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REPORT

Marine 2019/08



SUMMARY OF THE PART ONE REPORT ON THE COLLISION ON 8 NOVEMBER 2018 BETWEEN THE FRIGATE HNO MS HELGE INGSTAD AND THE OIL TANKER SOLA TS OUTSIDE THE STURE TERMINAL IN THE HJELTEFJORD IN HORDALAND COUNTY

AIBN and DAIBN has compiled this report for the sole purpose of improving safety at sea. The object of a safety investigation is to clarify the sequence of events and root cause factors, study matters of significance for the prevention of maritime accidents and improvement of safety at sea, and to publish a report with eventually safety recommendations. The Board shall not apportion any blame or liability. Use of this report for any other purpose than for improvements of the safety at sea shall be avoided.

This is a summary of the AIBN's part one report following the accident. The AIBN refers to the full text in the part one report for an accurate description and details of the sequence of events, factual information and the analysis of the accident up until the time when the collision occurred. Only the official part one report describes the AIBN's investigation and the findings completely. The report is available on www.aibn.no.

This report has been translated into English and published by the Accident Investigation Board Norway (AIBN) to facilitate access by international readers. As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.

THE COLLISION BETWEEN HNoMS HELGE INGSTAD AND SOLA TS

The frigate HNoMS Helge Ingstad and the tanker Sola TS collided in the Hjeltefjord in the early hours of 8 November 2018. The frigate had 137 persons on board with a mix of conscripts and permanent crew. A total of seven watchstanding personnel were present on the bridge, including two trainees. The tanker Sola TS was Maltese-registered and operated by the Greek shipping company Tsakos Columbia Shipmanagement (TCM) S.A. There was a total of 24 persons on board. The bridge was manned by four persons, including the pilot.



Figure 1: The point of impact when HNoMS Helge Ingstad and Sola TS collided outside the Sture Terminal in the Hjeltefjord at 04:01:15. Illustration: AIBN



Figure 2: The frigate HNoMS Helge Ingstad. Photo: Anton Ligaarden/Norwegian Armed Forces



Figure 3: The tanker Sola TS. Photo: Tsakos Columbia Shipmanagement S.A.

HNoMS Helge Ingstad suffered extensive damage along the starboard side. Seven crew members sustained minor physical injuries. Sola TS received minor damages in the bow area. Marine gas oil leaked out into the Hjeltefjord. The Institute of Marine Research has ascertained the effect of the oil spill had little impact on the marine environment.



Figure 4: Damage to the hull along the starboard side of HNoMS Helge Ingstad after the collision. Photo: The Norwegian Coastal Administration



Figure 5: The hawsepipe and the damage sustained by Sola TS in the collision. The hole in the hull is marked with a white circle. Photo: The Norwegian Maritime Authority

THE INVESTIGATION

The Accident Investigation Board Norway (AIBN) and the Defence Accident Investigation Board Norway (DAIBN) have performed a joint investigation into the accident, led by the AIBN¹. The investigation was conducted in accordance with the Act of 24 June 1994 No 39 (the Norwegian Maritime Code) Chapter 18. The Marine Safety Investigation Unit of Malta and the Spanish Standing Commission for Maritime Accident and Incident Investigations (CIAIM) have also participated in the investigation as ‘substantially interested states’; see Section 474 of the Norwegian Maritime Code.

This part one report contains the results of the AIBN’s investigation of the sequence of events up until the time when the collision occurred. Information relating to the sequence of events after the collision and up until everyone had been evacuated from the frigate, will be included in the part two report.

The description of the sequence of events is based on interviews, in addition to technical/electronic information obtained from both vessels, Fedje Vessel Traffic Service (VTS) Centre, the log from the Norwegian Coastal Administration’s (NCA) automatic identification system (AIS), and radio and radar recordings from Fedje VTS.

The AIBN has furthermore conducted technical examinations on board HNoMS Helge Ingstad and carried out an observation voyage with one of the frigate’s sister ship and Sola TS. A significant amount of information has also been obtained from the involved parties.

FINDINGS FROM THE INVESTIGATION

Introduction

The AIBN’s investigation has clarified the sequence of events, as well as how and why the two vessels collided outside an oil terminal in an area monitored by a VTS centre. The investigation has shown that the situation in the Hjeltefjord was made possible by a number of operational, technical, organisational and systemic factors.

¹ Hereinafter the investigation authorities (the AIBN and the DAIBN) are referred to as the AIBN.

The sequence of events, operational and technical factors

During the night leading up to 8 November 2018, HNoMS Helge Ingstad sailed south from Sognesjøen to the Hjeltefjord at a speed of approximately 17–18 knots. The frigate sailed with the automatic identification system (AIS) in passive mode, i.e. no transmission of AIS-signal. The frigate's bridge team had notified Fedje VTS by mobile phone of entering the area and followed the stated voyage. HNoMS Helge Ingstad also established a listening watch on VHF channel 80, the VTS's working frequency for the area. The passage through the Hjeltefjord was not considered particularly demanding, as the fairway is open and offers a good view all around. The VTS operator at Fedje VTS logged HNoMS Helge Ingstad, but did not plot the vessel in the monitoring system.

