

Final report *SHK 2023:01e*

Fire on the vessel ALMIRANTE STORNI in
December 2021, off Gothenburg

File no. S-302/21

18 January 2023

SHK investigates accidents and incidents from a safety perspective. Its investigations are aimed at preventing a similar event from occurring in the future, or limiting the effects of such an event. The investigations do not deal with issues of guilt, blame or liability for damages.

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ISSN 1400-5735

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General observations

The Swedish Accident Investigation Authority (Statens haverikommission – SHK) is a state authority with the task of investigating accidents and incidents with the aim of improving safety. SHK accident investigations are intended to clarify, as far as possible, the sequence of events and their causes, as well as damages and other consequences. The results of an investigation shall provide the basis for decisions aiming at preventing a similar event from occurring in the future, or limiting the effects of such an event. The investigation shall also provide a basis for assessment of the performance of rescue services and, when appropriate, for improvements to these rescue services.

SHK accident investigations thus aim at answering three questions: *What happened? Why did it happen? How can a similar event be avoided in the future?*

SHK does not have any supervisory role and its investigations do not deal with issues of guilt, blame or liability for damages. Therefore, accidents and incidents are neither investigated nor described in the report from any such perspective. These issues are, when appropriate, dealt with by judicial authorities or e.g. by insurance companies.

The task of SHK also does not include investigating how persons affected by an accident or incident have been cared for by hospital services, once an emergency operation has been concluded. Measures in support of such individuals by the social services, for example in the form of post crisis management, also are not the subject of the investigation.

The investigation

SHK was informed on 4 December 2021 that fire had occurred on the vessel ALMIRANTE STORNI that same day at 14:30 hrs.

The accident has been investigated by SHK, represented by Kristina Börjevik Kovaniemi, Chairperson, Jörgen Zachau, Investigator in Charge, Tomas Ojala, Investigator in Charge (Rescue Operation and Fire), and Daniel Söderman, Technical Investigator.

Patrik Jönsson was coordinator for the Swedish Transport Agency, Ulf Holmgren for the Swedish Maritime Administration, Anna Berglund for the Swedish Coast Guard, Pontus Rotter for the Västra Götaland County Administrative Board, and Robert Skyllberg and Per Delhage for the Swedish Civil Contingencies Agency.

Experts from the Department of Electrical Engineering at the Royal Institute of Technology (KTH) have been consulted regarding questions about electrical engineering.

Investigation material

A large number of interviews have been conducted, including with the crew, staff from the port of loading, and personnel involved in the rescue operation. Relevant government agencies and crew members from other vessels are also among those interviewed.

A fact-finding presentation meeting with the interested parties was held on 30 August 2022. At the meeting SHK presented the facts discovered during the investigation, available at that time.

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Ship particulars

Flag/register	Liberia
Identification	ALMIRANTE STORNI
IMO number/call sign	9497452/A8UN7
Vessel data	
Type of ship	Bulk carrier (specially adapted for deck cargo)
New building shipyard/year	Mawei Shipbuilding Ltd/2012
Gross tonnage	19,994
Length, overall	177.46 m
Beam	28.24 m
Draught (timber cargo)	10.15 m
Deadweight at max. draught	31,780 tonnes
Main engine, output	Mitsubishi 6UEC 43LSII, 6,300 kW (just over 8,500 hp)
Propulsion arrangement	One fixed-pitch propeller
Lateral thruster	No
Rudder arrangement	Semi-balanced rudder
Service speed	13.7 knots
Ownership and operation/IMO number	Vega Reederei GmbH & Co. KG and NSC Holding GmbH & Cie. KG/ 6212922
ISM/DOC holder/IMO number	NSC Holding GmbH & Cie. KG/5542335
Classification society	DNV

Voyage particulars

Ports of call	Orrskär to Alexandria, Egypt
Type of voyage	International
Cargo information	42,727 m ³ cut timber
Manning	17

Marine casualty information

Type of marine casualty	Serious marine casualty
Date and time	04/12/2021, c. 14:30 hrs
Position of the occurrence	N 57° 33.7 E 011° 35.3'
Consequences	
Injuries to persons	No
Environment	No
Vessels	Fire damage, hull damage and cargo damage

SUMMARY

The vessel ALMIRANTE STORNI was loaded with timber and en route from Orrskär outside of Ljusne, Gävleborg County, to Alexandria in Egypt. On 4 December 2021, the vessel was to bunker at Vinga off Gothenburg. While bunkering was taking place, the bunkering vessel detected flames emerging from the deck cargo on ALMIRANTE STORNI. The bunkering vessel alerted VTS Göteborg and an extensive maritime search and rescue and environmental rescue operation was initiated shortly thereafter.

The firefighting operation ended up taking more than one week and involved several vessels with major firefighting capabilities. However, it was not possible to extinguish the fire at sea because the deck cargo needed to be unloaded in order to get at the seats of the fire. On 11 December, the vessel was able to put into the Port of Gothenburg where it was possible to unload parts of the cargo and extinguish the fire. A municipal rescue operation, which had been initiated when the vessel entered the port area, was concluded on 14 December. Once the fire was extinguished and the cargo unloaded, the vessel went to a shipyard for repairs.

The fact that it took more than one week to extinguish the fire was due in part to the time-consuming process of getting the vessel into port. The assessment was made as early as the initial day of the firefighting operation that the cargo needed to be unloaded in order to get at the seats of the fire. It was only possible to unload in port, but the question of which port ended up taking time to resolve. Aside from uncertainties about the approach to resolving this, there were, among other things, questions relating to the legal circumstances and how the risks would be managed.

Implementation of the operational measures was largely effective in relation to the prevailing conditions. No people were injured and no hazardous substances were discharged. However, vessels were damaged during the firefighting operation.

