

第7回Arctic Shipping Summit参加報告 ～欧州海運界の北極海航行に関する動向～

海洋政策研究財団
海技研究グループ国際チーム
酒井英次



1. Arctic Shipping Summitとは？

1) 経緯

2005年にロイズの主導で始まった、北極海域の商業運航及び資源開発用機材に関する国際会議
(主催者:informa)

2) 過去の会議

■ 欧州

- Arctic Shipping Conference (Helsinki 2005)
- 2nd annual Arctic Shipping conference (St Petersburg 2006)
- 3rd annual Arctic Shipping conference (St Petersburg 2007)
- 4th annual Arctic Shipping conference (St Petersburg 2008)
- 5th annual Arctic Shipping summit (Helsinki 2009)
- 6th annual Arctic Shipping summit (Helsinki 2010)

■ 北米

- Arctic Shipping North America Conference (Montreal 2008)
- 2nd annual Arctic Shipping NA Conference (St John's 2009)
- 3rd Annual Arctic Shipping NA Conference (Montreal 2010)

informa
7th Annual
Arctic Shipping Summit
International Conference and Seminar
Tuesday 12th, Wednesday 13th and Thursday 14th April 2011
Helsinki Congress Plaza/Forum, Helsinki, Finland
www.arcticshippingsummit.com

TWO HALF-DAY SEMINARS (separately bookable) Friday 15th April 2011
AM Risk Management for Safe Voyages and Operations in Ice: Understanding 'total risk factors' for voyages in ice
PM Propulsion Systems in Ice-going Vessels: New concepts and possibilities

SAVE up to £400!
Book by 28th January 2011

New for 2011

- FOCUS on voyage planning for the Northern Sea Route
- ICE: overview, cargo stowage, on-board challenges, environmental considerations, Caseload developments, Polar Code update
- EXTENDED session on communications, infrastructure and AIS for navigation
- FOCUS on the number of essential roundtable discussion groups including EEDI for ice class vessels and DP in ice
- FOCUS on issues for offshore operations and design concepts for Arctic vessels

Simultaneous translation in Russian and English throughout the conference and seminar

Sponsors will include

MEMBER ACADEMY
Sergey Doronin, Deputy Minister, Ministry of Natural Resources of the Russian Federation

FEATURING

- Prof Paul Esker, Scot
- Prof Richard Holtby and Judge Business School, University of Cambridge
- Dr Michael Ingman, GECOM
- Frank H. Huggins, Director, Underwriter, CARGO AS
- Masa Imai, President, Akar Arctic Technology Inc.
- Hari Mohan Datta, Navant
- Robertson, Reaumur & White, Gøsses, Michres Couper
- Frank H. Huggins, The Shipping Company
- John Williams, The Aerospace Corporation
- Frank Zepfendorf, European Space Agency

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- Arctic Council
- Arctic Circle
- Arctic Council of Ministers
- Arctic Council of Ministers
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For more information and for info about programme, visit www.arcticshippingsummit.com