Navigation training was being conducted on board HNoMS Helge Ingstad as usual during a transit voyage. The officer of the watch led a team of one officer of the watch trainee and five enlisted crew, one of whom was also receiving training. The officer of the watch trainee and the officer of the watch assistant trainee were receiving training in optical positioning in particular.

At 0300 the frigate was approximately 17 nm north of the Sture Terminal. During the same period, the tanker Sola TS was preparing to leave the Sture Terminal. Sola TS had some of the deck lights turned on to light up the deck for the crew who were securing equipment etc. for the passage. Sola TS also exhibited navigation lights.

The pilot on Sola TS notified Fedje VTS by VHF radio of departure from the Sture Terminal at 03:45. The VTS operator acknowledged receipt of the message. The VTS operator zoomed in on the area near the Sture Terminal on the main work screen to check whether Sola TS had sufficient time and space to manoeuvre in relation to other vessels.



Figure 6: Sola TS departed the Sture Terminal at 0345. The tanker was assisted by the two tugs Tenax and Ajax during the departure. Illustration: AIBN

At the time of departure there were three northbound vessels approximately 2 – 3.5 nm south of the Sture Terminal. HNoMS Helge Ingstad was 5.8 nm north of the Sture Terminal, and outside the area that the VTS operator had zoomed in on, and was thus not part of the traffic situation being considered by the VTS operator. The VTS operator saw no need for traffic organisation or for issuing information to vessels in the area. Following the departure of Sola TS, the VTS operator's main work screen remained zoomed in on the area near the Sture Terminal. In the combination with

the lack of radar plotting, this contributed to the VTS operator not remembering HNoMS Helge Ingstad in the subsequent sequence of events.

