MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

ACCIDENT REPORT

SERIOUS MARINE CASUALTY | REPORT NO 12/2014 | MAY 2014

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This investigation has been conducted with the co-operation and assistance of the Swedish Accident Investigation Authority.

Anchor dragging and subsequent grounding of *STENA ALEGRA*

Karlskrona
28 October 2013

SUMMARY

At 1851 (UTC[1]+1) on 28 October 2013, the RoPax[2] ferry *Stena Alegra* **(Figure 1)** grounded after dragging its anchor in 76 knot winds off Karlskrona, Sweden.

The vessel's bottom plating and frames were damaged, and one ballast tank and one void space were flooded. Two tugs towed the vessel off the rocks after the weather had moderated the next day. Following an underwater inspection the vessel proceeded to Gdynia, Poland, for repair.

The MAIB investigation identified that the master had decided to anchor the vessel in winds that were forecast to increase to the assumed maximum design limit of its anchoring equipment without completing a full assessment of the consequent risks.

Figure 1: *Stena Alegra*

[1] Universal Co-ordinated Time

[2] Roll on roll off passenger ferry

The wind speed rose to above that forecast, causing the vessel to drag its anchor. Measures aimed at arresting the vessel's drift failed to prevent *Stena Alegra* from running aground.

Recommendations have been made to the vessel's manager, Northern Marine Management Ltd, to enhance its safety management system requirements for anchoring, including contingency planning, and the enhancement of masters' handover procedures.

FACTUAL INFORMATION

Vessel

On 27 May 2013, while laid up in Falmouth, UK, *Stena Alegra* was purchased by Stena North Sea Ltd. The vessel was then towed to Gdansk, Poland, for a major refit under the management of Northern Marine Management Ltd (NMM).

On 8 July 2013 the vessel was chartered to Stena Line and entered service between Gdynia and Karlskrona. An *'Operational Limits'* certificate, issued by the UK's Maritime and Coastguard Agency on 19 September 2013, included a '*Sea State Restriction'* of 4 metres significant wave height. In accordance with Merchant Shipping Notice (MSN) 1790 (M), this allowed *Stena Alegra* to operate the route between Gdynia and Karlskrona for which a significant wave height of 2.9 metres had been determined.

Stena Alegra was one of three vessels on the service and was scheduled to sail from Gdynia on Wednesday, Friday and Sunday, and from Karlskrona on Tuesday, Thursday and Friday. The schedule included overnight layovers in Gdynia on Saturday night, and Karlskrona on Monday night.

Environment

When *Stena Alegra* dragged its anchor the weather conditions in the area were south-westerly winds gusting 76 knots (Beaufort Force 12), a moderate sea state, and good visibility.

NARRATIVE

At 1800 on Sunday 27 October 2013, *Stena Alegra* sailed from Gdynia for its overnight crossing to Karlskrona. Once clear of the port the master handed over the watch to the third officer and left the bridge. He went to sleep in his cabin at about 2200. At 0400 he was called by the OOW[3] because a passenger had suffered a stroke, and went to the bridge. In an effort to expedite the vessel's arrival at Karlskrona the master agreed with the pilot, by VHF[4] radio, that the pilot could board the vessel once it was north of the submarine nets between Aspo and Tjurkö **(Figure 2)** rather than at the usual boarding position. The master then took the con, with the second officer remaining on the bridge to support the master until relieved by the chief officer. At 0550, the pilot boarded, followed shortly afterwards by paramedics to assist the sick passenger.

Stena Alegra was berthed by the master using one of the two bow thrusters, owing to a fault with one of its two diesel generators. Wind conditions at the time were approximately south-west 28 knots. After making fast, three of the four main engines were stopped while the cargo was discharged. No 3 main engine was left running to power a shaft alternator while the faulty diesel generator was under repair.

During the short time alongside, the master discussed with the pilot his intention to proceed to anchor in anchorage B **(Figure 2)** for the vessel's scheduled layover period. The master proposed anchoring as close to the main channel as possible to gain maximum sea room from Aspeskarsklapparna, owing to the forecast south-westerly winds. During these discussions, the pilot produced a local weather forecast

[3] Officer of the watch

[4] Very High Frequency

Reproduced from Chart SE 7411 by permission of the Swedish Maritime Administration, Norrköping 2012

