Proceedings of the 10 th Workshop "Seabed Acoustics", Presentation P13:

Magnetic cable-tracking and detection equipment – a supplementary tool for Innomar's sub-bottom profilers

Jan-Erik Rygh
Aquadyne AS, Norway

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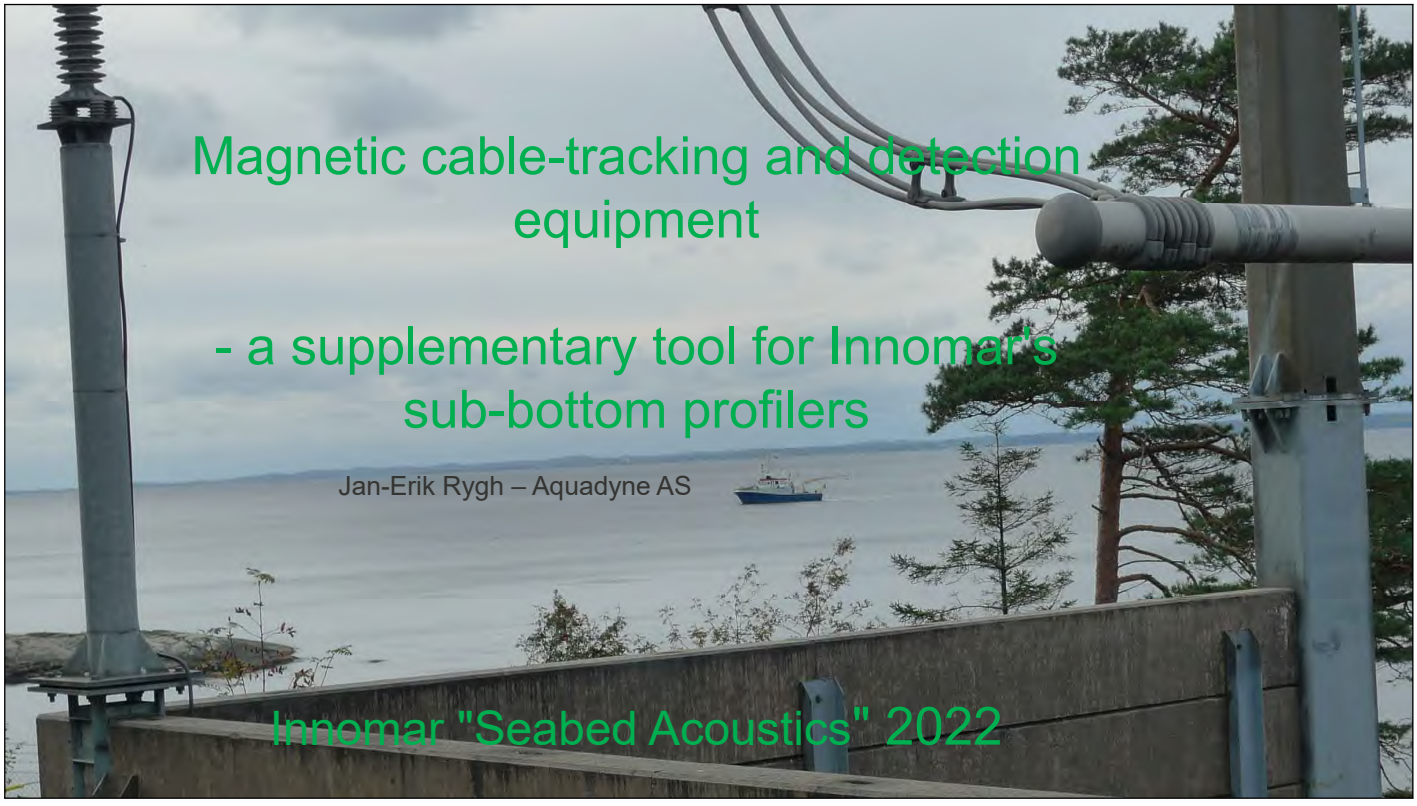

Contents

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Growing market:

- International energy exchange requires subsea cables
- Offshore windfarms require subsea cables
- Modern communication requirements demand more subsea fibreoptic cables

These require surveys, trenching, inspection, etc.