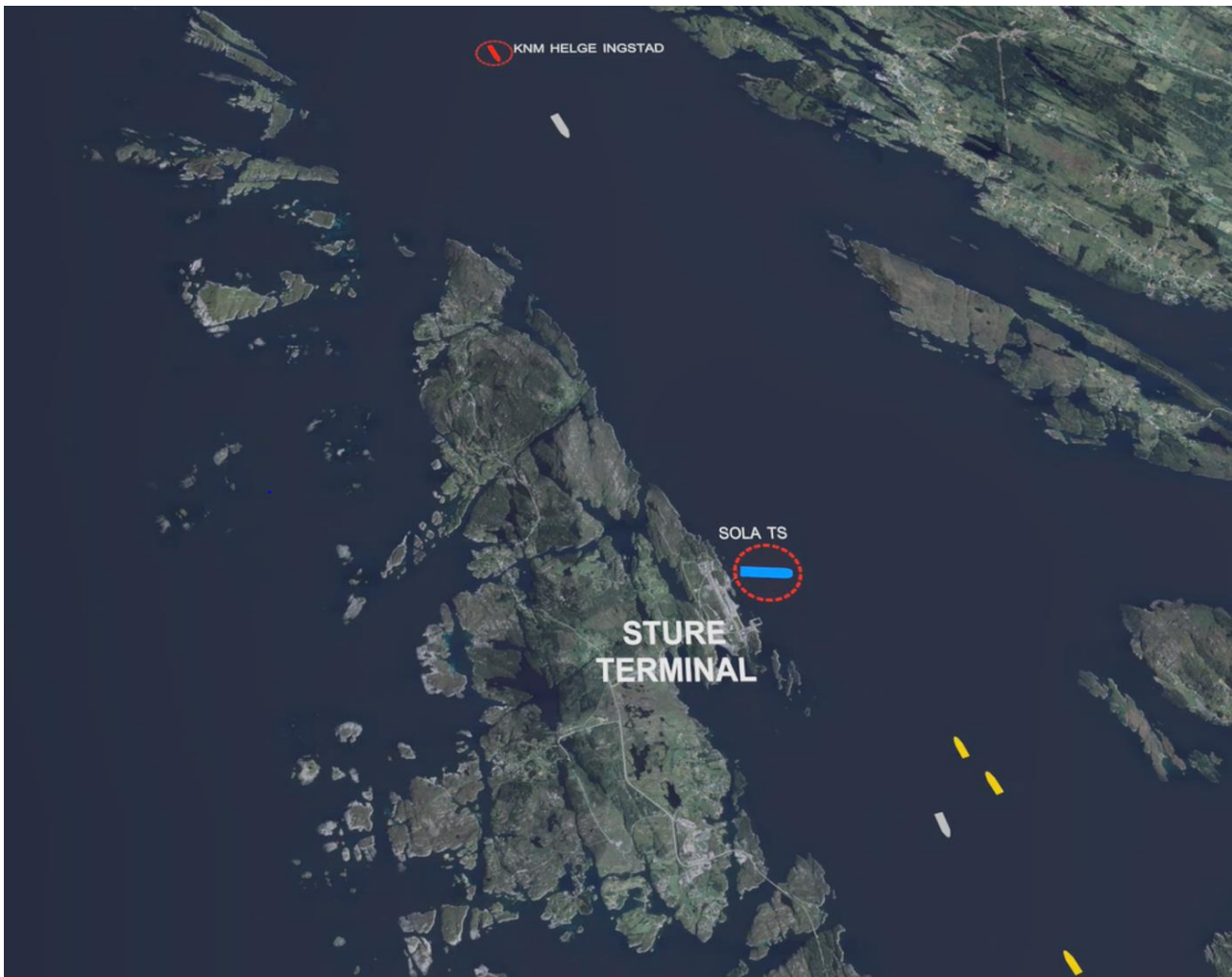


Figure 7: The traffic situation in the Hjeltefjord at approximately 0345. The frigate had one southbound vessel just ahead, and three northbound and one southbound vessels south of the Sture terminal. Sola TS and the tugs Ajax and Tenax had now left the quay and started a port turn to set a northbound course towards Fedjeosen. HNoMS Helge Ingstad was directly to the east of Nordøyta, 5.65 nm to the north of Sola TS. Illustration: AIBN

At the same time as Sola TS notified of her departure from the Sture Terminal, the watch handover between the officers of the watch started on HNoMS Helge Ingstad, while the officer of the watch trainee continued to navigate the frigate. During the watch handover, the officer of the watch being relieved and the relieving officer of the watch observed an object at the Sture Terminal, to starboard of the frigate's course line. The 'object' was observed both visually and on the radar display in the form of a radar echo and AIS symbol. The two officers of the watch discussed, but did not clarify, what the 'object' might be. Both officers of the watch had formed the clear perception that the 'object' was stationary near the shore and thus of no risk to the frigate's safe passage.

After the watch handover on HNoMS Helge Ingstad, the relieving officer of the watch's further decisions and actions relied on the situational awareness that the 'object' at the Sture Terminal was stationary. The investigation has demonstrated that it was difficult to rectify this situational awareness based on visual input alone.

Once Sola TS had manoeuvred out from the quay, the tanker set the planned course towards Fedjeosen and increased the speed to around 6–7 knots. When Sola TS first started manoeuvring out from the quay, this was done so slowly that it was difficult to register any movement from the bridge on HNoMS Helge Ingstad. The lights from the tanker appeared to be an extension of the

lights from the terminal. Sola TS was more clearly away from the terminal when the tanker turned her bow northwards towards Fedjeosen, so that the forward-pointing yellow deck lights became visible. The navigation lights on Sola TS were then difficult to discern because of the deck lights. The tanker appeared to be an object giving off light, and it was difficult to judge the distance in the dark.



Figure 8: Screenshot of video recording on the bridge of HNoMS Roald Amundsen on the observation voyage in the early hours of 2 April 2019, when Sola TS had turned to a north-northeasterly course (035°). This corresponds approximately to the situation at 03:49 on the night of the accident. Sola TS marked with yellow circle. Photo: The police

As far as the AIBN has found, none of the messages from Sola TS to Fedje VTS over VHF channel 80 were registered at HNoMS Helge Ingstad. This can be related to the watch handover between the officers of the watch, that traffic information was not provided by Fedje VTS, and how one registers and filters the communication that takes place on the radio.

On the bridge of the frigate, the training activity took parts of the bridge team's attention. Hence, during the decisive period before the collision, the bridge team had reduced capacity to monitor the traffic situation. In addition, the starboard lookout position was unmanned, and this meant that the bridge team was weakened during a period when Sola TS could have been identified as a vessel on collision course.

Furthermore, certain of own situational awareness, the relieving officer of the watch on HNoMS Helge Ingstad did not see any need to carefully monitor the fairway on the radar. Since the 'object' was assumed to be stationary, it was not investigated further or tracked on the radars on board HNoMS Helge Ingstad. The officer of the watch was focusing on the three vessels approaching in the opposite direction to port of HNoMS Helge Ingstad, which had been observed visually and tracked in the bridge system. Since the tanker was not acquired, no alarms were generated to indicate that HNoMS Helge Ingstad was on collision course with Sola TS and thereby draw the bridge team's attention to the collision danger.

The officer of the watch eventually realised that the 'object' giving off light on the starboard bow was closer to the frigate's course line than first assumed. The officer of the watch has stated that the 'object' was primarily observed visually, but the officer of the watch had also seen on the radar that a little distance had appeared between the shore and the 'object'. The officer of the watch was still under the impression that this was a stationary object close to the Sture Terminal, that there was no room to pass between the 'object' and the terminal, and that the distance between the shore and the

'object' on the radar screen could be explained by the frigate having come closer to the point which the 'object' lay alongside.

