KONGSBERG

Programkonferanse sjøsystemer 2019

Autonomi for skip og robotikk

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Autonomy?
No, automated Safe and Efficient Operation in critical environment

Autonomy?

Yes

- No crew
- Sensor based situational awareness
- Autonomous navigation
- Connected to Shore Control Center

Autonomy Builds on Existing Solutions

KONGSBERG

Shore Control Center

Cloud Based Digital Platform

SHORE CONTROL CENTER

KOGNIFAI

Communications

MARITIME BROADBAND RADIO

AUTONOMY ENGINE

K-BRIDGE / NAVIGATION

ADVANCED MANEUVERING FUNCTIONALITIES

Autonomous Navigation

Integration platform and common services

Situational Awareness

Situational Awareness Module

Sensor Fusion

Advanced Sensors

Deliberate Layer
- High level planning and monitoring

Reactive Layer
- Reacts to sensor input

Navigation, Guidance and Control

CCTV – INTERNAL AND EXTERNAL SURVEILLANCE

360 PTZ CAMERA VISION SYSTEM

GLOBAL NAVIGATION SATELITE SYSTEMS (GNSS)

Automated Engine Control Room & Machinery

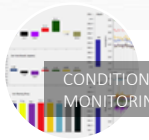
Power & Vessel Automation