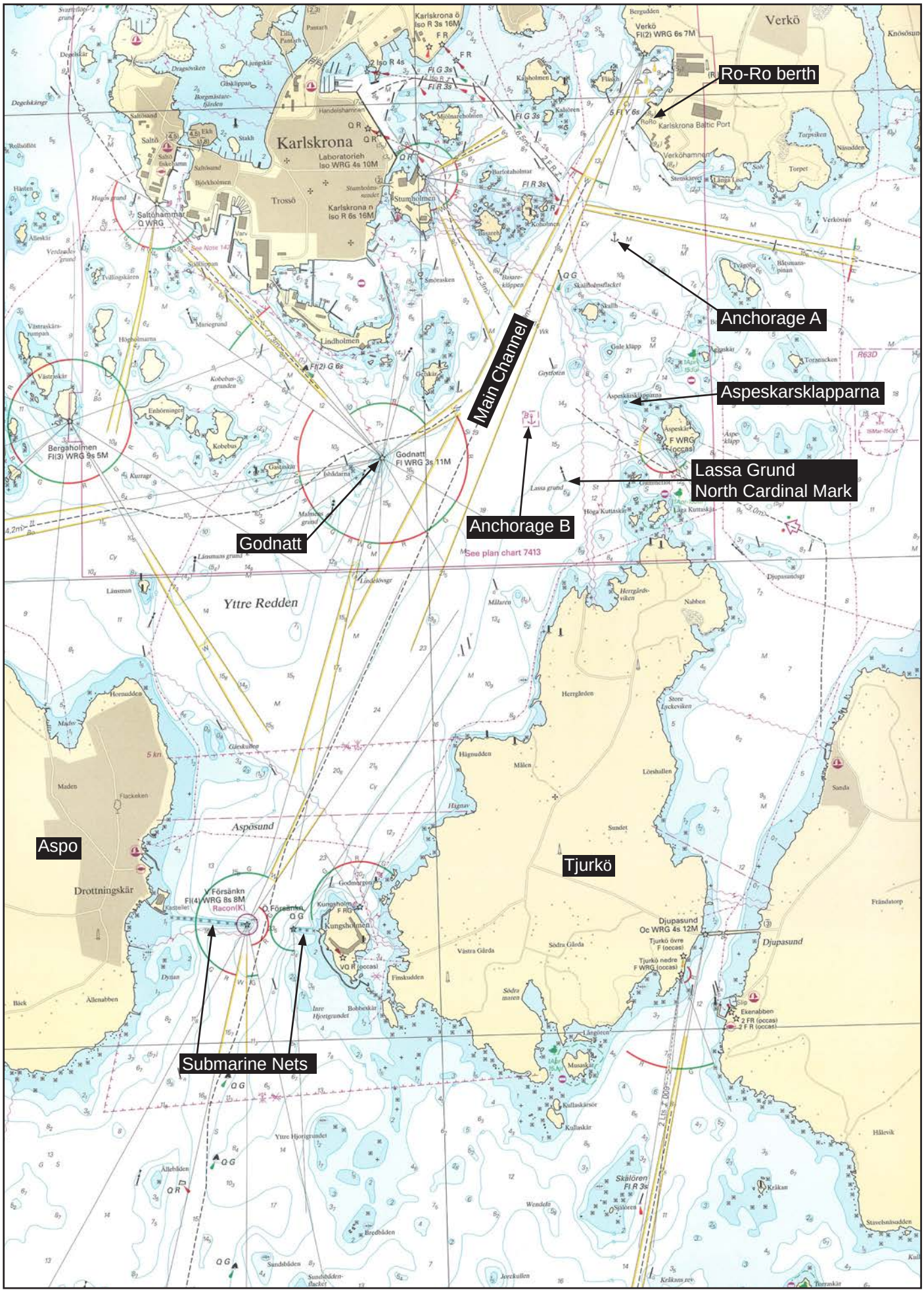

Figure 2: Chartlet showing anchorage and main features of Karlskrona and approach

that indicated winds would increase in excess of 40 knots and peak at about 2100 that evening. The pilot also commented that anchoring *Stena Alegra* south-west of its normal anchoring position should provide better holding ground because the seabed would be less disturbed. The local weather forecast predicted wind speeds similar to the vessel's NAVTEX[5] forecast of 18-24 metres/second (35-47 knots).

At 0800, after completing cargo discharge, *Stena Alegra* departed its berth for the anchorage. The wind had increased to 30 knots. The master had the con with the pilot providing advice. At 0827, the master ordered the starboard anchor to be let go. By 0845, *Stena Alegra* was 'brought up'[6] with 8 shackles[7] of anchor cable having been deployed. The vessel's bridge was positioned with Godnatt bearing approximately 267°(T)[8] at 0.82 mile.

The master then discussed the availability of the main engines with the chief engineer, and requested that they remain on 5 minutes' notice throughout the vessel's time at anchor. The chief engineer wanted to keep a shaft alternator running while the faulty diesel generator was under repair. He therefore suggested that No 3 main engine be kept running and available to be clutched in immediately should it be required, with the other engines to be started as quickly as possible afterwards. Following this conversation, No 1, 2 and 4 main engines were shut down and No 3 main engine remained running with the shaft alternator engaged to supply electrical power.

The master then handed over the anchor watch to the third officer, and left written instructions for the OOW to instruct the engine room to clutch in the main engine that was running and to call both him and the bosun should he suspect that the vessel was dragging its anchor. These instructions also advised the OOW that the wind was due to increase to over 40 knots.

At 1200, the third officer handed over the watch to the second officer on the bridge and the fourth engineer handed over the watch to the third engineer in the engine room. Both outgoing officers verbally passed on to their reliefs the master's requirement for the main engines to remain at 5 minutes' notice. At that time the wind remained blowing from the south-west at about 30 knots.

By 1300, the wind had increased and the master had started visiting the bridge about every 15 minutes to check on the wind speed; he was also monitoring the forecast conditions via the internet.

