Current and future role of AUVs in building maritime situational awareness and offensive activities

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Agenda

Current capability building blocks

- System AUV62
- AUV62-AT
- AUV62-MR
- AUV Docking

Building Capability today and tomorrow

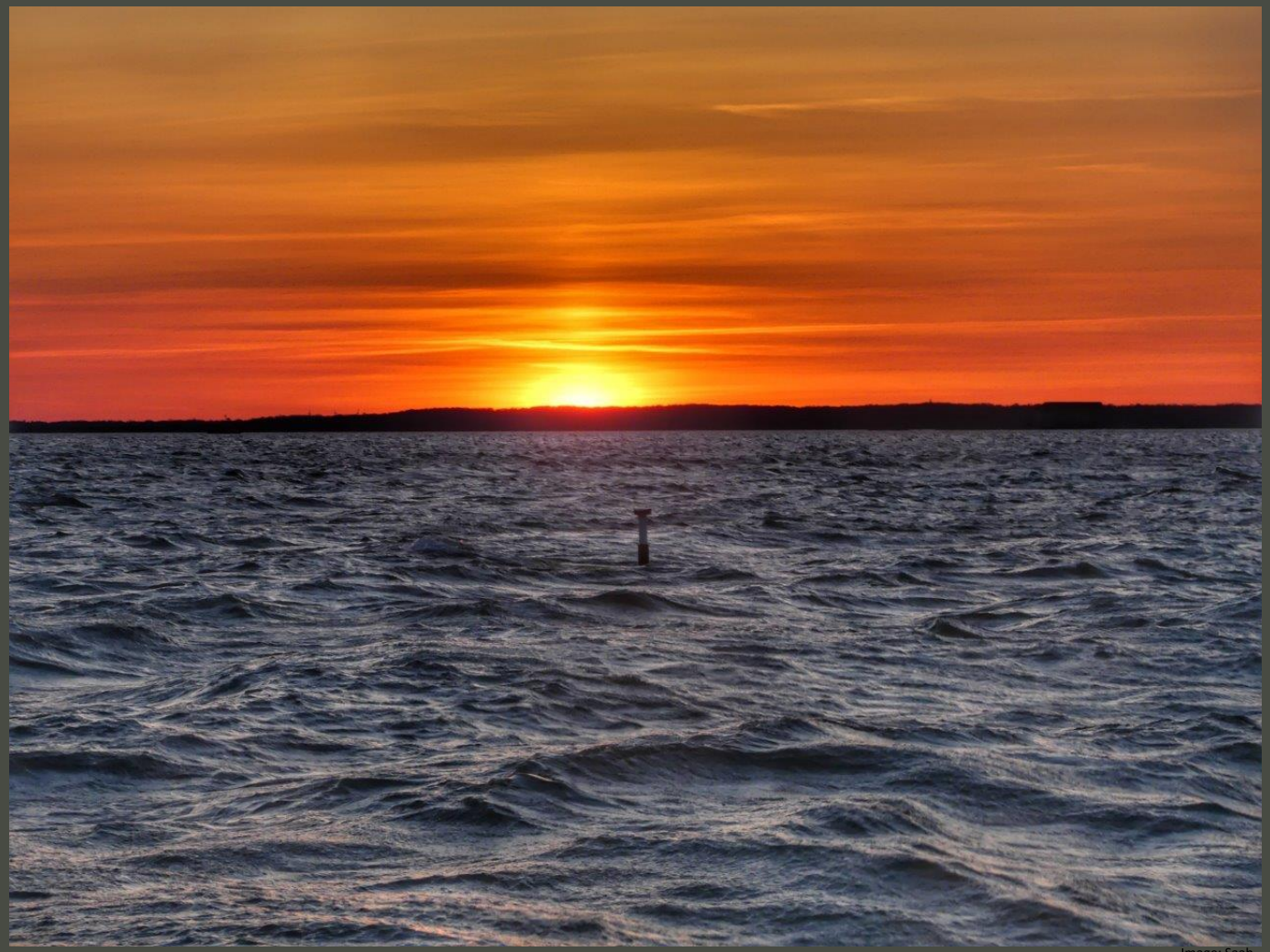

Image: Saab

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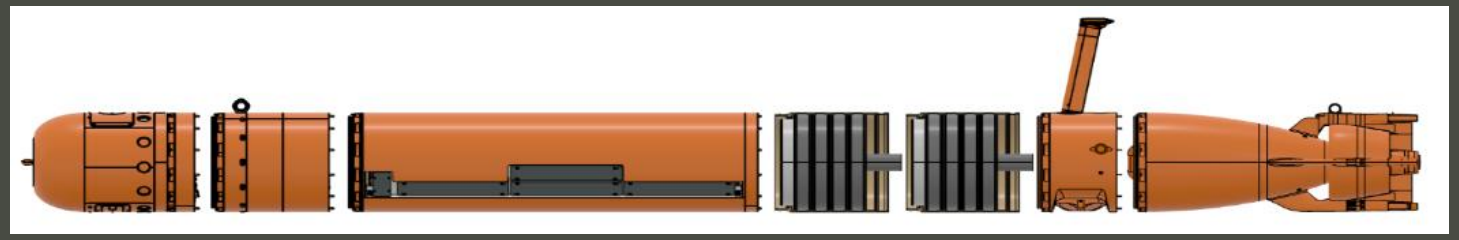
System AUV62

GM53 concept

- Universal energy module for all 533mm vehicles
- Modular design
- Stackable



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System relevance during lifespan

- Continuous upgrades and modifications
- Active life cycle management
- Control of development initiation and integration

Combined data processing – AT, MR, other assets

- Enables advanced mission evaluation
- Enhances mission planning

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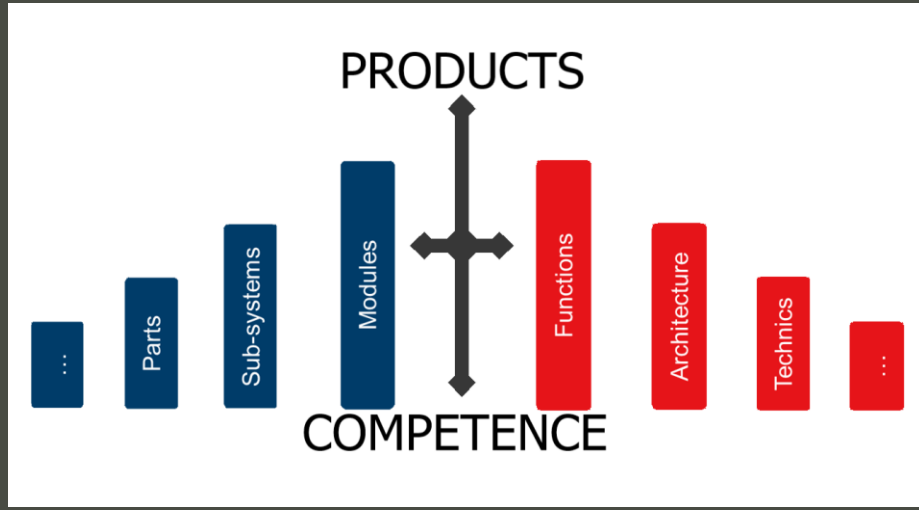
System AUV62

Technical platform

- Systems Engineering
- Environmental Know How
- Doctrine
- Energy Systems (battery systems, fuel cells, metal burning etc.)
- Hydrodynamics, propulsion, docking
- Signatures (acoustics, magnetic, electric potential, chemical sniffing etc.)
- Sensor Systems such as target heads and AUV-sensors
- Communications (wire, fibre optics, UW-Coms, RF, laser etc.)
- Navigation independent of GPS
- Autonomy, ”AI”, Machine Learning



System AUV62

Active and passive sensors for locate/track/attack chain

- Training objectives
- Mission execution
- Multi use of sensors and acoustics

Joint scenarios - helicopter, ship, USV, UAV, UUV

- Training objectives
- Data exchange and data transfer to manned assets
- Mission planning
- Mission updates

Image: Saab

AUV62-AT

REPMUS 2023 and 2024

- Reliability
- Modularity
- Rapid mission updates
- Superior acoustics (sound pressure and frequency range)

Life cycle management

- Improve navigation systems
- Improve HF and LF acoustics
- Mission control using SATCOM