The management of this vessel fire was one of the most extensive in modern times in Sweden and provided opportunities for unique lessons to be learned. Consequently, it is essential that the management of the fire be investigated jointly by several of the organisations involved in order to ensure that these lessons are learned. The investigation indicates that there are also grounds to make the management of ships in need of assistance more robust. However, further investigation is required in order to establish what action needs to be taken as a result of the questions brought to the fore by the investigation.

A fire scene investigation was conducted during unloading in Skandia Harbour. An extension cable that was found during this investigation was probably the remains of a cable that had been used for lighting during loading in Orrskär. When the vessel departed, the extension cable broke off and was left live.

Following further investigation, after other causes of the fire had been ruled out, the assessment was made that the probable cause of the fire was that an electric arc in the extension cable had ignited the timber cargo. The way in which the

packages of timber were loaded also meant that the fire was able to rapidly increase in intensity and spread through the cargo.

Safety recommendations

The Swedish Government is recommended to:

- Investigate and, where necessary, take the action required to ensure the efficient accommodation of ships in need of assistance (section 3.5.5). (*SHK 2023:01 R1*)
- Investigate and, where necessary, take action to bring about the legislative changes required in order to ensure that affected municipalities are included in the work to draw up plans for the accommodation of ships in need of assistance (section 3.5.5). (*SHK 2023:01 R2*)

The Swedish Transport Agency is recommended to:

- Prioritise and expedite the completion of the work to draw up plans for the accommodation of ships in need of assistance. Representatives from the affected municipal rescue service organisations, the Swedish Civil Contingencies Agency and the Swedish Association of Local Authorities and Regions should participate. The aim of this work should be to streamline the administration and decision-making processes concerning the accommodation of ships in need of assistance (sections 3.5.1, 3.5.2 and 3.5.5). (*SHK 2023:01 R3*)

The Swedish Coast Guard is recommended to:

- Initiate cooperation with the Swedish Transport Agency, Greater Gothenburg Rescue Service, Swedish Maritime Administration and other relevant organisations in order to evaluate the operation with respect to aspects including the legal circumstances, the process of bringing vessels into port, assessment of the rescue operation criteria during an operation, forms of cooperation, allocation of roles and need for joint training and exercises (sections 3.4.2 and 3.5). (*SHK 2023:01 R4*)
- Evaluate firefighting methods and the design of vessels for this type of operation (section 3.4.2). (*SHK 2023:01 R5*)

1. FACTUAL INFORMATION

1.1 Sequence of events

After being loaded, ALMIRANTE STORNI, with a crew of 17, had departed from Orrskär outside of Ljusne, Gävleborg County, on 1 December 2021 in order to sail to Alexandria, Egypt. The vessel was fully loaded with cut timber packed into plastic-wrapped packages in both the cargo hold and on deck. The timber packages were loaded onto almost the entire surface of the vessel's deck, which made it impossible to walk to the bow without climbing up onto the cargo and walking on top of the packages of timber to the forebody.

In conjunction with departure it was noted that there was an extension cable between the vessel and the quay that had not been disconnected (see Figure 12). The crew on the forecastle (foredeck) informed the master on the bridge, but it was not possible to prevent the cable from breaking off because the vessel was already in motion.

During the voyage, ALMIRANTE STORNI entered the roads off Gothenburg in order to bunker and therefore anchored in Anchorage A (see section 1.2). Bunkering began at 14:05 hrs on Saturday 4 December and was conducted by the bunkering vessel AMAK SWAN, which moored for this purpose on the port side of ALMIRANTE STORNI.

Just after the bunkering began, the crew of the bunkering vessel detected the smell of smoke and then saw flames emerging from the deck cargo on ALMIRANTE STORNI. The flames were coming out of the deck cargo on the port side on the forward part of the vessel, close to the gunwale. The crew of AMAK SWAN immediately informed the crew of ALMIRANTE STORNI about the fire and the bunkering was stopped. At that point, approximately 30 tonnes of fuel oil had been transferred. AMAK SWAN untied from ALMIRANTE STORNI and first moved away from the vessel, activated its water cannon and then moved closer to the vessel again in order to attempt to extinguish the fire. The crew on ALMIRANTE STORNI also started their attempt to extinguish the fire using the vessel's firefighting equipment. While this was taking place AMAK SWAN informed VTS¹ Göteborg about the situation.

¹ Vessel Traffic Service – the Swedish Maritime Administration's traffic centres, which monitor maritime traffic and provide, among other things, traffic information.



Figure 1. The situation viewed from the bridge on AMAK SWAN shortly after the fire was detected. Image: Private.

A large number of resources were called out to the location and an extensive rescue operation was initiated. A total of 27 units were activated. In spite of this, it was possible to establish as early as within the first 24 hours that the fire was difficult to extinguish and that simply spraying it with water on site was not sufficient.

The vessel needed to be moved to a port, but the question of which port ended up taking time to resolve. Cooperation meetings involving several of the parties involved, began as early as day one of the operation, and Gothenburg was nominated as a possible port. Upon further consideration, however, it was decided that the risks of this choice of port were not resolved and that other alternative ports should be investigated. As there was no implementation plan for such an occurrence, these deliberations took a long time. It was only on 10 December that the Swedish Transport Agency was able to decide that the vessel would put into Skandia Harbour in Gothenburg. Under her own steam with tugboats attached, ALMIRANTE STORNI docked there the following day. The cargo started being unloaded and smaller seats of fire needed to be extinguished. It was possible to conclude the rescue operation on 14 December without any extensive firefighting operation being required in the port (see section 1.6).

On 22 December the vessel was transferred at her own request to Arendal Harbour, Gothenburg, where temporary repairs were made to the vessel. On 2 January 2022, ALMIRANTE STORNI was then able, again following the approval of the supervisory authority and the classification society, to depart for Lysekil, where the entire cargo was unloaded before the vessel went to a shipyard for repairs.

