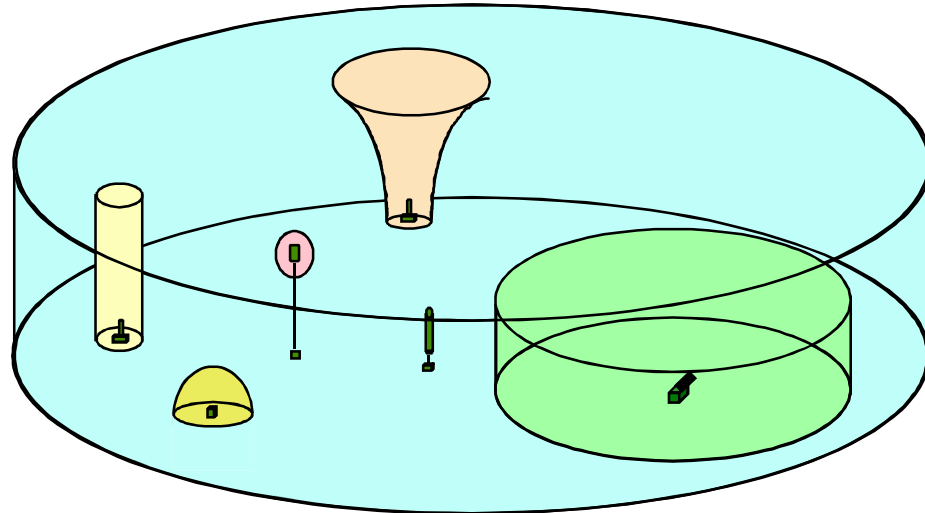
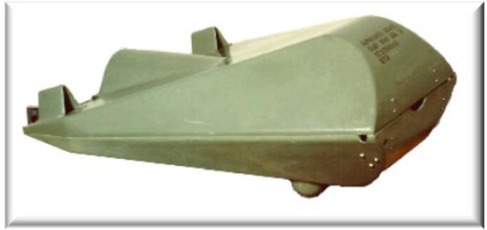
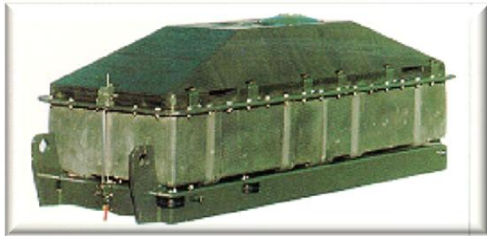


The future of mine warfare

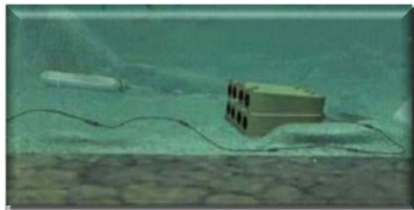


Current threat



- Uncontrollable sea mines:
 - Bottom sensor mines
 - Moored sensor mines
 - Contact mines
- Controllable mines M9
- Sensors: magnetic, acoustic and pressure

Future threat



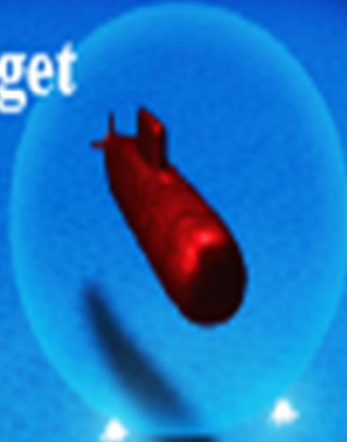
- Sensor development
 - Magnetic
 - Acoustic
 - Pressure
 - Electric sensors
 - Seismic sensors
- Kinetic development
- “Attack mines”
- Modular systems (sensors and weapons)
- Under water communication

Future mine threat?

