Assessment of Helicopter Emergency Response Capacity in the Barents Sea

NTNU – Trondheim
Norwegian University of Science and Technology

Master thesis by Marion Jakobsen
Supervisor: Professor II, Sören Ehlers
Co-Supervisor: Alexandar-Sasa Milakovich

INTRODUCTION

As oil exploration is moving further north on the Norwegian continental shelf, new challenges arise with the vast distances from shore and the challenging weather conditions. In the case of a helicopter ditching, The Norwegian oil and Gas Association has set a time requirement of 120 min to recover all personnel on board.

In a previous study, deterministic calculations of a rescue scenario at a single field, 360 km from shore, was studied, to evaluate if it was possible to rescue 21 persons at this distance. The study showed that with a SAR helicopter located in Hammerfest, it was possible to recover six persons from the water at this location within the time requirement.

To further evaluate the required level of emergency rescue capacity of an area, a simulation model is developed in SimEvents, which implements the effect of stochastic values such as weather conditions, variance of mobilisation time and recovery time. The purpose of the simulation model is to further investigate the rescue capacity of a SAR helicopter, by implementing additional factors, such as weather along the helicopter route.

Two cases are studied:

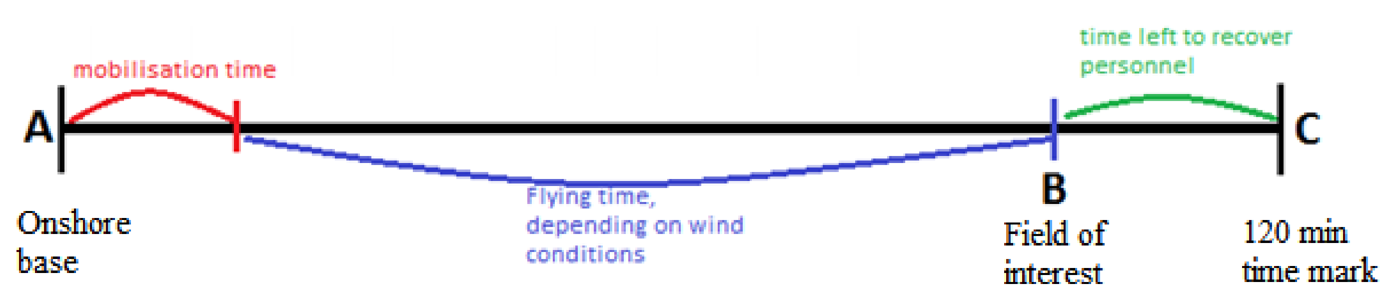
- Rescue capacity at a single field
- Rescue capacity of a larger area in the Barents Sea.

The results show the probability of successfully rescuing a certain number of persons.

METHODOLOGY

The simulation model implements weather data from the Barents Sea, and generates wind data for each month of the year. To find the actual helicopter speed as a result of wind conditions, the model calculates the ground speed of the helicopter.

When the helicopters ground speed is known, the model establishes the flying time. The model generates a random time between 15 and 20 minutes for the mobilisation time, and a random number for the time it takes to recover one person from the water.



The figure above shows, points in time and space. Point A marks the base in Hammerfest, the position of the helicopter at time zero of the simulation. Point B marks position where the rescue capacity is evaluated, and the point in time it took to arrive there. To evaluate the number of people of which is successfully rescued within 120 min, the model considers the time remaining after arriving at point B.

