LOGISTICS & MARITIME FORUM

The sustainable, connected and resilient road to 2030

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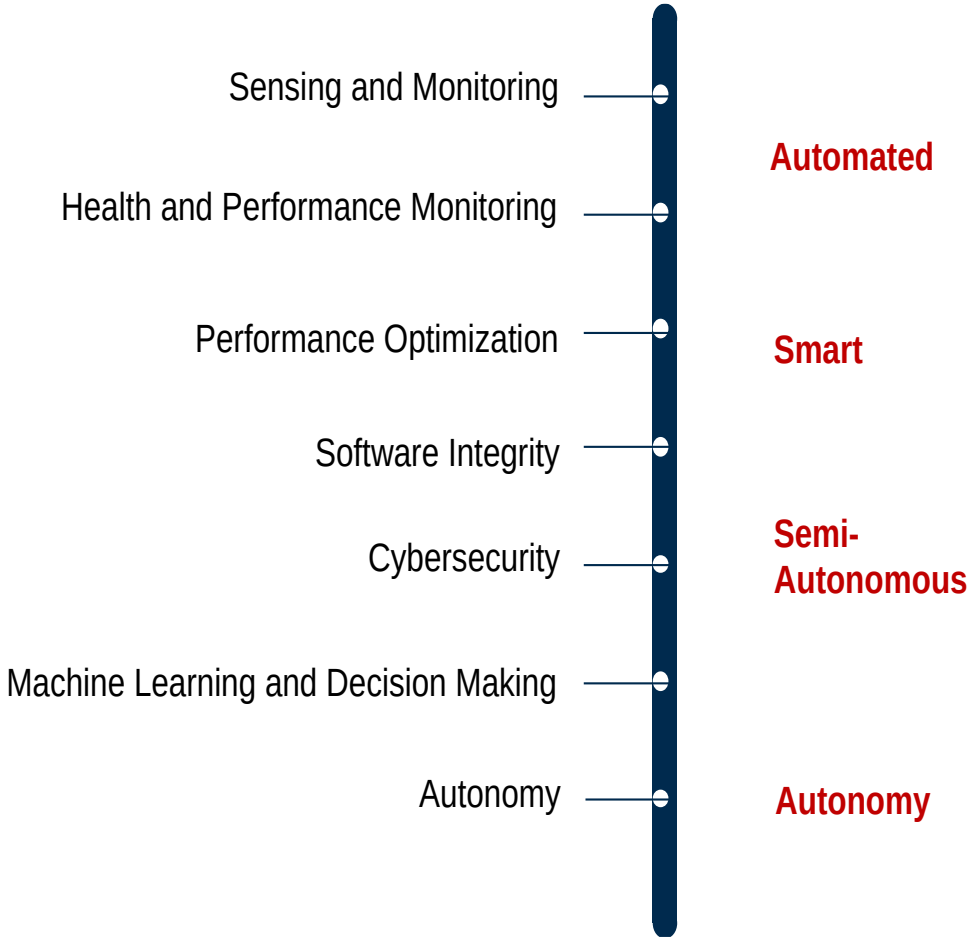
SALES & MARKETING MANAGER

SEASTEMA SPA

UNMANNED OVER THE SEAS
FROM AUTOMATION TO AUTONOMY

AUTONOMOUS SHIP | TREND & ENABLERS

AUTOMATION TREND



KEY TECHNOLOGICAL ENABLERS (*)

Endurance: Improved reliability & safety, increased endurance & range, support additional & more capable sensors

Autonomy & Precision Navigation: Increased levels of autonomy & decision making, increased accuracy & reliability

Command, Control & Communications

Payloads & Sensors: Increased capacity for sensors and payloads

Platform Integration: Increased capability to launch and recover and coordination with host platforms

(*) According to NASS System Vision (PEO USC)

STATE-OF-THE-ART OF NAVAL&MARITIME AUTONOMOUS SURFACE SHIPS

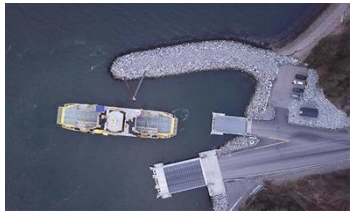
NAVAL AUTONOMOUS SURFACE SHIPS (*NASS*)