Target



Target



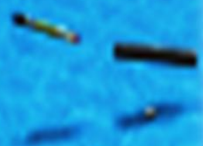
Sensor nodes

SENSORS

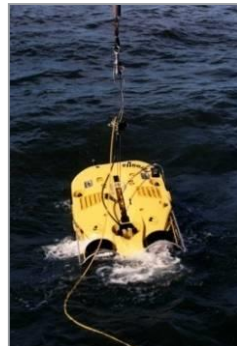
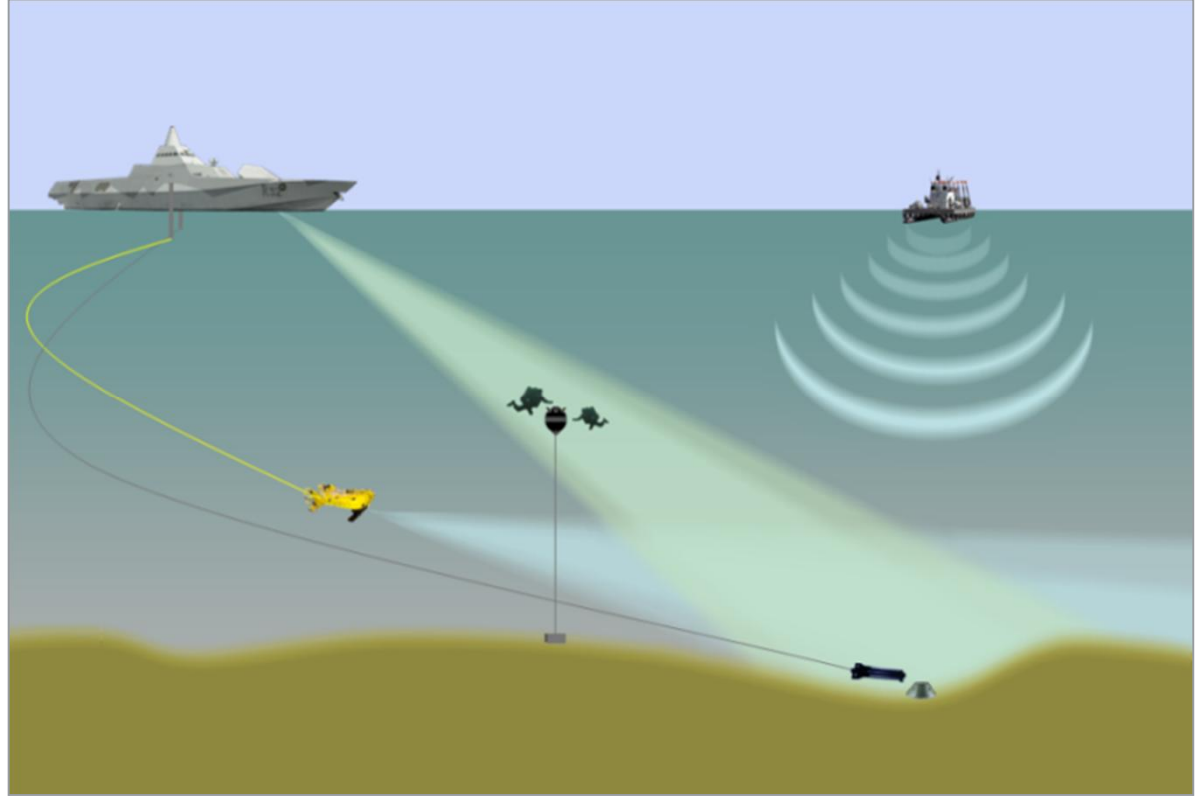
Weapon node on LDUUV



Anchored Weapon node



RSwN MCM-concept today



SWEDISH ARMED FORCES



FUTURE MCM

FUTURE MCM

Development:



- Modular systems *
- Autonomous systems *
- Sensor development
- Disposal methods – "termite system"
- Decision support systems
- Increase of intelligence and preparation
- Underwater communication



Modular systems



- "Disembarked systems" (Remus)

- Integrated systems (Visby / Koster)

