Mission management for Autonomous vehicles …

… and their hosts.

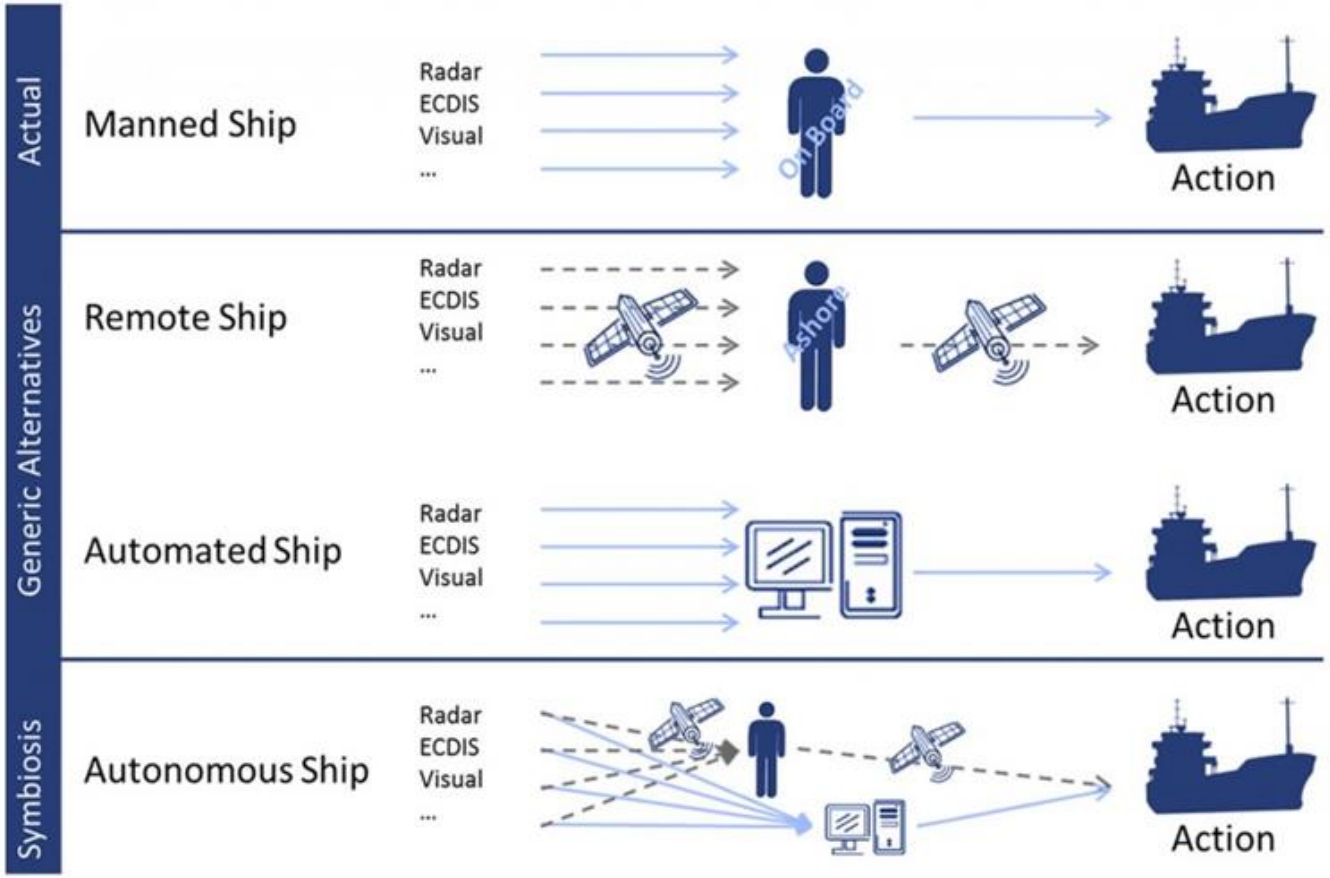
Integrated Mission Management

Commercial-in-Confidence

Command and Control (C2) – Joined up Warfare

- Can we **deliver C2** of autonomy to where it can be best exploited in the GEOINT battlespace?
- Can we **plan, control and exploit** these potential capabilities effectively and without a higher demand in personnel, systems and training?
- Can we deliver effective PMI and WSM to **assure safety** for other platforms?
- Can we **exploit what we already have** to deliver high performing autonomous capability to the fleet?
- Can we **keep it simple**?

