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Maritime Autonomous Surface Ships - A Mariner's Perspective

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Autonomous Technology in Shipping

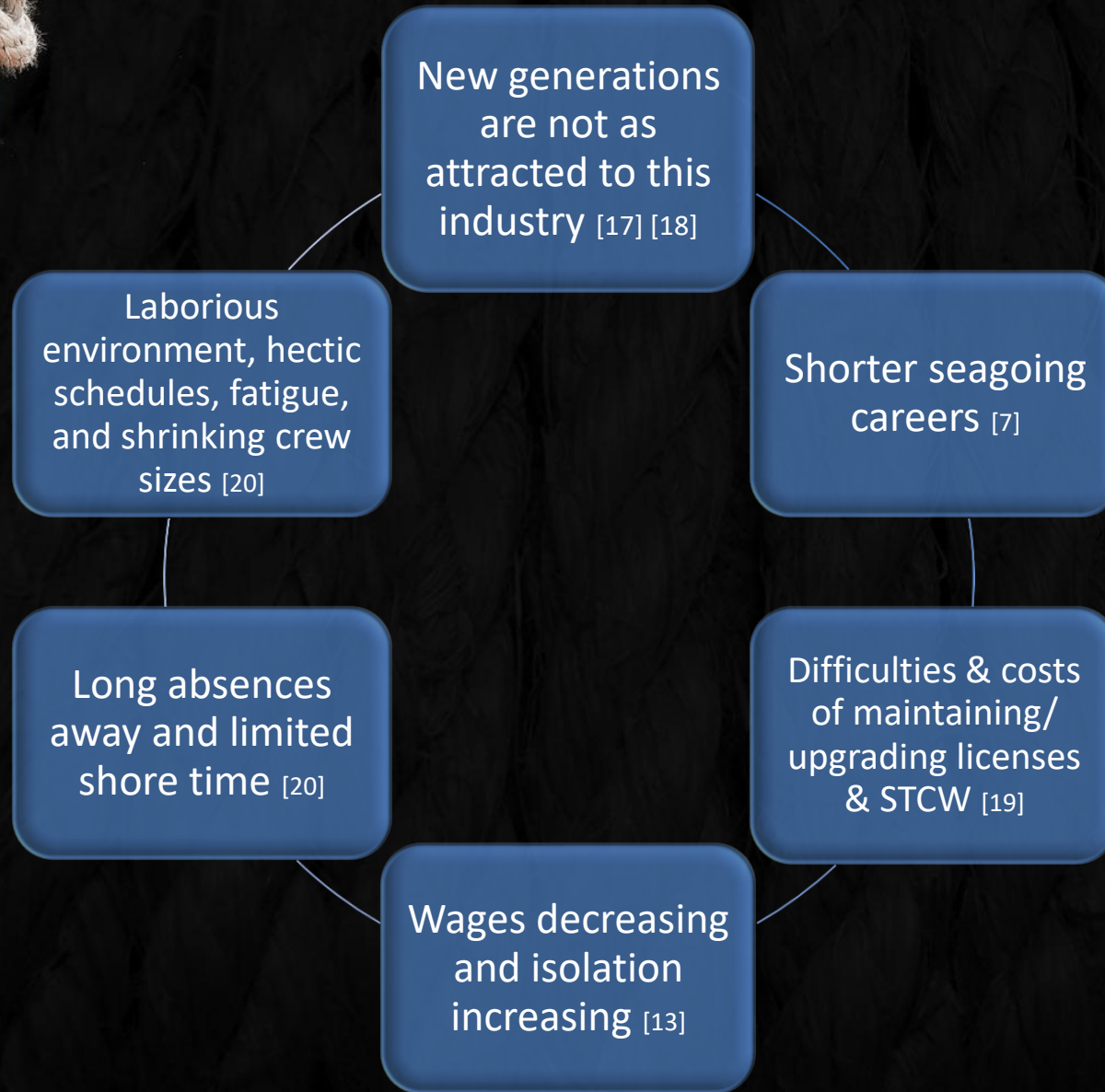
- Ships are being built larger with more advanced operating systems, and manned by a smaller, more specialized crew [2]
- **Maritime Autonomous Surface Ships (MASS)** are the next major step in the shipping industry [1], introduced globally in only a matter of time [2]
- Examples of MASS Projects:
 - NOVIMAR - EU
 - MUNIN - EU
 - MOL - Japan
 - YARA BIRKELAND - Norway
 - SEAFAR – Belgium
 - MAYFLOWER - UK
 - ZHI FEI - China
 - FALCO - Finland
 - DFFAS - Japan



Why MASS? Mariner Shortage [7] [8]

- Recruitment & training are not enough to fulfill the increasing global demand for seafarers [9]
- Global deficit of thousands of Officers [10]
- Shortage is expanding. Officer demand is increasing 10% every 5 years [11]
- Aging, retiring population [14]
 - “Average age of Washington’s maritime workforce is upwards of 54 years old.” [15]
 - “More than half of Houston maritime workers are over the age of 50.” [16]


Why MASS? Retention Issues [15]





