipment maintenance requires personnel to climb into the unit and work at height, then a safety harness with double lanyards and a working sling must be worn. Fugro Life-Saving Rules to be followed.

For working on top of the SEACALF®, a work at height frame has been installed which allows personnel to work safely on top of the SEACALF® with a safety harness attached to a suitable anchor point depending on the task that needs to be performed.

15. Rigging

During mobilisation, all lifting equipment on board will be checked to ensure it has valid certification. Prior to any deployment, all lift equipment will be inspected to ensure that it is fit for purpose.

16. Risk Assessment

Prior to commencement of any operation a TRA will be made or an existing TRA reviewed. All personnel involved must familiarize themselves with the TRA and sign to ensure they have read and understood it.

EUAF-FNLM-NMM-RA-002 TRA SEACALF MKV Launch & Recovery onboard Normand Mermaid TRA will take into account, but not be limited to the following:

- Environmental conditions; e.g. wind speed and direction, sea state, currents, temperature, visibility, etc.;
- Vessel motion and station keeping capability;
- Working area – free from slip/trip hazards (including ice/snow), adequate lighting provided;
- Equipment status and conditions;
- Personnel abilities;
- Personal Protection Equipment.

IF THERE IS ANY DOUBT AS TO THE SAFETY OF THE OPERATION, OPERATIONS WILL NOT BE COMMENCED UNTIL RISK FROM POTENTIAL HAZARDS ARE SUFFICIENTLY REDUCED.

17. DP Operations / Vessel Station Keeping

The vessel will set-up for DP operation following the guidelines as set out in Bridge procedures.

IF UNDER ANY CIRCUMSTANCES THE BRIDGE WATCHKEEPER IS NOT HAPPY WITH THE VESSELS PERFORMANCE THEN OPERATIONS WILL IMMEDIATELY CEASE OR NOT COMMENCE UNTIL THE SITUATION HAS BEEN FULLY RECTIFIED.

18. Pre-Deployment of SEACALF®

Prior to deployment of the SEACALF®, radio communications must be established between all parties involved in the operation.

Step	Description
1	Weather and sea state to be checked to ensure that a sufficient weather 'window' is available to complete the test.
2	The vessel to set up at the proposed deployment location on an appropriate heading. Once the Bridge Officer is satisfied that the vessel is maintaining position, permission will be granted for the deployment of the SEACALF®.
3	A Toolbox Talk to be held and recorded with Bridge, CPT operators, Crane Operator, Survey and Lab to ensure that the task to be performed is fully understood by all involved in the operation.
4	The Bridge Officer to be made aware of the number of personnel on deck.
5	PPE to be worn by all personnel on deck appropriate for the task and conditions.
6	Back deck barriered off and only personnel directly involved in the operation to have access to the CPT restricted access zone.
7	A CTD probe and 2 USBL beacons to be fitted to a suitable point on the SEACALF®.
8	The SO/Operator to ensure there is constant tension on the umbilical cable from the winch drum to prevent slack and the umbilical snagging on vessel or become pinched between the SEACALF® and moon pool.
9	The SO/Operator to ensure that the SEACALF® is ready for deployment.
10	Radio check to be performed to ensure that Bridge, Survey, CPT operators and Crane Operator are on the same radio channel.

Step	Description
11	Two persons of CPT crew to position themselves starboard forward on W@H frame and make sure the area where Y-sling is being connected is clear of obstacles and crew knows where to stand or go to when hook swings.
12	The Banksman to instruct the Crane Operator by radio to position the crane starboard forward corner of the W@H frame. This is done by booming down as much as possible and knuckle out to keep the crane hook as close to the sheave of the crane to prevent uncontrolled swinging.
13	Two persons of CPT crew to connect both ends of Y-sling on crane hook and ensure that safety pins are attached to locking pins.
14	The Banksman to instruct the Crane Operator to position the crane hook and the Y-sling to be in line with the centre-line of the SEACALF® and pull with ±5 tons of tension to prevent the hook and crossbeam from swinging.
15	Crane Operator to communicate to Banksman when crane is in centre position and tension is applied.

19. Deployment of SEACALF®

Step	Description
16	The SO/Operator to inform the Bridge and Survey that the SEACALF® is ready for deployment.
17	Surveyor to check communication with CTD probe and confirm to the Banksman that the SEACALF® can be deployed at the Banksman's discretion.
18	Banksman to inform Crane Operator about water depth at target location.
19	The Banksman to position himself in the dedicated position on deck at aft side of the moon pool and confirm, by radio check, that he has clear communication with the Crane Operator. The Crane Operator ***DOES NOT*** start any lift without the Banksman present at his dedicated position and radio communications confirmed.
20	The Banksman to instruct the Crane Operator to take up the load clear off the landing blocks.