New challenging demands on Sub Sea Pipe & Cable Tracker Technology

Smaller sensors for

- Remotely Operated Vehicle ROV
- Autonomous Underwater Vehicle AUV
- Autonomous Surface Vehicle ASV

Shorter baselines between sensors

Longer detection range needed for AUVs

High accuracy and low noise

Light weight and compact size

Examples of new survey platforms requiring suitable instrumentation

IXBlue

Kongsberg

Maritime

Fugro

Fugro Blue Volta eROV

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Methods for detecting and positioning cables

Cable trackers - methodology

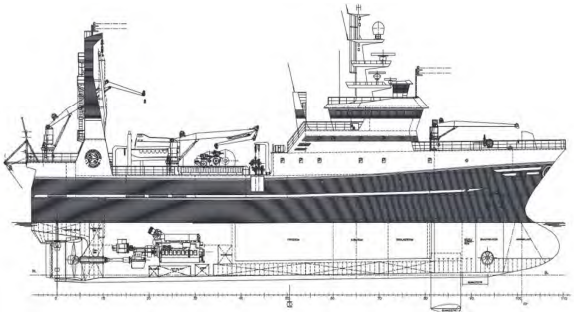
3 methodologies in general use today:

1. Electromagnetic fields
   - Detecting electromagnetic field around cable
   - Passive systems
     - Electromagnetic field generated by a tone-generator onshore
     - Fixed frequency, typically within 10-100Hz
   - Active systems
     - Generating electromagnetic field in cable by providing pulses from the system antenna
2. Magnetized cables
   - System tracking magnetized cables, switching polarity every 10-15m
3. Penetrating echosounder, sub-bottom profiler types:
   - Sound waves penetrating seabed, reflecting targets

iSurvey /Aquadyne Geilo 2022

Examples of Norwegian survey platforms with Innomar systems

UIT FF Helmer Hanssen



DOF Geocat

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Innomar cable and pipe tracker examples

ROV System

Innomar "standard-rov" SBP

Surface system

Innomar "standard" SBP

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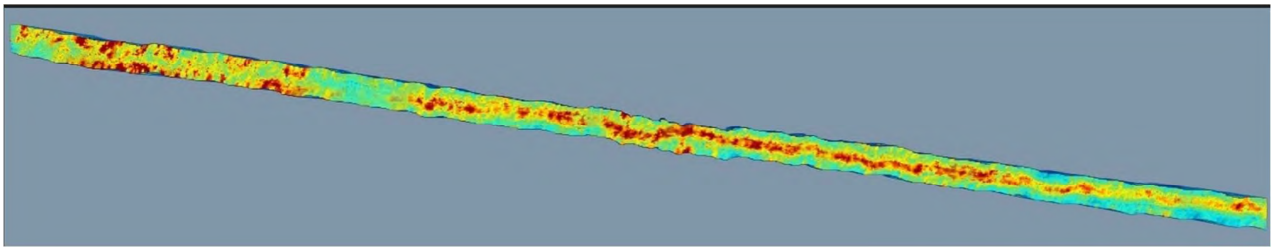
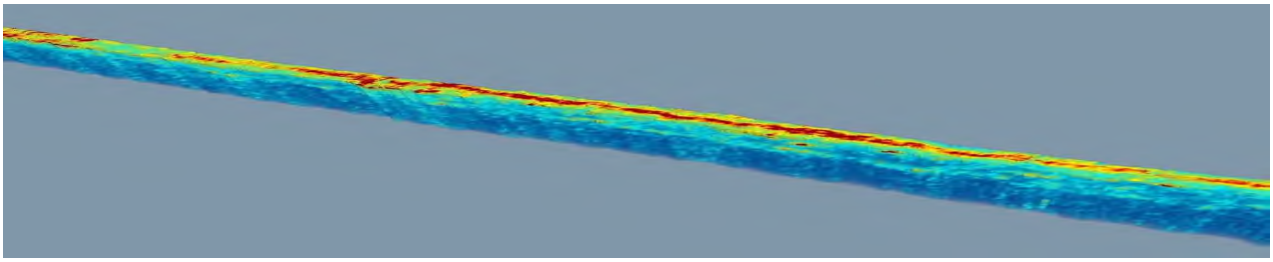
Innomar Sixpack used as cable tracker

