The 7th Maritime Silk Road Port International Cooperation Forum

Workshop on Digital Empowerment for Shipping Development

Improving the Safety of Navigation & the Sustainability of Shipping through the Introduction of Innovative Autonomous Shipping Technology in the Asia-Pacific Region

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Scope of Presentation

- Background:
  - The IMO's Maritime Autonomous Surface Ships (MASS) Code
  - Impact of autonomous Shipping in the Asia-Pacific

- **Part 1**:
  - Current Challenges to Shipping in Malaysia
    - Safety of Navigation
    - Sustainability in Shipping

- **Part 2**:
  - The Potential Impact of Autonomous Shipping in Malaysia

- **Part 3**:
  - Recommendations for Autonomous Shipping in Malaysia
  - Recommendations for Autonomous Shipping in the Asia-Pacific

Background

International Regulations on Autonomous Shipping

The International Maritime Organisation (IMO)

(Source: The IMO)

- ✓ **IMO** instruments such as the SOLAS, COLREG, MARPOL & ISPS Code are inadequate to regulate the advancement in autonomous shipping
- ✓ IMO is addressing this challenge by developing a goal-based **Maritime Autonomous Surface Ships (MASS) Code**
- ✓ The MASS Code will serve as a guideline to regulate **remote control** and **autonomous operation of ships**

Autonomous Shipping in Europe

- **Europe** is at the forefront of autonomous shipping development

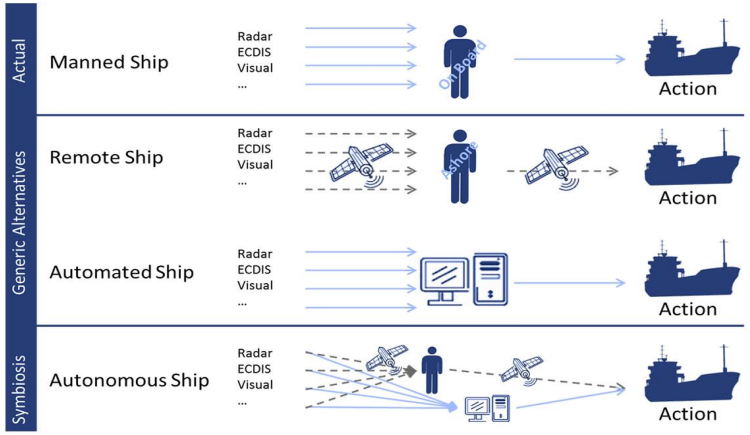
- Examples of projects and initiatives:

  - ✓ Kongsberg-Yara Birkeland

  - ✓ Maritime Unmanned Navigation through Intelligence in Networks (**MUNIN**)

  - ✓ Autonomous Shipping Initiative for European Waters (**Autoship project**)

Kongsberg-Yara Birkeland



MUNIN

Autonomous Shipping in the Asia-Pacific Region

- China, Japan, Republic of Korea, the Russian Federation & the United States of America are leading countries in the development of autonomous shipping technology

- Examples of projects and initiatives:
  - ✓ China's **Smart Ships**, the 1st autonomous ship, **JinDouYun-0**
  - ✓ Japan's **Centre for the Promotion of the Marine Innovation Strategy**, the autonomous ship **Suzaku**
  - ✓ Republic of Korea's **Korea Autonomous Surface Ship Project (KASS)**
  - ✓ The Russian Federation's **Autonomous and Remote Navigation Trial Project (ARNTP)**
  - ✓ The United States' **Automated Maritime Navigation and Control System (AMNCS)**

The Russian Federation's Autonomous Shipping

Source: Marinet, Russian Federation

Potential Impact of Autonomous Shipping in the Asia-Pacific Region

- **Navigation Safety:**
  - ✓ Eliminate needless voyages
  - ✓ Minimise the occurrence of incidents at sea

- **Sustainability of Shipping:**
  - ✓ Reduce environment impact
  - ✓ Seamless connections with other modes of transport

- **Economic**, **technological**, **social** and **human**:
  - ✓ Reform workstyles in ocean transport
  - ✓ Reduce workload on crew members
  - ✓ Reduce logistics costs