1.2 Site of occurrence

ALMIRANTE STORNI was anchored for bunkering in the south-east corner of Anchorage A, approximately four nautical miles south of Vinga and two nautical miles south-southwest of Trubaduren. The area is entirely open in a vector from Vinga and the west to southeast, with some protection being provided, at a distance, by the southern part of the archipelago. The depth at this location is around 50 m. A lot of traffic passes the area, including a large portion of the traffic to and from the various harbours in Gothenburg.

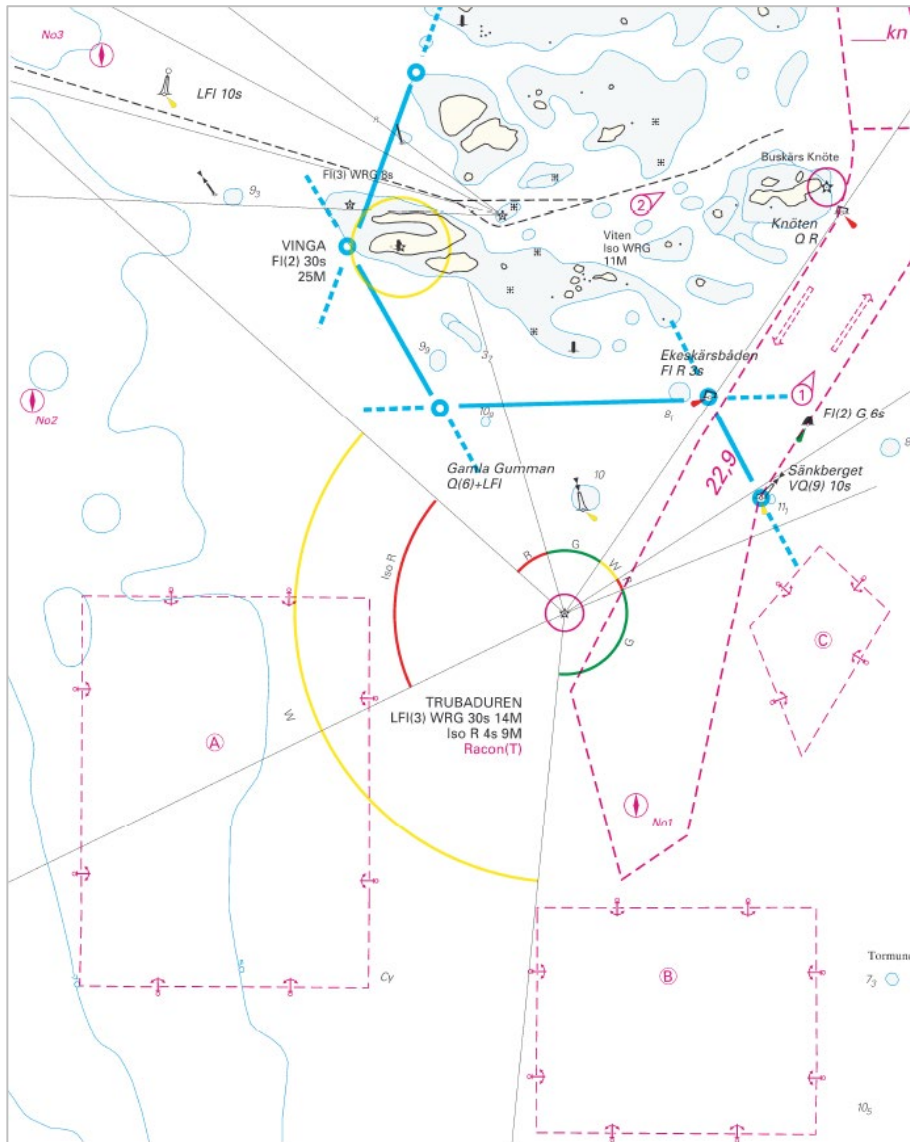


Figure 2. Nautical chart showing the area in question. ALMIRANTE STORNI was anchored in Anchorage A, in the bottom left of the image. The blue lines in the upper-right quadrant show the compulsory pilotage boundary. Image: © Swedish Maritime Administration licence no. 22-00642.

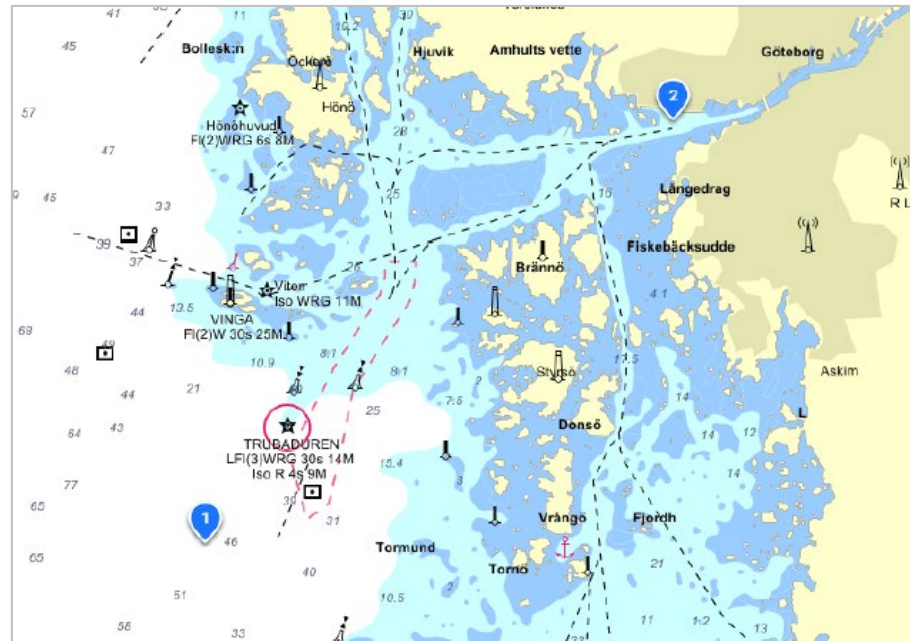


Figure 3. The blue point, labelled 1, indicates where the vessel was anchored when the fire was detected, while the point labelled 2 shows where the vessel docked. Image: Eniro, chart data Swedish Maritime Administration licence no. 22-00642, markings inserted by SMHI (Swedish Meteorological and Hydrological Institute).