Tool for system verification

- Calibrated acoustics
- Navigation accuracy and post processing

AUV62-MR

REPMUS 2024
- MCM
- REA

SAS module development
- SAS processing
- Lobe forming
- SAS/Side scan sonar dual mode
- No-gap design
- Sonar range dynamic mission adaptation – maintaining area coverage in challenging waters with low sonar range
- SAS processing during turns

Images: Saab

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AUV62-MR

Dynamic Mission Planning

Initial User Input:

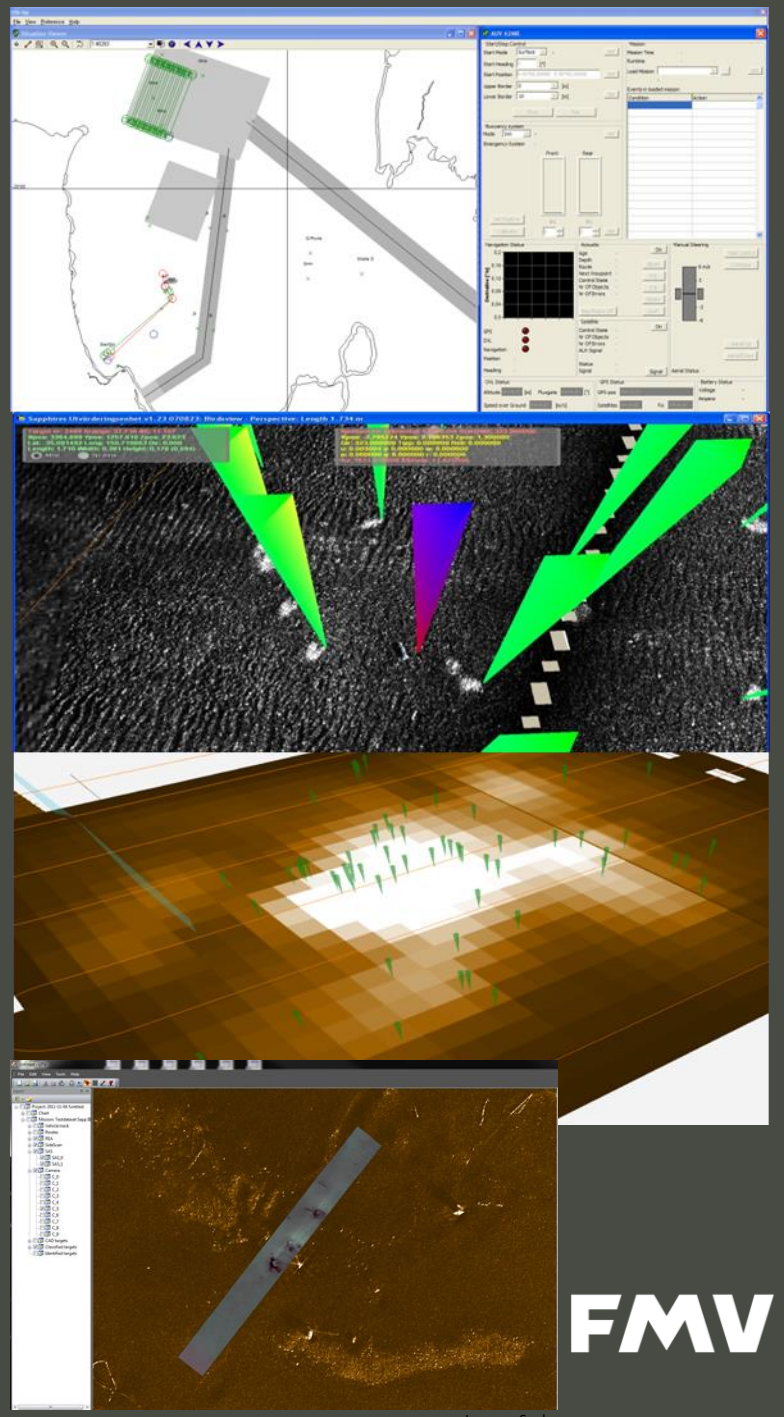
- Type of mission
- Area

Information created in the AUV:

- Seabed Topography (***during REA***)
- Mine like objects detected using in-vehicle CAD/CAC based on SAS data (***during Search***)

