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Eelume
SUBSEA INTERVENTION

Eelume:

A Resident Subsea IMR Vehicle

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Introducing Eelume



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Eelume: the Set Up



*LOOP Agreement
Demanding customer*

- **Demanding customer**
- User requirements
- Extensive subsea operation experience
- Access to Statoil's partners
- Pilot customer



- Development of Eelume vehicles
- Technology IPR, patents
- Research projects
- **Dedicated team**

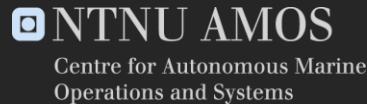
*Experience,
Marketing &
Sales*



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- AUV technology and experience
- **Industrialisation and manufacture**
- **Supply chain**
- **Marketing and sales**
- Investments

Expertise, theory, algorithms



- World class research expertise snake robots
- Theory, algorithms
- MSc, PhD and Post Doc projects and people



Introducing Eelume

- **Inspection and Intervention when you need it**
 - Resident on-site
 - Capable of routine inspection tasks
 - Conduct light intervention tasks
 - Equipped with swappable tools
 - Operated from ship, shore or globally
 - Rapid response to emergency situations
 - No need to wait for an ROV
- **Eelume can access places others can't**
 - Flexible body enables it to enter confined areas
 - Small cross-section makes inside pipes accessible
 - Eelume can change shape and hold a posture
 - It can cruise like an AUV or swim bio-mimetically
 - Ability to grasp structures for stability



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Why Use Eelume: What can it do?



Subsea Resident

Designed to live subsea by being connected to a docking station on the seabed



Safer and Greener

A resident solution which can be mobilized 24/7 without the need for a surface vessel



Modular System

Adaptable to a wide range of subsea operations. Modules can be connected in different combinations



Intervention

The vehicle itself is a dextrous robotic manipulator which can carry a range of tools



Long Range

The slender torpedo shaped vehicle can transit over long distances like a survey class AUV



Access Difficult Areas

The flexible and slender body can access and operate in restricted areas of subsea structures



Introducing Eelume: Where does it fit in?

- Traditional technology:
 - WROV
 - IROV
 - Survey Class AUV
- Eelume:
 - Capable of inspection, light intervention and some survey tasks
 - Enabler for lower-cost, increased regularity of inspection
 - Enabler for emergency response



Why Use Eelume: Cost Benefit Analysis

- Standby Time is expensive
 - Mobilisation
 - Transit
 - Wait on Weather
 - Standby
- Instant response
 - Resident on template
 - Conduct routine inspection
 - Respond to anomalies
 - Can be operated from platform, FPSO or shore
 - Being available instantly is more cost effective



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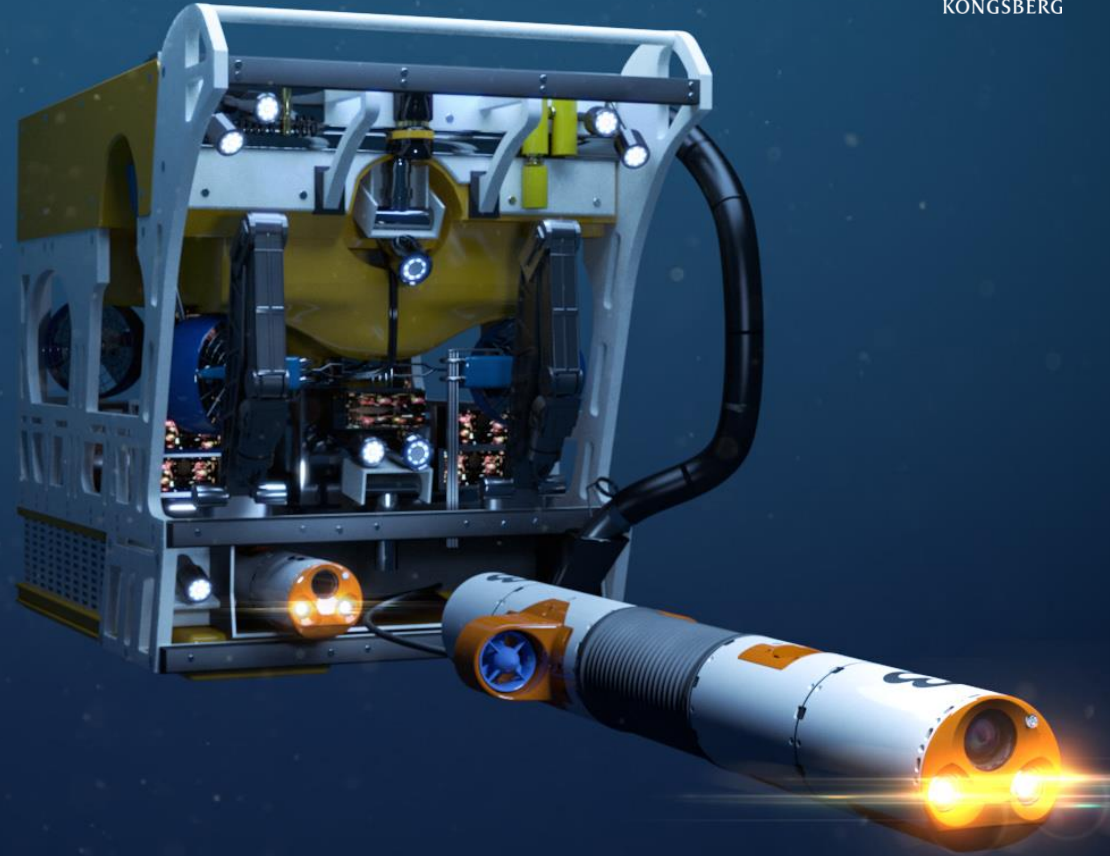




