

Maritime Autonomous Surface Ships Development Challenges on Domestic and International Fronts

CISMaRT
Québec
November 27, 2019

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Canada

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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

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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

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Examples



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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-Royce & Wärtsilä 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](#)

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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

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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 participants 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

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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?

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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
- RDIMS # 15990231 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

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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



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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:

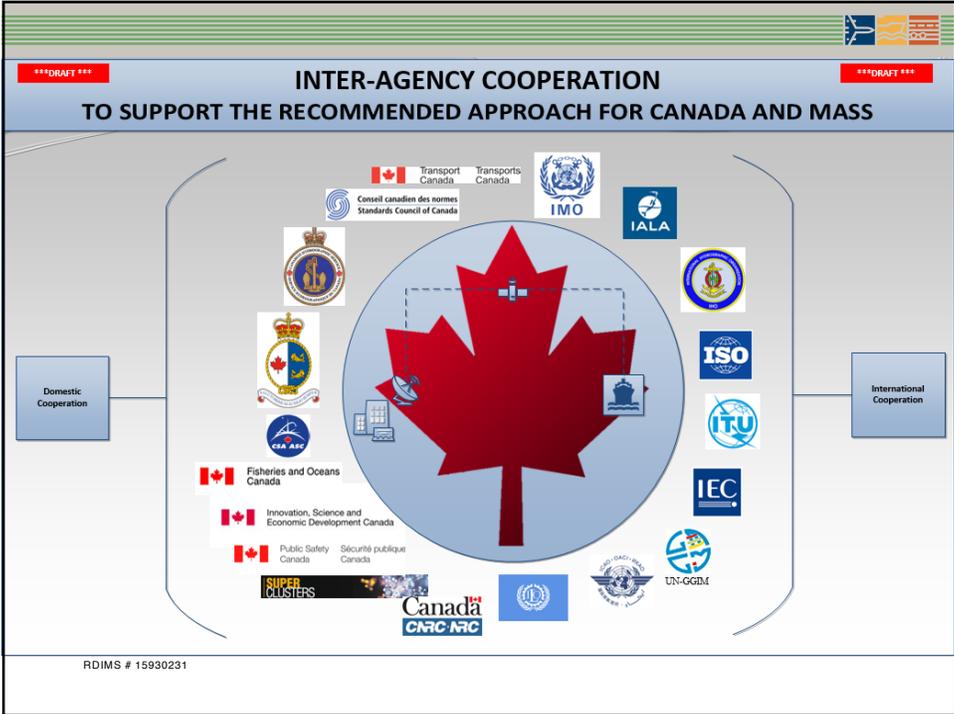
- Analysis of MASS at the international level
- Review of scientific literature on MASS

Strategic Orientation and Multilateral Cooperation:

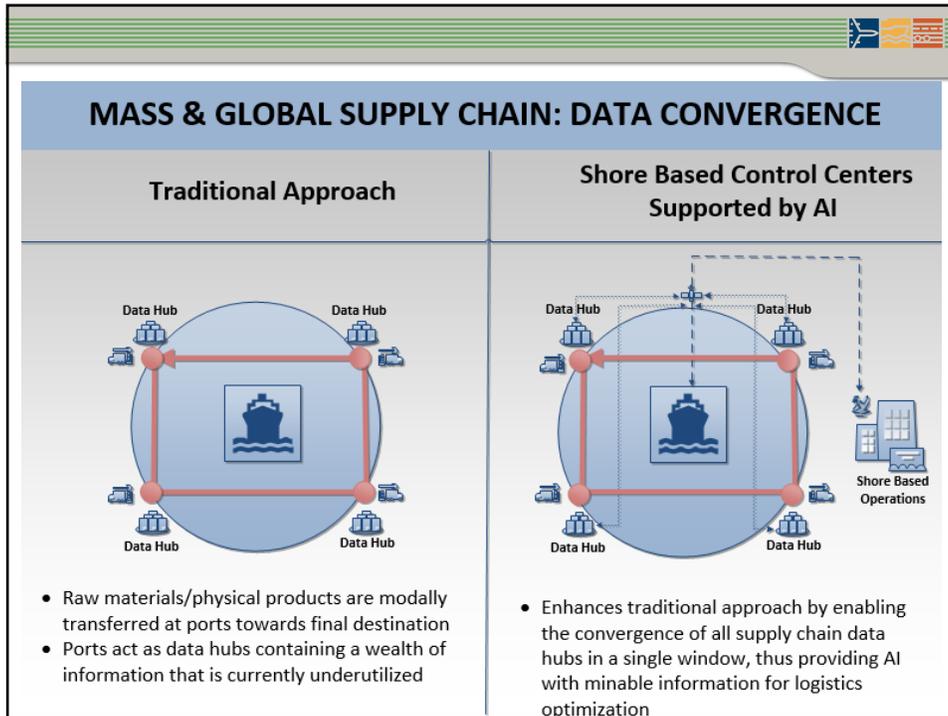
- Identification of best links with Artificial Intelligence in th epurpose of developing digital chain logistics

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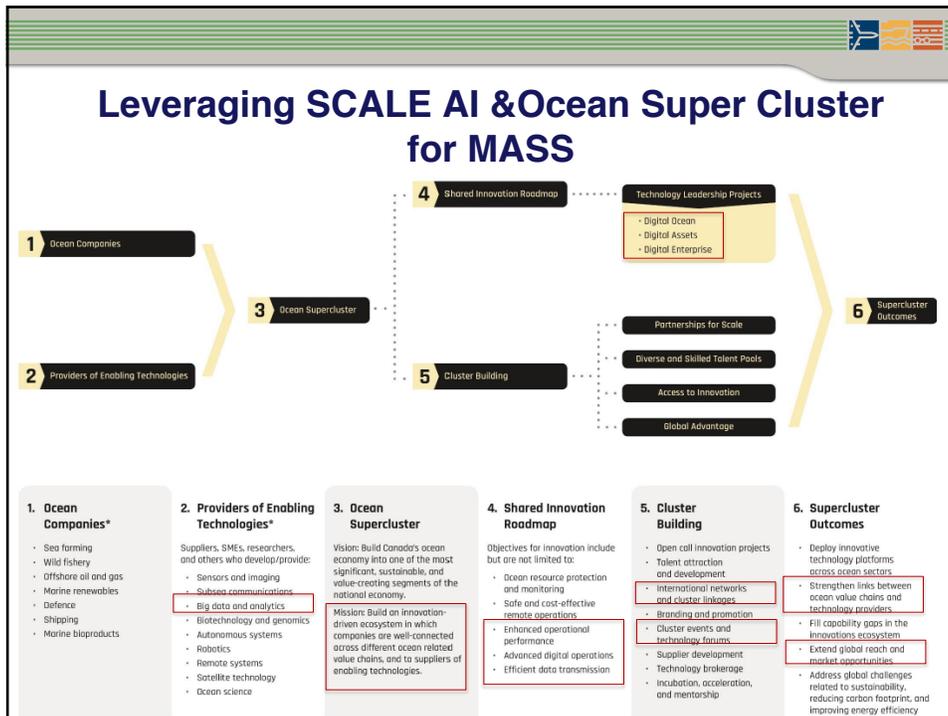
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