Autonomous planning / decisions

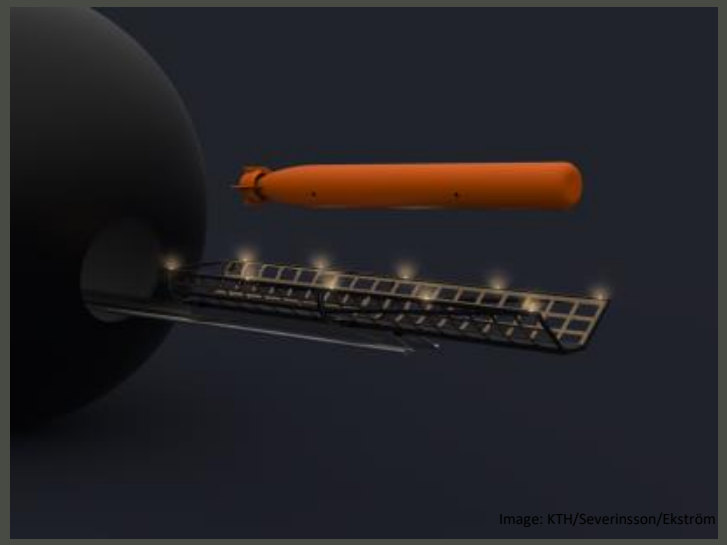
- Optimum route for search with SAS established (***after REA***)
- Optimum route for identification of Mine like object established (***after Search***)
- Identification by optical sensor using SAS-like processing (and correlation with SAS-images)

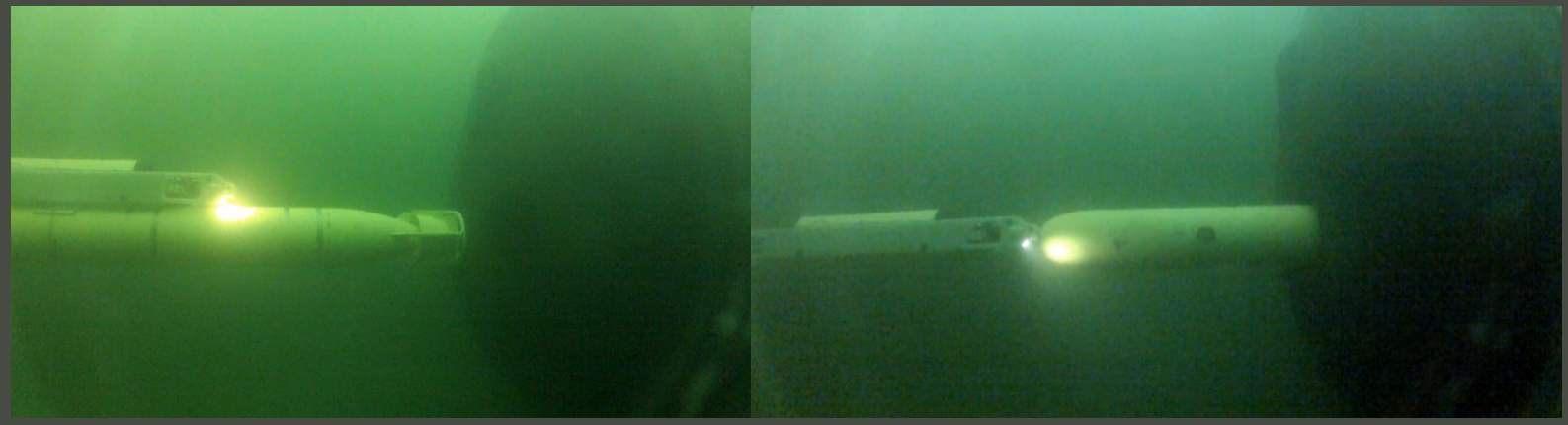


Images: Saab

AUV docking

- Established process for docking in 533mm tube using SubROV
- LARS study for Submarine class A26 Forward Payload Lock