Organized by informa

Lloyd's List



1. Arctic Shipping Summitとは？



2. プログラム

<p>Day One: Tuesday 12th April 2011</p> <p>Chairman: Mikko Niemi, President, Aker Arctic Technology Inc</p> <p>0915 Registration and coffee 0930 Chairman's welcome 0945 Opening Address Keynote Address Sergey Denisov, Deputy Minister, Ministry of Natural Resources of the Russian Federation</p> <p>1015 PANEL DISCUSSION Environmental and Strategic Challenges for Arctic Shipping The Arctic is currently seeing an upsurge in political and economic activity as a result of shipping cuts in the summer months and prospects of large oil and gas deposits for future exploration and development. As a consequence, pressure on the Arctic environment is likely to increase in the light of these activities. This session will explore the strategic and environmental implications that impact on shipping and commercial development in the region, and include the following measures to the ASCA Report: Led by: Prof Paul Burkman, Head of the Arctic Ocean Geopolitics Programme through the Scott Polar Research Institute and Judge Business School at the University of Cambridge Panel: Dr Mikhail Goryunov, GECON Prof Gao Pingping, Ocean University of China Per Sandemir, Head of Centre, Danish Maritime Authority Simon Sævi, Polaris, Maldives Cooper</p> <p>1100 Coffee and networking break</p> <p>1130 Commercial Prospects and Risks for Hydrocarbon Developments in the Arctic Prospective developments and shipping needs for current and new projects in the Arctic, including the Barents Sea, Kara, Laptev, East Siberian, Kara, Pechora and Beaufort Seas. Espen Selstad, Senior Analyst, Fearnleys</p> <p>1200 Lunch</p> <p>1300 GREENLAND SHIPPING AND ENERGY DEVELOPMENTS Overseas is seeing increased development in both exploration offshore and in cruise shipping. The parcel will examine project planning, ice management and risk management for offshore projects, cruise vessels and steady traffic, using case study examples. Panel includes: Hans Kristian Olsen, Managing Director, Nunaal Johan Rafstedt, Rederi AB TransAtlantic</p> <p>1415 Tea and networking break</p> <p>1430 SEAFARERS' RESPONSIBILITIES AND LIFELINE SAFETY Attendees can choose one of the following groups: 1 Oil Drill Response in Ice Covered Waters Led by: Alex Orlov, Rederi AB TransAtlantic 2 EEDI for Ice Class Vessels Led by: Prof Kai Riska, ILS Oy 3 Effective Ice Management for Offshore Operations Led by: Alex Orlov, Rederi AB TransAtlantic 4 Ice Challenging Multi-Forecasting Led by: David Jackson, Arctic Director, Canadian Ice Service Helen Tangen, Regional Director, Norwegian Meteorological Institute</p>	<p>1500 Close of Day One</p> <p>1615 Drinks Reception at Restaurant Sams, Island Terrace (transport will be provided)</p> <p>Day Two: Wednesday 13th April 2011</p> <p>0915 SHIP OPERATING Chairman: Dr Mikhail Goryunov, GECON</p> <p>0930 BREAKFAST BREKING Breaking the ice without breaking the point ... or the bank Industry experience, criteria and expectations for double hull protection in heavy ice conditions How to optimise the performance of carrying ship hulls in warmer waters and how to deal with ice loading during summer periods Regulatory and environmental guidelines for the use of hull coatings in the highly sensitive and fragile Polar waters. Pioter Cygal, Area Sales Manager, Hydrex NV</p> <p>0945 Coffee</p> <p>0955 Chairman's welcome</p> <p>1015 POTENTIAL FOR THE NORTHERN SEA ROUTE: VOYAGE PLANNING AND EXECUTION</p> <p>1030 Status and Prospects for Development of the Northern Sea Route by Foreign Shipping Companies Review of the Russian flag acts, regarding the international navigation through the NSR Plans of shipping companies to develop the Northern Sea Route Criteria, which are suitable for identification of the companies interested in Arctic shipping Prospects and scenarios of the Arctic shipping in Russia Dmitry Tulupov, School of International Relations, St Petersburg State University</p> <p>1045 ICE SITES Planning a Voyage along the Northern Sea Route 2010 saw a breakthrough in the number of ships sailing through the Northern Sea Route and 2011 promises to bring even more vessels onto the route, to take advantage of melting gas ice in the summer season. Hosts/clients have received at least 15 requests for assistance in 2011 from oil tankers, cargo ships and bulk carriers along with other cargo assistances. What are the requirements for planning such a voyage? How do the Russian regulations impact on practice? How best to deal with the companies that make the voyages in 2010 and understand the legal challenges for cutting them into practice, with comments from class and maritime perspectives. Moderator: Oleg Gerasimov, Technical Editor & Nordic Correspondent, Lloyd's List Panel: Vladimir Mikheyevskiy, Executive Director, "Non-commercial Partnership of the Coordination of Northern Sea Route Shippers" Igor Plankov, Sococomfort Representative, Rosatomflot Felix W Tschudi, Chairman, Tradest Shipping Company Aleksandr Kuchenko, Deputy Director, R&D Center Seamas Svetlana Olga Gerasimova, Deputy