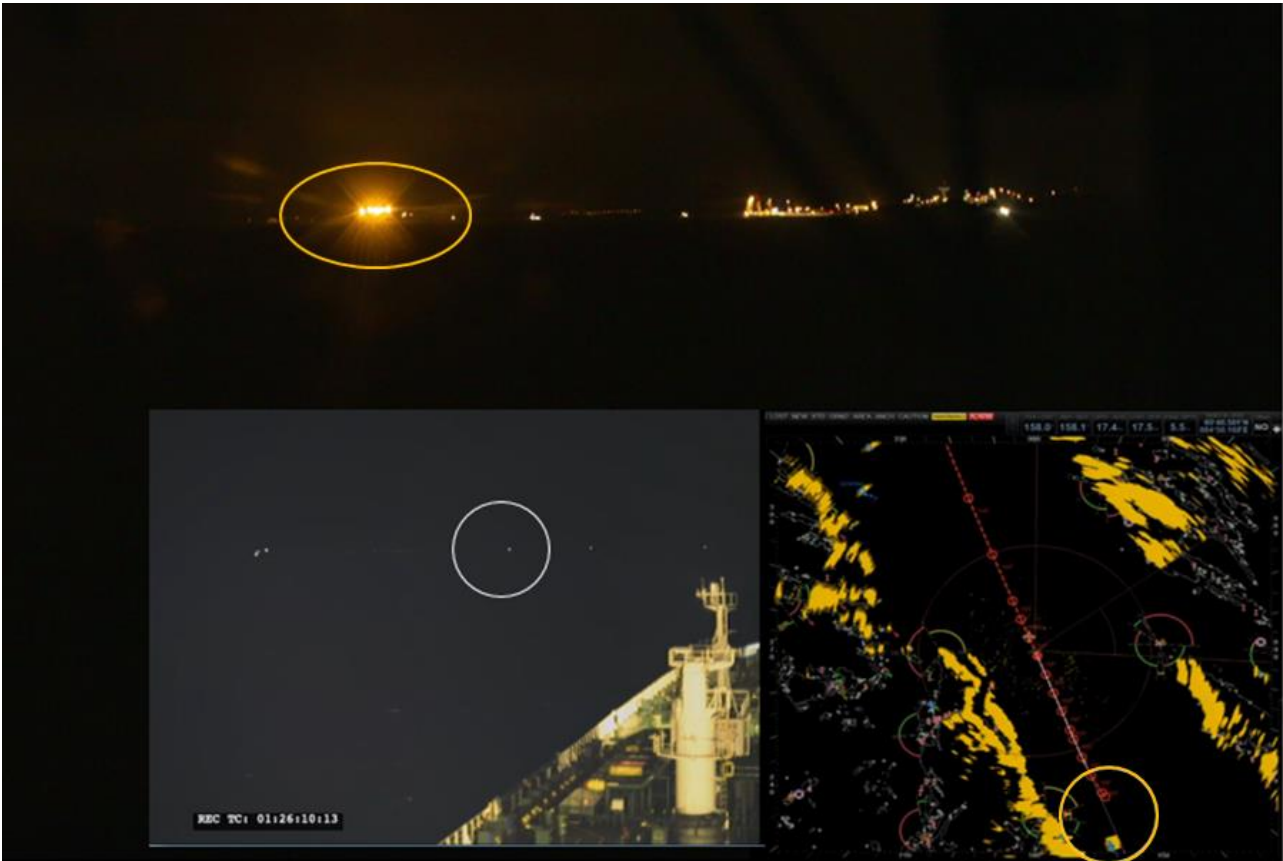


Figure 9: Top: Screenshot of video recording on the bridge of HNoMS Roald Amundsen on the observation voyage in the early hours of 2 April 2019. This corresponds approximately to the situation at 03:53 on the night of the accident. Bottom left: Screenshot of video recording on the bridge of Sola TS on the observation voyage, HNoMS Roald Amundsen marked with white circle. Bottom right: Screenshot of video recording of the radar display on HNoMS Roald Amundsen on the observation voyage, Sola TS marked with yellow circle. Illustration: The shipping company/police/AIBN