By about 1600, the wind speed had increased to 40 knots. *Stena Alegra* was maintaining its anchored position, but had started to yaw[9] by up to 60º either side of the wind direction. At 1646, a NAVTEX forecast was received predicting south-westerly winds at 18-25 metres/second (36 to 50 knots).

By 1700, the wind speed had increased to 50 knots and the repair to the faulty diesel generator had been completed. The chief engineer informed the master, who decided that No 3 main engine should remain running and ready to be clutched in immediately should it be required.

At 1800, the watches changed; the third officer took over on the bridge, and the fourth engineer took over in the engine room. At the time of the handover, the wind speed was around 53 knots. The master was also on the bridge and had observed the wind speed on the anemometer. Hoping that the wind strength had reached its peak, he went to have dinner with the chief officer.

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[5] NAVTEX (Navigational Telex) is an international automated medium frequency direct-printing service for delivery of navigational and meteorological warnings and forecasts, as well as urgent marine safety information to ships.

[6] A vessel is said to be 'brought up' when all way has stopped, it is riding to its anchor, and the anchor is holding.

[7] A shackle of anchor cable measures 27.5 metres.

[8] True

[9] The sideways movement and rotation around the vertical axis of a vessel at anchor.

At 1830, the master and chief officer returned to the bridge, noting a wind speed of about 51 knots on their arrival. The chief officer went to the chart room at the back of the bridge and began preparing a loading programme for the next day, while the master returned to his cabin. Approximately 10 minutes later, the chief officer became concerned by *'strange noises'* coming from the focsle[10]. Fearing that the starboard anchor windlass brake might not be holding, the chief officer returned to the front of the bridge and visually monitored the focsle. He then told the third officer that he would take one of the duty ABs[11] with him to inspect the anchor cable.

Before the chief officer left the bridge, the master returned and noted that the anemometer was registering a wind speed of 66 knots. At approximately 1847, the master looked at the ECS[12] display and saw the vessel's history trail, which had been scribing a consistent arc over the last few hours, start to move astern. He immediately instructed the third officer to call the engine control room to *"start the second engine quickly and clutch in the first"*. The third officer used the internal telephone system to call the engine control room and pass on the master's orders, which were acknowledged by the fourth engineer. The fourth engineer slowed down No 3 main engine in preparation to engage the clutch, and then began to start the other main engines.

At 1848, the master sent the third officer to the chief engineer's cabin to ask for No 3 main engine to be clutched in. On receiving the master's request, the chief engineer told the third officer to call the engine control room and pass the message to the duty engineer. He then proceeded to the engine control room himself.

The third officer returned to the bridge and, at 1849, a second call was made to the engine control room stating *"we need to start right now"*. This call was again answered by the fourth engineer. *Stena Alegra* continued to drag its anchor and drift north-eastwards at about 3 knots.

At 1851, *Stena Alegra*'s forepart grounded on rocks adjacent to Aspeskarsklapparna. Approximately 20 seconds later, the control of all four main engines and two bow thrusters were handed over to the bridge. The master attempted to manoeuvre the vessel clear of the rocks by splitting the engines[13] and using the bow thrusters and rudders. During this time he instructed the duty AB to call the crew, alerted the pilot station and coastguard by VHF radio, informed NMM by mobile telephone, and gave instructions for the tanks and void spaces to be sounded.

At 1905, the master stopped his attempts to free the vessel and left the engines running with zero propeller pitch applied. No 17 void space was found to be flooded.

At 2135, the tug *Dutch Power*, which had been moored in Karlskrona, arrived on scene to assist, and was made fast to *Stena Alegra'*s stern. *Stena Alegra* remained aground overnight.

During the morning of 29 October 2013, officials from the Swedish coastguard arrived with a classification society surveyor and divers to carry out a damage inspection. At 1000, No 6 ballast tank was found to be flooded. At approximately 1655, with moderating weather conditions and a second tug assisting, *Stena Alegra* was pulled off the rocks and re-anchored in anchorage B.

[10] Forecastle – forward mooring station, where the anchor windlass and mooring winches are located

[11] Able seaman – a deck rating

[12] Electronic Chart System

[13] To place port and starboard propeller pitch controls in opposite directions, ie one side ahead and one side astern to generate a turning moment at the vessel's stern.

Manning and watchkeeping

The master was Romanian and 51 years old. He was on his first contract with NMM and had joined *Stena Alegra* on 16 October 2013 for a familiarisation and handover period with the offgoing master. He formally took command of *Stena Alegra* on 27 October 2013 in Gdynia. Prior to joining NMM he had served as master predominantly on Ro-Ro[14] vessels and had gained some RoPax experience since 2002. He had obtained a Romanian STCW[15] II/2 Master Unlimited Certificate of Competency in 1996.

The third officer was Polish and 39 years old. He had worked for NMM for about 2 years and had joined *Stena Alegra* on 25 September 2013 for his second contract on board. He had held a Polish STCW II/1 OOW Unlimited Certificate since 2001, and had gained about 6 years' experience as second officer on a variety of vessel types prior to joining NMM.