General Director, R&D Center Seamas Comment: Reidun Haahjem, Senior Underwriter/Area Manager, Gard&S</p> <p>1100 Guidelines for Navigating Ice Covered Seas in Arctic Water Plan and schedule of update of Guidelines Determining points and topics relating to the navigation in Arctic waters</p> <p>1115 Switch Gyuha, Minister of Development Department, Nippon Kaiyokai (ClassNK)</p> <p>1130 Coffee</p> <p>1145 WORKSHOPS TO COMMUNICATE POLARICE TO INDUSTRY</p> <p>1145 European and Global Communication Requirements in The Arctic: Gaps and Solutions Study of all communication requirements in the Arctic: safety, navigation, emergency communications Have we been requirements for standard? Frank Zapperoffelt, Satellite Communications, European Space Agency</p> <p>1215 Broadband Satellite Communications Options for Future US Operations in the Arctic Introduction to research project Status of the Arctic Satellite coverage of the Arctic Providing broadband spectrum for the Arctic Leslie Wickham, Senior Engineering Specialist, Space Architecture Dept, The Aerospace Corporation</p> <p>1245 Audience feedback</p> <p>1300 Lunch</p> <p>1315 Developing Maritime Infrastructure in the Arctic: The Arctic Regional Hydrographic Commission Hydrography in general The IRD Needs and resources Challenges in the Arctic Charlotte Wain Havelstein, Head of Division for Hydrography and Marine Data, Danish Maritime Safety Administration</p> <p>1345 Real-Time Ice and Weather Information to Ships in the Arctic and Aids to Navigation Richard Hall, Business Development Manager, Kongsberg Satellite Services</p> <p>1500 Audience feedback</p> <p>1515 Tea and networking break</p> <p>1530 Using Remote Sensing to Detect Potentially Unmappable Ice Features Vladimir Smirnov, AARF and Dmitry Matkovich, ExxonMobil Upstream Research Center</p> <p>1615 Progress in Ice Navigator Training Update on the National Institute's proposals for a DP syllabus route to ice navigation training Capt David Snider, Maritech Polar Current Trends in Ice Navigation/ice Management Courses Use of simulators Training for offshore operations in ice Capt Christopher Heurns, Director, Centre for Marine Simulators, Marine Institute, Memorial University Capt Wilbo Hoffman, Maritime Institute Willem Barentsz Wladimir Kuznetsov, Admiral Makarov State Maritime Academy Svetlana Tulupova, Education Director, Kiyevskoboo Buy the latest marine conference proceedings! For more information: phone: +44 (0)20 7017 6000 / fax: +44 (0)20 7017 4176 / email: info@oprf.com</p>	<p>1645 The Latest Development within a Simulator Ice Model Results from a joint industry research project Development of new algorithms Ice management parameters and tuning Certified ice navigation training Bård E. Bjørnsen, Manager R&D, Projects and Business Development, Ship Manoeuvring Simulator Centre AS</p> <p>1710 Ice Navigation in Conjunction to ECDIS Carriage Requirement 2012 Ice charts Tracking vessel path through ice Costly errors On-board prediction of ice Ice navigation testing Anders Pjøltinger, Product Manager Navigation, Transas Marine International</p> <p>1735 Audience feedback</p> <p>1745 Close of day two</p> <p>Day Three: Thursday 14th April 2011</p> <p>0915 SHIP DESIGN AND TECHNOLOGY FOR POLAR VESSELS</p> <p>0930 BREAKFAST MEETING Supporting Human Performance in Cold Climates Hazards and performance influencing factors Measures for mitigating performance and risk Domenec Ujeuxart, Ice and Cold Operations Business Manager, Lloyd's Register</p> <p>0945 Development of Icebreaking LNG Carrier for Arctic Region Details of development study considering ice condition navigation in Arctic region and sailing terminal in Atlantic Performance model test in open water Ice hull strengthening and ventilation of equipment for operation in Arctic conditions Chang-Mun Joo, Senior Manager, Project Planning Team, Samsung Heavy Industries</p> <p>1000 Coffee</p> <p>1015 Chairman's welcome Dr Roger Davis, Director, Research & Product Development, Corporate Technology, ABS</p> <p>1030 Azpod – Clean Propulsion for Arctic Designing efficient propulsion system for ice operation Means to reduce fuel consumption and total emissions Dimensioning the power plant Propulsion motor technologies – designing to the ice operations Energy efficiency? Does it have any role in EIS (environmental design)? Samuli Hänninen, Area Sales Manager, Ice Vessels, Propulsion Products, ABB Marine</p> <p>1045 Modern RS Requirements for Propeller Blade Scantlings of Ice Going Vessels and Icebreakers Comparison with other methods and requirements in force Dmitry Samonichev, Principal Supervisor, Machinery Dept, Russian Maritime Register of Shipping Achim W. Andriessen, W. Everink, AB Steenberg, Russian Maritime Register of Shipping</p> <p>1100 New Propulsion Concept for Icebreaking Research Vessel Tees van Beek, Director, Propulsion Technology, Ship Power, Wärtsilä Netherlands BV Willy Dölling, Naval Architect / Technical Economist, Project Manager, Wärtsilä Ship Design Germany GmbH</p>
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2. プログラム