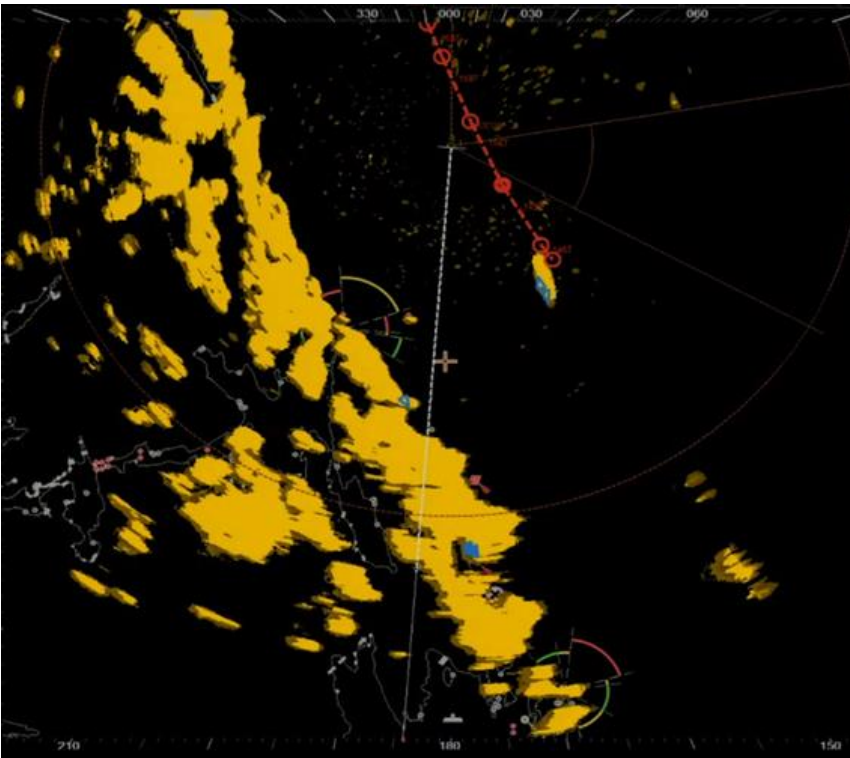


Figure 10: Screenshot of video recording of the radar display on HNoMS Roald Amundsen during the observation voyage in the early hours of 2 April 2019, with the range scale set to 1.5 nm. This corresponds approximately to the situation at 03:59 on the night of the accident, when the distance between Sola TS and shore (Ådnesflua) was approximately 950 meters. Photo: The police

A more experienced officer of the watch would probably have had greater capacity to pick up on weak signals of danger and be better equipped to suspect that his/her own situational awareness suffered from misconceptions. The officer of the watch thought, however, that the course had to be adjusted slightly to port to increase the passing distance to the 'object'. The course was then adjusted by a total of 10 degrees to port through a series of small course changes.

Neither HNoMS Helge Ingstad nor any other vessels were plotted on the radar on Sola TS, this may indicate that the bridge team took a less active role with the pilot on the bridge. Furthermore, there was little communication between the bridge team and the pilot about the passage and the general traffic situation in the fairway. This meant that the effect of active teamwork to build a common situational awareness, was not sufficiently ensured.

A while after setting course towards Fedje, the pilot reacted to the approaching vessel drawing closer without any indication of giving way. That was approximately four minutes before the collision, at which point the distance between the vessels was approximately 1.5 nm. As a consequence of HNoMS Helge Ingstad not transmitting AIS signals on this voyage, the name of the vessel that was approaching in the opposite direction was not presented on the displays on Sola TS.

The pilot requested information about the approaching vessel from Fedje VTS. The VTS operator had not monitored the passage of HNoMS Helge Ingstad after the frigate notified of entering the area, and was therefore unable to identify the vessel immediately.



Figure 11: The traffic situation in the Hjeltfjord approximately 3 minutes before the collision. Illustration: AIBN

The crew on Sola TS tried to establish contact with the vessel by flashing the Aldis lamp. The flashes from the Aldis lamp were concealed by Sola TS deck lights, and were therefore not perceived by the bridge team on HNoMS Helge Ingstad. The bridge team and pilot on Sola TS were probably not aware of the effect of the deck lights on the visibility of both flashing lights and navigation lights. Sola TS altered course 10 degrees to starboard, to indicate an evasive manoeuvre to the approaching vessel.

When the pilot on Sola TS was told by the VTS operator at Fedje VTS that the meeting vessel was HNoMS Helge Ingstad, the pilot immediately called the frigate. A total of 2.5 minutes passed from the time the pilot reacted to the approaching vessel until they got in contact with HNoMS Helge Ingstad.

At that point in time, the vessels were so close to each other that the VTS centre's scope of action had become very limited. Furthermore, the VTS operator did not have the same possibility of making visual observations as the two vessels involved. The VTS operator also assumed that the two vessels could see each other on the bridge instruments. Therefore the VTS operator left the further communication and clarification of the situation to the two vessels' bridge teams.

The officer of the watch on HNoMS Helge Ingstad answered the call from the pilot on Sola TS immediately. The pilot asked HNoMS Helge Ingstad to turn to starboard. The officer of the watch responded by saying that they were unable to turn to starboard. This was based on the firm perception that the floodlights came from a stationary object close to shore and not from a vessel. Furthermore, the officer of the watch assumed that it was one of the three northbound vessels approaching to port that was requesting the frigate to alter course to starboard, as the frigate had just adjusted the course to port.

