Norwegian Space opportunities within the IAP program

Trondheim 270514
### Norwegian Space opportunities within the IAP program

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>09.30</td>
<td>Welcome</td>
<td>MARINTEK</td>
<td></td>
</tr>
<tr>
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<tr>
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<td>The AP Norway Role</td>
<td>APNorway - Kay Fjortoft</td>
<td></td>
</tr>
<tr>
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<td></td>
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<tr>
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<td></td>
</tr>
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<td></td>
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</tr>
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<tr>
<td>12.00</td>
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<td>NTNU - Atle Heksstad</td>
<td></td>
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<td>15.00 – 15.30</td>
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<td></td>
</tr>
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<td>15.30 – 16.30</td>
<td>Individual talks</td>
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</table>
Arctic challenges and possibilities

- A remote area with Ice, Aurora Borealis, and Midnight sun ...

- But also an area with great potentials for maritime innovation
Norwegian Space opportunities within the IAP program

Trondheim 270514
## Program

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• PANEL DISCUSSION
Norwegian Space Opportunities
MARINTEK, 27.mai 2014

Maritime Communication Aspects
Arctic Maritime Activity

- Transport
- Oil/Gas
- Research
- Fishery
- Tourism

WORLD CLASS - through people, technology and dedication.
Ships, oil and gas - and broadband services

WORLD CLASS - through people, technology and dedication.
IMO eNav MSP (Maritime Service Portfolio)

- MSP 1 VTS Information Service (IS)
- MSP 2 VTS Navigation Assistance Service (NAS);
- MSP 3 VTS Traffic Organization Service (TOS);
- MSP 4 Local Port Service (LPS);
- MSP 5 Maritime Safety Information (MSI) service;
- MSP 6 pilotage service;
- MSP 7 tugs service;
- MSP 8 vessel shore reporting;
- MSP 9 remote monitoring of ships systems

- MSP 10 Telemedical Maritime Assistance Service (TMAS)
- MSP 11 Maritime Assistance Service (MAS)
- MSP 12 nautical chart service
- MSP 13 nautical publications service
- MSP 14 ice navigation service
- MSP 15 Meteorological information service
- MSP 16 real-time hydrographic and environmental information services; and
- MSP 17 Search and Rescue (SAR) Service.
There is a communication gap!
How can we best fill it?
1. Norway has through their Small Satellite Initiative achieved a lot of value for the end-users like the Norwegian Coastal Administration. How can Norway further exploit this position with respect to maritime operations in the high north?

2. A reliable maritime communication and navigational system for Arctic, would as it seems today, require some form of satellite infrastructure. How can ESA, Europe, Norway and Norwegian industry pave the road for such an Arctic focused satellite infrastructure?

3. What can be said regarding the requirement for communication capacity in the Arctic. What kind of analysis have been accomplished, and what do we expect from the different actor groups (ESA, NCA, the Government, the industry)?

4. EGNOS today is valid up to 70 degrees north. What can be done in order to increase the coverage in the Arctic.

5. For ships in standard transit mode, the required GNSS accuracy is 25m, 1 sigma. Is this accurate enough for transit in the Arctic, considering the special conditions in this region. (Ice, level of surveyed waters)

6. The Norwegian AIS project is a great success, and provide valuable information on the shipping activity in the Arctic. Could you elaborate how this project is continued? Are there possible to start similar Norwegian satellite initiatives with other payloads?
E-Navigation
Maritime Navigation Aspects

Trondheim, Norway – Mai 2014

Kouchou Tagne Ulrich Alain
Nautical Advisor
Situation: Impact on the Human, Environment and Economy

Shipping is perhaps the most international of all the world's major industries.

- Loss of life
- Environmental damage
- Loss of economy

*Increased public interest and social responsibility*
Situation: 7 Accidents → 68 billion NOK

- Exxon Valdez: 19 billion
- Amoco Cadiz: 15 billion
- Prestige: 14 billion
- Costa Concordia: 12 billion
- Hebei Spirit: 1.5 billion
- Selendang Ayu: 0.5 billion
- MOL Comfort: 6 billion
Situation: Technology and the Human Element

- The navigation and communication technology are developing rapidly
- It has never been more technological support than today, yet it still occurs accidents
- Most maritime accidents are caused by direct human error

Do we have a good link between Technologies, Regulations, Procedures, People and Education?
e-navigation

Addresses the needs for

SYSTEMS
INTEGRATION COORDINATION
REGULATIONS
TRAINING
GUIDELINES
STANDARDS
The e-Navigation Concept

Intends to promote and facilitate:

- Safety, security, and efficiency in global maritime navigation and shipping;
- Communications, information and data exchange between ships and shore;
- Integration/presentation of information onboard/ashore for optimized decision-making;
- Global coverage with consistent standards and interoperability;
- Protection of the marine environment.
Key Components of e-Navigation

- Ship Component
- Shore Component
- Communication Component

User Driven
# 5 IMO Approved e-Navigation Solutions

<table>
<thead>
<tr>
<th>S1</th>
<th>Improved, harmonized and user-friendly bridge design</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2</td>
<td>Means for standardized and automated reporting</td>
</tr>
<tr>
<td>S3</td>
<td>Improved reliability, resilience and integrity of bridge equipment and navigation information</td>
</tr>
<tr>
<td>S4</td>
<td>Integration and presentation of available information in graphical displays received via communication equipment.</td>
</tr>
<tr>
<td>S9</td>
<td>Improved Communication of VTS Service Portfolio.</td>
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</tbody>
</table>

The combination of these solutions ensures a holistic approach to the interaction between ship and shore-based users.
“Single Window” implies involving all relevant Stakeholders - Governmental Authorities, Agencies, and Mariners
# Maritime Service Portfolio (MSP)

<table>
<thead>
<tr>
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<th>VTS Information Service (IS)</th>
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<td>MSP6</td>
<td>Pilotage Service</td>
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<td>MSP7</td>
<td>Tugs Service</td>
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<tr>
<td>MSP8</td>
<td>Vessel Shore Reporting</td>
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<tr>
<th>MSP9</th>
<th>Telemedical Maritime Assistance Service</th>
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<td>Maritime Assistance Service (MAS)</td>
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<tr>
<td>MSP11</td>
<td>Nautical Chart Service</td>
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<td>MSP12</td>
<td>Nautical Publications Service</td>
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<tr>
<td>MSP13</td>
<td>Ice Navigation Service</td>
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<td>MSP14</td>
<td>Meteorological Information Service</td>
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<td>MSP15</td>
<td>Real-Time Hydrographic and Environmental Information Services</td>
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<tr>
<td>MSP16</td>
<td>Search and Rescue (SAR) Service</td>
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</table>

**The objective of the MSP:**

To align global maritime services with the need for *infrastructure for information, communication, and monitoring* services in a clearly defined operational areas.
Other Considerations and Services

**Auxiliary Service Catalogue**

- Remote monitoring of ship's onboard systems
- Oil spill detection, monitoring, tracking, and response
- Anti-Piracy and security
- Non-SOLAS ships
- Integrated systems for improved and harmonized presentation of domain awareness
One of the main attributes of integrated maritime services is: the ability to combine information from a range of different data sources, and as such greatly enrich the maritime domain awareness picture.

EMSA
SIP and Objectives
(Strategy Implementation Plan)

• To identify a list of “tasks” needed to work towards the agreed solutions - **18 tasks has been identified.**
• To assigns responsibilities for the tasks and time scales
• To provides a time-line for the implementation

When completed in the period **2015 - 2019**, these tasks should give opportunities to the industry to start designing products and services to meet the e-navigation solutions.
The Four Key Guidelines

The user needs and gap analysis identified the need for guidelines.

- HCD for navigational equipment and systems
- Usability evaluation of navigational equipment
- SQA Software quality assurance
- Harmonization of testbed reporting

Work is already underway on these guidelines and they are attached to the SIP.
Key Enablers for Global Implementation

• The Guidelines on HCD, SQA and Usability
• Regulations and global standard for data exchange
• Maritime service portfolios
• Resilient communication and navigations systems
• Harmonized equipment standards on-board
• Ship / Shore interconnectivity and integration
• VTS and Coastal state infrastructure
Thank you for your attention!
## TASKs

<table>
<thead>
<tr>
<th>T1</th>
<th>Guidelines on Human Centred Design (HCD) for e-navigational systems</th>
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</thead>
<tbody>
<tr>
<td>T2</td>
<td>Guidelines on Usability Testing, Evaluation and Assessment (UTEA) of e-navigation systems</td>
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<tr>
<td>T3</td>
<td>Guidelines on electronic equipment manuals</td>
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<tr>
<td>T4</td>
<td>Formulate the concept of standardized modes of operation</td>
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<tr>
<td>T5</td>
<td>Investigate whether an extension of existing Bridge Alert management Performance Standards (PS) is necessary.</td>
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<tr>
<td>T6</td>
<td>Develop a methodology of how accuracy and reliability of navigation equipment may be displayed</td>
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<tr>
<td>T7</td>
<td>Investigate if an Integrated Navigation System is the right integrator and display of navigation information for e-navigation</td>
</tr>
<tr>
<td>T8</td>
<td>Member States agree on standardized format guideline for ship reporting so as to enable “single window” worldwide.</td>
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<tr>
<td>T9</td>
<td>Investigate the best way to automate the collection of internal ship data for reporting.</td>
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<tr>
<td>T10</td>
<td>Investigate the general requirements resolution A.694(17) and IEC 60945 to see how Built In Integrity Testing (BIIT) can be incorporated.</td>
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## TASKs