The fourth engineer was Polish and 29 years old. He had joined NMM 3 months before the accident and was on his second 2-month contract on board *Stena Alegra*. Prior to joining NMM he had worked as a commissioning engineer in a Polish shipyard for about 4 years. He held a Polish STCW III/1 OOW Engineering Unlimited Certificate.

All Officers on board *Stena Alegra* held appropriate UK Certificates of Equivalent Competency enabling them to serve on UK registered vessels.

Stena Alegra was conventionally manned with a master, chief, second and third officer in the deck department, and a chief, second, third and fourth engineer officer in the engine department.

The master, chief officer, chief engineer and second engineer worked daywork and were not part of the regular watchkeeping routine. The second officer and third engineer kept the 0000-0600 and 1200-1800 watches. The third officer and fourth engineer kept the 0600-1200 and 1800-2400 watches.

Two ABs were assigned to each bridge watch.

Safety management system

NMM's safety management system (SMS) provided instructions and guidance on anchoring, which included a statement recognising that Ro-Ro and RoPax vessels did not routinely anchor. It also advised masters to carefully consider the following when anchoring: *'depth of water; nature of the bottom; ship type and condition; weather and tidal conditions; proximity of dangers; length of stay.'* The advice also included a warning that, should two anchors be used in strong weather conditions, then the second one should be recovered as soon as possible when the conditions moderate to prevent the anchor cables fouling.

In addition to the written instructions and guidance, a checklist was provided. The checklist required an anchor plan to be prepared, which considered: *'speed reduction in ample time; direction/strength of wind and current; tidal stream when manoeuvring at low speed; need for adequate sea room particularly to seaward; depth of water; type of seabed; and the scope of the anchor cable required.'*

Industry guidance on anchoring

The Nautical Institute publication entitled *'Mooring and Anchoring Ships – Principles and Practice'* provides detailed information regarding anchoring operations and associated equipment. It references assumed worst conditions for vessels at anchor, discusses methods of anchoring, and suggests

[14] Roll on, Roll off

[15] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended

considerations for deciding the amount of anchor cable to deploy. A commonly used formula for calculating the minimum number of shackles of anchor cable to deploy is 1.5 x square root of the water depth (measured in metres).

The Nautical Institute publication *'Bridge Watchkeeping'* provides practical guidance on anchoring operations and the keeping of an anchor watch. The guidance includes the recognised best practice of fixing the vessel's position at the time of letting go the anchor, allowing a measured distance from the anchor to the bridge when the vessel is brought up, and constructing a swinging circle. This practice was not followed on *Stena Alegra*.

Design limitations of anchoring equipment

The IACS[16] *'Requirements concerning mooring, anchoring and towing'* includes the following in respect of the design of anchoring equipment:

> *'The anchoring equipment required herewith is intended for temporary mooring of a vessel within a harbour or sheltered area when the vessel is awaiting berth, tide, etc;*
>
> *The equipment is therefore not designed to hold a ship off fully exposed coasts in rough weather…;*
>
> *The anchoring equipment presently required herewith is designed to hold a ship in good holding ground in conditions such as to avoid dragging of the anchor...;*
>
> *The Equipment Numeral (EN) formula for anchoring equipment required here under is based on an assumed current speed of 2.5 m/sec, wind speed of 25 m/sec and a scope of chain cable between 6 and 10, the scope being the ratio between length of chain out and water depth.'* [sic]

Similar accidents

On 26 November 2011, the port windlass of the UK registered Ro-Ro vessel *Norcape* suffered catastrophic damage during an attempt to weigh anchor after experiencing a wind speed of up to 50 knots[17]. Rather than keep the vessel underway or seek a less exposed location, the master had opted to anchor the vessel with 8 shackles of anchor cable deployed in a water depth of 35 metres. Even though a second anchor had been lowered onto the seabed to reduce anticipated yaw, the vessel's heading was noted to swing through 150º. A safety flyer that accompanied the MAIB's safety investigation report strongly advised an owner or operator to ensure that its SMS provides masters with clear guidance on the capability of its vessel's anchoring system, including:

- Any limitations of the anchor system components, including those of the windlass.
- Effects of windage in various load conditions.
- Risks associated with excessive yaw.

On 1 January 2002, the Cyprus registered product tanker *Willy* grounded after dragging its anchor in a wind speed of up to 24 knots[18]. The vessel had been anchored 0.4 mile off a leeshore with 4 shackles of anchor cable deployed in a water depth of 10 metres. The MAIB safety investigation report concluded that insufficient anchor cable had been deployed, and that the vessel's close proximity to the shore, together with the speed at which it dragged its anchor, provided insufficient time for the engine to be started and for the crew to take effective corrective action.

[16] International Association of Classification Societies

[17] MAIB Report No 28/2012

[18] MAIB Report No 31/2002

ANALYSIS

The master decided to anchor *Stena Alegra* with forecast winds of up to 47 knots. Insufficient contingency planning meant that the possibility of winds in excess of those forecast, and measures to reduce the consequent increased risk of the vessel dragging its anchor and grounding when anchored in such close proximity to land, had not been considered. The vessel dragged its anchor while encountering wind speeds that were well in excess of its anchoring equipment design parameters, and grounded due to insufficient corrective action being taken in the limited time available.

