Maritime Autonomous Surface Ships
Development Challenges on Domestic and International Fronts,
informal presentation

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Purpose of Presentation

• Impacts of disruptive technology
• Disruptive technology in the marine transportation sector
• Overview of the political developments on maritime autonomous surface ships (MASS)
• Transport Canada’s role regarding MASS
• Policy questions surrounding future control centres
• Moving forward with MASS
Disruptive Technology

• Defined as a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up the market, eventually displacing established competitors.

• Recent trends have shown that the introduction of disruptive technologies raise questions regarding existing legislation and regulatory guidelines.
  – New business models tend to challenge the status quo.
Examples

airbnb

amazon

UBER

NETFLIX

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Disruptive Technology in Marine Transportation

• A MASS is defined as a ship which, to a varying degree, can operate independent of human interaction

• The degrees of autonomy are as follows (still under development):
  1. Ship with automated processes and decision support
  2. Remotely controlled ship with seafarers on board
  3. Remotely controlled ship without seafarers on board
  4. Fully autonomous ship

• MASS technological advancements are rapidly progressing
  – In November 2018 and within days of each other, Rolls-Royces & Wärtsiä undertook successful dock-to-dock navigation tests aboard ropax ferries

• Some solutions are being driven by industries that are not traditional shipping companies
  – Yara Project - Norwegian fertilizer company - The world's first autonomous, zero emission container ship
Political Developments

- MASS gaining political traction in North America
  - October 2017: Conference of the Great Lakes and St. Lawrence Governors and Premiers adopted a resolution to aim at developing the region into global centres of excellence for MASS
  - August 2018: Conference launched a Smart Ships Action Plan
    - A Smart Ships Coalition of the Great Lakes and St. Lawrence was formed
    - Michigan Tech University unveiled its Marine Autonomy Research Site and the first freshwater testbed

- International Maritime Organization initiated a regulatory scoping exercise
  - Interim guidelines for autonomous vessel trials are to be developed
  - Member states and organizations were requested to submit proposals for consideration by December 2018

- In addition, countries in the Baltic States, Finland, Japan, Norway, United Kingdom and South Korea, to name a few, are working on MASS concepts, in some cases developing domestic guidelines for operations (i.e., U. K.)

- Singapore has vested interests in shore-based control centres
Transport Canada and MASS

• Undertaking fact-finding missions to fully grasp the developments of MASS and its associated technologies (i.e., Norway, Finland)
• Participated in workshop on ‘Transport maritime durable et intelligent’ with the Réseau Québec Maritime May 31, 2018
• Took part in the International Maritime Organization Correspondence Group on the MASS Regulatory Scoping Exercise
• Engaged internationally to position Canada in appropriate organizations
• Founding member of the Smart Ships Coalition of Great Lakes and St. Lawrence (USA)
• Proactively engaging stakeholders through workshops:
  – Enables stakeholders to share their understanding of related commercial, legal, and operational issues associated with MASS
  – A first workshop, limited to the Canadian federal government, was held in April 2018 (29 individuals were present)
  – A second workshop was recently held on September 12–13, 2018. 100 participates from diverse private and public sectors
  – Feedback and information gathered will serve to develop legislative and regulatory frameworks for MASS on the domestic, transborder and transoceanic fronts
Control Centres

- Highly unlikely that MASS will be fully autonomous with no human interaction in the near future
- It is foreseeable that control centres will remotely operate shipping fleets in the medium to long term
- This brings to light a series of questions:
  - Where would they be located?
  - How would they be regulated?
  - What economic model would govern its operations?
  - How would they be certified and who would be responsible for certification?
  - What type of competencies would be required to remotely operate ships?
  - Would ship owners adhere to external control centres remotely operating their ships from a foreign jurisdiction?
  - How would countries react to a foreign control centre operating flag ships from other countries in its territorial waters or exclusive economic zone?
  - Should a tragic event occur, who would be legally held responsible? The flag state? The country in which is located the control centre? The country that accepts that a ship is remotely operated in its waters?
  - From an insurance perspective, how would this work?
  - What would be the recourses for affected parties in case of disputes?
Moving Forward

