Ongoing MASS projects in Norway

Sailing together: Striving for a future-proof IMO MASS Code

Sifis Papageorgiou – Principal surveyor / Technical coordinator for international work
Department for vessels and seafarers
Autonomous ship projects in Norway today

- Flagship projects: Yara Birkeland and Asko seadrones
  - Commercially active, testing phase
- Smaller, automatic passenger transport
  - MilliAmpere
  - Several cities are showing interest (Torghatten and Zeabuz paradigm)
- Ongoing USV projects
  - Reach Subsea
  - Deepocean
- Extensive R&D activity in academia and industry clusters (AUTOSHIP, AEGIS, SEAMLESS, SFI Autoship, AUTOFLEX)
# Ship characteristics

<table>
<thead>
<tr>
<th>Name</th>
<th>Ship type</th>
<th>Length (m)</th>
<th>Beam (m)</th>
<th>Capacity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yara Birkeland</td>
<td>Container feeder</td>
<td>80</td>
<td>15</td>
<td>120 TEU</td>
<td>In operation/ testing</td>
</tr>
<tr>
<td>ASKO seadrones</td>
<td>Ro-ro cargo</td>
<td>67</td>
<td>15</td>
<td>16 trailers</td>
<td>In operation/ testing</td>
</tr>
<tr>
<td>Deepocean – Ocean Challenger</td>
<td>ROV support vessel</td>
<td>24</td>
<td>7.5</td>
<td></td>
<td>Final design approval phase/ under construction</td>
</tr>
<tr>
<td>Reach Remote</td>
<td>ROV support vessel</td>
<td>23.9</td>
<td>8</td>
<td></td>
<td>Final design approval phase/ under construction</td>
</tr>
</tbody>
</table>
Yara Birkeland

- Fully electric
- Fallback states per mission phase and system
- After final approval: uncrewed – supervised from a ROC*
- Operational area
ASKO seadrones (x2)

- Fully electric
- Fallback states per mission phase and system
- After final approval: uncrewed – supervised from a ROC
- Currently automated: DC charging, docking/undocking, mooring, crossing
- Operational area
Reach Remote (x2)

- Hybrid diesel-electric propulsion system and battery package
- Fallback states
  1. Limp home with degraded system functionality
  2. Abort current operation and standby
     a. When sailing: stop and standby
     b. When in ROV operation: Recover ROV and standby
  3. Move to a set safe location [e.g. move out of safety zone]
  4. Controlled drifting
  5. Anchoring

- Uncrewed, with support vessel during testing, operated from ROC*
- Operational area: Haugesund area (testing mainly in Horten)
Ocean Challenger

- Hybrid diesel-electric propulsion system and battery package
- Fallback states
  1. Station keeping
  2. Towing
  3. Anchoring
- Possibility to be uncrewed, remotely monitored 1:1
- Operational area: not defined (Norwegian Continental Shelf)
ROC*

• Massterly concept
• Several working stations while enabling to monitor and control several vessels for several owners at the same time
Fjord1 (Lavik – Oppedal ropax ferry)

- No uncrewed operation – reduced crewing
- Preliminary approval
- Four vessels to be operated
## Current regulatory approach for autonomous ships

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National (Norwegian territorial waters and economic zone)</td>
<td>National rules. All current projects will be handled by exemptions where necessary. RSV 12-2020: Guidelines related to the construction or installation of automated functionality, with the intention of performing unmanned or partially unmanned operations. (based on IMO’s Circ.1455)</td>
</tr>
<tr>
<td>Between countries with bilateral agreements</td>
<td>No agreement up to date. Will be assessed on a case-by-case basis. (Norway just co-signed North Sea MoU)</td>
</tr>
<tr>
<td>International voyages</td>
<td>As per SOLAS exemptions and equivalences if possible, eventually MASS Code</td>
</tr>
</tbody>
</table>
Main challenges

- Technology/system qualification - standards in development phase
- Safety level – how to demonstrate equivalence
- Testing/validation methodologies
- ROC standards
- Remote operator competence standards
- Wide range of concepts and systems
Iterative design and approval process

Kickoff meeting

Sprint 1

Sprint 2

Sprint 3

Final approval
Next steps

- Non-mandatory MASS Code implementation
- RSV 12-2020 revision
- Collaboration within North Sea MoU