Training and Support Facilities for Ship Officers working in the Arctic

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Tokyo University of Marine Science and Technology (TUMSAT)
Tokyo University of Marine Science and Technology (TUMSAT) was established in October 2003 through the merger of two universities: Tokyo University of Mercantile Marine and Tokyo University of Fisheries. Although TUMSAT has only a 12-year history, the University boasts the long traditions of its predecessors, which date back to 1875 (Tokyo University of Mercantile Marine) and 1888 (Tokyo University of Fisheries).

Faculty of Marine Technology, the former Tokyo University of Mercantile Marine, has always been the leading academic institution in Japan in providing higher education for students wishing to become practical leading engineers who have acquired practical engineering expertise and techniques to identify problems, tackle important issues and provide solutions in a variety of marine, maritime and related fields.
In the Faculty of Marine Technology, the six-month Sea Training Course is provided for graduates from the Department of Maritime Systems Engineering and the Engine System Course in the Department of Marine Electronics and Mechanical Engineering.

The Faculty of Marine Technology is approved by the Japanese Government as a first-class training institute for navigation officers and engineers.

About 30% students of the faculty will become officers and engineers for an ocean liner.

Our university has training facilities for officers and engineers. However, these facilities are not taken into account for the operation at the northern sea route.
The Northern Sea Route (NSR) has long been regarded as the shortest sea route between Europe and Asia. However, until the last century, due to its harsh environment, the only ships that use the NSR were oceanographic ships conducting surveys. In recent years, the number of foreign merchant ships using the NSR is increased because the quantity of ice in the Arctic Ocean has been decreased.
Northern Sea Route handbook had been published by the Japan Association of Marine Safety (http://www.nikkaibo.or.jp/) in 2015.

The Handbook explains in simple terms the basic knowledge that is essential for navigation safety, environmental conservation, and daily life when using the NSR/Ice Sea.
Special skills and expertise are needed to sail safely through the NSR/Ice Sea.

- Early detection of ice by means of appropriate watch-keeping
- Estimation of the direction and speed of ice movement
- Visual determination of the hardness and thickness of ice
Conditions for Navigating NSR

- In order to use the NSR, the permission from the Russian government’s Northern Sea Route Administration (NSRA) is required.

- The main conditions for navigating the NSR
  - Application
  - Criteria for Permission to Navigate
  - Marine Traffic Control
The handbook is also mentioned the navigation and the engine operation on the NSR in practice.

- Principles of navigation
- Principles of watch-keeping
- Effective use of radar
- Sign of ice appearing
- Navigational watch-keeping teams
- Passage planning
- Principles of ship handling
- General ship handling methods
- …
Icebreakers in Japan

- Japan Coast Guard
  - Soya
  - Teshio
- Japan Maritime Self-Defense Force
  - Shirase
- Sightseeing vessels
  - Garinko II
  - Aurora
  - Aurora 2

- Training to navigate the NSR/Ice sea is basically depending upon organizations
How to Train Officers/Engineers?

- Since officers and Engineers who has enough knowledge to navigate the NSR/Ice sea are limited in Japan, training program and facilities are required.
- Special equipment such as the heater system to melt the ice on deck, decision support system which provides the recommended course and speed etc. are also desired.
UiT The Arctic University of Norway is the third largest in Norway and the northernmost university of the world.

Its location on the edge of the Arctic implies a mission.

The Arctic is of increasing global importance.

Climate change, the exploitation of Arctic resources and environmental threats are topics of great public concern, and which the University of Tromsø takes special interest in.
MAROFF and UTFORSK

- **MAROFF** will help realize the Government’s maritime strategy for the promotion of innovation and environmental value creation in the maritime industries.
- The program will contribute to maritime companies and research institutions development of their knowledge advantage, and supports projects that are oriented towards the research challenges that are necessary to achieve the three key innovation areas:
  - Environment
  - Advanced transport and logistics
  - Environment-friendly demanding maritime operations.
- **UTFORSK** Partnership Programme supports project cooperation between higher education institutions in Norway and higher education institutions in Brazil, China, India, Japan, Russia and South Africa.
- The overall aim of the UTFORSK Programme is to enhance long-term cooperation in higher education with the prioritized countries.
- The programme also aims to enhance the quality of international cooperation in education by encouraging links to research cooperation and work life.
The title of our MAROFF project is “Optimization of Ship Operations in Arctic Waters by Application of Sensor Technologies for Ice Detection, De-icing and Weather Data”.

The need for increased operational efficiency (economical, environmental)

Requires safer and environmentally friendly Platform Supply Vessels (PSVs)

Negative effects of icing (operational safety)

The offshore industry need further development of solutions for de-icing

Main Motivation: Troms Offshore Management AS is eager to further enhance the efficiency and safety of operating vessels in Arctic waters
The aim of our MAROFF project is to develop following systems:

- Development of ultrasound sensors and photogrammetric based system for measurement of ice thickness and ice accretion.
- Development and investigation of new surface technology for efficient de-icing with minimum energy consumption.
- Integration of onboard sensor data in a decision-support system that can provide the ship’s officers with an early warning of the risk of ice accretion.
Main objectives of our UTFORSK project are

- To get a better link between research and education in international cooperation
- To build cooperation in education on already existing international research projects
- To establish a robust and long-term co-operation between Tromsø and Tokyo within the education and research field of maritime technology
Tusen Takk!!