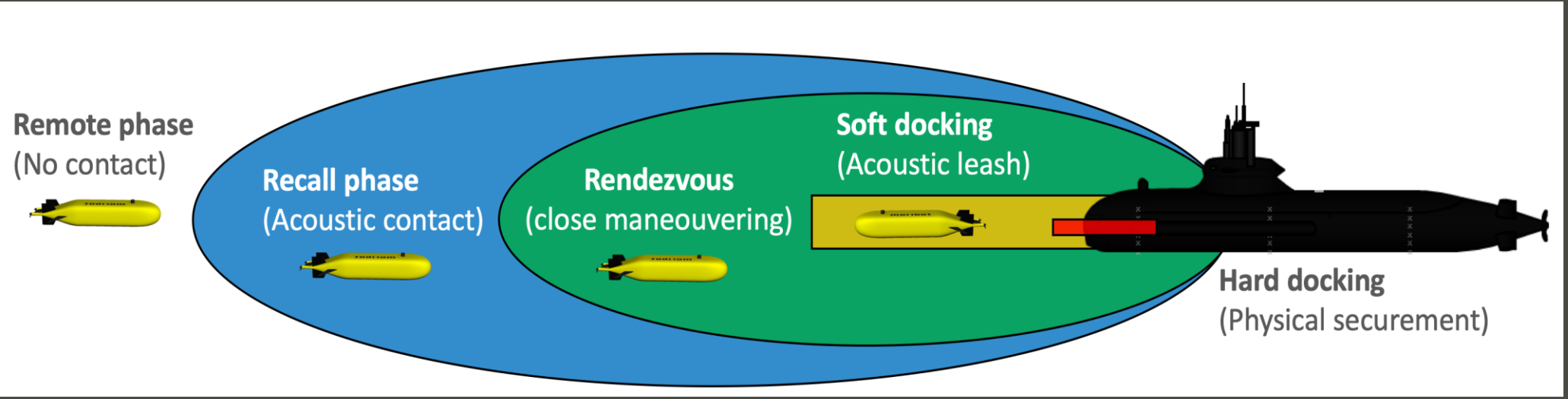




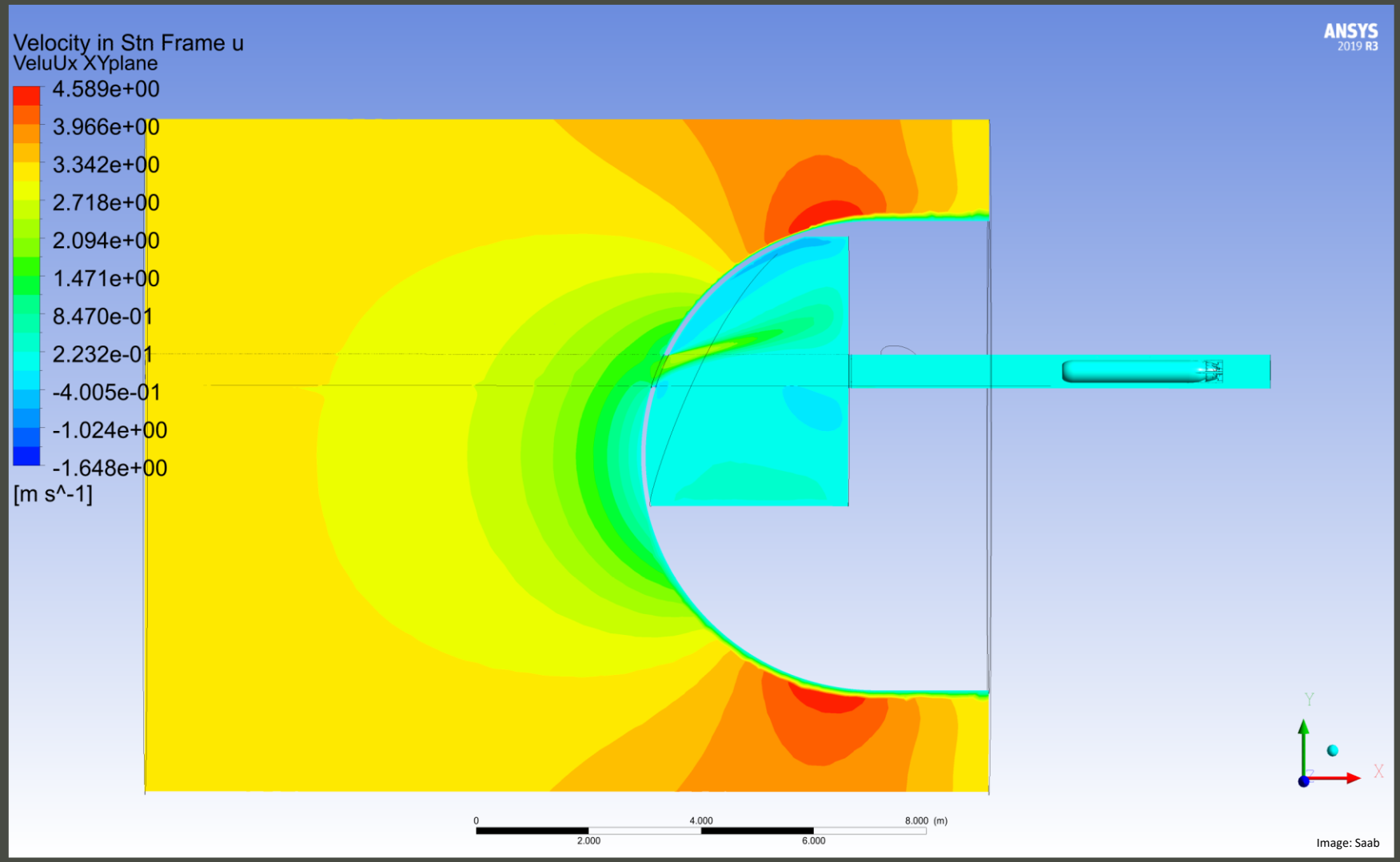
AUV docking

Challenges:

- Stealth levels
- Communication
- Docking cases & docking phases
- Positioning
- Water-flow around docking area
- Inspection/handshake of AUV before docking