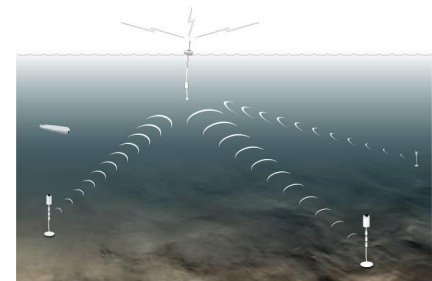
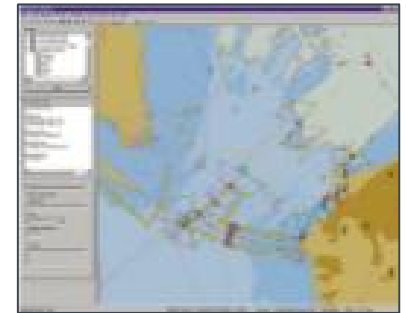
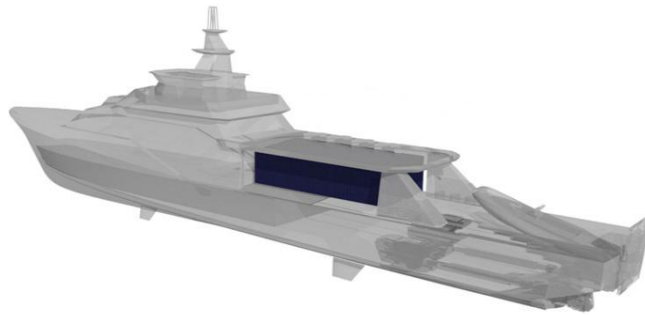
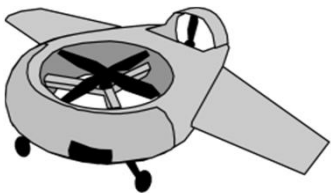
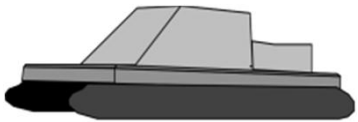
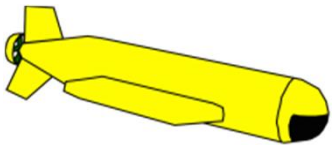
- System and personnel modules (US Littoral Combat Ship)

- Mission adapted systems

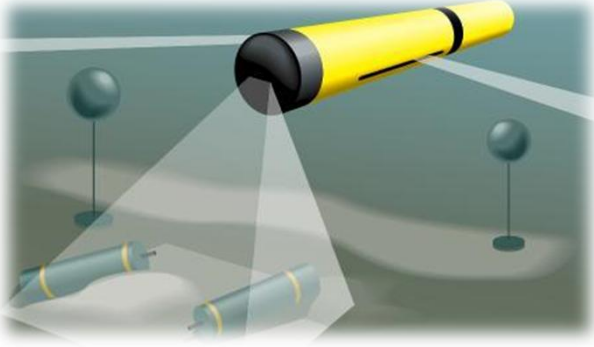


MODULAR SYSTEMS

C2I



AUTONOMOUS SYSTEMS



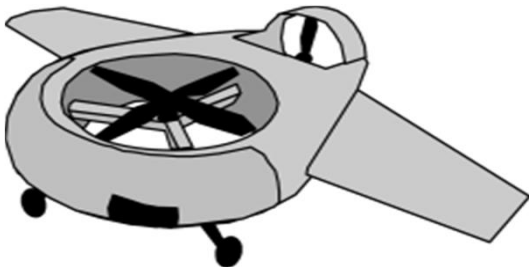
Autonomous Under Water Vehicle (AUV)

