Technological challenges for Arctic shipping

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Technological challenges

• Communication
• Search and rescue
• Ports
Example – vessel stranded at 74°N
## Arctic communication challenges

<table>
<thead>
<tr>
<th>Systems</th>
<th>Characteristics</th>
<th>(&gt; 80° N)</th>
<th>(70° N - 80° N)</th>
<th>(&lt; 70° N)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HF, MF</strong></td>
<td>Safety related messages and voice communication</td>
<td>Low reliability and unsuitable for digital communications</td>
<td>Low reliability</td>
<td>OK, but unsuitable for digital communications</td>
</tr>
<tr>
<td><strong>VHF</strong>, <strong>GSM, 3G</strong></td>
<td>Line-of-sight (30 nautical miles), voice and low data rate communications</td>
<td>Ship-to-ship communication is OK. No connection to land based stations</td>
<td>Connection to a small number of land based stations. Ship-to-ship OK</td>
<td>OK close to the coast.</td>
</tr>
<tr>
<td><strong>GEO satellites, including Inmarsat</strong></td>
<td>Medium capacity. Low to medium latency</td>
<td>Not available</td>
<td>Potential problems with quality and availability</td>
<td>OK (except in fjords and similar special areas)</td>
</tr>
<tr>
<td><strong>LEO satellites; Iridium, OpenPort</strong></td>
<td>Currently max. 128 kbps. High and variable latency</td>
<td>Potential problems with quality</td>
<td>Potential problems with quality</td>
<td>OK</td>
</tr>
<tr>
<td><strong>HEO Satellites</strong></td>
<td>Properties comparable to GEO. Currently unavailable</td>
<td>Expected to provide coverage, capacity and quality in the Polar and Sub-Polar areas. Spare capacity can be used in other sea areas. Not yet implemented.</td>
<td></td>
<td></td>
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</tbody>
</table>
Inmarsat coverage Russian Arctic
Challenges facing Arctic SAR operations - Communication

- Ships
  - dot = ship/day
  - AIS-Sat1

- Probable Oil or gas
  - US Geol. Survey

- Shore based Maritime Radio
  - 0 – 10 Mbps

- Global satellites: Telenor, Intelsat, Inmarsat etc.
  - Up to 4 Mbps

- LEO satellites: Iridium
  - < 0,2 Mbps

Source: AIS-Sat 1 / Norsk Romsenter
Joint rescue coordination centres
Helicopter resources
Russian regulatory structure

Ministry of Transport (Mintrans)

Federal agency of maritime and river transport (Rosmorrechflot)

Federal State-Owned Institution "The Northern Sea Route Administration" (NSRA)

Federal State Unitary Enterprise "Romsorport"

Federal Budgetary Enterprise "State Marine Emergency Salvage, Rescue and Pollution Prevention Coordination Service" (Gosmorspassluzhba)

Federal Autonomous Enterprise "Russian Maritime Register of Shipping" (RS)

Federal State Unitary Enterprise "Hydrographic Department"
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<tr>
<td>Department of Navigation and Oceanography (Hydrographic service)</td>
<td></td>
<td>Russian Coast Guard</td>
<td>Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet)</td>
</tr>
</tbody>
</table>
SAR capability – Russian Arctic west
SAR capability – Russian Arctic east
Russian military development in the Arctic

Key Locations
1. Boda, Norway's National Joint Headquarters
2. Severomorsk, home of Russia's Northern Fleet
3. Naryan-Mar
4. Rogachevo
5. Nagurskoye
6. Sredny Ostrov
7. Alykel
8. Tiksi
9. Temp
10. Zvyozdny
11. Mys Shmidt
12. Uugolny

Russian civilian & military bases in the Arctic

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Some final points

• There are large needs for research technological solutions for the Arctic.

• There are a lot of ongoing work amongst authorities and regulatory bodies on specifying and defining standards and codes to be followed in these areas, but the technical solutions are not yet in place to provide satisfactory safety for personnel.

• There are challenges in the Arctic related to the different nations that are involved, internal organisation and resources needed to fill the special requirements for SAR operations in the area.

• More cooperation between researchers and final users is always beneficial.

• It is important to study and analyse real-life examples and user experiences.
A-LEX 2 – MARINTEK publications

Published papers:


Project reports/memos:

• Gribkovskaia, V. Russian organisations and documents related to Arctic shipping, 2014.
• Gribkovskaia, V., Kvamstad, B. Supporting technologies for safety at sea, 2014.
• Steinebach, C., Gribkovskaia, V. GMDSS in the Arctic, 2014.