- "***Protector***" is a 11m length and 40 knots speed USV realized by the Israeli Defense Industry, already operationally employed by different navies with or w/o a weapon system
- "***Vigilant***" is a 17m length and 30 knots speed USV, realized and operated by Singapore Navy for surveilance purposes only: it is presently the largest USV in operation
- "***SEA HUNTER***" is a 40m length and 30 knots speed NASS, w/o a weapon system and presently under sea trials, realized by the US Navy as a technological demostrator of the remote operations of a large unmanned vessel

NB: all these USV are remotely controlled by a shore center but offers partial navigation autonomy

MARITIME AUTONOMOUS SURFACE SHIPS (*MASS*)

- ***"Yara Birkeland"*** program (ready 2020) is a small cargo ship designed for auto-remote operations and built from Vard/Fincantieri Yards in Norway, which shall initially manned and tested at sea for remote control
- **Small supply vessel**: remote operation of a DP system from the shore control center for a has been recently demonstrated
- **Small urban ferry** in Finland and a **tug-boat** in Copenaghen: a series of tests performed for autonomous navigation, remote control and automatic docking
- **PCTC (Pure Car Truck Carrier)**: first autonomous MASS ship test has been recently finalized (sept. 2019) under new IMO guidelines by NYK japanese shipping company



SEASTEMA APPROACH COVERS ALL BUILDING BLOCKS

focus in next slides

ENABLING TECHNOLOGIES FOR AUTO-REMOTE SHIP CONTROL

Common technologies for MASS/NASS

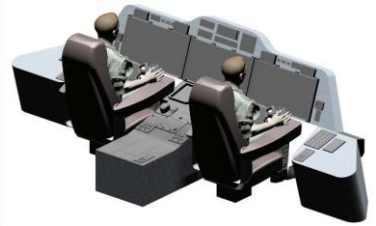
- Remote control center (Virtual & Augmented reality)
- Ship-Shore communications
- Autonomous control of onboard machinery and auxiliaries
- Autonomous navigation & Collision Avoidance
- Situational Awareness & Collision Detection Systems

- COMPLETE DUALITY OF ''*MARITIME*'' & ''*NAVAL*'' TECHNOLOGIES (***with the obvious exclusion of Combat System…)***
- GREATER SYSTEM INTEGRATION, AUTOMATION AND TECHNOLOGICAL COMPLEXITY OF ''*NAVAL*'' APPLICATIONS
- BENEFICIAL TECHNOLOGY TRANSFER FROM NAVAL EXPERIENCES TO ''MASS'' APPLICATIONS

ENABLING TECHNOLOGIES FOR AUTO-REMOTE SHIP CONTROL

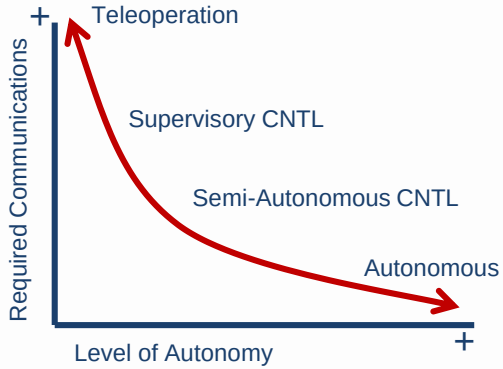
REMOTE CONTROL CENTER
fusion of different sensors and technologies