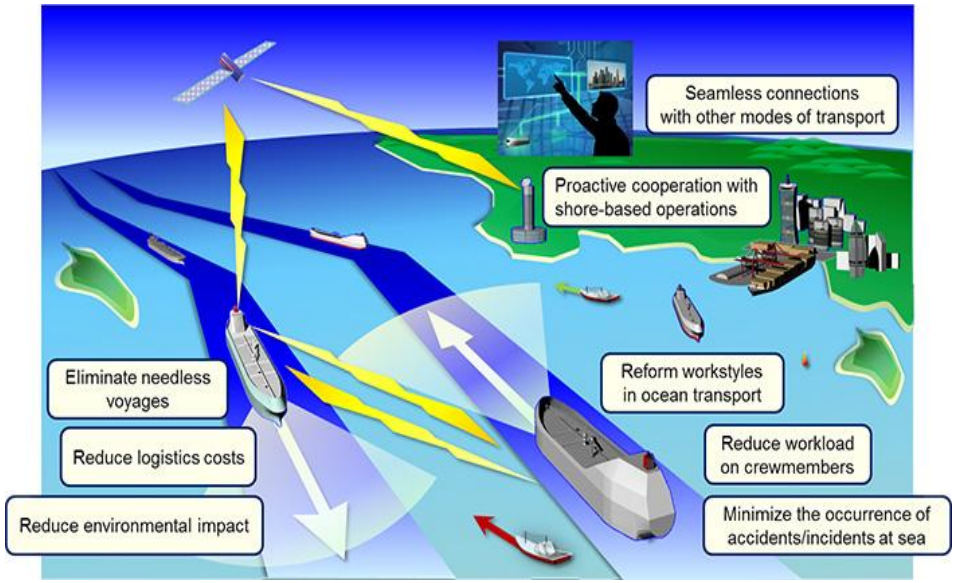


Illustration of Potential Impact of Autonomous Shipping

(Source: https://www.mol.co.jp)

Part 1:
Current Challenges to Shipping in Malaysia

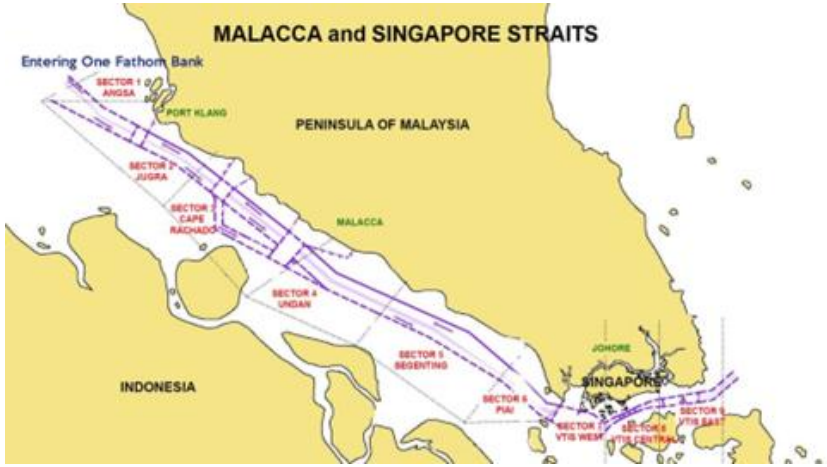
- As a council member of the IMO, Malaysia:
  - ✓ Complies with **IMO instruments** such as the SOLAS, COLREG, MARPOL & ISPS Code
  - ✓ Participates in the **IMO's programs** on safety of navigation & reduction of greenhouse gas emissions from ships & ports
- However, the **safety of navigation** & the **sustainability of shipping** remain as major concerns in Malaysia

Malaysia's participation in the IMO programs

(Source: Ministry of Transport Malaysia)

Current Challenges to the Safety of Navigation in Malaysia

- Malaysia collaborates the IMO & neighboring nations to improve the **safety of navigation** by:
  - ✓ **The Malacca Strait Patrols** and **Traffic Separation Scheme** help prevent collisions
  - ✓ **Malaysian Maritime Enforcement Agency(MMEA)** enforces maritime laws and regulations
- However, there are still **marine incidents** happening in Malaysian waters.