Autonomy - Definitions



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Manpower and Autonomy

- **Quite a lot!**

Mission Planning and Oversight for both domains/missions

Operating Scenarios

- Force Protection
- Local Area Surveillance
- Wide Area Surveillance
- Mine Warfare
- Shallow water survey
- Wider Area survey
- Support to Boarding Operations

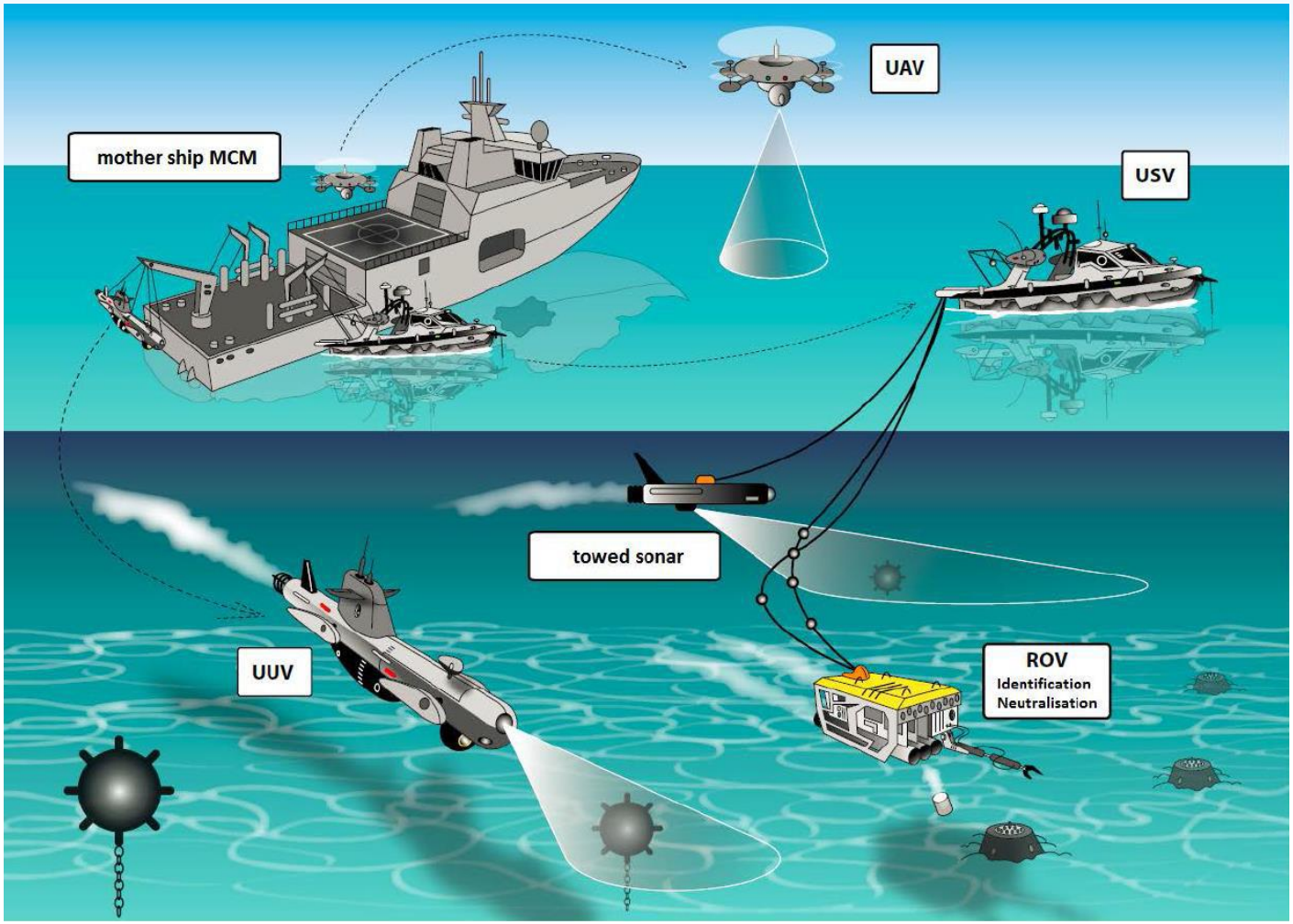
Force Protection

Local Area Surveillance

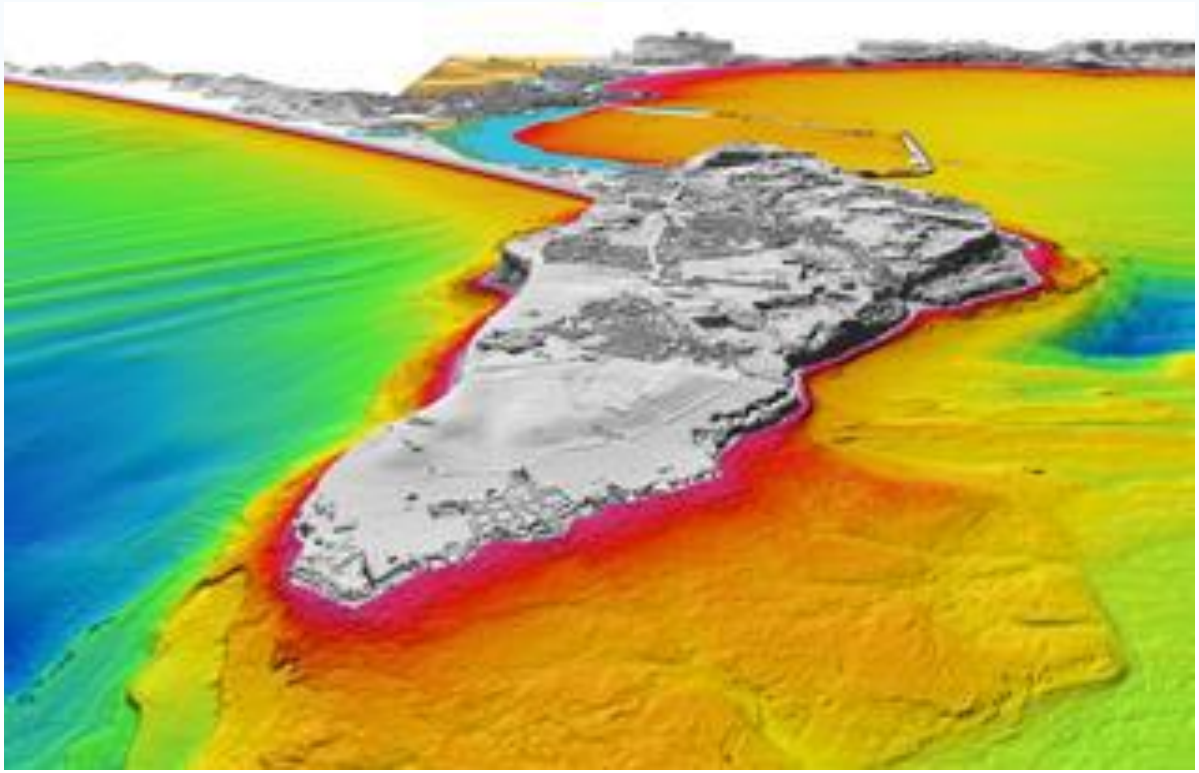
Wide Area Surveillance

Unmanned MCM development

BE/NL MCM - technology fusion



Shallow Water Survey



Wider Area Survey

Support to Boarding Operations

Autonomous Mission Cycle

EXamine – determine what the information gap is, what assets are available and what can done.

Programme – plan the mission(s), deconflict from other activity, run a safety check (depths, hazards, other routes), download this to the mission vehicle and share with other space users.

Launch – commence the mission when in the appropriate launch basket.

Oversight – manage the on-going mission, receive feed-back (position course speed depth and data stream), interact with the vehicle for real-time events/avoidance and emergent changes to plan.

Recover – determine best unit to achieve recovery (data or the vehicle or both) terminate the mission and reprep for subsequent tasking.

Exploit – share data with federated users/platforms and reach back to incorporate into the recognised GeoInt picture.