Step	Description
21	The landing blocks to be pulled up and secured by rope.
22	The Banksman to instruct the Crane Operator to lower SEACALF® down into the moon pool. During lowering, the SEACALF® needs to be moved towards the walls of the moon pool to prevent swinging of the SEACALF®.
23	Once the SEACALF® is below the vessel, the Banksman instructs the Crane Operator to move the lift wire half meter to starboard and half meter to forward of centre of cursor frame to maintain sufficient space between the SEACALF® and the port aft corner of the moon pool.
24	Banksman to instruct the Crane Operator to lower the SEACALF® with a maximum speed of 30 meters per minute to a safe distance above the mudline, depending on water depth (to account for potential depth measurement inaccuracies).

19.1 Landing on soft seabed

Step	Description
25a	Upon correct depth of the SEACALF® above mudline confirmed by Survey, the Crane Operator to switch Active Heave Compensation on and pre-charges Active Constant Tension on the pullback weight given by the Sr Operator/Operator.
26a	Banksman to instruct Crane Operator to lower the SEACALF® from the safe stopping distance above mudline to seabed. ***Operations to be carried out in a steady and controlled manner at all times.***
27a	Crane Operator to keep monitoring the hook load and when SEACALF® touches seabed showing a weight reduction, activate Active Constant Tension.
28a	Once Active Constant Tension is engaged Crane Operator to confirm this to all parties involved (command words used: ***"CPT on seabed"***)
29a	Sr operator/Operator to monitor sinkage and slope of SEACALF® when on seabed prior to starting CPT.
30a	Survey to confirm position of SEACALF® from target is within client specifications.

19.2 Landing on hard/dense seabed

Step	Description
25b	Upon correct depth and position of the SEACALF® above mudline confirmed by Survey, the Crane Operator to lower SEACALF® to seabed. ***Operations to be carried out in a steady and controlled manner at all times.***
26b	Crane Operator to keep monitoring the hook load and when SEACALF® touches seabed showing a weight reduction keep lowering until 3-4 meters of slack is achieved (depending on the weather conditions).
27b	Once Crane Operator is satisfied that the full weight of the SEACALF® is on seabed, he then has to confirm this to all parties involved (command words used: ***"CPT on seabed"***).
28b	Sr operator/Operator to monitor sinkage and slope of SEACALF® when on seabed prior to starting CPT.
29b	Survey to confirm position of SEACALF® from target is within client specifications.

20. Re-Testing

Reference is made to contract documents/ technical specifications.

Whilst following the launch and recovery procedure and after discussion with the Bridge, the SEACALF® unit can be lifted sufficiently clear of the seabed allowing the vessel to reposition the unit at the re-test location minimal 4 meters from the original location, but within the client specified distance from the original intended location.

21. Recovery of SEACALF®

Step	Description
31	The SO/Operator to inform the Bridge and Survey on completion of test (Command words used ***"End of Test"***), when the coil is retracted and the cone is back in the frame.
32	The SO/Operator to confirm with Survey that the vessel is still in the correct position and that he has permission to commence with recovery of the SEACALF®.
33	The Banksman to position himself in the dedicated spot on deck at aft side of the moon pool and confirm, by radio check, that he has clear communication with the Crane Operator.

Step	Description
34	The Banksman to instruct the Crane Operator to lift the SEACALF® from seabed (Command words used ***"Start Lifting"***). The Crane Operator ***SHALL NOT*** start any lift without the Banksman present on his dedicated position and radio communication confirmed.

21.1 Recovering from soft seabed

Step	Description
35a	Crane Operator to start increasing the tension until SEACALF® is lifted of seabed.
36a	When the SEACALF® is at a safe stopping distance above mudline switch to normal mode and continue hoisting with max 30 meters/min.
37a	When the crossbeam is at waterline, the Banksman to instruct the Crane Operator to move the lift strop half meter to port and half meter to aft, in line with the centre of the cursor-frame.
38a	The Banksman to instruct the Crane Operator to lift the SEACALF® out of the water dragging the SEACALF® against the walls of the moon pool above the landing blocks.
39a	The landing blocks to be lowered.
40a	The Banksman to instruct the Crane Operator to lower the SEACALF® onto the landing blocks.
41a	No attempt to be made to work on the SEACALF® until the Banksman has confirmed that the SEACALF® is safe and secured.