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<tbody>
<tr>
<td>T12</td>
<td>Develop guidelines on how to improve reliability and resilience of onboard PNT systems by integration with external systems.</td>
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<tr>
<td>T13</td>
<td>Develop guidelines showing how navigation information received by communications equipment can be displayed in a harmonized way.</td>
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<tr>
<td>T14</td>
<td>Develop a Common Maritime Data Structure and include parameters for priority, source, and ownership of information based on the IHO S-100 data model. Harmonization will be required for both use on shore and use on the ship and the two must be coordinated.</td>
</tr>
<tr>
<td>T15</td>
<td>Identify and draft guidelines on seamless integration of all the currently available communications infrastructure and how they can be used (range bandwidth etc) and what systems are being developed (for example, maritime cloud) and will be in use when e-navigation is live. The task should look at short range systems such as VHF, 4G and 5G as well as HF and satellite systems taking into account the 6 Areas defined for the MSPs.</td>
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<tr>
<td>T16</td>
<td>Conventions and regulations for navigation and communication equipment would be best carried out.</td>
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<td>T17</td>
<td>Further develop the Maritime Service Portfolios to refine services and responsibilities ahead of implementing transition arrangements.</td>
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<tr>
<td>T18</td>
<td>Draft Guidelines for the Harmonization of test beds reporting.</td>
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Maritime navigation aspects

1. The IMO eNavigation initiative is an important contribution to the mariners. How will it impact the arctic challenges?

2. What would be the most valuable (new) product and services within maritime eNavigation in the arctic?

3. Remote assistance and pilotage might be very relevant for future navigation support in the arctic environment. Do we have sufficient competence and technology to provide such a service? (There is already such service in the Arctic, although quite limited. Example there is a Compulsory pilotage service in Svalbard west coast. Should we extend our services)

4. In other countries and districts there are services collecting data from the users, which are shared with other users. Do we see the needs for such a service also in Norway, particularly in the Arctic? (Norway is exchanging AIS data with other countries and international organization such as UK, Ireland, Denmark, Helcom, EMSA.)

5. Autonomous operations is currently a "hot" topic. A trusted infrastructure is crucial. Is the infrastructure in the high north good enough? Indicates how we together can make it better?
Maritime observation aspects

1. Sentinel-1 is a new satellite ESA supports. How can this satellite improve arctic observations?

2. Integration of data to build a better situational awareness is claimed to be important. What kind of situational awareness is especially important for the arctic environment?

3. Ice monitoring and prediction is a central element. How can we give better support on ice monitoring to the mariners, and particularly distinguish between ice bergs and vessels?

4. Could you give examples of better earth observation support to maritime operations (safety, QoS, Integrity)?
Maritime observation aspects

Annekatrien Debien
Kongsberg Satellite Services
Earth observation - Applications and developments

• Currently
  – SAR-imageries delivery – NRT (RS2, CSK) and TSX, RISAT, Sentinel-1
  – iceberg detection
  – ice edge detection
  – automatic ship detection in open sea
  – oil spill detection / monitoring service
  – SAR wind

• Under development
  – Forecasting of ice edge drift in cooperation with Met.no
  – Sea surface currents

• Experimental
  – Ice floe drift
  – Wave (swells)
Satellite imagery for the Arctic

Planned route through the ice
6 hours
Actual route around the ice
3 hours
Satellite imagery for the Arctic
SAR-image delivery to ship in ice \(\rightarrow\) NRT eNav support - optimized for low bandwidth

Total file size: 1-2 Mbyte

Hans Eilif Larsen, KSAT
The Norwegian Arctic
Examples From The Arctic...
Examples From The Arctic...

MET.NO Ice Chart – March 6, 2013 – 14:00

KSAT Ice Edge Shape File – March 7

~20 minutes after satellite pass - 07:27:23 UTC
Examples From The Arctic...