- MCM and intelligence gathering

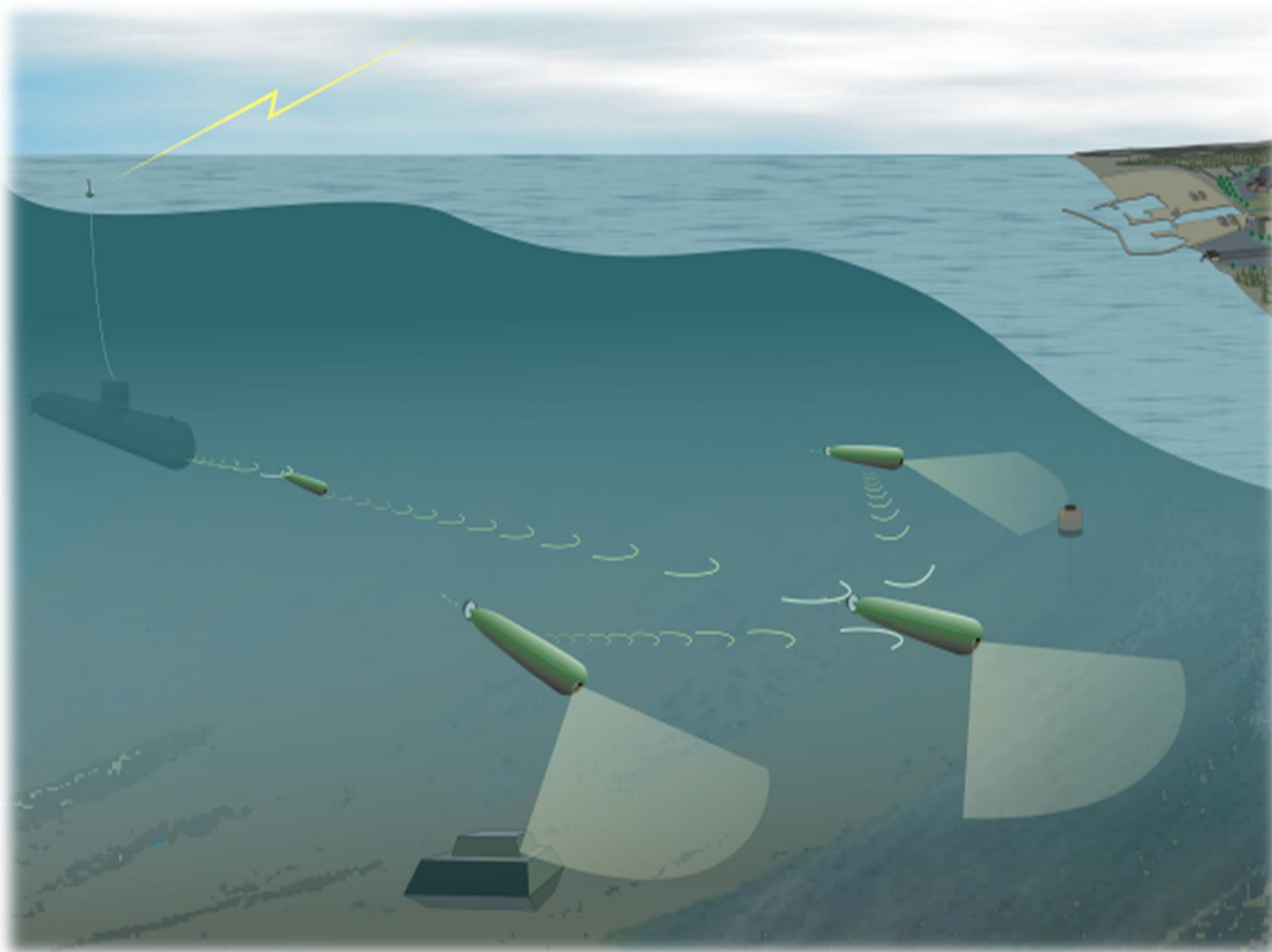


Autonomous Surface Sweep Vehicle (ASV)

Unmanned Aerial Vehicle (UAV)



COVERT MCM



CIV-M



SARUMS



Safety and Regulations for European Unmanned Maritime Systems

Unmanned maritime systems is one of the agreed 22 priority areas with a potential to become successful as joint European research work in the European Defence R&I (EDRI) strategy. Unmanned maritime systems also have strong links to Maritime Mine Counter-Measures, being one of the priority areas in the parallel European military capability strategic work that resulted in a Capability Development Plan (CDP). As result, several research projects with participation from many EU nations in the area of unmanned maritime systems came together in the European Defence Agency UMS (Unmanned Maritime Systems) programme.