Traffic Separation Scheme in the Strait of Malacca
(Source: https://mehsoms.net)

A recent ship's fire in the Malaysian waters
(Source: Local daily)

Current Challenges to the Sustainability of Shipping in Malaysia

- Shipping has an impact on **marine ecosystems** and **climate change**
- **Maritime law enforcement** & **collaborations** among relevant agencies on environmental protection in Malaysian waters
- However, the Strait of Malacca is still challenged with some **maritime sustainability issues.**

Maritime regions in the Peninsular Malaysia
(Source: MMEA)

A recent oil spill from ships' collision in the Strait of Malacca
(Source: MMEA)

Part 2: SWOT Analysis for Impact of Autonomous Shipping on The Safety of Navigation

- **Strengths**:
  - ✓ **Safety improvement**
  - ✓ Enhanced situational awareness
  - ✓ Faster response time
- **Weaknesses**:
  - ✓ Lack of human oversight
  - ✓ **Limited regulatory framework**
  - ✓ Limited infrastructure
- **Opportunities**:
  - ✓ **Enhance the sustainability of shipping**
  - ✓ Real-time risk management
- **Threats**:
  - ✓ Public acceptance
  - ✓ **Cybersecurity vulnerabilities**
  - ✓ Economic implications

Illustration of an autonomous ship

Source: https://sync.cobham.com/

Part 2: SWOT Analysis for Impact of Autonomous Shipping on the Sustainability of Shipping

- **Strengths**:
  - ✓ Reduced emissions
  - ✓ Increased use of renewable energy
  - ✓ Improved coastal monitoring
- **Weaknesses**:
  - ✓ Potential for environmental accidents
  - ✓ Disruption of marine life
  - ✓ **Limited regulatory framework**
- **Opportunities**:
  - ✓ **Improved environmental sustainability**
  - ✓ Real-time monitoring and response
  - ✓ Advancements in sustainable technology
- **Threats**:
  - ✓ Potential environmental accidents
  - ✓ Disruption of marine ecosystems and wildlife
  - ✓ Inadequate enforcement of environmental regulations

Illustration of an autonomous ship

Source: https://www.porttechnology.org/

Potential Impact of Autonomous Shipping in Malaysia

➢ Improved Safety of Navigation (Strength)

- Autonomous shipping reduces the **risk of human error**

  ✓ Advanced sensors, computer systems, and AI can enhance **navigation safety**

  ✓ Improved **efficiency** and **reduced costs**

Illustration of an autonomous ship

Source: https://sync.cobham.com/

Potential Impact of Autonomous Shipping in Malaysia

➢ Reduced Environmental Impact (Opportunity)

- Autonomous shipping can reduce **greenhouse gas emissions**

  ✓ Use of alternative fuels and energy-efficient technology

  ✓ Potential for better management of marine ecosystems and reduced pollution

Kongsberg-Yara Birkeland

Source: https://www.offshore-energy.biz/worlds-1st-zero-emission-container-vessel-yara-birkeland-delivered/

Potential Impact of Autonomous Shipping in Malaysia

➢ Increasing Cybersecurity Risks (Threat)

- **Autonomous ships** are vulnerable to **cyber attacks**

  ✓ **VTMS** could be a risk to cyber attacks as the current **AIS system** which is an integral part of its system is vulnerable to security breach

  ✓ Threats to **safety** and **security protection**

  ✓ Need for strong **cybersecurity measures** and **regulations**

AIS & Cybersecurity Attack

Source: conference.hitb.org

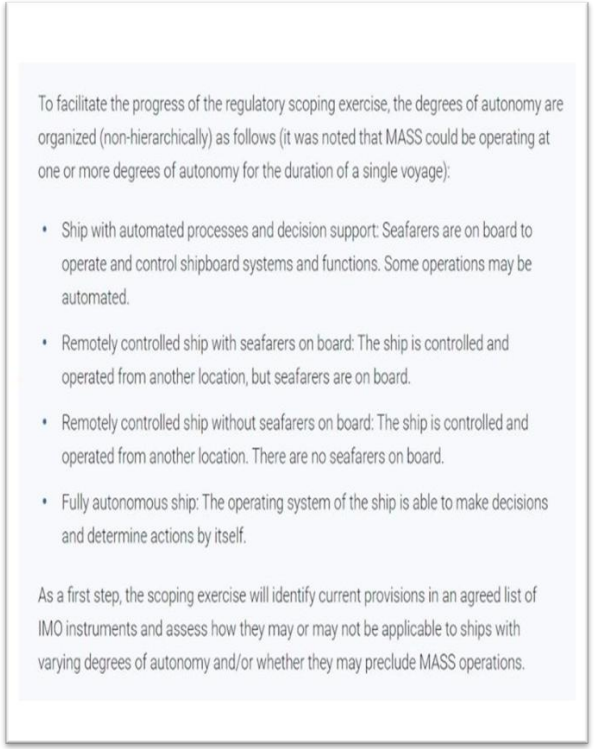
Potential Impact of Autonomous Shipping in Malaysia

- **Limited Regulatory Framework (Weakness)**

  - ✓ Limited **regulatory framework** on autonomous shipping poses a challenge

    - Need to comply with the IMO's **MASS Code** by 2028 to ensure safe and sustainable implementation

    - Malaysia to collaborate with the IMO & other countries on autonomous shipping



To facilitate the progress of the regulatory scoping exercise, the degrees of autonomy are organized (non-hierarchically) as follows (it was noted that MASS could be operating at one or more degrees of autonomy for the duration of a single voyage):

- Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated.
- Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location, but seafarers are on board.
- Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.
- Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.