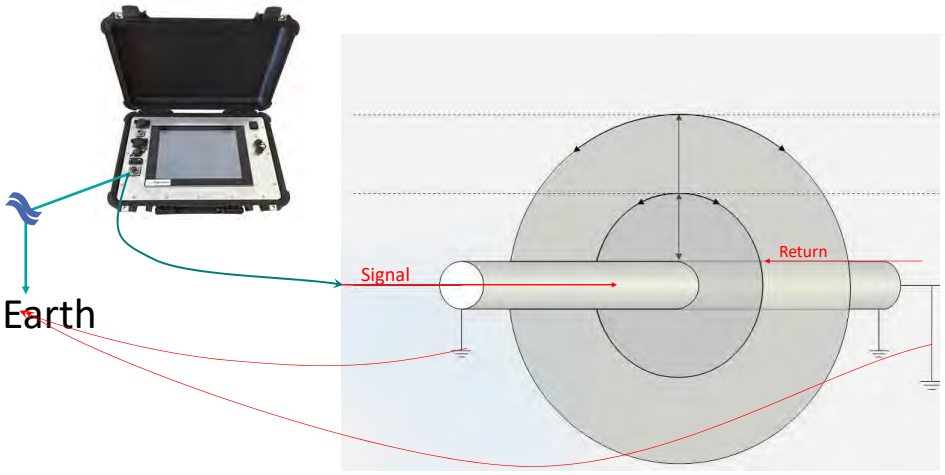


Top picture shows top view of a burried cable



Picture showing the a cable in the seabed 3D; the seabed above the cable is removed

Passive Magnetic detection, principle of operation



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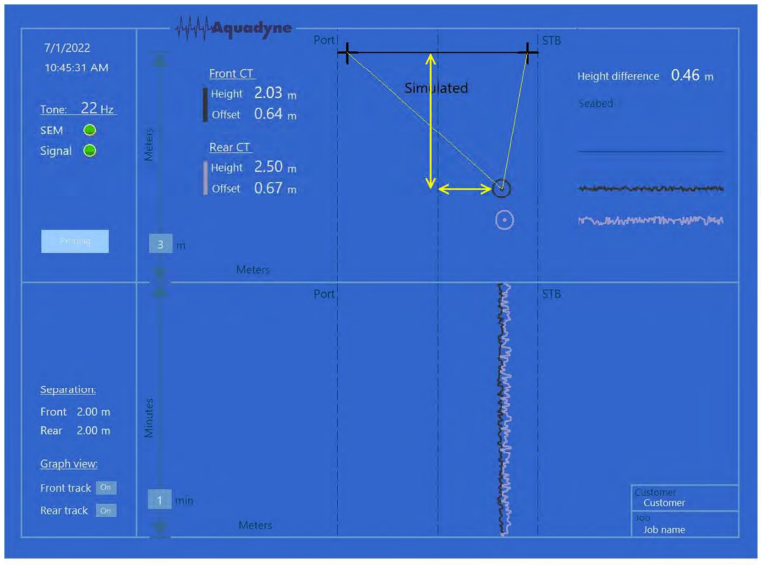
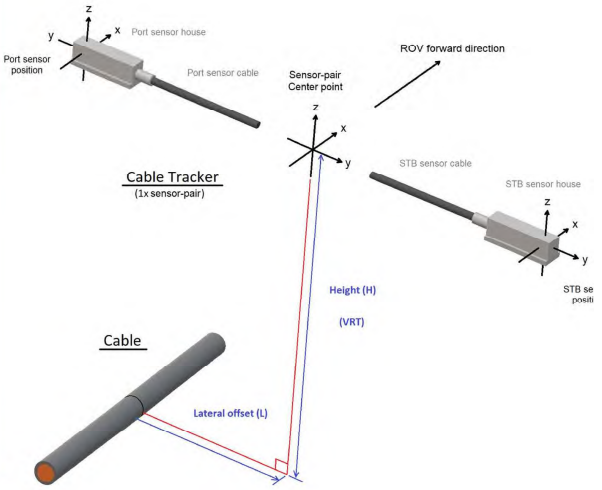
How does a passive cable- tracker work?