AUV docking



Flow velocity Xdirection, viewed in XYplane

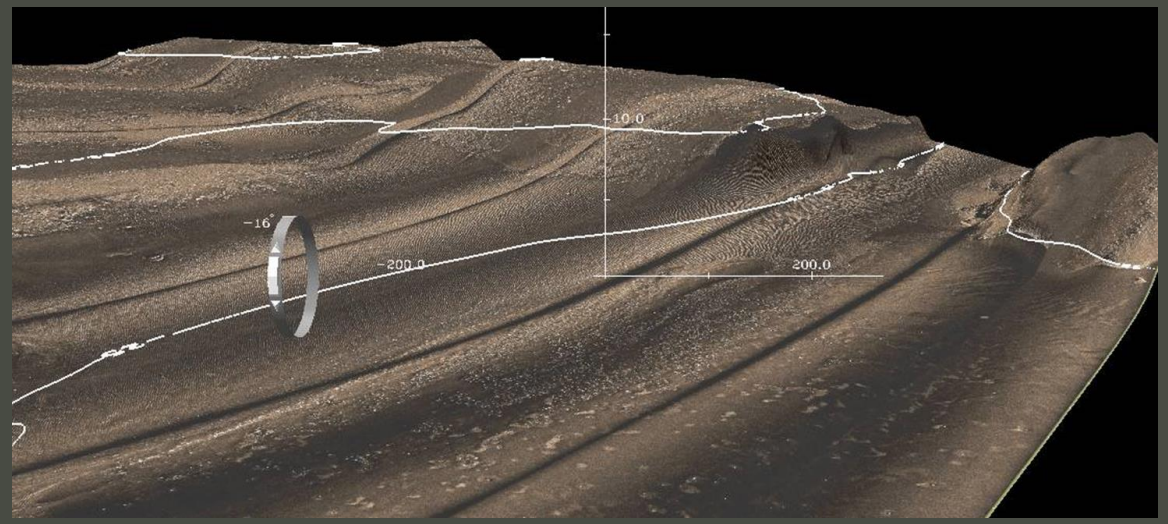
Building Capability

The capabilities of these systems can be used and combined to enhance operational effect and streamline the amount of assets required.