- Integrated Bridge Systems
- Virtual Reality
- Enhanced HMI
- Aumented Reality



SHIP-SHORE COMMUNICATIONS
less communication requires greater autonomy

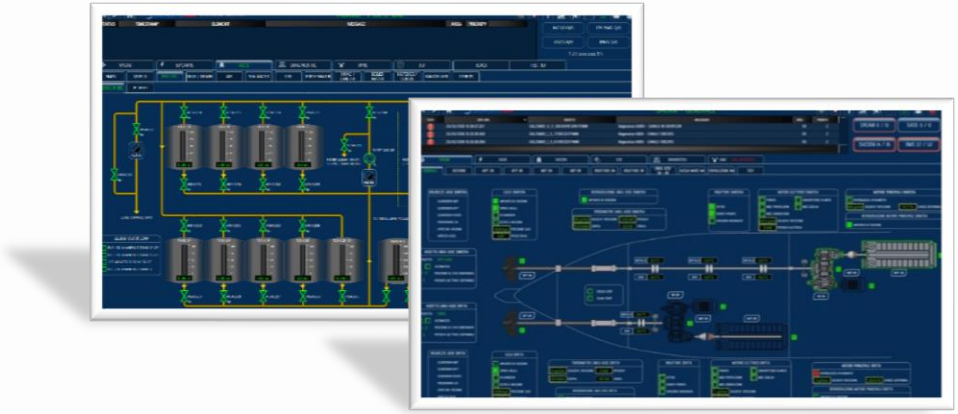
- Possibility to use 4G/5G techn. for coastal comm
- Tethered Drone can be used as a bridge (100NM)
- Commercial satcom are not reliable for remote control (latency, cost)
- Troposcatter on the sea need more development



AUTONOMOUS CONTROL OF ONBOARD MACHINERY AND AUXILIARIES

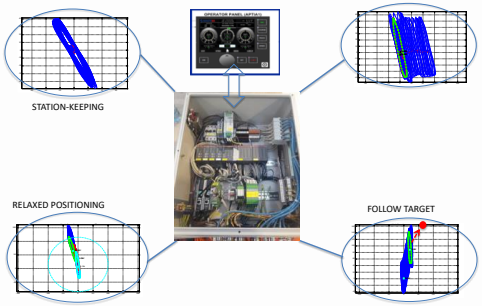
- Propulsion
- Auxiliaries
- Power Plant
- Damaged Stability Condition Monitoring
- Safety

Virtual Chief Engineer



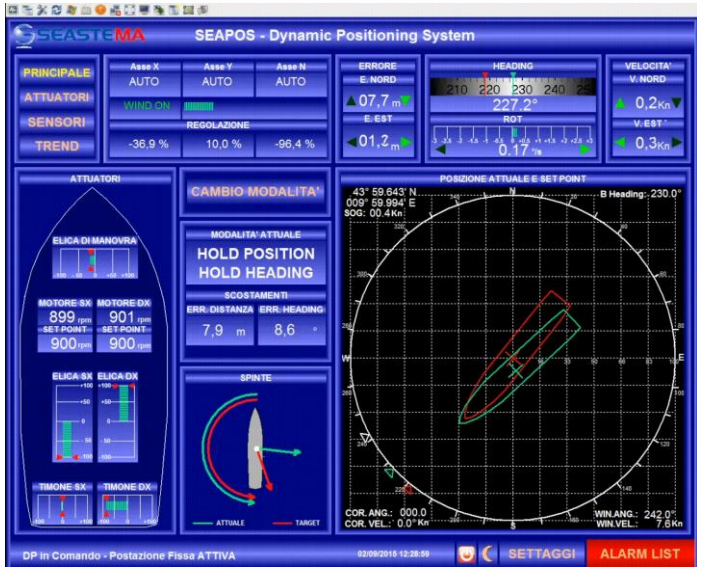
AUTO-REMOTE MANAGEMENT OF NAVIGATION SYSTEMS