The decision to anchor

Stena Alegra was required to layover from Monday morning until its scheduled loading time on Tuesday afternoon. Three vessels routinely used the same Ro-Ro berth in Karlskrona. Consequently, *Stena Alegra* was required to leave the berth after discharge, which left the master with a choice of either leaving the port and proceeding to sea, or anchoring in one of the designated anchorage areas within the port approaches until the berth became available the following day.

The weather forecast available to the master at the time of his decision to anchor was for winds to increase up to 47 knots from the south-west. The master considered there would be little protection from the wind and sea immediately outside the port because of the port's southerly location. He also assessed that the small islands surrounding the designated anchorages within the port approaches would provide an adequate lee for *Stena Alegra*.

In dismissing the option of proceeding to sea, the master did not consider steaming east or west along the coast from Karlskrona, and then heaving to in areas where the sea conditions were likely to have been more favourable due to the shelter provided by the Swedish coast. Such an option was feasible considering the length of the layover period **(Figure 3)**.

The master's decision to anchor was influenced by his previous successful, albeit limited, experience of anchoring other Ro-Ro and RoPax vessels in wind speeds of about 40 knots. His lack of experience of anchoring *Stena Alegra* was due mainly to the short time that he had been on board, and the limited opportunities he had had to observe how the vessel performed at anchor. His lack of familiarity with *Stena Alegra*'s anchoring capabilities were further exacerbated by the limited experience of both the outgoing master and the officers and crew in general, none of whom had witnessed the vessel anchored in strong winds.

Stena Alegra was a recent acquisition for NMM. Therefore, in familiarising themselves with its capabilities and performance, the crew were reliant on information exchanged during handover periods, and instructions and guidance held on board, some of which is likely to have been lost during the vessel's change of management.

Although the forecast wind speed was at the assumed maximum design limit of *Stena Alegra*'s anchoring equipment, the yawing effect of the vessel would have increased the loading to beyond that limit. NMM's SMS did not refer to this information. Had such guidance been available on board, it might have deterred the master from his decision to proceed to anchor.

Lack of crew familiarity with a vessel's capabilities and performance, and the need for clear guidance to be provided in a company's SMS, featured in the MAIB's safety investigation report and accompanying flyer following the accident on board *Norcape*.

Having decided that anchoring the vessel in the forecast wind was feasible, *Stena Alegra*'s master then needed to carefully appraise his intended anchorage, fully assess the consequent risks, plan the anchoring operation and implement appropriate safeguards to prevent the vessel dragging anchor and/or running aground.

