The SEDNA Project

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What is “SEDNA”?

- **SEDNA** stands for “Safe maritime operations under extreme conditions: the Arctic case”.
- **SEDNA** is a Horizon 2020 research project addressing topic MG-3.3-2016 (Safer waterborne transport and maritime operations).
- **SEDNA** has started 1 June 2017 (i.e. last week) and will run for three years.
- **SEDNA’s** budget is about €6.5 million

Consortium

No.	Name	Country	Expertise
1	BMT Group	UK	Project Management and ship modelling
2	University College London	UK	Anti-icing solutions voyage optimisation
3	Chalmers Technical University	Sweden	Voyage optimisation and bridge design
4	Architecture and Design University Oslo	Norway	Bridge design and Augmented Reality
5	University of Southampton	UK	Data science
6	MET Office	UK	Weather and sea ice forecasting
7	Cork Institute of Technology	Ireland	Maritime human factors
8	Aalto University	Finland	Safe ship operations and risk-based design
9	Lloyd's Register	UK	Maritime regulations and human elements
10	Aker Arctic Technology	Finland	End user – ship bridge technology
11	Stena Rederi	Sweden	End user – shipping line
12	Dalian University of Technology	China	Arctic weather and sea ice forecasting
13	Harbin Engineering University	China	Modelling of ship-ice interaction

The Background

- Due to global warming, larger parts of the Arctic waters are becoming navigable.
- Hence, ship traffic in the Arctic regions is increasing fast over the last years. In particular, Arctic tourism on cruise ships has **doubled** between 2004 and 2007.
- Moreover, it is estimated that around 13% of the world's undiscovered oil is located in the Arctic.

Operational challenges in the Arctic

- Highly variable and dynamic ice cover;
- Ice build-up on vessels (affecting stability);
- Changing wave climate;
- Almost 24 hour darkness in winter;
- Extreme air and water temperatures;
- Lack of specific navigational aids;
- Crews lack experience in Arctic waters;
- Remoteness – far removed from help.

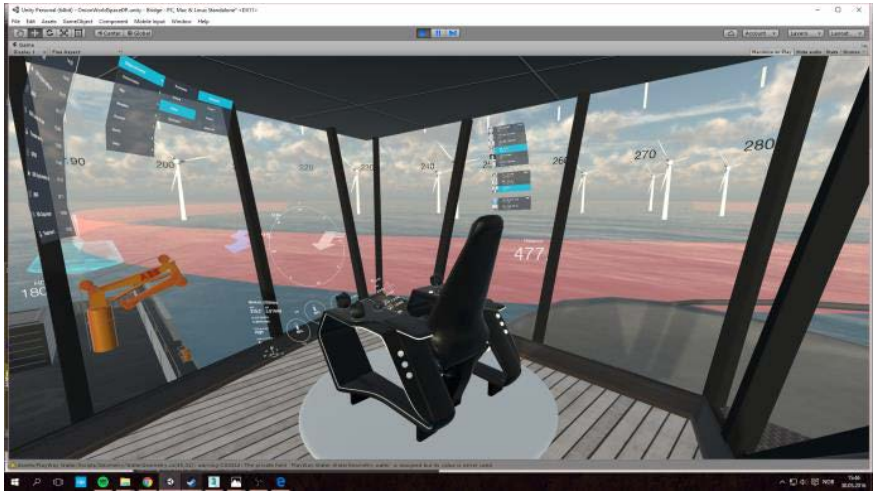
How will SEDNA address these issues?

The project's main objectives are as follows:

1. Create a human-centred "Safe Arctic Bridge" for ice-going vessels;
2. Combine ice monitoring and weather forecasting to optimise Arctic voyages;
3. Deliver anti-icing solutions for vessels;
4. Develop a 'risk-based design framework' to encompass all aspects of Arctic ship operation;
5. Analyse the safety of Methanol bunkering and the use of Low Flash Point Fuels in Arctic shipping.

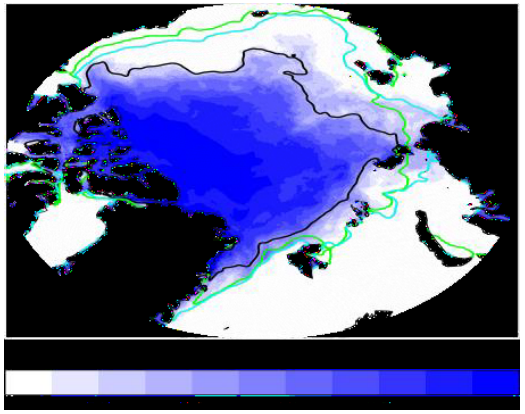
The ‘Safe Arctic Bridge’

- Optimising Bridge design for the Arctic means focusing on ice, weather and lack of charts rather than ship traffic.
- Development will be based on AHO’s virtual bridge prototyping system.
- Using Augmented Reality (possibly Head Mounted Displays) can increase situational awareness on the bridge and thus improve decision making.



Arctic Voyage Optimisation

- Develop a system for ship routing decision support.
- Factors to be included:
  - Meteorological and oceanographic data sets
  - Models for the prediction of weather and ice conditions
  - Accuracy of hydrographic chart data
  - Models for ship performance and fuel efficiency
- Integrate the output of these models into the Safe Arctic Bridge to provide crews with safest and (if possible) most efficient route.



Anti-icing engineering solutions

- Ice build-up on vessel superstructures can dangerously affect the ship's stability and interfere with navigation and communication equipment.
- SEDNA will develop anti-icing coatings mimicking the super-hydrophobic properties of penguins' feathers.

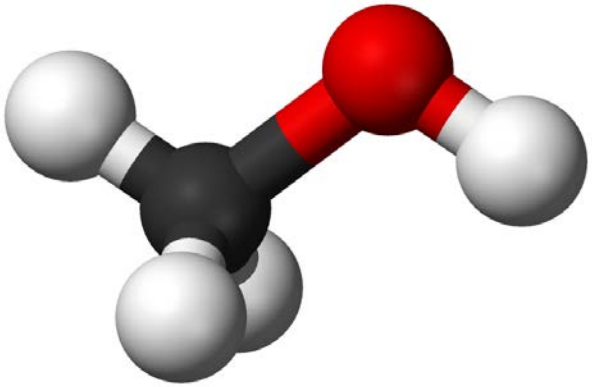
Photo by Glenn Grant

Risk-based framework for safe ship design

- Develop a design framework including the Arctic-specific challenges:
  - Ship-ice interaction
  - Integration of meteorological and oceanographic data to predict ice conditions
  - Previous accidents
  - Lack of specific human/machine interfaces and bridge technology
- Ensure that safe ships are designed for use in Arctic environments
- Determine extreme operational conditions for vessels according to their ice class, hence complement the IMO's Polar Code.

Low Flash Point Fuels

- Analyse safety risks in the bunkering of Methanol
- Provide safety assessments for the use of LFPFs in the Arctic
- Achieve a CEN Workshop Agreement (CWA) on the bunkering of Methanol
- Write IMO Inf papers



Demonstration and Validation

- We will test the outputs of the project in a variety of ways:
  - Usability testing in a simulated Arctic ship environment (Safe Arctic Bridge)
  - Field testing on real Arctic-going vessels (anti-icing coating)
  - End-user demonstration (Arctic Voyage Optimiser)
  - Test case study for a vessel in the Russian Arctic (Design Framework)
- In addition, stakeholder workshops with industry experts will help to "keep things real".

Thank you!