An avoidance manoeuvre to prevent collision would still have been possible at this point in time, had a correct decision been made and correct action taken. However, the communication between the pilot on Sola TS and the officer of the watch on HNoMS Helge Ingstad did not provide the officer of the watch with information that enabled the officer of the watch to rectify the situational

awareness. The pilot was convinced that HNoMS Helge Ingstad could see Sola TS both visually and on the bridge instruments.

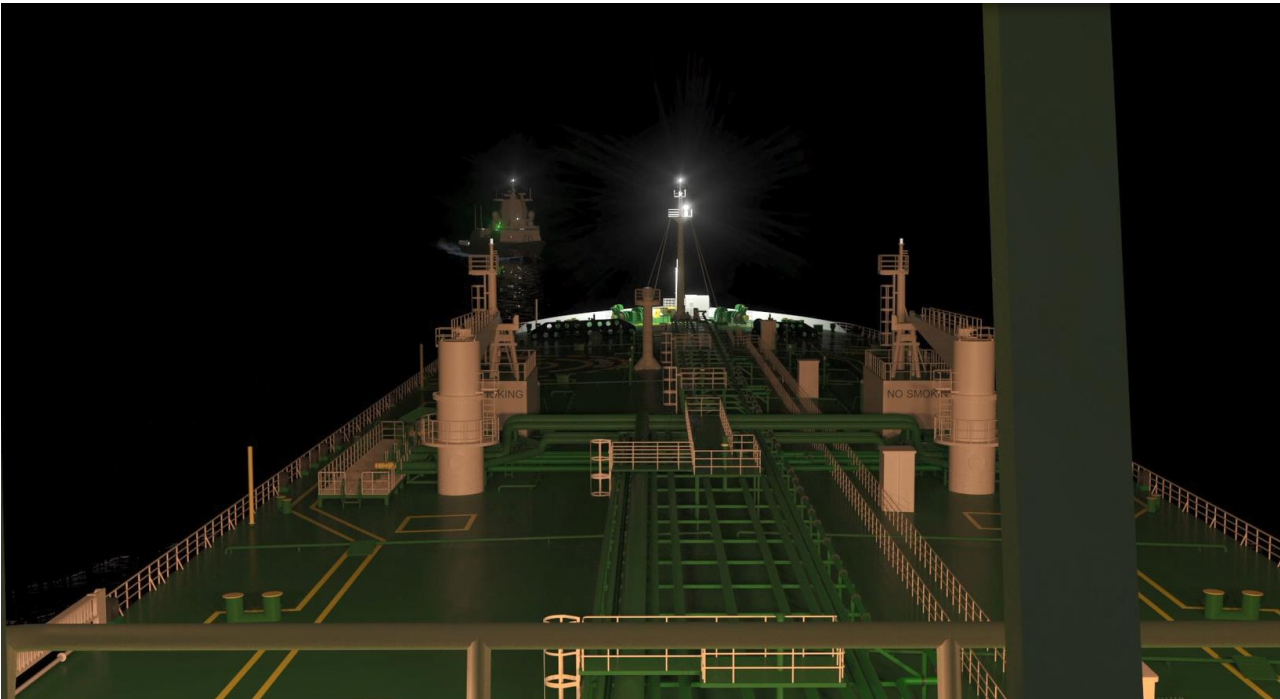


Figure 12: Illustrates the view from the bridge on Sola TS just before the collision. Illustration: AIBN

When HNoMS Helge Ingstad did not alter course, the master on Sola TS ordered ‘stop engines’ and, shortly afterwards, the pilot ordered full speed astern on the engines. These two measures were carried out only short time before the collision, and were therefore without material effect. Any use of the escorting tugboat to change course or bring the tanker to stop would probably also have been ineffective at this late stage of the sequence of events.

When the officer of the watch on HNoMS Helge Ingstad understood that the ‘object’ giving off light was moving and on direct course to collide, it was too late to avoid the collision.

Organisational and systemic factors

The frigate and the Navy

- a) Organisation, leadership and teamwork on the bridge of HNoMS Helge Ingstad were not expedient during the period leading up to the collision. The watch changes between the officers of the watch and the officer of the watch assistants, the night meal and the rotation of positions between the bridge crew team coincided with the training in optical positioning.
- b) The Navy lacked procedures to ensure the functioning of the bridge team while administering training. The training activity being conducted for two watchstanding functions reduced the bridge team’s capacity to address the overall traffic situation, and the officer of the watch lacked assistance for operating important bridge systems.
- c) The Navy lacked competence requirements for instructors. The Navy had assigned the officer of the watch a role as instructor which the officer of the watch had limited competence and experience to fill. Furthermore, the Navy had not given the officer of the watch assistant sufficient training and competence to operate important bridge systems while training the officer of the watch assistant trainee at the same time.
- d) As a consequence of the clearance process, the career ladder for fleet officers in the Navy and the shortage of qualified navigators to man the frigates, officers of the watch had been granted

clearance sooner, had a lower level of experience and had less time as officer of the watch than used to be the case. This had also resulted in inexperienced officers of the watch being assigned responsibility for training. The level of competence and experience required for the lean manning concept (LMC), was apparently not met.