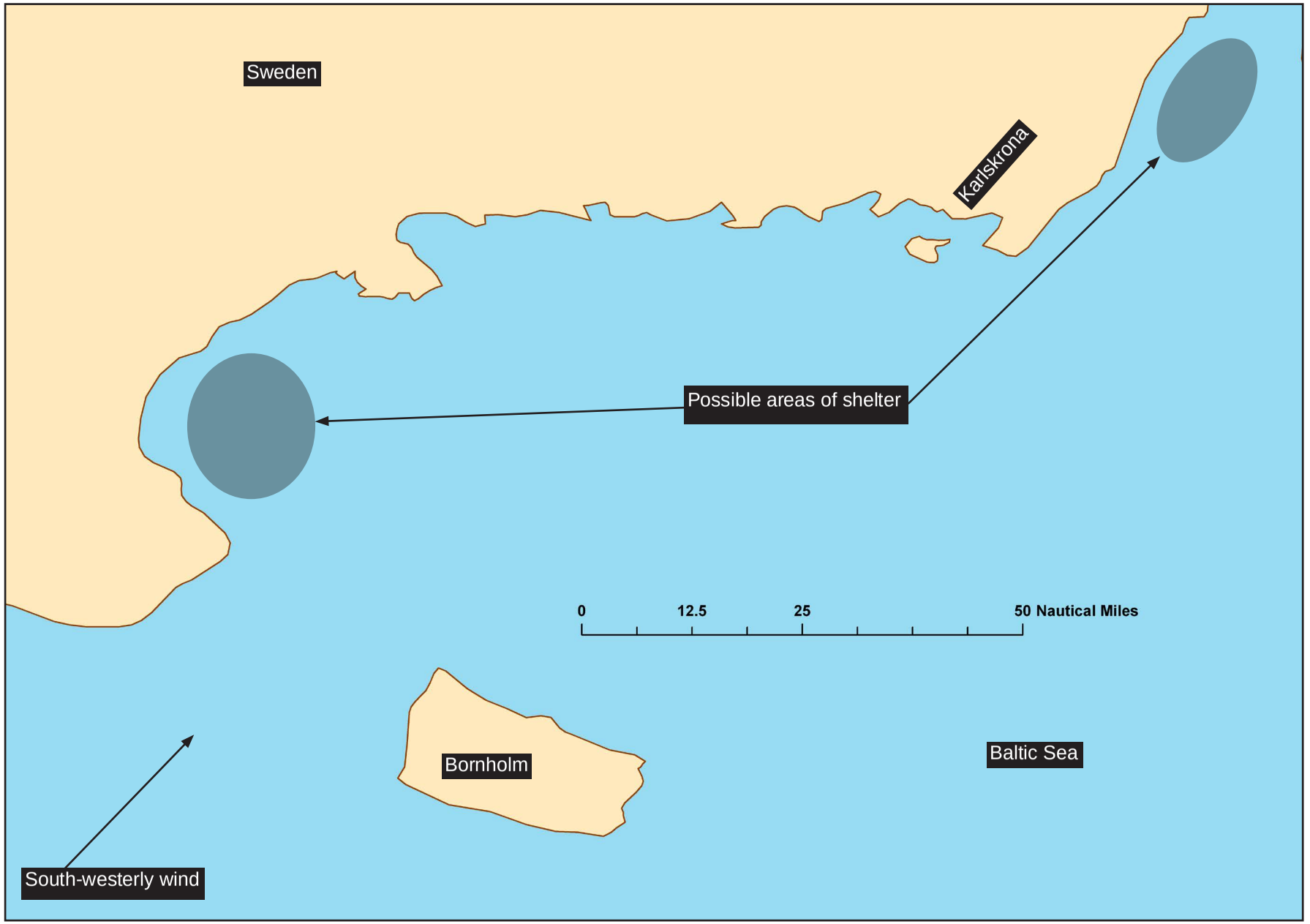

Figure 3: Swedish coast and possible areas of shelter

Appraisal of anchorage

There were two designated anchorages within the approaches to Karlskrona. The master selected anchorage B because in anchorage A *Stena Alegra* would have potentially impeded the passage of other vessels using the Ro-Ro berth. He decided to anchor the vessel south-west of its normal anchoring position so as to maximise its distance from Aspeskarsklapparna, without unduly encroaching into the main entrance channel. He also increased the amount of anchor cable normally used, to 8 shackles which, in a water depth of 15 metres, provided a scope of 14.7 (ie greater than the assumed maximum scope in the IACS design requirements for anchoring equipment). The pilot's comments regarding the suitability of the holding ground at the master's intended anchoring position provided tacit validation of the appropriateness of his decision to proceed to anchor in anchorage B despite the forecast weather conditions.

In modifying *Stena Alegra*'s normal anchoring position and increasing the amount of cable normally used, the master broadly took into consideration the factors listed in the NMM's SMS.

However, the master did not construct a swinging circle for the vessel either at the planning stage or after anchoring. Had he done so, he might have identified the potential for *Stena Alegra* to pass over Lassa Grund north cardinal mark, and the vessel's close proximity to Aspeskarsklapparna **(Figure 4)**. Taking into account *Stena Alegra*'s windage area, this graphical illustration might have alerted the master to the limited time that he would have available in which to arrest the vessel's drift should it start to drag its anchor, and might have encouraged him to reconsider his decision to anchor.

Finally, the master did not consider the possibility of the vessel experiencing stronger winds than those forecast. A higher wind speed increased the potential for the anchoring equipment to fail or the vessel to drag its anchor, and for an increased rate of drift reducing the time available before the vessel grounded. With no contingency plan developed in the event of stronger winds than forecast being experienced, the trigger point at which a response was executed became the point at which the vessel eventually started to drag its anchor.

Monitoring of vessel at anchor

As the wind increased during the afternoon of 28 October, *Stena Alegra* maintained its position, which reaffirmed to the master that the amount of cable deployed was probably sufficient to prevent the vessel dragging its anchor in the forecast conditions. Additionally, if the vessel did start to drag its anchor, he remained confident that, by clutching in No 3 main engine, the vessel's drift could be satisfactorily arrested to prevent it from grounding.

However, once the wind had increased to over 40 knots, the master became concerned by the erratic and severe yawing of the vessel. This behaviour can be explained by the position of the vessel's hawse pipe which, owing to the bow door, was situated further aft on the shoulder than that on a conventional vessel, and to the effect of the wind on the forward accommodation block. The combined effect of these factors was a tendency for the vessel to present itself beam onto the wind, particularly during gusts.

The erratic yawing of the vessel prompted the master to consider what options might be available to him. There is conflicting evidence suggesting that he might have been influenced by a misinterpretation of the *'Sea State Restriction'* of 4 metres listed on the vessel's *'Operational Limits'* certificate in not deciding to proceed to sea. However, once the wind had increased to 50 knots, he considered it to be too dangerous for the vessel to safely pass through the narrow gap between Aspo and Tjurko.

Having decided to remain at anchor, the master could have taken proactive measures to reduce the risk of the vessel dragging its anchor and grounding. No 3 main engine could have been clutched in, and all other main engines, steering motors and thrusters could have been started and placed on bridge control.