21.2 Recovering from hard/dense seabed

Step	Description
35b	Crane Operator to slowly pick up remaining slack while monitoring the heave of the vessel.
36b	Once the full weight is on the hook, the Crane Operator can recover SEACALF® to waterline in a controlled manner.
37b	When the crossbeam is at waterline, the Banksman to instruct the Crane Operator to move the lift strop half meter to port and half meter to aft, in line with the centre of the cursor frame.
38b	The Banksman to instruct the Crane Operator to lift the SEACALF® out of the water dragging the SEACALF® against the walls of the moon pool above the landing blocks.
39b	The landing blocks to be lowered.
40b	The Banksman to instruct the Crane Operator to lower the SEACALF® onto the landing blocks.
41b	No attempt to be made to work on the SEACALF® until the Banksman has confirmed that the SEACALF® is safe and secured.

22. SEACALF® Operations in Close Proximity to Seabed Structures

If the SEACALF® is to be deployed within 100 meters of any existing seabed structure a Toolbox Talk will take place before any operations commence.

The SEACALF® is to be recovered back to deck each time vessel will cross an existing subsea infrastructure.

Depending on client or project requirements a Sector Scan Sonar sweep of the target area might be necessary, for this refer additionally to FNAS Normand Mermaid Sector Scan Sonar deployment Work Procedure.

23. Emergency Recovery Procedure

The Bridge is to be informed immediately of an emergency situation.

All personnel located within an area of immediate danger shall immediately move to a designated safe area. Immediate action can be carried out if safe to do so.

If during a total hydraulic, air or electrical failure the SEACALF® is suspended over the deck, all personnel are to move to a safe location away from the area of immediate danger and, if possible, the unit is to be lowered safely to deck.

If a total hydraulic, air or electrical failure occurs when the SEACALF® is on the seabed, the Bridge is to be informed immediately. Repairs are to be carried out as a matter of priority. In the worst-case scenario, the lift wire will be severed, and the umbilical paid out and disconnected from the vessel. The SEACALF® will be left on the seabed for later retrieval (EUAF-FNLM-OPL-PR-035 Procedure Lost Frame or Power to Frame).

In the event of a muster alarm during operations, the SEACALF® is to be immediately raised off the seabed and if possible, returned to the deck.

A Toolbox Talk will be held to discuss the immediate situation and possible resolutions. Personnel will remain alert and follow instructions carefully.

In the event of an incident resulting in an injured person, the ERP is to be followed, a hard copy of which is to be kept on the Bridge.

Immediate repairs may be carried out only if safe to do so and with permission of the Bridge. All other personnel on deck shall immediately move to a designated safe area, or muster in accordance with the vessel's Station Bill (Muster List).

Bridge shall be informed immediately of an emergency situation.

Emergency	Communication	Action
DP Failure	Alarm from Bridge to Deck.	Stop operations. Await instructions from Bridge and SO/Operator.
Hydraulic, air or electrical failure (of SEACALF® related equipment) (SEACALF® on seabed)	Deck informs Bridge immediately. Deck informs Bridge when leaks are detected.	Emergency repairs to be carried out to SEACALF®. Operators on standby.
Hydraulic, air or electrical failure (of SEACALF®/SEACALF® related equipment) (SEACALF® suspended over deck)	Deck informs Bridge immediately. Deck informs Bridge when leaks are detected.	All deck personnel to move to safe area under supervision of SO/Operator.
Weather suddenly rapidly deteriorating	Bridge notifies Deck.	Stop operations.
Black-out of vessel	Alarm from Bridge.	Clear deck, move to designated safe area/ muster station and await instruction from Bridge.
Other vessel emergencies	Alarm from Bridge.	Stop operations. Muster at appointed muster station.

Emergency	Communication	Action
Incident resulting in injury	Deck informs Bridge immediately.	ERP is to be followed. A hard copy of the ERP is kept on the Bridge.

* SEACALF® left on the seabed for later retrieval in accordance with procedure *Lost Frame or Power to Frame*.

A Toolbox Talk must be held to discuss the immediate situation and possible resolutions.

24. Records generated

EUAF-FNLM-QSE-FO-003 Toolbox Talk

25. Revision History

Table 25.1: Description of revision to document

Issue	Date	Description of changes	Prepared By	Approved By
1	02-12-2021	Initial Issue	R. Wojke / M. Hagens	D. Koenen
2	29-12-2021	Modified Section 18 to make pre-deployment clearer and include steps that were not listed before. Modified Section 19 to split steps for landing Seacalf on soft or hard/dense seabed. Modified Section 21 to split steps for recovering Seacalf from soft or hard/dense seabed. Drawing Update (App A)	R. Wojke / S. de Bruijn	D. Koenen
3	6-may-2022	Steps 24 and 26a	B. Flack / B. Berndsen	D. Koenen
4	17-oct-2022	Steps 10 and 36b updates + spelling	R. Wojke	D. Koenen
5	23 Jan 2024	Last paragraph in Section 14 & Spell checks	W. Pretorius	D. Koenen

Appendix A

Drawings