- e) A more coordinated bridge team with more information sharing would have been more capable of detecting the tanker sooner. Achieving good teamwork is particularly challenging in the case of bridge teams whose members are constantly being replaced. Furthermore, the bridge team was part of a culture characterised by great confidence in each other's skills, and this may have contributed to the perception of them being in full control of the situation and thus less vigilant and sensitive to weak signals of danger.
- f) The governing bridge service documents (the bridge manual) provided insufficient job support with regards to risk assessment and ensuring a safe voyage. The navigational aids, the bridge design and the bridge manual were not optimised to ensure the best possible situational awareness on the bridge.
- g) The bridge team was not correctly put together with regards to the requirements for vision in current regulations. It may be questioned whether the Navy's system for medical selection and follow-up was satisfactory.
- h) The bridge team on HNoMS Helge Ingstad may have been somewhat affected by fatigue, particularly considering the time of day. The Navy lacked systematic logging of working hours and hours of rest. The Ministry of Defence has initiated the process of establishing protective provisions for sea-going personnel in the Navy.
- i) According to the Navy's regulations for the use of AIS, AIS shall, as a rule, be in transmission mode and special vigilance shall be exercised when deviating from the rule. After 2014, the use of AIS in passive mode had generally become more of a rule than an exception on the Fleet's vessels, as a consequence of an ever more demanding security policy situation, without any specific guidance being provided on compensatory measures.
- j) If the frigate had set AIS to mode 3 for the voyage, it's highly likely that the VTS monitoring system would have displayed the AIS information. The investigation has found that the dialogue between the NCA and the Navy about the use of W-AIS in the Fedje VTS area, faded away before guidelines for such use were in place.
- k) After the accident, the Navy has implemented relevant measures relating to safety culture, navigation, technical safety, documentation, competence management and handling of nonconformities (see Appendix H), as well as teamwork training, medical requirements and fitness.

The tanker and the shipping company

- a) It is a known fact and normal practice that tankers approaching the terminal need to start preparing for mooring and loading, and that vessels leaving the terminal work on securing for sea. The shipping company had not established compensatory safety measures with regards to the reduction of the visibility of the navigation lights due to deck lighting, and claims that the current practice is safe. The AIBN is of the opinion that to the extent that the visibility of the navigation lights is reduced this may pose a risk.
- b) Radar plotting and communication between the bridge crew and the pilot on the bridge did not sufficiently ensure the effect of active teamwork to build a common situational awareness. This could have increased the time window for identification and warning of the frigate.

- c) After the accident, the shipping company has not implemented changes in connection with any of the possible areas of improvement relating to its vessels that have been identified by this investigation. This concerns use of deck lights and the shipping company's own navigation procedures with pilot on board.

The Norwegian Coastal Administration, the VTS and the pilot services

- a) When the pilot has the most active role on the bridge, while the bridge team assumes a more standby role, the corrective effect of active teamwork to build up a common situational awareness, can be reduced. This is to some extent in line with findings in previous investigations. The AIBN has previously issued a safety recommendation² on this subject to the Norwegian Coastal Administration.
- b) Lack of monitoring meant that the VTS operator's situational awareness and overview of the VTS area were inadequate. In combination with night work, the VTS operators' duties can cause a weakening of the ability to concentrate. The functionality of the monitoring system with regards to automatic plotting, warning and alarm functions, was not sufficiently adapted to the execution of the vessel traffic service. The NCA had not established human, technical and organisational barriers to ensure adequate traffic monitoring.
- c) Traffic monitoring is necessary to ensure that the VTS centres have sufficient scope of action to operate an early, effective and safe traffic organisation and information service. The night of the accident, the VTS centre's scope of action had largely been lost when the VTS once again became aware of the presence of HNoMS Helge Ingstad.
- d) Fedje VTS did not adequately inform other traffic in the area of Sola TS leaving the Sture Terminal. An efficient and correct information service is an important contribution to situational awareness on all vessels when tankers operate within the VTS area. Due to the lack of traffic information the frigate's bridge team missed an opportunity to register that a tanker was leaving the Sture terminal.
- e) The introduction of AIS and electronic charts may have contributed to establishing a general expectation among seafarers that other vessels have a complete overview of the traffic situation. In turn, this might have given rise to the view that there was less need for the VTS centre to provide information. It might also have contributed to less manual radar plotting of vessels on the part of VTS.
- f) It is not given that the introduction of a traffic separation scheme in the Hjeltefjord will improve maritime safety for the area as a whole. Any introduction of traffic separation in the fairway must also be considered in relation to what challenges it can create for traffic entering and leaving other fairways to and from Bergen, and in relation to whether traffic organisation by Fedje VTS can provide the same degree of safety.