Examples:

- The AUV62-AT can be used as:
  - Training target
  - Tool for system verification
  - Active/passive sensor (including bi- and multi static)
  - Decoy

- The AUV62-MR can be used as:
  - MCM asset (including mines in the water column)
  - REA asset
  - Sea floor mapping asset
  - ASW asset
  - CUI watchdog



Building Capability

Modularity enables combination and adaptation to intended mission types

- Stack additional energy modules
- Combine existing payload modules
- Add other payloads and sensors
  - TAS
  - Signature generation
  - UW communication
  - Cargo
  - Other effectors

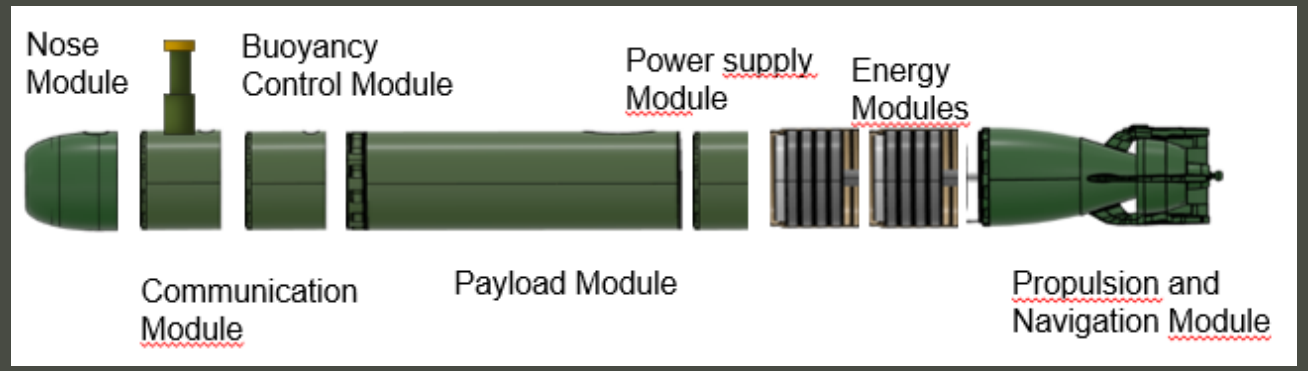


Image: Saab

System design and modularity also enables use from different platform types

- Surface assets
- Subsurface assets
- COOP
- Land based

Modularity also enhances system availability

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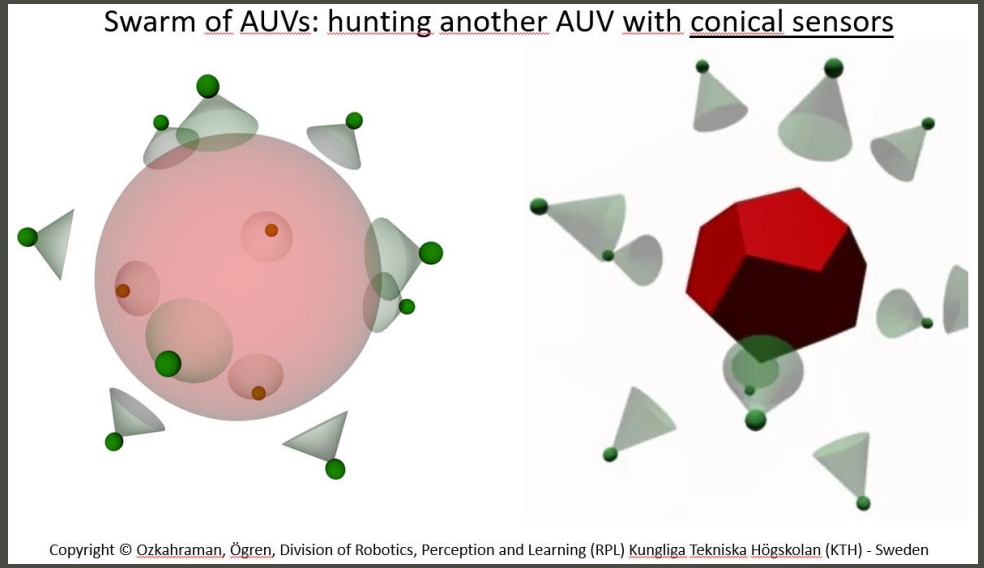
Looking into the future

- Widening the system perspective on the scale between few, complex and expensive -> cheap expendables
- Enhanced endurance for smaller systems
- Signature optimization
- Further developed multi mission toolbox
- Uncrewed teaming and swarming
- Enhanced autonomy
- AI supported mission execution enables stand off for human assets
- Human to machine process replication
- AUV underwater infrastructure (energy, communication, payloads)
- Gliders for shallow and congested waters
- Standardization, e.g. STANAG 4817 and STANAG 1364
- Technical platform underwater systems



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