Existing ECPINS Capability

- Route Planning – waypoints, speed, XTE, Tidal and current offsets
- Route validation - Safety checks for varying depths, hazards and speeds
- Deconfliction between tracks (SUBNOTE function)
- Waterspace Management
- Tactical control of subordinate craft (T-ACT) – track control +++
- Messaging formats
- real-time replanning and transmission of updates
- Interoperability - NMEA message standards
- Communications ready – radio, AIS and SATCOM proven, but will be incorporated into UW digital high speed communications systems
- Tracking of 3rd party contacts (ARPA, Command tracks and AIS)
- Track and data Replay functions
- Route trace back and data sharing to other platforms
- 3D seabed mapping and exploitation, including terrain matching
  - **Already in use on RN, RDN, RCN, RAN and other Platforms (+USN)**

Challenges

- Deployed Sensor data transfer – bandwidth limits
- Endurance limits: power, propulsion, tidal impact and sea state
- Contact data – RADAR/SONAR/visual track data
- ASV collision avoidance:
  - Visual EO/RADAR sensors and COLREGS
  - Decision making – automatic rules, manual intervention, or oversight
  - National legislation/regulation (For a warship)
- AUV positional accuracy (EP, INS) – + Terrain Matching
- UAV positional data (own and targets) - in wide area surveillance this may be devolved as oversight and not control

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- Yes, we can.