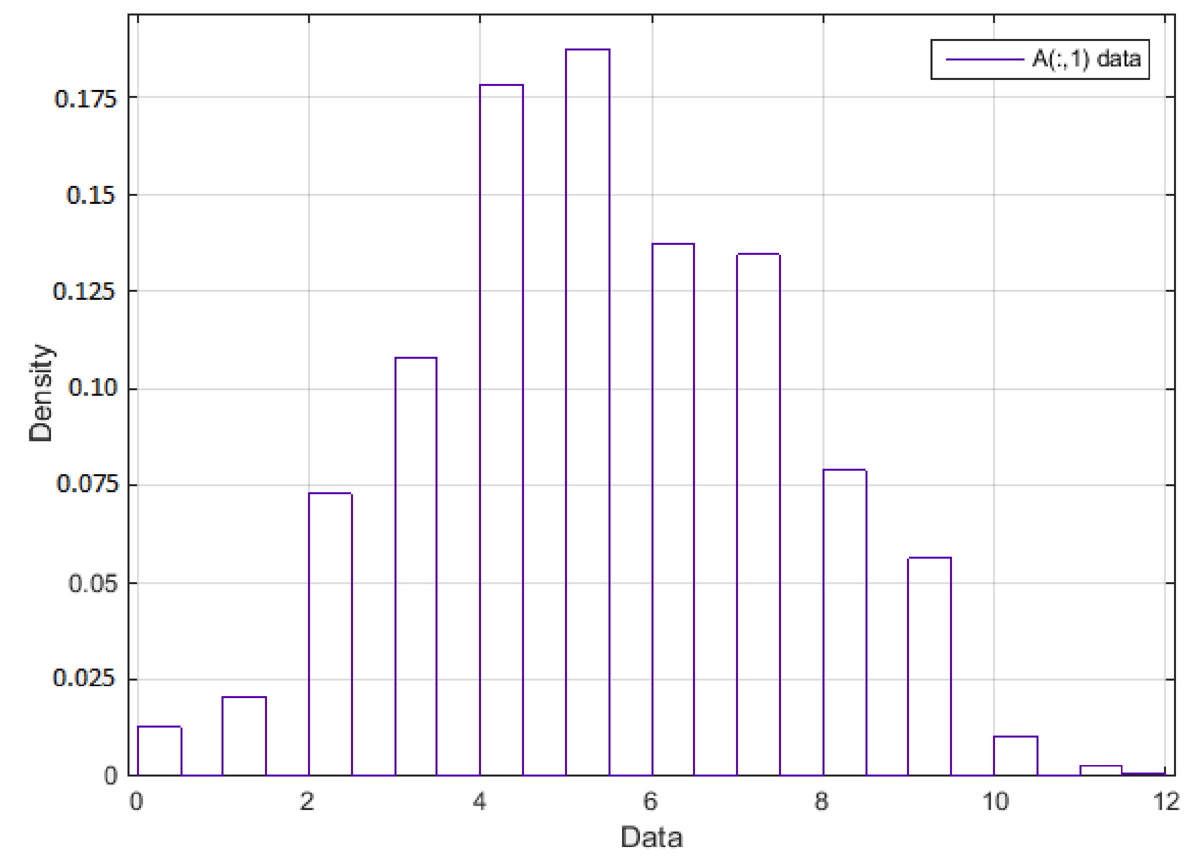
For the single field, the weather along the route is assumed to remain constant. While when considering the larger area of the Barents Sea, the model takes height for changing weather along the route.

The probability of rescuing people is found for 25 points in a grid in the Barents sea, and to find the probability between these grid points, interpolation is used.