01.04.2019

K-CHIEF AUTOMATION

BATTERIES

K-POWER

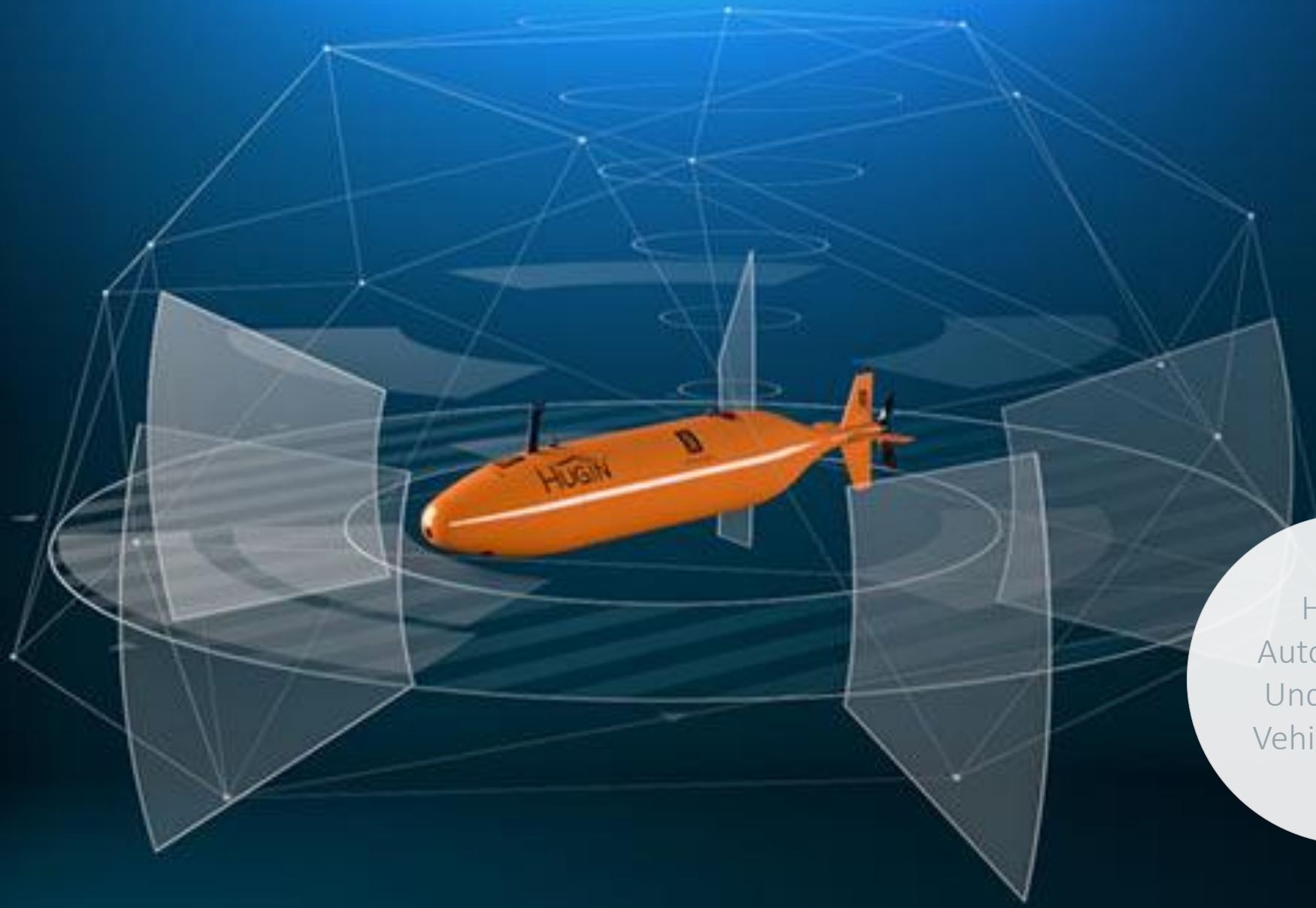


CONDITION MONITORING

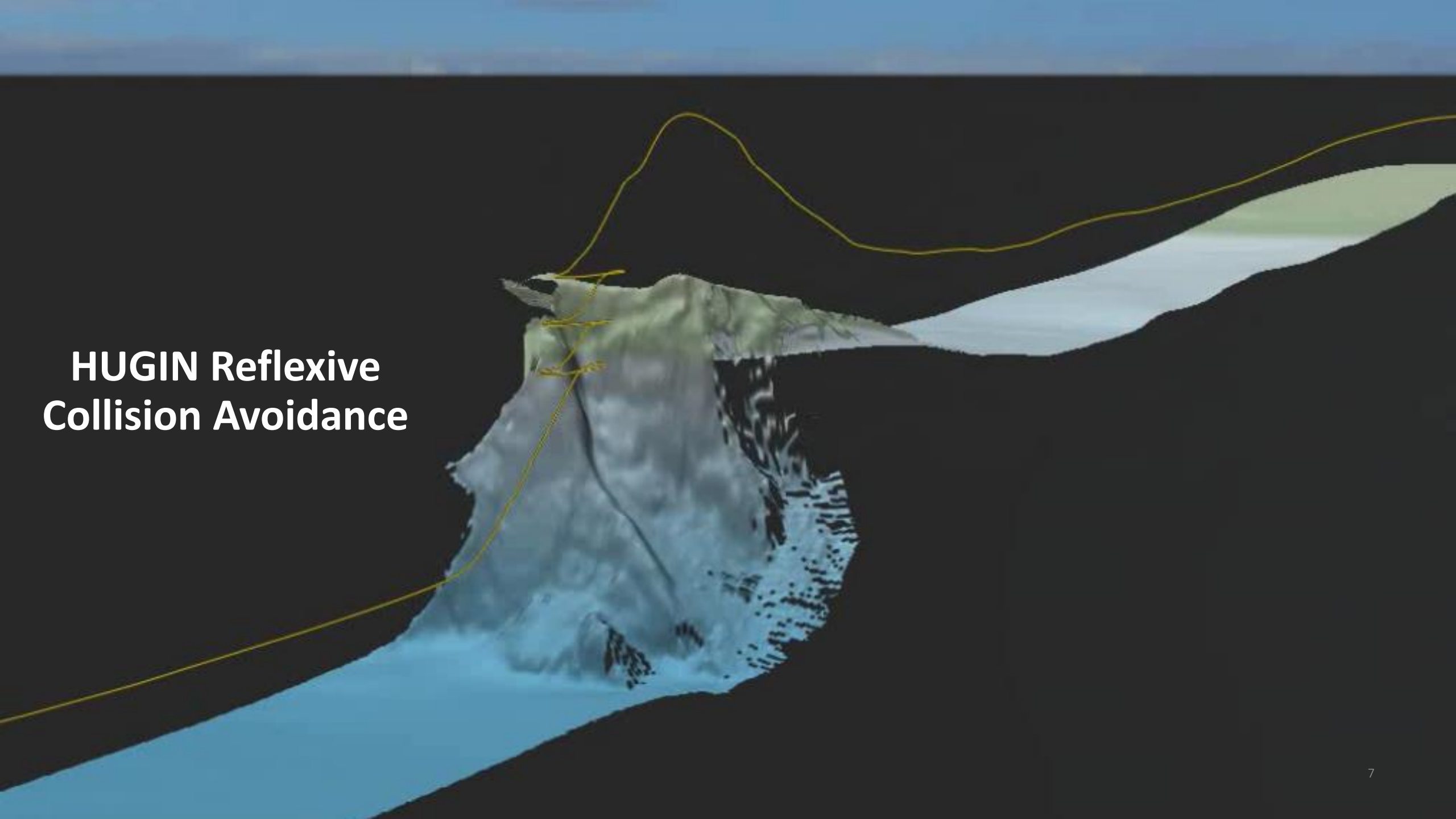
K-WINCH – AUTOMATED MOORING SYSTEM


KONGSBERG
Dynamic Positioning
and Advanced
Maneuvering
1977

KONGSBERG



HUGIN
Autonomous
Underwater
Vehicle (AUV)
1991



HUGIN Reflexive Collision Avoidance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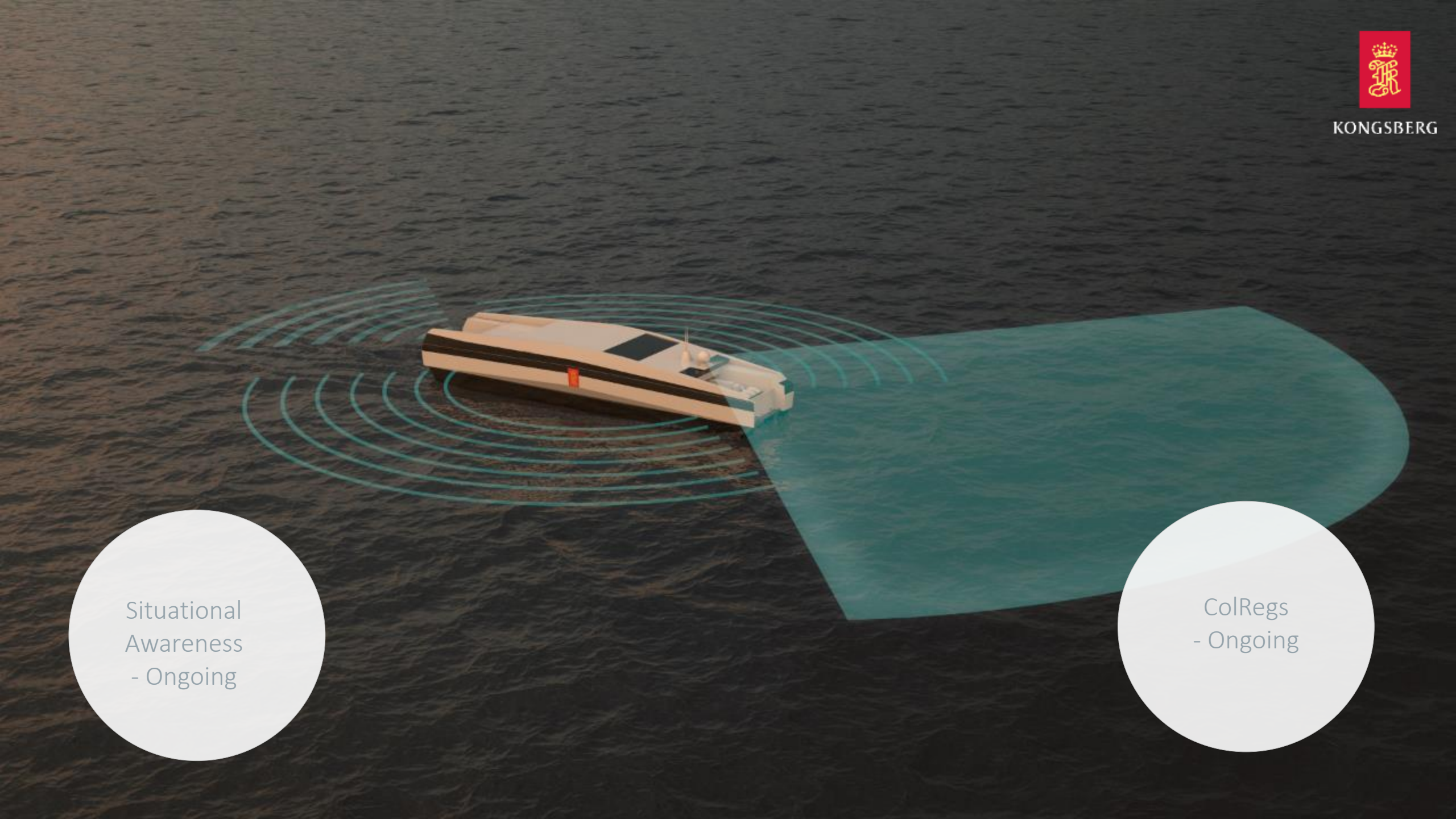
ODIN
UNMANNED SURFACE
VEHICLE (USV)
2016
KONGSBERG
FFI
Forsvarets
forskningsinstitutt
Odin