As a first step, the scoping exercise will identify current provisions in an agreed list of IMO instruments and assess how they may or may not be applicable to ships with varying degrees of autonomy and/or whether they may preclude MASS operations.

The International Maritime Organization (IMO)'s News: IMO takes first step to address Autonomous Ships

Source: https://www.imo.org/en/MediaCentre/PressBriefings on May 25, 2018 ·

Part 3: Recommendations for Autonomous Shipping in Malaysia

➢ Enhancing Safety of Navigation

- ✓ Develop **regulations and guidelines** for autonomous ships based on IMO's MASS Code
- ✓ Provide **training and education programs** for stakeholders
- ✓ Improve the **VTMS monitoring system** to track autonomous ships
- ✓ Conduct regular **safety assessments** to evaluate performance and identify potential risks

Vessel Traffic Management System (VTMS)

(Source: http://rds.co.in/Marine.html)

Recommendations for Autonomous Shipping in Malaysia

➢ Mitigating Environmental Impact

- ✓ More stringent enforcement on **environmental laws**
- ✓ Incentivize the use of **clean energy sources**
- ✓ Promote **sustainable port infrastructure**
- ✓ Promote **waste management**

Malaysia's Contribution to the United Nations' Sustainable Development Goals (SDGs)

(Source: Mazlin Mocktar, Lee K E & S Sivapalan)

Recommendations for Autonomous Shipping in Malaysia

➢ Mitigating Cybersecurity Risks

- The **Cyber Security Malaysia (CSM)** & the **National Cyber Security Agency (NACSA**) are to further mitigate cybersecurity risks to be guided by The **National Cyber Security Policy (NCSP) &** The **Malaysia Cyber Security Strategy (MCSS)** 2020 – 2024

Cybersecurity in Malaysia

(Source: https://techwireasia.com)

- To enhance the VTMS/AIS monitoring system to counter risks to cyberattacks through:

  - ✓ Information-sharing on cybersecurity to prevent threats to safety and security protection

  - ✓ Coordinate training on countering cybersecurity measures

Recommendations for Autonomous Shipping in Malaysia

➢ Enhancing Regulatory Framework

- ✓ Enhance regulatory framework with the **IMO's MASS Code** by 2028 on the safety of navigation & the sustainability of shipping
- ✓ Collaborate with international organizations to develop global standards
- ✓ Collaborate with stakeholders to develop and implement safe & sustainable shipping practices
- ✓ Coordinate research and development in autonomous technology

Part 3: Strategy to Prepare Malaysia for Autonomous Shipping

- **Invest in Technological Infrastructure**: Invest in the necessary technological infrastructure to **support the development and operation of autonomous ships**, including its **regulatory framework**.

- **Enhance Navigation Safety**: Enhance **navigation safety** by promoting the use of advanced technology such as collision avoidance systems, electronic chart displays, and automated identification systems.

- **Promote Sustainable Shipping**: Promote **sustainable shipping practices** by encouraging the use of low-emission fuels, such as liquefied natural gas (LNG) and biofuels.

- **Develop a Skilled Workforce**: Develop a **skilled workforce** to support the development and operation of autonomous ships.

- **Foster Collaboration**: Foster **collaboration with other countries**, international organizations, & the private sector to promote the safe and sustainable development of autonomous shipping

Part 3: Recommendations for Autonomous Shipping in the Asia-Pacific

- **Enhance collaborations** with international organizations such as the IMO, United Nations ESCAP, APEC & ASEAN
- Encourage nations to enhance their **regulatory framework** & **VTMS monitoring systems** to track autonomous ships for safety of navigation
- Promote **information-sharing** among regional organizations and nations
- Establish a **regional task force** to address the potential impact on environment and local communities
- Coordinate and promote **research and development** on autonomous shipping

Conclusion

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