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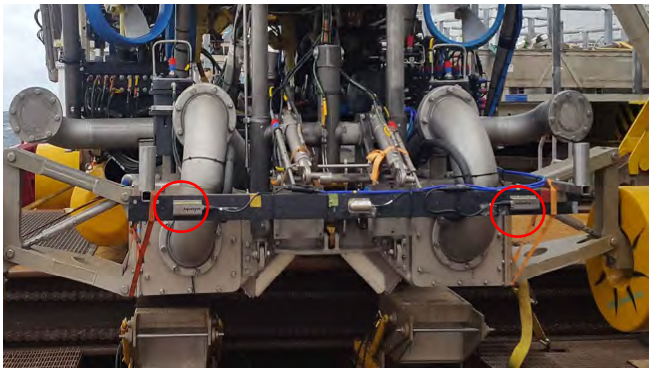
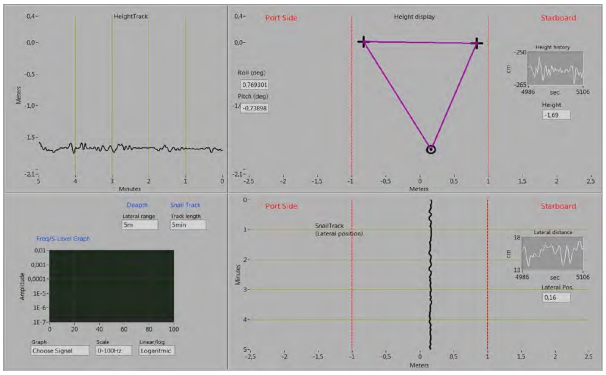
Detecting Cables on the beach in Denmark 2015

First offshore tests 2020

First test offshore on Nexans' Capjet, in between regular operation





Please note the size of the magnetometers and they are monteted on the CapJet trencher !

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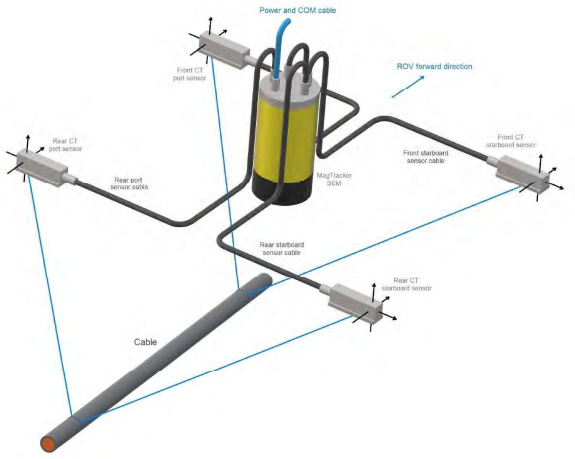
Ongoing operations fiber optical fiber connections