SUMMARY OF THE MAIN FINDINGS

- As a consequence of the clearance process, the career ladder for fleet officers in the Navy and the shortage of qualified navigators to man the frigates, officers of the watch had been granted clearance sooner, had a lower level of experience and had less time as officer of the watch than used to be the case. This had also resulted in inexperienced officers of the watch being assigned responsibility for training. Furthermore, several aspects of the bridge service were not adequately described or standardised. The night of the accident, it turned out, among other things, that the bridge team on HNoMS Helge Ingstad did not manage to utilise the team's human and technical

² Safety Recommendation Marine no 2010/04T in Report Marine 2010/01.

resources to detect, while there was still time, that what they thought was a stationary object giving off the strong lights, in fact was a vessel on collision course. Organisation, leadership and teamwork on the bridge were not expedient during the period leading up to the collision. In combination with the officer of the watch's limited experience, the training being conducted for two watchstanding functions on the bridge reduced the bridge team's capacity to address the overall traffic situation. Based on a firmly lodged situational awareness that the 'object' was stationary and that the passage was under control, little use was made of the radar and AIS to monitor the fairway.

- When Sola TS set out on its northbound passage with the forward-pointing deck lights turned on, it was difficult for the frigate's bridge team to see the tanker's navigation lights and the flashing of the Aldis lamp, and thereby identify the 'object' as a vessel. The shipping company Tsakos Columbia Shipmanagement SA had not established compensatory safety measures with regards to the reduction of the visibility of the navigation lights due to deck lighting. Furthermore, radar plotting and communication on the bridge did not sufficiently ensure the effect of active teamwork to build a common situational awareness. This could have increased the time window for identification and warning of the frigate.
- The Norwegian Coastal Administration (NCA) had not established human, technical and organisational barriers to ensure adequate traffic monitoring. The functionality of the monitoring system with regards to automatic plotting, warning and alarm functions, was not sufficiently adapted to the execution of the vessel traffic service. Lack of monitoring meant that the VTS operator's situational awareness and overview of the VTS area were inadequate. Hence, Fedje VTS did not provide the vessels involved with relevant and timely information and did not organise the traffic to ensure the tanker's safe departure from the Sture Terminal.
- On the southbound voyage, HNoMS Helge Ingstad sailed with AIS in passive mode. This meant that the frigate could not be immediately identified on the screens at Fedje VTS or Sola TS. None of the parties involved made sufficient use of available technical aids. It was a challenge for maritime safety that the Navy could operate without AIS transmission and without compensatory safety measures within a traffic system where the other players largely used AIS as their primary (and to some extent only) source of information.

SAFETY RECOMMENDATIONS

Based on the investigation of this marine accident, the Accident Investigation Board Norway issues 15 safety recommendations within the following areas, for the purpose of improving safety at sea.

- **The Royal Norwegian Navy** should establish competence requirements and procedures for training activity on the bridge, attending to both the training function and safe navigation.
- **The Royal Norwegian Navy** should consider the career path and the clearance process for officers in the Fleet in relation to the Navy's manning concept for frigates, with a view to ensuring that bridge teams have a sufficient level of competence and experience.
- **The Royal Norwegian Navy** should establish systematic bridge resource management (BRM) training for the whole bridge team.
- **The Royal Norwegian Navy** should review and revise the governing bridge service documents.
- **The Royal Norwegian Navy** should review and improve its system for medical fitness assessment and follow-up with regards to vision.

- **The Royal Norwegian Navy** should review the use of AIS and ensure that adequate compensatory measures are put in place when using AIS in passive or encrypted mode.
- **The Royal Norwegian Navy**, in cooperation with **the Norwegian Coastal Administration**, should resume and formalise their combined effort to develop and implement guidelines for the use of Warship AIS in the Fedje VTS area, as well as in other Norwegian VTS areas as required.
- **The Royal Norwegian Navy** should review the operating concept and ensure that safety management and operational needs are compared as management parameters.
- **The Royal Norwegian Navy** should install VDR on the Navy's vessels.
- **The Ministry of Defence** should introduce, particularly relating to critical functions, a system to give the Navy a systematic overview and positive control of hours of rest. In addition, a requirement for compensatory measures should be put in place when non-compliance with the provided hours of rest in the civilian protective provision.
- **The shipping company Tsakos Columbia Shipmanagement S.A.** should establish safety measures for the use of deck lights on vessels, which ensures that the deck lights do not reduce the visibility of the navigation lights.
- **The shipping company Tsakos Columbia Shipmanagement S.A.** should review and improve its practice relating to cooperation on the bridge and safe navigation on vessels under pilotage.
- **The Norwegian Maritime Authority** should address the industry in general with regards to the use of deck lighting which could reduce the visibility of the vessel's navigation lights.
- **The Norwegian Coastal Administration** should review and improve how traffic monitoring is conducted, with regards to manning, tasks and technical aids.
- **The Norwegian Coastal Administration** should review and improve its procedures and practice for traffic information.