<p>156 The Role of Structural Monitoring in Arctic Operations Hao Ye, Director High Environment Group, Corporate Technology, ABS</p> <p>156 Coffee and networking break</p> <p>158 Regulations for Future Arctic Tankers - A case study based on recent Arctic shuttle tanker Robert Hindley, Project Engineer, Aker Arctic Technology Inc</p> <p>158 BREAKOUT UNDELETABLE DISCUSSION EPISODES</p> <p>1. Salvage in Ice Covered Waters Led by: Boase Nordard, Director of Operations, Titan Salvage</p> <p>2. Dynamic Positioning in Ice Led by: Capt Christopher Hoare, Director, Centre for Marine Simulation, Marine Institute, Memorial University</p> <p>3. Update on the Polar Code Led by: Andrew Kendrick, Vice-President, DMT Fleet Technology with representatives of classification societies</p> <p>4. Small Target Detection in the Arctic: Ice Hazards, Search and Rescue, Advanced Vessel Operations Led by: Sten Wærsted, Sea-Nawk Navigation</p>	<p>1636 Winterization Challenges: Practical Experiences and Case Studies Torel Spande, Product Sales Manager Heating, Tranberg AS</p> <p>1700 Experience with Icebreaking OSVs for the Caspian Sea Edvine Thøgersen, Head of ILM Section D11 - Marine Technical Department, Bureau Veritas</p> <p>1725 Audience feedback</p> <p>1730 Close of conference</p>	<p>TWO HALF-DAY SEMINARS (separately bookable) Friday 15th April 2011, Helsinki Paasitorni Congress Centre</p> <p>AM Risk Management for Safe Voyages and Operations in Ice: Understanding 'total risk factors' for voyages in ice</p> <p>PM Propulsion Systems in Ice-going Vessels: New concepts and possibilities</p> <p>0930 Registration and coffee</p> <p>AM RISK MANAGEMENT FOR SAFE VOYAGES AND OPERATIONS IN ICE</p> <p>0930 Chair's welcome and introduction: What are the specific risks and liabilities for operating in the Arctic and ice-covered waters? How can the human factor be quantified or predicted in harsh environments? What can be done to mitigate the risks? Assessing 'total risk factors' for a voyage in ice. Capt James R Parsons, Academic Director, MIM, School of Maritime Studies, Fisheries and Marine Institute, Memorial University</p> <p>0950 Identifying and Understanding Ice Conditions for Safe Navigation • Identifying hazards • Data collection and identification • Weather, winds and tides • Using available tools David Jackson, Acting Director, Canadian Ice Service</p> <p>1030 Discussion and feedback</p> <p>1045 Coffee</p> <p>1100 Managing Effective Operations in Ice • Practical guidelines • Identifying the key areas of danger and assessing the training and standards required • Ice management around offshore structures, ports and terminals: what can and can't be done • Can simulator training be an effective replacement for practical experience? • The 'human element' Anders Backman, Rønde AB Transatlantic</p> <p>1140 Legal Challenges for Operating in Cold Climates • Charterparty clauses • Safe port warranties in charterparties • Snow-berths and blue-berths in ice negotiation • Managing ice damage claims and disputes Andrew Rippen-Green, Solicitor, Stephenson Harwood</p> <p>1215 Insurance Aspects: Understanding Risk Assessment Strategies • What the insurer is looking for • How the insurer assesses the risk • Evaluating the risk Marius Schenberg, Senior Loss Prevention Executive, Gard AS</p> <p>1245 Discussion and feedback</p> <p>1300 Lunch</p> <p>1345 Registration for Afternoon Seminars</p>
<p>1570 Lunch</p> <p>STREAMLINE ONE: OFFSHORE DESIGN AND TECHNOLOGY FOR ICE AND COLD CLIMATES</p> <p>Chairman: Dr Roger Bass, Director, Research & Product Development, Corporate Technology, ABS</p> <p>1416 Offshore Operations in Harsh Environments New operators will provide updates on current and future offshore Arctic projects with an emphasis on support vessel requirements, safety, ice and risk management. Hans A Hansen, Maritime Manager, DP&S COG, Polarcus DMCC</p> <p>1500 Offshore Developments for the Barents and Kara Seas Main principles for creating an ice management system for offshore structures in the Barents and Kara Seas Masaru Ye, Seisaku K, Gudoshnikov Ye, Zubakin G, Buzin I, Yulin A, AARH</p> <p>1525 Tea and networking break</p> <p>1542 Integrated Arctic Simulators - basic component of ensuring safety of marine operations near ice-resistant platforms and terminals • Description of the research and computer package and design works for creation of two Integrated Arctic Simulators: • "Simulation University" - for simulating the operations of towing the platforms and installing them in the specified area under permissible conditions • "Simulator-Interaction" - for