1.3 Meteorological conditions

SHK has obtained data on the actual weather conditions from SMHI (Swedish Meteorological and Hydrological Institute). These are reported below.

At Trubaduren 4–11 December

During the period, the wind direction was between east-northeast and southeast. Windspeed varied between 10 m/s at the time of the occurrence, up to 13 m/s the day after and then 6–13 m/s.

The currents were in a north-westerly and north-easterly direction, with a speed of up to 1 knot until 6 December. After that, the speed increased to between 1.1 and 1.9 knots in a north-easterly direction, occasionally turning to the east-southeast up until 8 December. On 9 December the current turned to roughly north and gradually decreased from 1.4 knots to 0.2 on the morning of 11 December.

The air temperature was below freezing until the morning of 8 December and thereafter above freezing.

During the move to Gothenburg on 11 December

The wind was easterly 5 m/s in the morning and dropped during the day to 2 m/s. The air temperature was just above freezing.

Skandia Harbour 11–18 December

The wind was from the south-southeast 4–6 m/s, before turning to the southwest and increasing to 9 m/s on the evening of 13 December. After this it varied between south-westerly and north-westerly 6–11 m/s, before turning to the south and falling to 2 m/s on the afternoon of 17 December.

The air temperature was initially just above freezing, only to then increase later to up to eight degrees Celsius.

1.4 The vessel ALMIRANTE STORNI

1.4.1 General information about the vessel

ALMIRANTE STORNI (formerly VEGA NEPTUNE) was, at the time of the occurrence, part of the fleet of NSC Holding GmbH & Cie. KG, together with over thirty ocean-going vessels. Two of these were bulk carriers, one of which was ALMIRANTE STORNI. She was just over 177 metres long had a deadweight² of just under 32,000 tonnes, with engines and superstructure astern of the cargo hold.



Figure 4. ALMIRANTE STORNI. Image: Maxi Alonso.

There were five cargo holds and each hold stretched from side to side across the full breadth of the vessel, aside from the uppermost and lowermost parts of the lateral bulkheads of the cargo holds, which had sloping sides behind which there were wing tanks and bottom tanks (hopper tanks). The floor of the cargo holds formed top of the bottom tanks. This construction thus meant that the hatches did not stretch across the entire breadth of the cargo holds and that the vessel did not

² The maximum carrying capacity of a vessel – the weight of cargo, fuel, stores, crew and passengers, when loaded down to the maximum permissible draught.

have a double hull along the whole of her sides, but did have a double bottom.

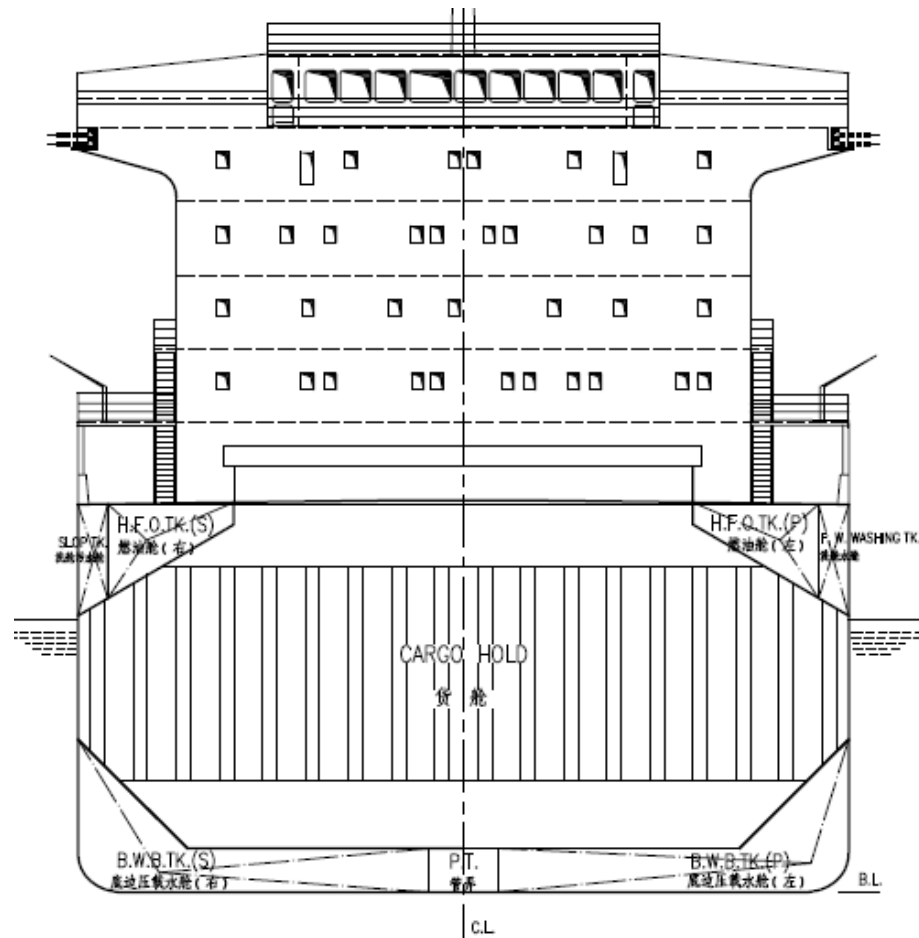


Figure 5. Cross-section of one of the largest cargo holds, which does not taper. The image shows the structure of the top wing tanks and the bottom tanks, with the latter stretching up the side somewhat. Image: Photograph courtesy of Owners of ALMIRANTE STORNI.