MET.NO Ice Chart – March 7, 2013 – 14:00

KSAT Ice Edge Shape File – March 7

~20 minutes after satellite pass - 07:27:23 UTC
NRT Monitoring of ice edge
Maritime Situational Awareness (MSA):

- Increasing presence of vessels
  - Commercial (North East Passage)
  - Offshore oil & gas
  - Fisheries
- Detection, identification & tracking
  - General traffic safety
  - Resource utilisation
  - Extended security
- Norway operational since 1997
  - Defence/Coast Guard
  - Coastal Directorate
- Coordination of satellites and other surveillance resources
- Service improvement needs
  - Improved detection reliability
  - Discriminate other targets (icebergs)
  - Vessel details/information
  - Integrate new missions

Radarsat-2 August 2011
Red: EO detected vessels
White: AIS vessels
Detecting non-reporting vessels

Vessel positions from satellite images correlated with AIS information to detect non-reporting vessels (marked by red circles)
The emergency oil spill set-up scenario
Maritime Arctic challenges

1. The ice melting also gives new opportunities. The NE passage will reduce sailing time, but do we really know the new corridor regarding challenges (political and operational) and available infrastructure?
2. As a follow-up, the relation to Russia and the way they are controlling the NE passage is important to know. How can we assist to an open dialog regarding safe maritime operations in NE?
3. The new oil fields have multi-national companies involved. How can we build common understanding together?
4. What will be the most challenging new issue regarding arctic operation?
5. The safety aspect is number one on the priority list. How can space technology be used to increase safety? What about the cost element by using space technology in a safety perspective?
Maritime needs within O&G
The five major phases of an oil and gas (O&G) exploration and production (E&P) company's operations

**Exploration**
No dedicated e-com infrastructure is normally applied during this phase. Large amounts of data are stored on board the survey vessels to be processed ashore upon delivery. If a reliable broadband and qualified data link between the vessels and land would be accessible, the potential of saving time and money is significant.

**Appraisal**
This phase comprises careful planning of the production phase and its facilities, and hence also decisions regarding the e-com infrastructure solutions, from the more mobile exploration/appraisal stages to a fixed infrastructure supporting the installations for a long period (i.e. installation of fiber). An assessment scrutinizing the cost/benefit of pertinent communication solutions to meet the operational requirements is consequently needed to specify the infrastructure, the equipment, and to issue an RFP. Subsequent decisions on suppliers and follow-up on deliveries and installations, including testing, are additional crucial tasks in this phase.

**Development**
No dedicated e-com infrastructure is normally applied during this phase either. The dynamic positioning (DP) operations are central in a drilling process. Large amounts of data are stored on board the drilling vessels to be processed ashore upon delivery. The drilling activities are very costly and must be planned with a long perspective. The drilling rigs are hired by the operators.

**Production**
When production starts fixed fiber cables connecting the main offshore installation to the shore is normally installed, and both fiber cables and radio links are used to connect surrounding installations to this main hub. Previous studies have revealed current capacity demands around 100 Mbps for typical oil rigs in the North Sea. Operative predictions indicate significantly increased use of remote operations and control in the future, which again brings about higher bandwidth demands.

**Decommissioning**
Decommissioning is a large and complex multi-discipline project. Each decommissioning project is unique and each platform has its own unique challenges. Consideration for decommissioning should start in the concept phase of a new asset to ensure no unnecessary cost liability is placed on the operator. Decommissioning in design can increase the net present value of an asset significantly by making informed decisions in the design stage.
The 22nd licensing round - closing up on the polar ice rim
COINOR - Communications in the High North and other remote areas
Oil and Gas, Integrated Operations

**Generation 1**
- Integrated onshore and offshore centers
- Continuous onshore support
- Periodic onshore support

**Generation 2**
- Integrated operation centers of operators and vendors
- Heavily automated processes
- Integration across companies
- 24/7

**Generation 3**
- Task forces?
- Remote operations?
- Heavily automated processes?
- Less people, safer operations?
- New operation areas; arctic etc.
- Higher degree of collaboration between companies?
- Autonomy?

**Traditional processes**
- Self-sustainable fields
- Specialized onshore units
- Periodic onshore support

Ref: olf
R&D important for technology development, example:

Subsea factory?
Maritime needs within O&G

1. What is the status for ice detection from a Satellite EO point of view? When can we expect the opportunity to obtain ice thickness data remotely, and to reliably distinguish between icebergs and vessels?

2. The O&G sector needs qualified and accurate positioning data. What is the current guarantee level, and what is the expected progress within the next 10 years?

3. The e-com infrastructure is still highly underdeveloped in the Arctic. Can ESA or others take the lead for a (global) "High North e-com development program"?

4. The O&G sector is heading for more remote surveillance and control, but the security in SatCom data exchange is allegedly missing. Please reflect on security issues of e-com, both current and future options.

5. The O&G sector sees potential in use of UAV's and ROV's. If we appreciate the benefit of a UAV it is clear that price is an issue. Do we believe that SatCom (e.g images transfer) can compete with UAV's?