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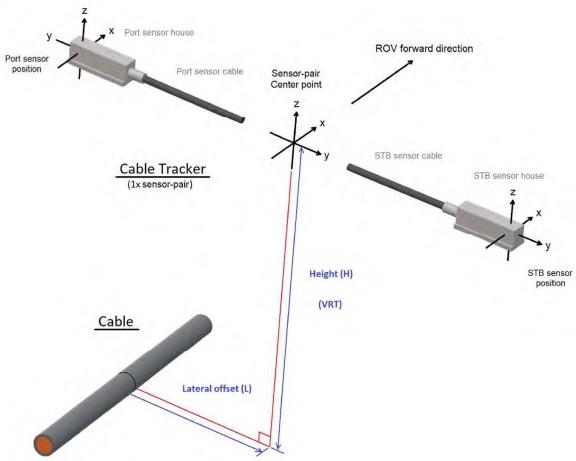
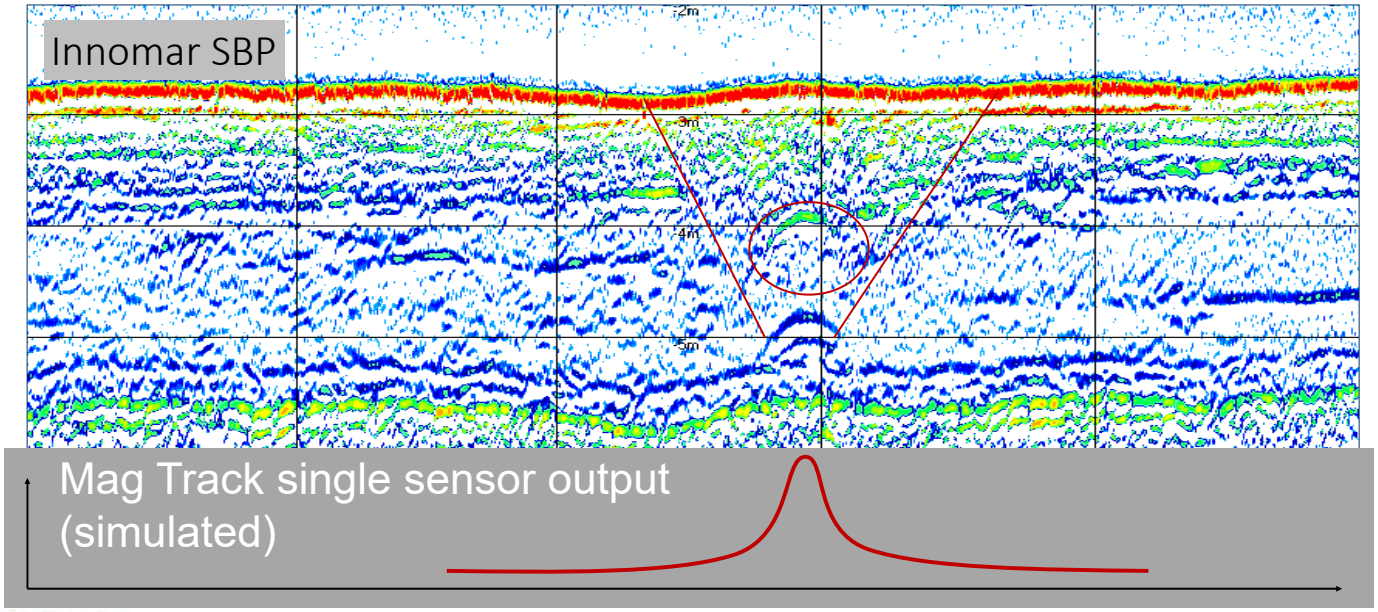
Combination Innomar quatro or sixpack with Aquadyne MagTrack ?



Aquadyne MagTrack will make it possible for users of the Innomar system to follow the cable

Instant verification of cable/pipe detection in realtime



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Why combine penetrating acoustic systems and magnetic detection ?

Both systems have advantages :

- Active acoustic systems give information about changes in acoustic impedance in the seabed
- Passive magnetic systems read the magnetic field from cables and calculate its relative position
- Active magnetic systems do the same as a passive system, but in addition induce an electric current in objects as pipelines, cables

Why combine the Acoustics with magnetics ?

- Enables automatic detection and positioning of conductive materials in the seabed
- Combined Acoustic and Magnetic systems enable safer and faster detection of cables and pipelines as well as UXO detection and online classification
- We use simular components, possible to share transmittters and A/D Converters (?)

