Challenges for SAR operations in the Barents Sea

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This paper gives a brief overview of challenges in SAR operations in the Barents Sea. It presents statistics for historic SAR operations in the Norwegian part of the Barents Sea as a starting point. This is followed by a comparison between operational conditions in the North Sea and Barents Sea and the need for specific requirements for SAR infrastructure (including communication systems). The third part is a review of available SAR infrastructure and a discussion on the need for improvements and bi-lateral agreements on SAR operations between Norway and Russian Federation.
Accident and SAR statistics – Northern Norway

According to statistics from the Norwegian Coastal Administration, the most common causes of accidents in Norwegian waters at latitudes above 65°N from January 1981 to 23rd of August 2010 were collisions, fire/explosions, contact damages (quay, bridges etc.), leakages and capsizing, as shown in Figure 1. The most frequent cause is collisions, and taking a closer look at the environmental conditions during such accidents, we see that most accidents occur in smooth sea, in days with good visibility (see Figure 2 and Figure 3). Approximately 50% of the accidents occur during day time, in good light conditions.

**Figure 1 – Most common types of accidents at latitudes above 65°N from 1981 to 2010**

**Figure 2 – Wave conditions during collisions**

**Figure 3 – Number of collisions during different types of visibility**

**Figure 4 Number of accidents at latitudes above 65° N (note that the numbers for 2010 represents the 8 first months)**

**Figure 5 Accidents for different vessel categories**
In their annual reports RCC Bodoe lists actions taken based on incidents at sea, on land or in the air. Table 1 gives an overview of actions related to different types of incidents at sea. The table shows a significant increase in the number of assistance to ships in 2009 and 2010 and a small increase in the number of groundings over the five year period.

**Table 1 Distribution of at sea incidents recorded by RCC Bodoe 2006 – 2010**

<table>
<thead>
<tr>
<th>Type of incident</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistance to ships</td>
<td>104</td>
<td>119</td>
<td>116</td>
<td>278</td>
<td>366</td>
</tr>
<tr>
<td>Drifting vessel or object</td>
<td>35</td>
<td>53</td>
<td>35</td>
<td>40</td>
<td>37</td>
</tr>
<tr>
<td>Grounding</td>
<td>30</td>
<td>38</td>
<td>41</td>
<td>46</td>
<td>50</td>
</tr>
<tr>
<td>MEDEVAC</td>
<td>60</td>
<td>57</td>
<td>65</td>
<td>75</td>
<td>69</td>
</tr>
<tr>
<td>EPIRB</td>
<td>325</td>
<td>303</td>
<td>268</td>
<td>280</td>
<td>336</td>
</tr>
<tr>
<td>Others</td>
<td>148</td>
<td>131</td>
<td>156</td>
<td>216</td>
<td>207</td>
</tr>
<tr>
<td>Total number of incidents</td>
<td>702</td>
<td>701</td>
<td>681</td>
<td>935</td>
<td>1065</td>
</tr>
</tbody>
</table>

Figure 6 shows positions for most of the ship incidents where assistance from RCC Bodoe was given in 2010. Some of the operations have been to targets outside the Northern Norwegian SAR area.

**Operational conditions**

Figure 7 shows a map of maximum wave heights where it is seen that the highest waves are found in the Norwegian Sea and that the height is reduced in the Barents Sea.
Arctic and Antarctic Research Institute (AARI) have collected metocean and ice data for the Barents Sea. The conditions vary significantly and AARI have prepared Figure 8 where the Barents Sea is divided in 8 sectors according to ice conditions. As can be seen the Norwegian part of the Barents Sea is mostly all year ice free. The exception is waters north and east of Svalbard.

In a workshop at MARINTEK in December 2010 Norwegian Meteorological Office presented new figures showing areas with polar lows. Polar lows are small scale phenomena which at present is difficult to predict. They are connected to rather strong winds and fast weather changes. Figure 9 presents locations of birth of polar lows recorded the last decade.
One major additional challenge for SAR operations in the Barents Sea is the distance from shore-based resources to a vessel needing assistance. The low traffic density will also reduce the vessels of convenience that can be requested to take part in SAR operations. For some of these vessels of convenience one should also be aware of crew member’s lack of experience of arctic working conditions and in some cases lack of proper clothing for outdoor work.

Low water and air temperatures will reduce the survival time for persons falling into the sea so a quick response is necessary to save lives in such cases. Darkness is another challenge in the winter season while summer fog may introduce an additional challenge in the summer season. Heavy snow showers will also reduce the visibility and may in specific cases restrict helicopter operations. Electronic or infrared tracking may be options for low visibility operations.

