

Predominating ice conditions in the area:

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|--------------------------------------|--|
| ▪ Ice concentration | 9/10 to 10/10 |
| ▪ Floe size | Small, medium (WMO 3,4) |
| ▪ Stage of development/ice thickness | grey and grey-white/ 10-25 cm, first year ice up to 40-50 cm and nilas |
| ▪ Snow cover | 0-7 cm |
| ▪ Ridges/rafting | 1-2 points (1/5 to 2/5) |
| ▪ Ice pressure | occasional, light to moderate |



Figure 2-1. Typical ice conditions in the FOIROT area

Test locations Ice conditions:

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|--------------------------------------|--------------------------------------|
| ▪ Ice concentration | 10/10 |
| ▪ Floe size | Big (WMO 5) |
| ▪ Stage of development/ice thickness | grey and grey-white/ 15-30 cm, first |
| ▪ Snow cover | 0-5 cm |
| ▪ Ridges/rafting | 0 - 1 points (up to 1/5) |
| ▪ Ice pressure | none |



Figure 2-2. Typical ice conditions of the performance tests (March 20, 2008. Speed-power test, 30 cm)



Figure 2-3. Transiting ridges



Figure 2-4. Bollard pull test in a cluster of ridges

3 Overview of implemented tests and programs

3.1 Trafficability data collection and analysis

The main objective of the trafficability data collection and analysis was to establish the correlations between ice conditions and ship performance. The Russian Arctic and Antarctic research Institute (AARI) was contracted to support trafficability program. The program was run by specially trained observers on the basis of 24 hour watch during all ship's transits, maneuvering and tests by logging the observations into AARI developed form. The trafficability analysis and results are present in the separate AARI report.

3.2 Propulsion-resistance and maneuvering tests

According to the test program this type of testing required at least 3 different ice thicknesses for both loading conditions ballast and laden (see attached Ice Trials Program, Table 2.8-1). Due to relatively uniform ice conditions in the area available for trials the vessel performance were tested in very light ice in the range of thickness from 22 cm to 31 cm. This allowed conducting approximately 20% of tests specified in the test program.

- 19 Lifeboats Engines
- 20 Inert Gas Hydraulic Deck Seal Heating
- 21 Main Deck Steam System
- 22 Main Cargo Pumps
- 23 Cargo and Ballast Drainage Pipes



Figure 3-1 Lifeboat test



Figure 3-2 Anchor Windlass test

Ice conditions data has been logged 24 hours a day into trafficability spreadsheet by two observers Mr. Sergey Frolov of AARI and Mr. Alex Iyerusalimskiy of COP. Video recording has been performed on starboard side 24 hours a day for post-trials analysis.



Figure 4-1 GPS receiver and workstation on the bridge



Figure 4-2 AARI digital video camera recording vertically turning ice cusps