• MASS developments and in particular control centres are projected to create economic opportunities and potentially generate high-quality jobs

• The Government and interested parties’ role is to prepare the ground for the development, testing and full-scale deployment of MASS

• TC’s MASS policy developments and future regulatory and legislative frameworks require that we
  – Continues to take into consideration private and government stakeholders needs
  – Take into consideration international developments by foreign governments and regulatory bodies
  – Ensure that all appropriate parties are working in a common fashion (see next slide)

• TC is working with both the Ocean and the Artificial Intelligence Superclusters to ensure that MASS supports, and is integrated in, future Smart Supply Chain logistics developments

• TC is working on establishing a Mirror Committee of ISO’S Technical Committee 08

• TC is supporting IMO’s work related to MASS interim guidelines, which will be presented at MSC 101, and hopefully be in place for Fall 2019
Canadian Forum for Maritime Autonomous Surface Ships

• Through our engagement efforts, Canadian public and private stakeholders expressed the need for a Forum to:
  1. Foster a Canadian approach to support the MASS development and implementation
  2. Strengthen co-operation among Canadian public and private stakeholders
  3. Be a Canadian consolidated voice
  4. Collaborate and exchange with national/international counterparts fora

• Forum launched on April 11, 2019

• To support the above four pillars, the Forum is composed of three Sub-Committees that have distinct functional areas

Sub-Committee
Test/research and development

Sub-Committee
Domestic and international frameworks development

Sub-Committee
Strategic orientation and multilateral cooperation

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Next Steps for Subcommittees

Test/Research and Development:
• Proceed with the selection of an interoperability framework that answers subcommittees needs
• Workshop in Quebec City in September on MASS

Domestic and International Frameworks Development:
• Analysis of MASS at the international level
• Review of scientific litterature on MASS

Strategic Orientation and Multilateral Cooperation:
• Identification of best links with Artificial Intelligence in th epurpose of developing digital chain logistics

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INTER-AGENCY COOPERATION
TO SUPPORT THE RECOMMENDED APPROACH FOR CANADA AND MASS

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MASS & GLOBAL SUPPLY CHAIN: DATA CONVERGENCE

Traditional Approach

- Raw materials/physical products are modally transferred at ports towards final destination
- Ports act as data hubs containing a wealth of information that is currently underutilized

Shore Based Control Centers Supported by AI

- Enhances traditional approach by enabling the convergence of all supply chain data hubs in a single window, thus providing AI with minable information for logistics optimization
Leveraging SCALE AI & Ocean Super Cluster for MASS

1. Ocean Companies
   - Sea farming
   - Wild fishery
   - Offshore oil and gas
   - Marine renewables
   - Defence
   - Shipping
   - Marine bioproducts

2. Providers of Enabling Technologies
   - Suppliers, SMEs, researchers, and others who develop/provide:
     - Sensors and imaging
     - Subsea communications
     - Big data and analytics
     - Biotechnology and genomics
     - Autonomous systems
     - Robotics
     - Remote systems
     - Satellite technology
     - Ocean science

3. Ocean Supercluster
   - Vision: Build Canada’s ocean economy into one of the most significant, sustainable, and value-creating segments of the national economy.
   - Mission: Build an innovation-driven ecosystem in which companies are well-connected across different ocean-related value chains, and to suppliers of enabling technologies.

4. Shared Innovation Roadmap
   - Objectives for innovation include but are not limited to:
     - Ocean resource protection and monitoring
     - Safe and cost-effective remote operations
     - Enhanced operational performance
     - Advanced digital operations
     - Efficient data transmission

5. Cluster Building
   - Open call innovation projects
   - Talent attraction and development
   - International networks and cluster linkages
   - Branding and promotion
   - Cluster events and technology forums
   - Supplier development
   - Technology brokerage
   - Incubation, acceleration, and mentorship

6. Supercluster Outcomes
   - Deploy innovative technology platforms across ocean sectors
   - Strengthen links between ocean value chains and technology providers
   - Fill capability gaps in the innovations ecosystem
   - Extend global reach and market opportunities
   - Address global challenges related to sustainability, reducing carbon footprint, and improving energy efficiency