KONGSBERG
NTNU
SINTEF
Trondheim Havn
KONGSBERG
OCEAN SPACE
DRONE2
TRONDHEIM
AUTONOMOUS

DRONES
2017


KONGSBERG
Shell
OCEAN DISCOVERY
XPRIZE
USV MÅLØMER
MALDON
SEA-KIT
SEA –KIT USV and
HUGIN AUV
2017 and 2018

KONGSBERG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Situational Awareness - Ongoing
ColRegs - Ongoing

Sounder USV
2019

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Autonomous
& Electric
Container
Vessel
2019

Categorization of Autonomous Marine Systems

**ROVS,
INSPECTION MAINTENANCE
REPAIR VEHICLES**

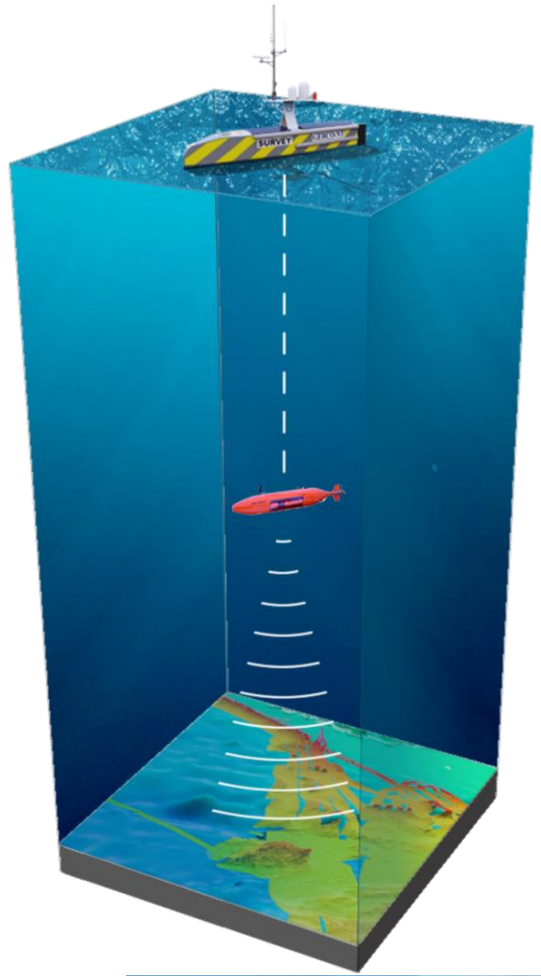
**AUTONOMOUS UNDERWATER
VEHICLES (AUV)**