The forward cargo hold, cargo hold 1, was somewhat smaller than the others because it narrowed towards the bow. The hatches to the cargo holds were approximately 19.2 metres long and 16.8 metres wide, aside from the hatch to cargo hold 1, which was approximately 14.4 metres long and 15.2 metres wide. There was a deckhouse in each of the four spaces between the cargo hatches on deck. These were used for storage and contained, among other things, electrical switchboxes and parts of the foundations of the vessel's four cranes.

The vessel was specially adapted to carry timber, which meant that a substantial portion of the cargo was carried as deck cargo (i.e. carried on top of the cargo hold hatches). Special supports farthest out to the sides were used to keep the cargo in place when carrying cargo in this way.

When fully bunkered the vessel could carry just under 1,500 m³ of fuel oil. This was stored in tanks, including the aft wing tanks, from the middle of cargo hold 3. The bunker in the wing tanks, which was heavy

fuel oil, was too viscous to be pumped directly and needed to be heated before being transferred. The forward wing tanks were intended for ballast.

1.4.2 Crew

The crew of 17 was made up of people of several nationalities, with the majority of the officers coming from Eastern Europe and the ratings from the Philippines. Of these, almost all of the deck ratings had been on board since the beginning of August, while the bulk of the officers came on board at the last port of loading, Orrskär. The entire crew had been replaced since August. Most of the crew members had many years' experience working at sea, and the majority of them had been on the vessel previously.

1.4.3 Cargo and loading

The cargo consisted of just over 42,727 m³ of cut timber, 25,900 m³ of which was in the cargo holds, the rest was carried as deck cargo. The cargo consisted of a total of 10,592 plastic-wrapped packages of timber equipped with slings. The majority of the packages had uniform edges. Around 15–20 percent of the packages had uneven edges, i.e. the timber in the package was of varying lengths at one end. The packages were generally of varying sizes, which is why it was possible for there to be spaces between the packages, both horizontally and vertically. There were spaces under the packages between the cargo hatches. Cargo was loaded across the full breadth of the vessel, which is why the only way to get from the stern to the bow was by walking on top of the cargo. Consequently, there were ladders at both ends to allow the crew to climb up onto the topmost packages.

The cargo on the deck was seven to eight packages high and the packages were stacked all the way out to the gunwale. There was no cargo directly above the deckhouses on either side of the cranes and there were free spaces with timber packages above them on the deck on either side of the deckhouses. The packages there were resting on a support structure made of strong pipes that extended out from the deckhouses with stanchions on the deck. There were ladders from the topside of the cargo down to the deckhouses and the exposed deck surface.



Figure 6. Lower part of crane 3 with an equivalent construction to crane 1. Deckhouses on either side of the base of the crane and the support structure with green painted pipes for the cargo to the side of the deckhouses. The accessible space under the cargo can be seen on the left of the picture.

Loading began on 8 November and was completed on 30 November. The cranes were operated by dockers, who experienced some difficulties with some of the cranes, which they deemed to be slow. Because loading took a long time, the shipowner called out a service technician to adjust the cranes.

Lashing of the cargo was done by a local company.

At the same time as ALMIRANTE STORNI was docked, maintenance work was being conducted on the quay, and the electricity needed to be disconnected. To compensate for the lack of floodlights, an extension cable from the vessel was connected to a mobile floodlight on the quay (see section 1.5.2).



Figure 7. Picture of the vessel being loaded in Orrskär. Image: Photograph courtesy of the owner of ALMIRANTE STORNI.

1.4.4 *Safety organisation*

All of the crew members had specific duties allocated in the event of a fire. The organisation in the event of a fire consisted of five different units.

- **Bridge.** This unit was made up of three people, including the master. The unit was responsible for manoeuvring the vessel, external communications and raising the alarm.
- **Engine control room.** The chief engineer, assisted by two other members of the engineering department, started the fire pumps and similar equipment, as well as operating of the engineering equipment.

- **Samaritan unit.** This consisted of two to three people who were prepared to perform medical interventions to the extent required.
- **Support unit.** Three people whose principal task was to prepare hoses etc. while the defence unit was getting ready. Their duties also included closing fire dampers.
- **Defence unit.** This unit consisted of six people and conducted the actual firefighting. There were normally two firefighters with breathing apparatus and two people who were able to relieve them when necessary. The chief officer was the head of this unit and also the fire chief on board. This unit was also able to conduct operations in the event of chemical accidents. A specific station with equipment for this purpose was located by the base of one of the cranes.

The vessel's documentation indicates that regular exercises had been conducted on board, with the latest regular exercises involving firefighting having taken place on 7 October, 6 November and 11 November 2021.

1.4.5 *Fire alarm and the fire extinguishing system*

The vessel was equipped with the fire alarm and extinguishing systems required under the applicable regulations.

There was a fire alarm system with detectors for smoke, heat or flames, depending on the type of space. There were smoke detectors in the cargo holds. The fire alarm system did not cover the open deck. Fire alarm panels on which the location of an activated detector inside the ship was indicated were located on the bridge and in the fire control station.

For firefighting there were fixed water sprinkler systems and hand-held extinguishing equipment such as fire hoses and hand-held fire extinguishers. There were two fire pumps to supply the system with water. These could be activated locally at the respective pump, or remotely from the bridge or the fire control station on the upper deck. It was also possible to supply the extinguishing system with water from another vessel or from shore.