The future emergency and SAR operations will have higher demands to information exchange and information access compared to today’s operations. One example is that Norwegian tugs which operates in the Arctic, are now been equipped with technology for remote monitoring of tug operations. Live video will be transmitted near real time from the tug to the operation centre in Horten. However, this is challenging because today’s communication infrastructure in the Arctic is not sufficient neither with regards to the coverage or the capacity demands. In areas outside reach of mobile systems (GSM/3G, ICE), one have to use satellite systems. VSAT and other geostationary satellite communication systems are expensive both in investment and use, and do not guarantee services above 75°N. Iridium OpenPort, which is the only system that provides true global coverage, shows unstable performance and low bandwidth (maximum 128 kbps). Two separate communication tests performed by the MarSafe North project has collected data that shows low performance of geostationary satellite communication systems at latitudes above 75°N.

**Review of available SAR infrastructure**

At present the main SAR resources in Norway consists of helicopters, Coast Guard vessels and vessels operated by Norwegian Sea Rescue (NSSR). The present generation of main rescue helicopters is old Sea King machines operated by Royal Norwegian Air Force. The operational envelope of these helicopters in Northern Norway and the Barents Sea is shown on Figure 10. At present work is ongoing to prepare tender documents for the next generation of rescue helicopters as the Sea Kings are reaching their extended life time. In this figure the operational envelopes of other helicopters operated from shore base in Northern Norway by the Coast Guard and the Royal Norwegian Navy are added (Lynx and the new NH90 that will be delivered in 2011 - 2012). In addition the RCC in Northern Norway has an agreement with the commercial helicopter company at Longyearbyen (Svalbard) that their helicopter can be used for SAR operations. The operational
envelope for this helicopter is shown in Figure 11. As is shown, using additional fuel tanks the envelope may be increased. It has also been established a number of fuel depots in the area as a way of increasing the operational reach. The Norwegian Coast Guard is operating 14 vessels in Norwegian waters. 9 of these belong to the inner Coast Guard fleet and 5 to the outer Coast Guard fleet. In addition to the 3 new Barentshav class of vessels the outer Coast Guard fleet includes the vessels KV Harstad and KV Svalbard. Only the last one is designed for operation in ice covered waters at Svalbard.

The voluntary organisation Norwegian Sea Rescue operates different types of vessels along the Norwegian Coast line. In total the organisation has close to 50 vessels, of which approximately 40 are in operation at any time. Most of the vessels have a permanent crew while some are manned on a voluntary basis and will need somewhat longer mobilisation time in case of an emergency. An overview of the Russian Federation organisation of SAR operations and resources was presented by CNIIMF at a safety at sea workshop in Murmansk 6 April 2011. The State Maritime Rescue
Coordination Centre is located in Moscow and there are 6 regional Maritime Rescue Coordination Centers. The centre in Murmansk covers the Russian part of the Barents Sea as shown in Figure 12. At present this centre operates three vessels:

- Salvage ship (5300 KW)
- Salvage ship (2600 KW)
- Tug (2200 KW)

Figure 12 Operational area for Murmansk RCCC (Shigabutdinov, 2011)

**Future safety at sea improvements for the Barents Sea**

At present Norway is looking for the next generation helicopters to take over for the Sea King reaching its final lifetime. Norwegian Coastal Administration is developing their competence center which will be located in Kirkenes and/or Tromsoe. According to a Governmental decision from October 2010 and the federal program “Development of the transport system of Russia for 2010 – 2015” 37 new salvage units will be built. Of these 15 have been Arctic waters as their first priority. The new vessels will include:

- 4 multipurpose rescue and salvage ship (Russian Maritime Register of Shipping class KM*Icebreaker AUT2 FF2 Salvage Ship, 7 MW), see figure 18
- 4 tow-salvage ships (RMRS class KM*Arc5(1) AUT2 FF2WS Salvage Ship, 2.5 – 3 MW))
- 4 fire-prevention tow ships (RMRS class KM*Arc4(1) AUT3 FF2WS Tug)
It is expected that surveillance of ship traffic will be improved and that ship trajectory information will be shared across national boarders. This will make it possible for national authorities to position SAR resources to minimize transit time to reach the site of an incident. Better surveillance of all types of seaborne activity will help vessel traffic centers to obtain a correct picture of potential abnormal situations. The success rate of future SAR operations will to some extent depend on the quality of weather forecasts as the weather has a strong influence on the operability of different SAR tools. A collaboration agreement has been signed between meteorological offices in Norway and Russian Federation.

**References**

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Tangen, H.: Metocean data forecasting for Northern Barents Sea – Quality and reliability; MARINTEK workshop December 2010, Trondheim, Norway, 2010