Reproduced from Chart SE 7413 by permission of the Swedish Maritime Administration, Norrköping 2012

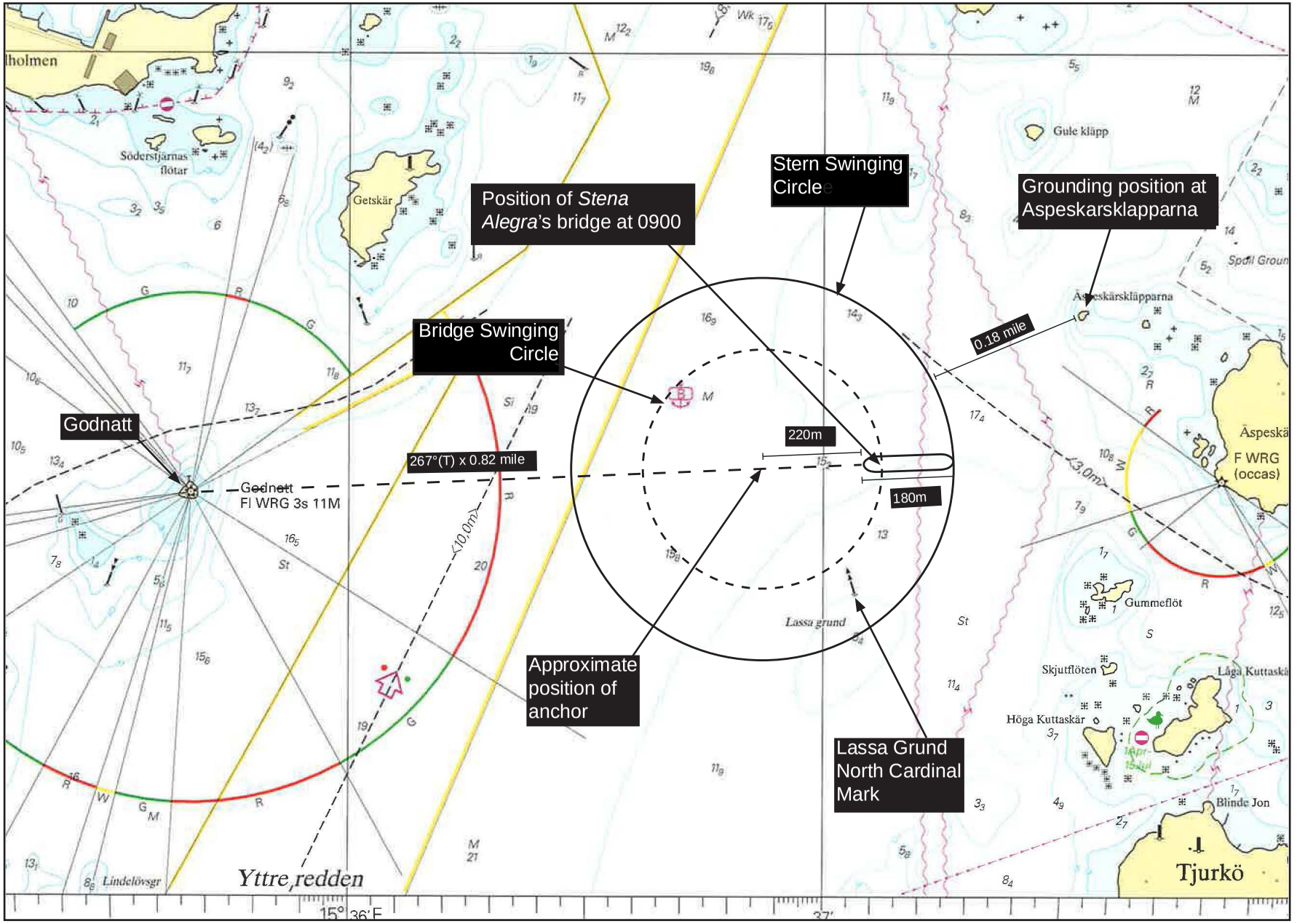

Figure 4: Anchor swinging circle for *Stena Alegra*

The master could then have manoeuvred the vessel ahead to reduce the loading on the anchoring equipment. He could also have lowered the port anchor to the seabed to reduce the vessel's yawing. Although NMM's SMS referred to the possibility of using two anchors in strong weather conditions, it made no reference to using the second anchor for this purpose. He might also have considered paying out more anchor cable, although this would have reduced the vessel's distance from the leeshore and so decreased the time available in which to prevent it from grounding.

Had the master prepared a contingency plan to respond to changes in observed wind conditions rather than to simply react to the vessel dragging its anchor, he might have included the above measures in that plan. Such action required a greater level of proficiency and precautionary thought than that demonstrated. Instead, the master remained hopeful that the wind would peak before the vessel started to drag its anchor, and was confident that the main engines would be available for use in sufficient time to prevent it from grounding.

Dragging of anchor and grounding

When *Stena Alegra* started to drag its anchor the wind speed had increased to 66 knots observed on the anemometer by the master (a maximum of 76 knots was recorded on the vessel's VDR[19]). Such wind speeds were about 50% higher than those for which the vessel's anchoring equipment had been designed, and it is therefore unsurprising that the vessel dragged its anchor at this stage.

The early identification that *Stena Alegra* was dragging its anchor failed to prevent it grounding because of the vessel's close proximity to the leeshore, and the crew having insufficient time in which to respond. The main engines were at 5 minutes' notice and were made ready within this time. However, *Stena Alegra* quickly reached a speed of 3 knots when dragging, and covered the short distance to Aspeskarsklapparna in 4 minutes. Having the main engines at 5 minutes' notice, with the trigger point for their use being when the vessel started to drag its anchor, was inappropriate and is indicative that the master did not appreciate the vessel's likely rate of drift in such circumstances.