simulating the operations of various approach to the platform/terminal in ice conditions assisted by controllers and tugs, intervening during oil loading and departure to make after completion of loading • The technical solutions with regard to configurations and parameters of simulator components and their interaction as a part of integrated systems. Professor Evgeniy M. Anpolutov, Deputy Director, Kiylov Shipbuilding Research Institute</p> <p>1610 Winterization of Offshore Drilling and Production Units for Safe and Reliable Operation • What is winterization - what is included? • Winterization is key to increase safety and operability • How to ensure efficient winterization, and select the best measures • Some challenges and practical solutions Morton Mathieson-Larsen, Segment Director Arctic Operations and Technology, DNV</p>	<p>DESIGN CONCEPTS FOR ARCTIC VESSELS</p> <p>Chairman: Andrew Kendrick, Vice President, BMT Fleet Technology</p> <p>1416 New Requirements to the Design, Equipment and Supplies of Ships Navigating the Northern Sea Route Prof Lolly Toy, Head, Laboratory of Icebreaking Technology, CNIMF</p> <p>1442 New Ship Concepts for Arctic Trade and Offshore Operations in Ice Guido Schulte, Nordic Yards • The POLAR maritime cluster in Muckelbüllg/Wismar, Germany • Maritime cold climate technologies research • A201 (ASST LNG Containment for icebreaking Arctic LNGC) (LNG-FSC) Burghard Zimmermann, Nordic Yards, on behalf of the POLAR consortium</p> <p>1500 Conceptual Design of Arctic Shuttle LNG Carrier for Yamal • The POLAR maritime cluster in Muckelbüllg/Wismar, Germany • Design conditions and functional requirements for Arctic LNGC • The role and form of the different types of propulsion plant concerned Authors: Sui Mizumoto, Mitsubishi Heavy Industries; Kenji Tsunaga, Mitsubishi Heavy Industries; Jeremy Shiroki, Chiyohai; Rik-Arnt Sagenen, Aker Arctic Technology Inc</p> <p>1525 Tea and networking break</p> <p>1542 Multipurpose Line Icebreakers for the Baltic Sea: "Moskva" and "Sankt-Peterburg", Project 21900 • Engineering, construction, and full scale ice trials A.R. Fomichev, General Director, Baltiyskiy Zavod JSC, General Director of Sevnyaya Verf JSC, Shipbuilding Project Manager of OPRF</p> <p>1612 Developing an Energy Efficient Icebreaking Vessel • Selection of power based on operational profile • Utilization of energy saving measures within the vessel • How to manage the oil design requirements Genaro Jourdain, Chairman of the Board, Offshore Technology Center Ltd; Sebastian Sala, Project Manager, Deltamarin Ltd</p> <p>1647 Audience feedback</p> <p>1700 Close of conference</p>	<p>PM PROPULSION SYSTEMS FOR ICE-GOING VESSELS</p> <p>Chairman: Prof Kai Rinka, ILS Oy</p> <p>1430 Current and Future Propulsion Systems for Vessels in Ice • Designing to meet Polar Code requirements • Speed v. power • Understanding propeller/hull/rudder interaction with ice Prof Kai Rinka, ILS Oy</p> <p>1435 Audience Feedback</p> <p>1437 Industry Focus: New Propulsion Concepts for Operating in Ice • Are we ready for the future? • Durability and rating of podded propulsion systems for multi-year ice • Future developments Sami Hänninen, Area Sales Manager, Ice Vessels, ABB Marine</p> <p>1455 Experiences from Operation of Nuclear Icebreakers • Costs and crew training Authors: Captain Alexandr Oblevskiy, Head of Shipping Control Department, Rosmorrechflot</p> <p>1460 Prof. Lolly Toy, Head of Laboratory of Icebreaking Technology, CNIMF</p> <p>1510 Tea</p> <p>1516 Options for Dual Fuel in Ice Class Vessels Otto Wisdal, Director for Customer Support in Promotion and Sales, MAN Diesel & Turbo</p> <p>1600 LNG Fueled Vessels: gas engines propulsion systems, conversions, newbuildings and operating vessels • Rolls Royce Marine products (brief overview) • Use of natural gas (LNG) as marine fuel • Rolls Royce gas propulsion systems - gas engines • LNG ready class for marine building • Overview on Rolls Royce LNG fueled vessels currently under construction • Rolls Royce references on LNG fueled operating vessels Maria Anshole, LNG Fuelled Marine Systems, Technical and Business Development Campaign Manager - Fusion, Rolls-Royce</p> <p>1620 DEBATE SESSION • Assessing the alternatives: choosing the right system for the right situation • Consider battery power or other alternative fuel be used? • What are realities for using fuel cell power? • Impact of environmental regulations and EEDI • Will there be an EEDI in the Arctic or how would that affect future designs and fuel choice?</p> <p>1700 Close of seminar</p>