There were fire hydrants with associated hoses and nozzles located throughout the entire vessel, both inside and outside. Out on deck there were boxes containing fire hoses and nozzles by the aft edge of the base of each crane. There were two fire hydrants on either side of the centreline by the forward coaming of each cargo hold.



Figure 1. Example of the firefighting equipment on deck. The two arrows on the left mark the hose lockers and the right arrow marks the location of the fire hydrant. Timber was loaded between these.

The engine room, the paint store and all five cargo holds were equipped with fixed carbon dioxide extinguishing systems. There was also a high-pressure water sprinkler system in the engine room.

There was a fire control station on the starboard side of the deckhouse on the upper deck. This contained the following:

- Fire alarm panel.
- Button for activating the general alarm.
- Button for activating the fire alarm manually.
- Fire kit (for firefighting in breathing apparatus).
- Emergency telephone (required neither electricity nor batteries).
- Emergency cut-off for lubricating oil pump.
- Emergency cut-off for fuel pump.
- On/off switch for fire pump.
- On/off switch for emergency fire pump.
- Remote closure of ventilation to various spaces such as the engine room, emergency generator room, accommodation and cargo holds.
- Activation of quick-closing valves on the fuel and lubricating oil systems.
- Activation of the CO₂ extinguishing systems.

1.5 Fire investigation

A fire investigation has been conducted for the purpose of establishing the cause of the fire and to assess the sequence of events as the fire spread.

1.5.1 *Observations in conjunction with the detection of the fire*

The fire was detected by the crew of AMAK SWAN who initially noticed a smell of smoke and shortly afterwards saw flames emerging from the deck cargo. The flames were emerging from the port side, close to the gunwale, in line with crane 1.



Figure 2. The fire at 14:44 hrs, ten minutes after the crew of AMAK SWAN had informed VTS Göteborg. Image: Private.



Figure 3. The fire after 30 minutes. Image: Private.



Figure 4. The fire after 90 minutes. Image: Greater Gothenburg Rescue Service.

1.5.2 *Observations from loading*

For part of the period during which the cargo was being loaded in Orrskär, work was being carried out on a conveyor belt. This work resulted in the electrical supply to the quay where the vessel was being loaded being disconnected for a few days. The consequences of this included it not being possible to supply electricity to the lighting on the quay. Consequently, an extension cable was run from an electrical outlet in the port deckhouse by crane 1 on the vessel in order to power a floodlight on the quay. The cable was secured to the vessel's gunwale on the port side and to a railing on the quay. Once the work on the conveyor belt was completed, the floodlight was again connected to the port's electricity supply.

When the vessel departed from Orrskär on 1 December, the extension cable was still attached to both the vessel and the quay. The linesmen who untied the vessel notified the crew of this when the vessel departed. However, it was too late to take any action and the extension cable was stretched until it broke off. When the pilot left the vessel, he saw that a few metres of the extension cable were hanging down by the side of the vessel. No inspections of the cable were conducted after the vessel had departed.

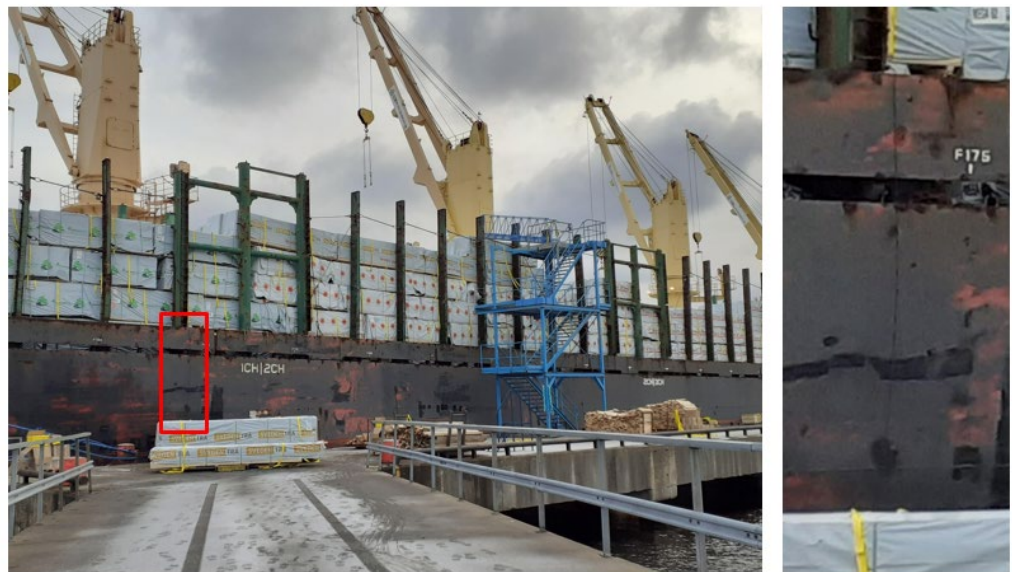


Figure 12. Extension cable that was run from the port deckhouse by crane 1 on the vessel. Image: Photograph courtesy of the owner of ALMIRANTE STORNI.

1.5.3 Observations from the vessel

There were some technical problems while the vessel was being loaded, including with the vessel's cranes. These problems primarily involved crane 3 and were rectified while loading was ongoing. No specific problems occurred during loading with the forward crane, crane 1, where the fire subsequently was at its most extensive. There were also no repairs or other works conducted on that crane. Furthermore, no technical problems occurred during the voyage from Orrskär to the anchorage at Vinga.

The routine on the vessel was to check the lashings on the cargo twice a day by walking over the deck cargo. The last check of the lashings before the fire was detected took place on 3 December 2021. No smoke was smelled or visible during the regular checks of the cargo lashings or when the crew were on top of the cargo in conjunction with bunkering.