The MAIB safety investigation report of the accident involving *Willy* highlighted the rate at which the vessel dragged its anchor, allowing insufficient time for the crew to prevent it from grounding.

The master expected No 3 main engine to be immediately clutched in when requested, and he had left written instructions on the bridge to this effect. However, his verbal instructions were for the main engines to remain on 5 minutes' notice. The fourth engineer's understanding was that No 3 main engine was running, and ready to be clutched in, to reduce the time needed to have all main engines ready for use to satisfy the master's 5 minutes' notice requirement.

The differing interpretations of the master's requirement for the main engines' readiness remained unresolved throughout the vessel's time at anchor. Therefore, when the third officer called the fourth engineer to *"start the second engine quickly and clutch in the first"*, the instruction failed to transmit the master's expectation for No 3 main engine to be clutched in and its control passed to the bridge immediately.

No 3 main engine could, in fact, have been clutched in from the bridge, a function that none of the bridge team were aware of. However, it is uncertain whether the immediate use of a single main engine would have prevented the vessel from grounding in the prevailing conditions.

[19] Voyage Data Recorder

CONCLUSIONS

- The master decided to anchor *Stena Alegra* with wind conditions forecast to increase to the assumed design limitation of its anchoring equipment. In doing so, he did not take into account the additional loading that would be caused by the vessel yawing, and did not consider contingency options should the wind speed increase to beyond that forecast.

- In dismissing an option of proceeding to sea, the master did not consider steaming a short distance along the coast and to then heave to in areas where the sea conditions were likely to have been more favourable. He might also have misinterpreted the *'Sea State Restriction'* of 4 metres listed on the vessel's *'Operational Limits'* certificate.

- The master's decision to anchor was influenced by his previous successful, albeit limited, experience of anchoring other Ro-Ro and RoPax vessels in winds of about 40 knots. He lacked familiarity with *Stena Alegra*'s capabilities and performance when anchored due to his limited time on the vessel and a lack of available guidance on board.

- The master did not construct a swinging circle for the vessel. Had he done so, he might have been alerted to the vessel's close proximity to danger and the limited time that he would have available to arrest its drift should it start to drag its anchor.

- Had the master prepared a contingency plan to respond to changes in observed wind conditions rather than waiting for the vessel to drag its anchor, he could have taken proactive measures to prevent the grounding.

- The master lacked an appreciation of the vessel's likely rate of drift should it start to drag anchor in the prevailing wind conditions. His expectation for No 3 main engine to be clutched in immediately if the vessel dragged its anchor was not effectively communicated to the engine control room. However, if No 3 main engine had been clutched in immediately, it is uncertain that its sole use would have prevented the vessel from grounding.

ACTION TAKEN

Actions taken by other organisations

The **Maritime and Coastguard Agency** has:

Undertaken to revise the wording of its *'Operational Limits'* certificate pro forma to remove any potential for confusion regarding the meaning of *'Sea State Restrictions'*.

Northern Marine Management Ltd has:

Carried out its own internal investigation into the accident, and:

- Conducted additional audits of its Ro-Ro and RoPax vessels, focusing on the standard of management and navigation practices on board.
- Held 2-day seminars for senior officers at its head office to encourage communication and, specifically, to discuss this accident.
- Conducted a review of its SMS anchoring and heavy weather procedures with the intention of ensuring lessons learned from this accident are incorporated.
- Issued a fleet circular with amendments to be incorporated in the next revision of its SMS Manual.

RECOMMENDATIONS

Northern Marine Management Ltd is recommended to:

2014/118 Improve its safety management system by:

- Providing specific guidance on the operational limitations of vessels' anchoring equipment.
- Providing further guidance to masters on its expectations for anchor planning, including the importance of contingency planning and the need for early action to prevent a vessel dragging its anchor.
- Enhancing its masters' handover procedures to ensure that key information regarding a vessel's capabilities and performance while at anchor are discussed during handover periods.

SHIP PARTICULARS

Vessel's name	*Stena Alegra*
Flag	United Kingdom
Classification society	RINA
IMO number/fishing numbers	9147291
Type	RoPax
Registered owner	Stena North Sea Ltd
Manager(s)	Northern Marine Management Ltd
Year of build	1997
Construction	Steel
Length overall	180.0 metres
Registered length	Not applicable
Gross tonnage	22,152
Minimum safe manning	20
Authorised cargo	Vehicles and passengers

VOYAGE PARTICULARS

Port of departure	Karlskrona (anchorage B)
Port of arrival	Karlskrona (anchorage B)
Type of voyage	International
Cargo information	In ballast
Manning	33

MARINE CASUALTY INFORMATION

Date and time	28 October 13, 1851 (UTC+1)
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Karlskrona, Sweden
Place on board	Not applicable
Injuries/fatalities	None
Damage/environmental impact	Plate and frame damage to hull plating with one ballast and one void tank opened to sea, no pollution
Ship operation	Anchored
Voyage segment	Anchored
External & internal environment	Wind south-west force 12; moderate sea state; good visibility
Persons on board	33