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15 JULY MEETING NOTES - DRAFT

Alaska Region Research Vessel

Meeting in Victoria, B.C.

Arno Keinonen, Robin Browne, DHK

Date: 15 July 2002
File No.: 01084
From: Dirk Kristensen

Following are my notes from the Victoria meeting with Arno Keinonen and Robin Browne:

Regarding ice-breaking ability, Arno felt that the MARC observations and conclusions were somewhat conservative. Arno estimates that some improvement in the ice breaking performance can be achieved with some relatively minor hull and powering modifications. Specifically:

- Reduce size of the wedge (specifically the distance from the waterline to the top of the leading edge), possibly flare out aft to incorporate transverse SWATH mapping transducer
- Soften upper corner of the wedge side in section
- Investigate the specific thrust; our values seem quite low (e.g., Botnica 117 kN/MW versus ARR V at 97 kN/MW) although this is primarily because of our high open water speed requirement, i.e., bollard thrust traded for speed.
- Consider hull wash system. Arno says that the new Swedish ice breakers (name?) have found these systems to be very effective, particularly in heavier ice/snow conditions. We would need to consider the trade-off here between added weight for such a system versus increased performance (i.e., the additional weight of such a system would result in decreased deadweight capacity – fuel).

Arno also noted that we could increase the ice performance by roughly 10% by hardening the shoulder shape, shortening the aft end of the bow and reducing the rounding radius of the waterlines. However, we are reluctant to consider this since it would be at the expense of added resistance (speed) in open water.

We discussed the possibility of having to move away from the Azipod propulsors if no resolution can be found to the the relatively high underwater radiated noise inherent to the AC motors in these units. We discussed the following issues relating to Z-drives:

- Try to get athwartship slope of thrusters up to 5 degrees to improve their ability to clear ice. This may necessitate revising the aft sections and pulling in the waterline as a result of the slope of section. Glosten will investigate these modifications, along with the suggested wedge geometry modification. Arno will review the proposed modifications once we have a revised set of lines. Note that all of the proposed modifications should not adversely affect open water performance.
- Arno suggested that orienting the Z-drives in the “tractor” mode would be advantageous for hydrodynamic efficiency and would result in better for ice clearing because of lack of struts in front of the propeller.

- We discussed the possibility of using bolt-on blades for the propellers to facilitate changing between blades optimized for ice and those optimized for quiet open water ops. Glosten will investigate through vendors.
- Arno will look into which manufacturers of Z-drives have had successful histories on vessels operating in ice.

We discussed the on-going issue of how to best characterize the potential operating areas that would be accessible to a vessel with our structural class and ice capability. Arno's colleague, Roger Pilkington, has an extensive historical data base of ice conditions that we can utilize for this. One use of this tool has been to generate accessibility maps for various CASPPR classes. Arno believes it will be a relatively easy matter to develop accessibility maps based on our vessel's ice capability.

Generating maps based on a "worst ice year" scenario, a "light ice year" scenario and an "average ice year" scenario was discussed. Data resolution on a monthly basis was thought to be appropriate for our purposes. Maps for both the Western and Eastern Arctic would be generated.

Arno will discuss cost/schedule with Roger.

We discussed a number of structural design questions with Robin Browne. The most significant of which was which structural philosophy to use. We have been proceeding on the basis of using DnV rules because of their relatively rational presentation (vs. ABS) and the ability to vary the frame spacing (an important constructability issue due to the double hull). However, Robin says that the DnV rules are very conservative (for example, bow plating thickness requirements do not vary with displacement!). He recommends that we proceed with the new IACS rules since they will soon be enacted. The IACS rules, in Robin's opinion, represent the latest, best thinking in efficient ice structure. Our earlier investigation of these rules tends to confirm Robin's assessment that a lighter structure can result if we use the IACS rules.

Robin also recommended that the entire mid-body be transversely framed as it will result in a stiffer ship. Their investigation of this on the GLIB showed that there was no weight penalty due to the transverse framing. We noted that this may also help the Interling roll tank configuration by eliminating some of the cross structure in the double bottom that Interling was objecting to.

We discussed Arno's schedule and ability to attend the upcoming meetings in August and September. Arno confirmed that he could attend a meeting in Seattle on August 19.

The September meeting slated for the 12th is OK per Arno's schedule but he emphasized that it will be difficult to accommodate any change to this date.