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Eelume Example Operations

- Tethered:
 - Launched from a WROV tool skid
 - Launched from a USV or ship
 - Direct operation for internal pipeline inspection
 - Inspection
 - Observation
 - Light intervention
 - Emergency response



Eelume Example Operations



- Resident:

- Inspection
- Observation
- Valve operation
- Emergency response
- Survey
- Cleaning





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Eelume 1 (2016)

- Inspection vehicle
- Short configuration
- Forward looking camera
- In water tests completed

Eelume 2 (2016)

- Inspection vehicle
- Long configuration
- 5 sections plus joints
- Forward looking camera plus 360 degree camera
- In water tests completed with demonstrations Q4 2016





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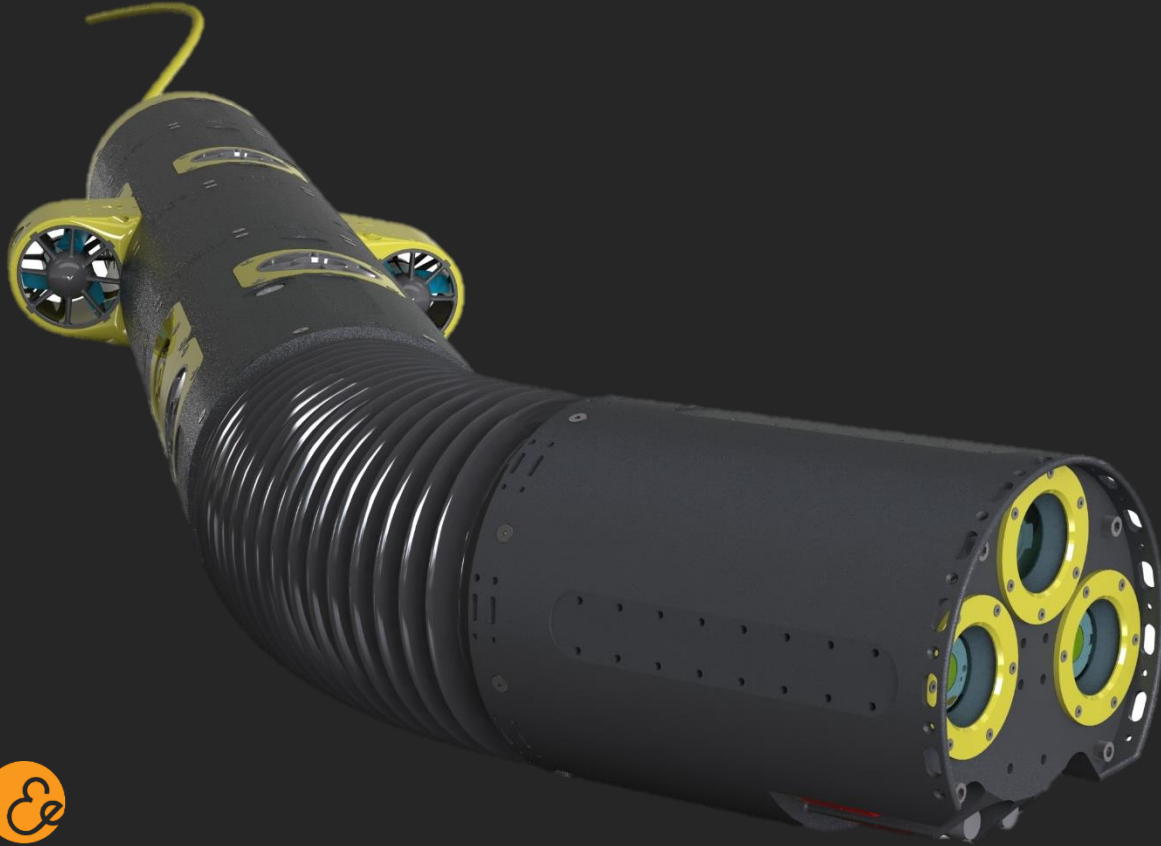
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Testing at PREZIOSO Linjebygg
Subsea Test Center



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Eelume 3



- Eelume 3 Configuration

- Short vehicle
- Single joint with flexible inspection head
- 20 cm diameter
- 500 m depth rating

- Operations and Applications

- Tethered inspection
- Observation launched from ROV tool skid
- Potential to attach tooling

- Schedule

- Modules are built
- Pressure testing underway
- Assembly and tank test in August
- At sea tests in September



Eelume 4



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- **Eelume 4 Configuration**
 - Long vehicle
 - 5 sections with joints
 - Tethered
 - 500 m depth rating
- **Operations and Applications**
 - Tethered inspection
 - Inspection & Intervention
 - Potential to attach tooling
- **Schedule**
 - Some modules are built
 - Pressure testing in August
 - Assembly and tank test in September
 - At sea tests in October & November





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VALVE OPERATION TEST

Eelume Developments for 2018




DOCKING STATION



TOOLS / PAYLOADS



- Charging
- Shore communication
- Tool rack
- Torque tool
- Gripper
- Cleaning tool
- CP probe
- Visual insp. tools
- Transit battery pack
- ...



Any questions?

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