Workforce in the Maritime Industry

- Need to diversify the workforce
- Need for established pipelines for skilled trades, Community Colleges, and University track students
- Exposure
 - Increase of internships, scholarships, and coops
 - Marketing and Communication
 - Mentorship
- Creating a regional Maritime Cluster to boost the economy to include autonomous systems and technology



Current Issues with Implementing MASS

- Regulation:
 - Slow to change
 - Liability
- Operational:
 - Collision avoidance systems
 - Overreliance on sensors
 - Situational Awareness
 - Further reduced crew, safety issues
- Training:
 - Mariners have to keep pace with increasing technological changes



Mariners Perspective

2019 Survey of 42 Licensed Deck Officers regarding the Onset of Autonomous Shipping:

- **76%** - Licensed Deck Officer skillsets will significantly change
- **62%** - MET will significantly change in the next decade
- **50%** - Those currently sailing are NOT adequately prepared for changes in the industry
- **90%** - Shipping companies, unions, & MET facilities are NOT adequately prepared for changes that will be brought on by autonomous shipping




Mariners Perspective

- **76%** - Cadets are NOT well prepared for these changes
- **79%** - Remote Control Centers will require operators who possess experience and credentials similar to current License Deck Officer experience and credentials
- **57%** - An increase in vessel automation will increase Licensed Deck Officers' over-reliance on sensors and could cause information overflow



Mariners Perspective


- 60% **disagree** that an increase in shipboard automation will reduce the number of navigational accidents or decrease their daily duties
- 71% **disagree** that reducing onboard crew while increasing shipboard automation is **safe**
- 76% **disagree** that Situational Awareness can be accurately replicated shoreside
- 2/3 believe that it will **not be safe** to operate vessels in the future as fully autonomous (level 4)



Mariners Perspective – COLREGs and MASS

COLREGs: 271 Licensed Deck Officers Surveyed

- Results:
 - Many barriers exist with the COLREGs with MASS implementation
 - Original COLREGs were preferred by majority of participants for majority of the rules
 - Minor amendments were preferred for some of the rules
- These results are generally in line with the results of the IMO's RSE. Preferred amendments include:
 - Adding/clarifying definitions to terms: master and crew, ordinary practice of seaman, crew ashore, lookout
 - Adding separate traffic separation schemes that are compulsory for MASS
 - All-around colored identification light for MASS



Mariners Perspective – COLREGs and MASS

- The strongest preference found was that NO part of the rules should be quantified
- Participants are Open to Some Change
 - 75% chose more than one amendment over the original rule
 - Participants with more years of experience with practicing the COLREGs are slightly more inclined to choose the amended rules versus participants with less experience

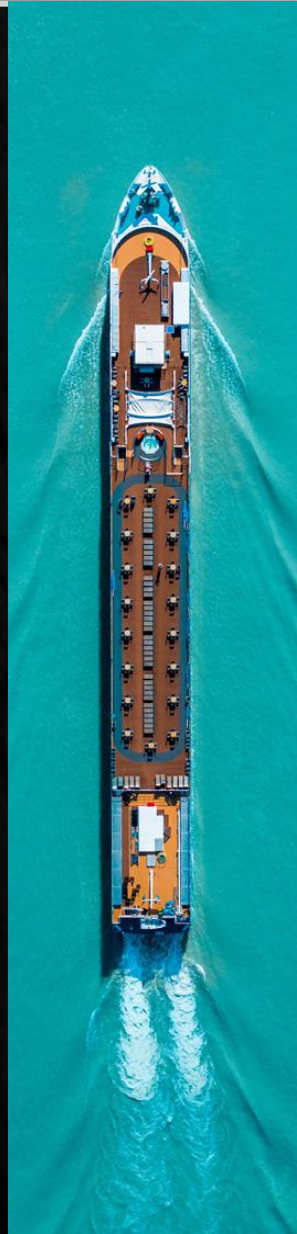
A bright future for Mariners

- Expected increase of the world's fleet [11]
- Global demand for freight is increasing and may triple in next 5 decades [21]
- Mariner demand may double from 2020 to 2040 [22]
- Mixed Environment: few vessels will be entirely autonomous in the next couple decades [11]; some vessels may never be automated
- MASS will need to be operated by competent mariners [3] [24]
- New jobs requiring mariner experience will emerge. Technical shoreside roles can be filled by retraining mariners [22]



A bright future for Mariners

- **The mariner is adaptable [23]**
 - With exposure, mariners are more willing to accept changes with technology & autonomy
- New technologies could improve working conditions, reduce workloads, and improve ship safety and maintenance [11]
- MET will appreciably change within the next decade [23] and new skills and STCW competencies may be required [25]
- Licensed Deck Officer training is recommended to be **required** for those who are Remote Control Operators [4] [5]



More Opportunities in Maritime Studies



ODU is focused on increasing R&D and/or training in:

- Autonomous systems
- Mission engineering
- Offshore wind
- Data science
- Cyber security, including maritime
- New School for Supply chain, logistics, maritime operations
- Workforce pipeline in skilled trades
- Increasing internships, coops, and networking for students
- Increasing small businesses with a maritime flavor in Hampton Roads- SBIRs



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Questions?

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