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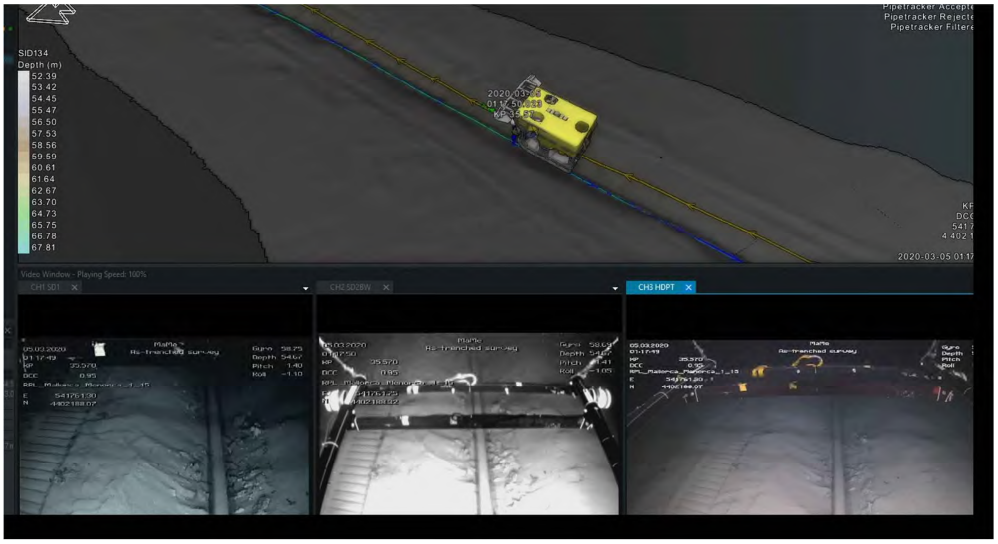
Video iSurvey Aquadyne MagTrack + Video



iSURVEY Aquadyne

Thanks to:

iSURVEY Innomar

Kenneth Leverkjær who saw the potential and got finance for further development.

iSurvey now owns several systems with both 2 and 4 montion -compensated miniatur magnetometers

Nexans Statnett

Who have bought several pinpointing systems

Thank you for watching !

For more information contact
Jan-Erik Rygh, jer@aquadyne.no

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2022 Some key specifications

Subsea electronics module (SEM)

- Titatium + carbonfiber.
- 500 or 1500 meter depth rated
- 2 or 4 magnetometers, +2 or 4 optional hydrophones
- Weight Less than 15kg

Sensor:

- Titanium housing >>>1500 m
- 3 axis minature low noise, nano Tesla –resolution, magnetomer compensated for ROV roll
- weight in air less than1 kg in air, in water less than 300 gram
- Cable Detection range dependent on tone current typical 2-15 meters
-

This system will indicate depth of burial and position acoustic emmissions from a faulty cable .

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The 500m System

4 sensor cable tracker
2 or4 hydrophones

2022 Some key specifications

Subsea electronics module (SEM)

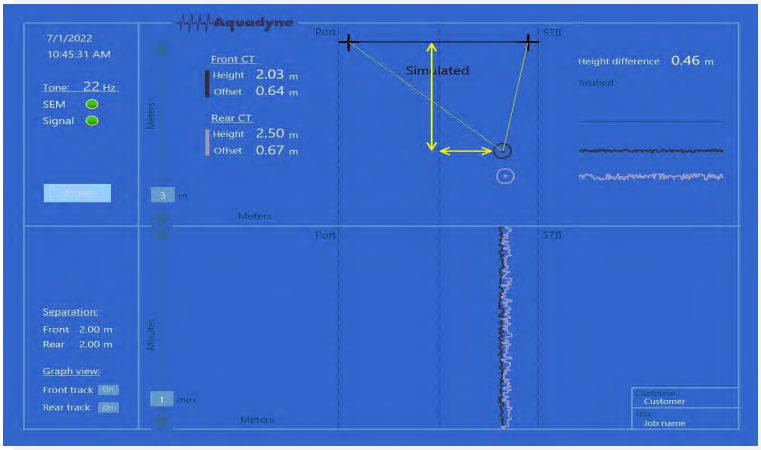
- Titatium + carbonfiber.
- 500 or 1500 meter depth rated,
- Up to 4 hydrophones

Sensor:

- Titanium housing 1500 m
- 3 axis minature low noise, nano Tesla –resolution, magnetomer compensated for roll and pitch
- weight in air less than1 kg in air, in water less than 300 gram
- Cable Detection range dependent on tone current

The new 500m iSurvey SEM

- Less than 10 kg
- An AUV system is estimated to less than 5 kg dry weight for SEM and 4 sensors.
- Depend on AUV / ASV owner specification.



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