

Appendix E5:

Report from Navantia: Navantia's safety measures and barriers following the HNoMS Helge Ingstad and Sola TS collision

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1. Introduction

Following the collision between HNoMS Helge Ingstad and Sola TS 8 November 2018, and as a response to the interim safety recommendation set out in AIBN's (now NSIA's) preliminary report dated 29 November 2018, Navantia has allocated large resources and conducted several internal investigations relating to the issue raised by NSIA. Navantia has a high focus on safety and is fully committed to safety management systems and quality assurance systems in its work.

2. Navantia's safety measures and implemented barriers

2.1 Significant evolution of the safety management system and quality management system

Since HNoMS Helge Ingstad was designed and constructed in the mid 2000s, Navantia's safety management system and quality management system has continuously undergone extensive increased focus, and strong and comprehensive development. As presented for NSIA, this includes among others, an extensive safety assurance framework, including more detailed safety analysis, internal and external safety audit etc. The quality management system is designed to contribute to prevent future incidents and includes a detailed risk analysis and review of product design and systems, "lessons learned" database and traceable design requirement database and design instructions. The evolved safety management system and quality management system that Navantia has in place now makes it less likely that a similar issue as raised by NSIA would occur again without being detected by the safety management and quality management systems in place.

2.2 Actions taken after the incident

Immediately after receipt of the preliminary report by NSIA dated 29 November 2018, Navantia conducted a review of the design of its delivered vessels. The specific requirements of the Nansen-class frigates delivered to the Norwegian Navy impose design features where a propulsion shaft flexible coupling is installed in the gearbox output shaft and an "in-line" Oil Distribution Box is installed in an intermediate shaft for the propeller pitch control. Navantia quickly established that these design features are unique for the Nansen-class design and different from Navantia's other propulsion shafting design which includes no flexible couplings and the Oil Distribution Boxes are located at the forward end of bull gear shaft. Hence, the issue pointed out in the preliminary report is connected with these special design features and limited to the Nansen-class frigates only and will not apply to any other design delivered by Navantia.

Navantia has a good working relationship with the Norwegian Navy and NDMA, and a dialogue was immediately established in order to advise and assist on necessary safety measures relating to the propeller shaft and the watertight integrity of the frigates.

Furthermore, Navantia initiated several internal investigations in order to obtain an overview of the issue and to assess safety measures and safety barriers, both existing and potential new measures to be implemented. Navantia's internal investigation has included a review and analysis of (i) the design process, (ii) Navantia's Safety Management System, and (iii) Navantia's Quality Management System. In its internal investigation, Navantia has also sought expert assistance from third parties to assess, investigate and supplement Navantia where necessary.

2.3 Results from Navantia's internal investigations

Navantia's analysis and investigations has not revealed any breach of rules and regulations applicable during the design and building phase of the Nansen-class frigates, and show that it complied with the current safety management and quality management systems in place at such time. It was not found any source of design rules and regulations for vessels that contained requirements or regulations aiming at discovering the specific issue relating to a hollow propeller shaft. There were already several requirements and barriers in place for detecting issues relating to watertightness for penetration of bulkheads by doors, hatches, valves, piping and cables etc. However, the issue with the hollow propeller shaft is special and was not detected by any of these requirements or barriers. To prevent the same issue in the future, measures have been implemented as set out below in section 2.4.

Navantia's analysis show that the likeliness of any other issue representing a similar potential safety issue is extremely low, as any other penetration of the watertight bulkhead will be covered by the existing requirements. However, to prevent any possible future safety issues Navantia has implemented new general measures into the design documentation.

2.4 Measures and barriers implemented to prevent future safety issues

Navantia has implemented two new measures in its design process in order to prevent any future safety issues of a similar nature as the issue identified in the preliminary report by NSIA:

- (i) Update of the Design Instruction Document (DID-243-002 Propulsion shafting calculation) with inclusion of a new requirement to check that: *"propulsion shafting is provided with the required elements that ensure that watertightness of penetrations through hull plating and watertight bulkheads is maintained, both at the external surface of the shafts by means of sterntube or bulkhead seals, and through the inner bore of the shaft by means of plugs or caps as needed to avoid that the hollow shaft could connect two different watertight compartments"*.
- (ii) Inclusion of new review procedures in the safety and quality management systems. Under the current safety and quality management systems in place, specific reviews will be conducted for controlling potential interconnections of watertight compartments by means of hollow shafts or similar components. These reviews will be carried out as part of the independent Safety Audits and the detailed Quality Gates that are planned for any current and future constructions.

With these additional measures implemented, Navantia has several barriers in place that will prevent future safety issues. The above measures will serve as the principle barrier to ensure that any safety issue is detected during the design process. Due to the evolution of the Safety Management System and Quality Management System in the last decades, Navantia's current Safety Management System and Quality Management System will serve as additional barriers and ensure that the design requirements are flown down and implemented into the final product, and any deviations from the design instructions or any other safety issue will be detected by these systems.

Navantia's implemented measures and barriers should therefore effectively prevent any future safety issue of a similar nature.