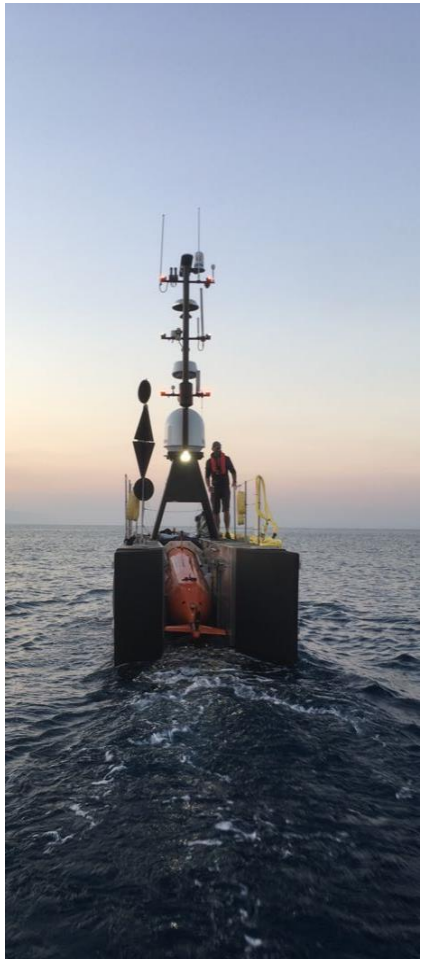
**UNMANNED SURFACE
VEHICLES (USV)**

**MARITIME AUTONOMOUS
SURFACE SHIP (MASS)**

Navigation Autonomy

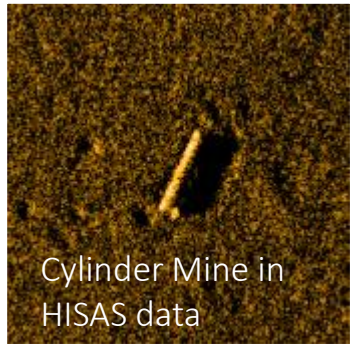
- Navigating a route in accordance with COLREGS
  - Advanced maneuvering, including auto docking
  - Auto transit
  - Situational awareness
  - Collision avoidance
- Connected operation
- Shore or Ship Control Center
- Swarm operations, i.e. multiple USVs
- Multi-domain operations, i.e. Ships, USVs and AUVs

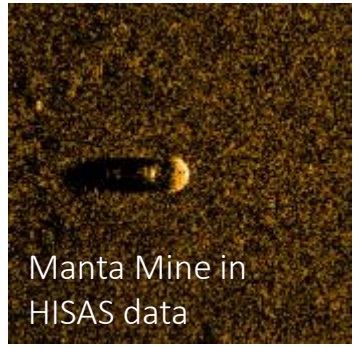


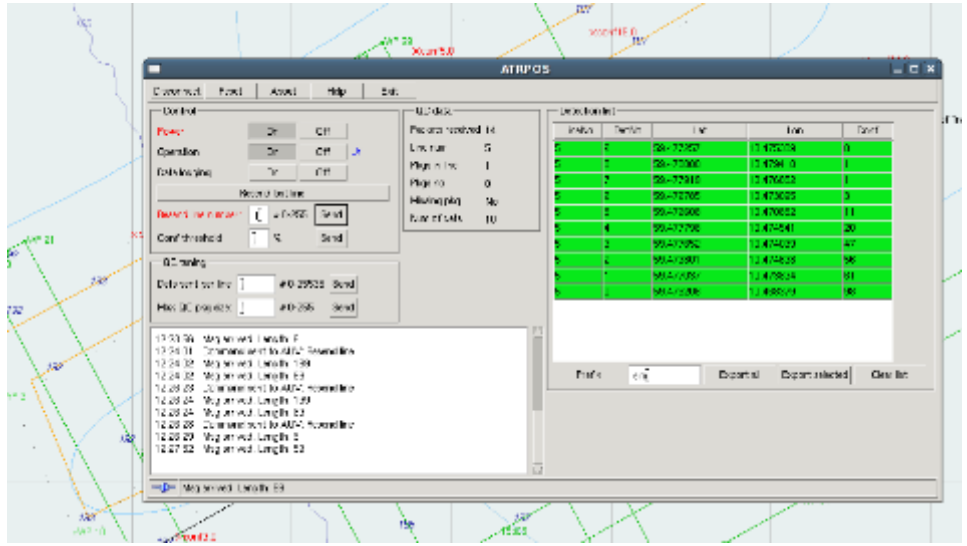


Mission Autonomy

- Mission Autonomy ensures succesuful completion of assigned tasks.
- Mission Autonomy works in concert with Navigation Autonomy
- Mission Autonomy builds on Secure Communication and Shore Control Centers
- Examples on Mission Autonomy:
  - Naval MCM: Provide safe route
  - Short sea transportation
  - Inland waterways transportation
  - Tug harbour operations
  - Offshore energy inspection, maintainence and repair operations







Picture: In-mission Automatic Target Recognition (ATR)

Maritime MCM Brings it All Together

- MCM mother vessels
- MCM toolbox for unmanned and autonomous forward operations
  - USV
  - AUV
  - Mine disposal weapons
  - Sweep

Kongsberg MMCM

Command & Control (C2)

Secure Communication

Mine disposal weapon

AUVs

USV

Sonars

Autonomy Enables Safe and Efficient MMCM

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"Future development of a Norwegian mine counter measure capability will be based on an unmanned MCM concept"

Sjef Sjø (2015)