RESULTS

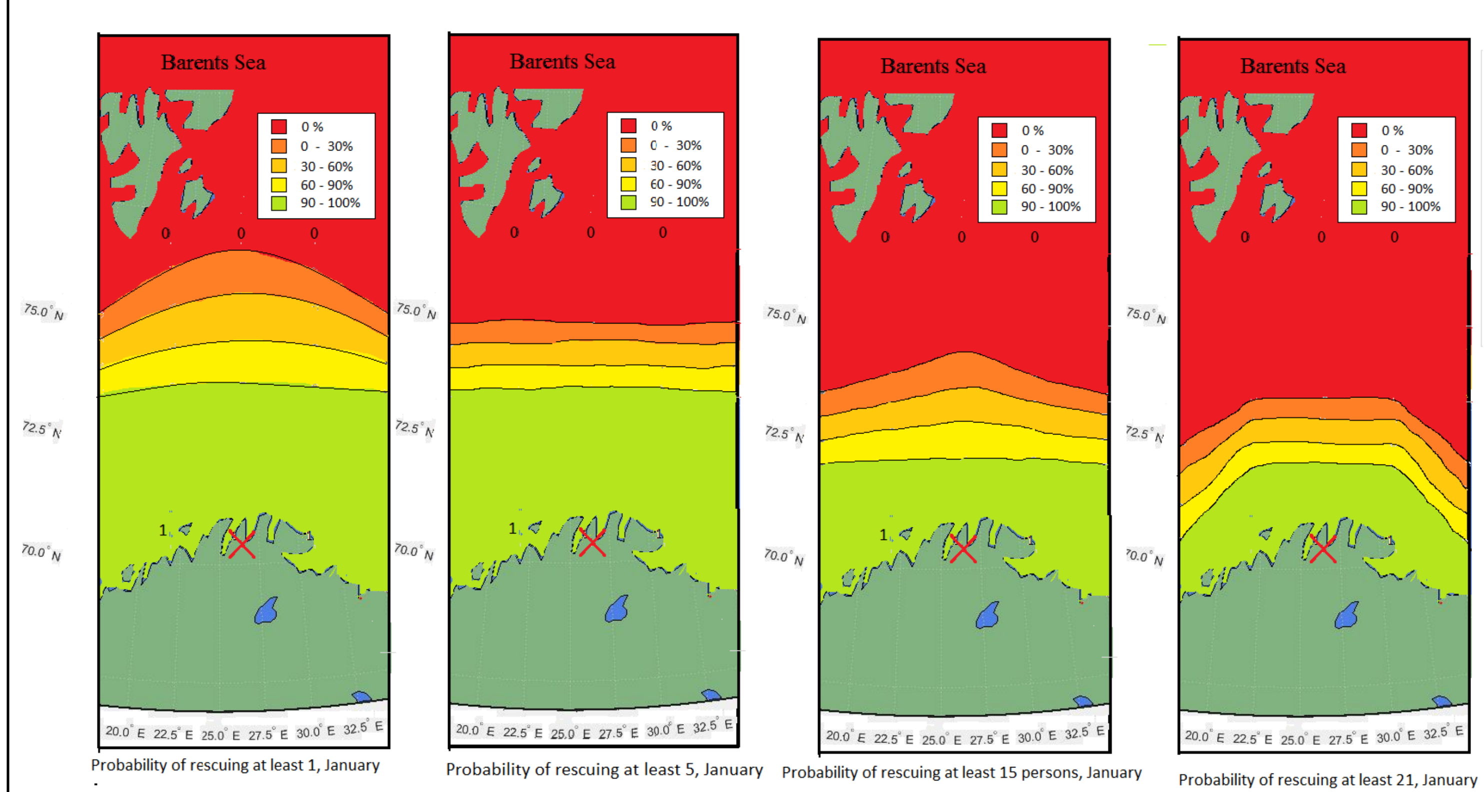
For a single field, 200nm, from Hammerfest.

The graph shows the probability of successfully rescuing between 0 and 12 persons within 120min.



Probability of successful rescue for a larger area of the Barents Sea

Rescue capacity in probability of successfully rescuing between 1-21 persons from the water within the time requirement of 120 min in the Barents Sea region in January.



Results are collected from January, April, July and October, but only the results from January is presented here.

CONCLUSIONS AND FURTHER WORK

The results indicate that the main limiting factor when considering the rescue capacity, is the distance from the onshore helicopter base to the field of evaluation. The results also indicate that the operation is not greatly affected by the seasonal weather, and give similar results through out the year.

The model can be developed further, by taking additional stochastic parameters into account. Such as the effect of poor visibility and the effect of waves on the recovery. To get more accurate results, it would be beneficial to consider more points and additional weather windows along the route. Then the model will give a more accurate result for the flying time.

CONTACT
NAME: Marion Jakobsen
EMAIL: marionf@stud.ntnu.no