1.5.4 Observation during the firefighting operation

Video recordings were made from one of the Swedish Sea Rescue Society's boats during the firefighting operation on 4 December. When examining this video, something was detected that is probably the extension cable that broke off when ALMIRANTE STORNI departed from Orrskär (section 1.5.2). In a sequence in the video, the extension cable can be seen hanging over the gunwale down into the water (Figure 13).



Figure 13. Image from the video recorded on one of the Swedish Sea Rescue Society's boats on Saturday 4 December. The arrow points to the extension cable that is probably the one that was torn off when the vessel departed from Orrskär.

1.5.5 *Fire scene investigation*

The fire scene investigation took place on board ALMIRANTE STORNI over the period 11 to 18 December 2021 at Skandia Harbour in Gothenburg.

The remaining cargo was unloaded later in Lysekil in January 2022. SHK was not on site during unloading but photos and information from this have been obtained.

The area forward of the middle of the vessel was monitored and examined during unloading at Skandia Harbour. The packages of timber that were not fire damaged were unloaded using a crane with a hook. The damaged timber was unloaded using a crane with a claw. This unloading method did not allow careful exposure of the fire area. In addition, a large portion of the timber that was lifted up was dropped back down into the fire area while working with the claw. Consequently, it is not possible to rule out that findings linked to the cause of the fire were lost, despite the timber being inspected when it was being placed on the quay.



Figure 54. Unloading of the timber cargo in the fire area surrounding crane 1.

The fire-damaged area

The fire-damaged area extended from between the gunwales in line with crane 1 and forward of this. The fire damage to the cargo out towards the starboard gunwale was relatively limited but increased in intensity towards the area surrounding the crane. Timber that was lying on the deck closest to cargo hold 1, forward of the crane, was completely burnt. The packages of timber aft of the crane sustained substantial fire damage. Several packages of timber had largely burnt up on the port side of the crane, out towards the gunwale and along the coaming of the cargo hold forward towards the foredeck. The most extensive fire damage was located at the level of the deck and two layers of timber packages above this. The packages of timber on top of the support structure above the deck surface next to the port side deckhouse were also largely burnt up. The area that sustained the most fire damage was located around the exposed deck surface between crane 1 and the starboard gunwale (see Figure 15). The fire damage to parts of the vessel was limited to soot covered surfaces, burned off paint and burned cables, hoses and seals. The largest areas with burnt off paint were forward of crane 1 and out towards the port gunwale.



Figure 65. The square indicates the area in which the fire spread to varying degrees. The ring indicates the area that suffered the most extensive fire damage. The bow of the vessel is at the bottom of the picture.



Figure 16. The deckhouses beside crane 1, with the port side deckhouse to the right of the base of the crane. The areas where the paint was burned off were larger forward and on the port side of the crane.

Port side deckhouse by crane 1

There was a door from deckhouse out towards the exposed deck surface under the support structure. This door was held open with a catch. Various equipment was stored in the deckhouse, including portable floodlights. There were no containers of flammable substances in the deckhouse. An extension cable was plugged into an electrical outlet in the deckhouse and ran through the door opening out onto the deck. A switch for the electrical outlet was in the 'on' position. Inspection of the vessel showed that other switches and circuit breakers for the outlet into which the electrical cable was plugged were turned on. No other electric cables or electrical objects were plugged in in the deckhouse.

There was damage from soot and melting in the deckhouse but no signs of extensive fire.



Figure 17. The support structure for the cargo by the port side deckhouse. The arrow marks the open door to the deckhouse.



Figure 18. The port side deckhouse by crane 1 and the deck surface under the support structure for the cargo after the area had been cleared of carbon residue. The open door to the deckhouse is in the background.



Figure 19. Shown in the upper ring is the electrical outlet with the switch in the 'on' position and the plugged-in extension cable in the deckhouse. In the lower ring, a connection can be seen between the cable from the electrical outlet and the extension cable that was out on the deck. The arrow points to the extension cable where it runs through the open door to the deckhouse on the left of the picture.

An extension cable was plugged in in the deckhouse

In the carbon residue, it was possible to follow the extension cable from the deckhouse out to the outermost part of the support structure on the port side. The cable lay in coils on the deck but also ran over a number of bundled chains that had been placed on the deck. The insulation was intact on those parts of the cable that had been lying on the deck closest to the deckhouse. The insulation was burnt off on those parts of the cable that had been lying on the piles of chain and on a pipe by the outer part of the support structure on the port side. The extension cable was cut off close to the deck by the outer side of the support structure on the port side. The end showed signs of carbonisation and melting. No

additional electric cable or objects that the extension cable could have been connected to were found.

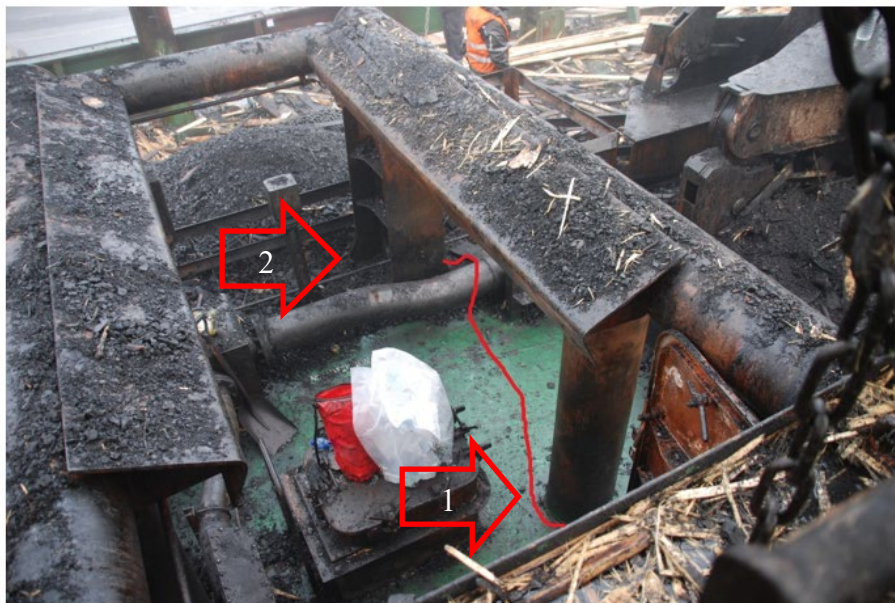


Figure 20. Photo from the topside of the port side deckhouse by crane 1. The deck has been cleared of carbon residue and the extension cable has been removed. The arrow marked with 1 points to the drawn line showing the approximate path of the cable when it was found in the carbon residue. The arrow marked with 2 points to the approximate position behind the steel pillar where the end of the extension cable was found.