3. 各パネル・セッションでの議論のポイント

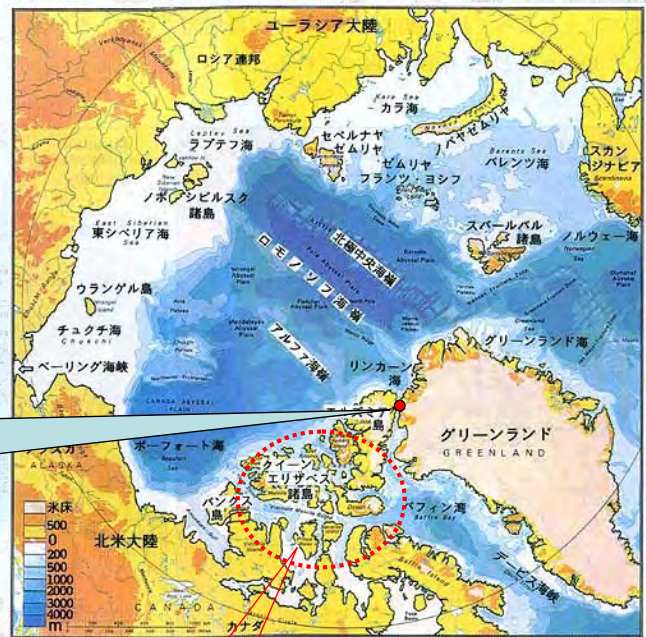
1) 北極海の開発と環境対策

■ クルーズ船とSAR(搜索救助)