UMS has the objective to enhance European capabilities in a number of naval applications by means of several research projects related to unmanned systems. Unmanned vehicles in particular are expected to be an integrated part of modern fleets. Common understanding of minimum safety procedures and a joint view on rules and regulations among European navies would enhance interoperability in future joint maritime operations and training.

National or international rules, regulation and legislation governing safe operations at sea and applicable to unmanned maritime vehicles are virtually non-existent. Common understanding of minimum safety procedures and a joint view on rules and regulations among European navies would enhance interoperability in future joint maritime operations and training.

To establish a foundation to achieving the important interoperability, a forum was created to address all regulations, legislation and safety issues related to design and operators of UMS. The forum evolved to project group part of the UMS research programme with the name **SARUMS** (abbreviation for Safety and Regulations for European Unmanned Maritime Systems).

The objective of **SARUMS** is to provide European Navies a best practice safety framework for Unmanned Maritime Systems that recognises their operational usage, legal status and the risk as well as applicable rules and regulations. The philosophy behind this guidance document for this purpose titled:

Best practice guide for UMS handling, operations, design and regulations.

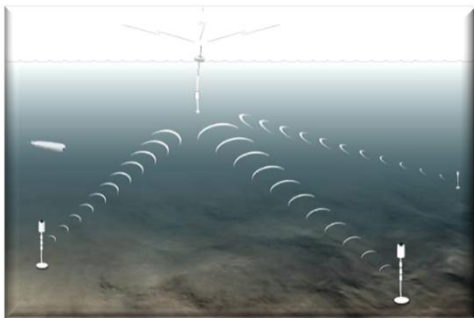
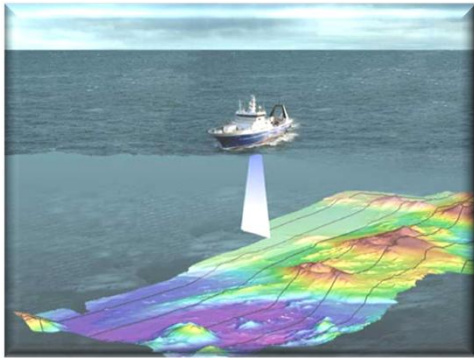
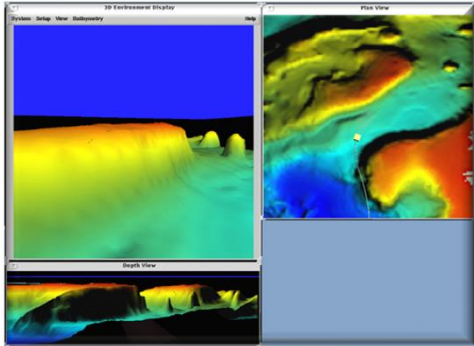
A significant improvement in interoperability and standardisation in design and operation of UMS users, designers, regulatory and legislative experts and maritime administrations will be invited to review and discuss project work and conclusions.

The **SARUMS** group agenda also includes arranging expert forum conferences. Experts such as UMS users, designers, regulatory and legislative experts and maritime administrations will be invited to review and discuss project work and conclusions.

Contact:
The SARUMS group has members from Belgium, Finland, France, Germany, Netherlands, Italy and Sweden. For more information please contact European Defence Agency (EDA) UMS co-ordinator, SARUMS Chairman or any national representative:

EDA UMS: Solon Mias
SARUMS Chairman (Sweden): Magnus Ormfelt
esm1@eda.europa.eu
magnus.ormfelt@rmv.se

SUMMARY



- The mine will remain a threat in future conflicts
- The general development of sensors and means will continue
- Mines used will vary from WW I – modern attacking mines (torpedo mines)
- Intelligence and pre-survey will multiply scarce resources
- Going towards autonomous MCM and automated decision making, man will still have to be in the loop

Warfare in the littorals is an art, not just science