Enabling Technologies for CONTROL



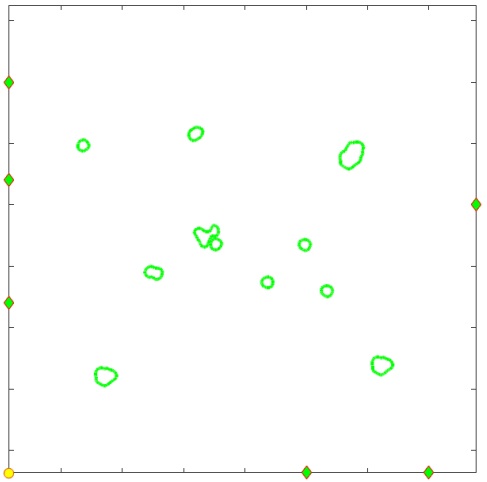
Enhanced Auto-Pilot System

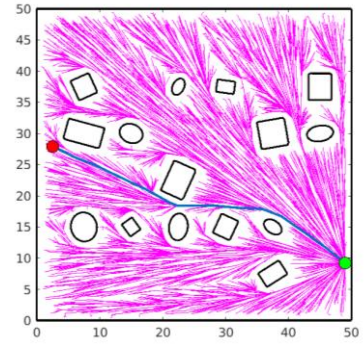
Docking Assistant



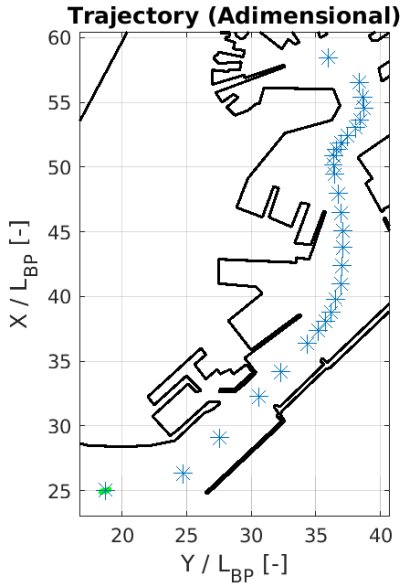
Dynamic Positioning

Enabling Technologies for GUIDANCE





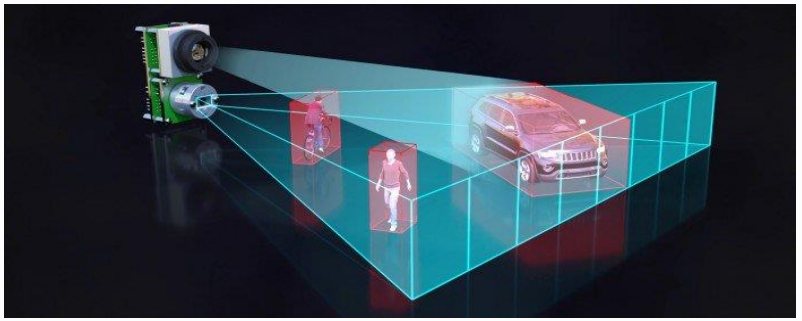
Collision Avoidance
Maneuvers at close range



Automatic piloting via PIM track control

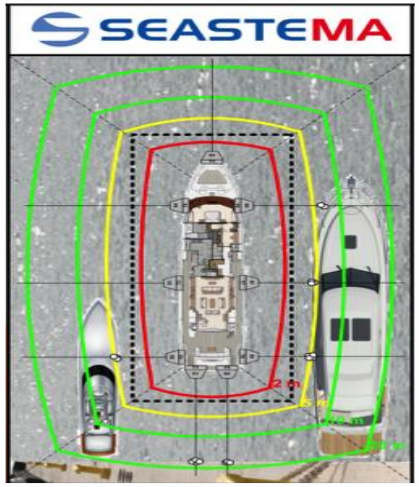
AUTO-REMOTE MANAGEMENT OF NAVIGATION SYSTEMS

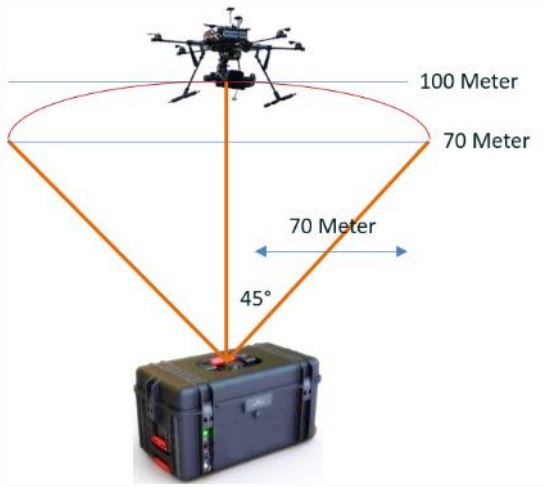
Situation Awareness *works combining multiple sensors providing a complete understanding of the ship's surroundings. It works integrating AI modules/machine learning techniques with sensors data fusion (radar, EO day-night-all weather, AIS)*



LIDAR proximity sensors from automotive sector

Radar proximity sensors from offhsore sector





'***bird-view***' reconstruction of vessel surroundings and obstacle detection via a '***tethered***' UAV

SEASTEMA R&D ACTIVITIES

H2020 ‘’TALOS” proposal

- Enable auto-remote operations of existing manned ships. This is the most promising market for unmanned technologies
- Challenge: development of a retrofit technological package to enable auto-remote control integrating on-board exhisting systems