- グリーンランド沖での観光船の無制限な増加
- Hans島



- カナダ多島海インフラ整備



カナダ多島海域



3. 各パネル・セッションでの議論のポイント

1) 北極海の開発と環境対策

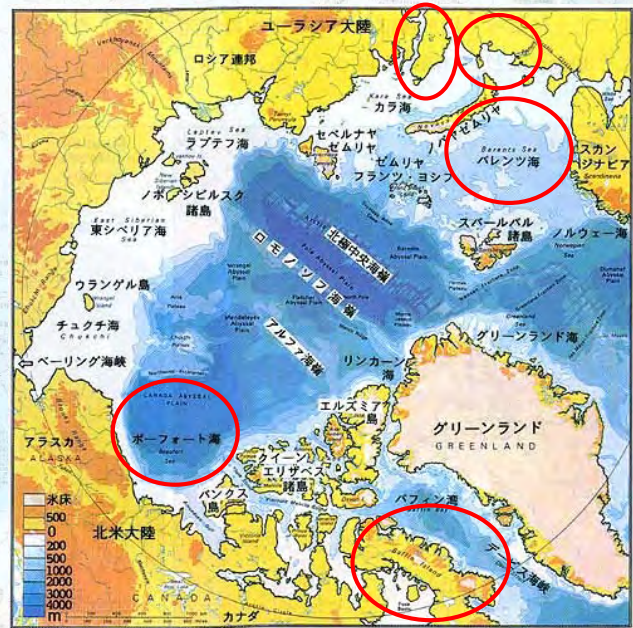
■ エネルギー資源開発の 経済性評価

Fearnleys社調査

- ボーフォート海、バフィン島、
- バレンツ海、ペチョラ湾、ヤマル半島



多数船舶が往来する将来像は描けず、
当面は "Niche trade"



3. 各パネル・セッションでの議論のポイント

1) 北極海の開発と環境対策

■ 流出油対策

油回収には有効な手段なし



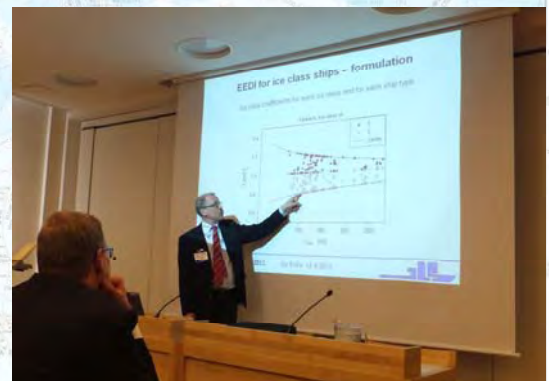
漁船に初期防除を義務づけるノルウェー方式
が有効な手段

■ EEDI (Energy Efficiency Design Index)

多目的砕氷船へのEEDI適用



大出力主機搭載の妨げとなる
アイスクラス船舶への設定には難航を予想



3. 各パネル・セッションでの議論のポイント

2) 北極海航路と海運

■ NSRに関するロシアの見解

- Mikhaylichenko氏(ロシア: Coordination of the NSR Usages)
NSRの商業運航に問題なし
- Pankov氏(ロシア: Sovcomflot社)
航行リスクについて評価と更なる低減が必要

■ 海運業界

NSRはリスクの多い航路。船舶、船員何れも十分な準備が必要



今後の動きは新NSR通航料制度の発表次第



3. 各パネル・セッションでの議論のポイント

2) 北極海航路と海運

■ 北極海航行指針

ClassNK→human factorが極めて重要。
STCWエリアに踏み込んだ航行ガイド

■ 通信・リモートセンシング

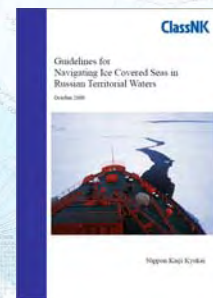
ロシア、カナダ、EU、米国による個別システム

- 採算性・国家安全保障の見地から統合には否定的意見

■ シミュレータ

航行訓練の国際規格はない

- 国際基準確立に向け国際関係機関への提言を予定



3. 各パネル・セッションでの議論のポイント

3) 氷海航行船舶関連技術

- 寒冷域における乗員作業性
主題として取り上げられたのは初
- 小物体探知技術(小氷山、漁船)
 - 多様なセンサー技術が存在するも完全ではない
 - 乗員のウオッチが最も重要な探知手段
- Polar Code (IMOの国際基準)
2011年10月の承認を期待



4. 総括

航路開発に至るプロセス

- (1)可能性の検討・障害となり得る事項の抽出
- (2)factsの収集・分析 ←北極海航路
- (3)evidences形成
- (4)verdict of evidences and the industry
- (5)将来予測・ロードマップ検討
- (6)appropriate measuresの策定
- (7)国際合意の具体化

4. 総括

北極海航路は2つのカテゴリがある

1) Non-Commercial NSR

ロシアの海としての内航航路

2) International NSR

- a) バレンツ海、カラ海以西の欧州向け航路
- b) シベリア以西を含む、東アジア向け航路
- c) 極東ロシアを中心とする航路

ご静聴ありがとうございました