H2020 ‘’E-NAVIGOMED” proposal

- MASS prototype for short-sea shipping in Mediterraneum sea | Small costal passenger ferry, abt 50 pax
- Challenge: Demonstrator with automated navigation, route planning, optimized mooring, assisted docking

Large UPV Concept Design

- Concept design to make unmanned a 50+mt. patrol vessel (NASS)
- Challenge: to integrate legacy systems in a complete unmanned architecture

H2020 “SOVEREIGN” proposal

- MASS prototype for short-sea shipping (90m autonomous cargo ship)
- Challenges:
  - Whole transport system approach
  - Autonomous capabilities, environmental & transport mission complexity
  - Navigational safety analysis and validation by fullbridge simulator
  - Back Office Support System (BOSS)

New Multirole 16 mt. USV

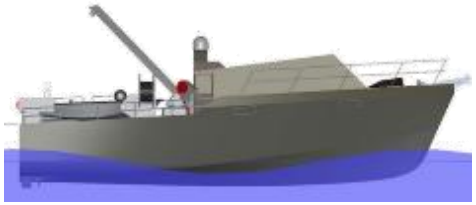
- Main missions: SAR/Patrolling
- Challenges:
  - Developing Decision Support System (DSS) for Automatic routing, Situation Awareness, Automatic collision avoidance & Autonomous navigation
  - Integration and fusion with a wide range of sensors and reliable Datalink

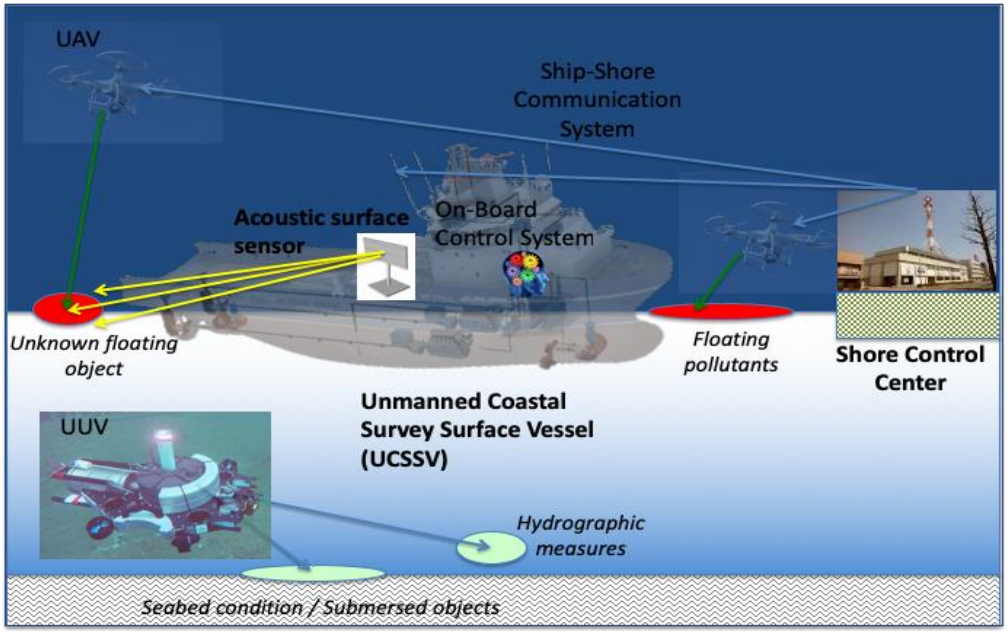
FOCUS ON ONE FO MAIN SEASTEMA R&D ACTIVITIES

«MARIN» Project | Ongoing | End 2021

- MARIN project is led by SEASTEMA and sponsored by the Regione Puglia with the objective of realizing a Technological Demonstrator of an unmanned coastal survey vessel acting as platform for aerial and submarine unmanned vechicles

- Missions: Remote Monitoring of Environment (Hydrographic measures, Seabed conditions, submersed objects, floating pollutants)





- Challenges:
  - Refit of UCSSV (Unmanned Coastal Survey Surface Vessel) | 17 mt. Fishing boat
  - Integration with other Unmanned Sub-systems (UUV, UAV)

Thank you

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