Figure 71. The torn off end of the extension cable that was plugged into an electrical outlet in the deckhouse on the port side of crane 1.

Light fittings

There were six fixed light fittings forward and aft of the outside of the base of the crane. These were located about two metres above the deck. There were protective metal frames surrounding the light fittings. On one light fitting the upper protective frame was bent but the light fitting undamaged. None of the other protective frames were damaged. Under the outer part of the support structure there were two light fittings that were similar but without the protective frames. The protective glass and

bulbs on all of the light fittings were broken and the exposed electric cables to the light fittings were burnt.



Figure 22. Fixed light fitting with protective frames on the port side deckhouse by crane 1.

A floodlight with a stand was leaning against one of the stanchions of the support structure outside the deckhouse. The glass on the lamp was broken but the halogen bulb was intact. The insulation on the cable to the floodlight was burnt off in several places. The plug was not plugged into an electrical outlet and the pins on the plug were dirty, without clean metal surfaces, which suggests that it was not plugged in at the time of the fire. The floodlight was also not directed towards the timber cargo.



Figure 23. Portable floodlight that was leaning against one of the stanchions of the support structure on the port side of crane 1. The picture on the right shows the plug for the floodlight, which showed no signs of being plugged into an outlet during the fire.

Cargo hold 1

When the deck cargo had been removed, the hatches to cargo hold 1 were opened. Only a visual inspection of the upper layer of the timber cargo was conducted. The plastic packaging on all timber packages had melted, but no carbonisation of the timber was visible.



Figure 24. The timber cargo in cargo hold 1 when the hatches were opened and the deck cargo had been removed in Skandia Harbour in the Port of Gothenburg.

After the deck cargo had been unloaded in Skandia Harbour, the vessel went to Lysekil to unload the remainder of the cargo. A number of packages of timber that were heavily carbonised were observed in the forward half of the cargo hold on the port side, under the upper layer. The carbonisation went down to about half the depth of the cargo hold. On the same side there was soot and patches where the paint had burned

off on the roof of the cargo hold and part of the way up on the cargo hold coaming.



Figure 85. Cargo hold 1 during unloading in Lysekil. Some of the timber packages towards the port side of the cargo hold were heavily carbonised.



Figure 96. Soot and burned off paint on the port side of the cargo hold.

1.6 Rescue operation

The actions of the organisations involved during the occurrence were extensive in terms of time and the resources utilised. The vessel needed to be taken into port in order to allow the fire to be extinguished. Consequently, a number of complicated legal and practical issues needed to be dealt with.

The sections below begin with a general account of a rescue operation in the event of a maritime accident and the legal regulations. This is followed by a periodic description of the occurrence reporting the actions taken by the organisations involved. These sections begin with a brief summary and are then divided up into operational command and planning and the sequence of events at sea.

1.6.1 *Rescue operations in the event of maritime accidents*

In the event that an accident involving a vessel has to be dealt with, provisions in legislation including the Civil Protection Act, the Act on Measures against Pollution from Vessels, and the Vessel Safety Act are relevant. Aside from the rescue operations for which the central government and the municipality are responsible, the master of the vessel and the shipowner have a major responsibility for dealing with an accident.

This section contains a brief account of the legislation that formed the basis of the actions taken as a result of the occurrence.

Civil Protection Act

This act governs areas including rescue operations, i.e. the emergency response for which municipalities or the central government are responsible in the event of accidents and the imminent threat of accidents. Responsibility for rescue operations is divided up between municipalities and the central government. Municipalities are responsible for preventing and limiting injuries to people and damage to property or the environment. Central government rescue operations are divided up into mountain rescue, aeronautical and maritime search and rescue and environmental rescue operations, as well as searching for missing persons and the emergency response in the event of the release of radioactive substances. Responsibility for central government rescue operations falls to various authorities and, in some cases, also has geographic boundaries.

Four criteria have to be met for a rescue operation to be applicable. Consideration shall be given to the need for rapid intervention, the weight of the interests that are under threat, the cost of the intervention and the circumstances in general. Municipal and/or central government rescue services can be conducted at the same time.

There shall be an incident commander for every rescue operation. The incident commander makes decisions about actions taken during the

operation and about when to conclude the rescue operation. One of the incident commander's powers, which is pertinent to this investigation, is the power to encroach on the rights of others. This means that they are able to gain access to others' property, cordon off or evacuate areas, use, remove or destroy property, and make other encroachments on the rights of others. The encroachment must be justifiable in light of the nature of the threat, the damage caused by the encroachment and the circumstances in general.

Municipalities and central government authorities shall coordinate their activities and cooperate with one another and with others who are affected. In addition, they shall have a programme that, among other things, describes their capabilities with respect to rescue operations and how they are to cooperate with others.

Rescue operations in the event of maritime accidents

The responsibility of central government for rescue operations in the event of maritime accidents encompasses Sweden's territorial waters except watercourses, canals, ports and lakes other than Vänern, Vättern and Mälaren. Maritime rescue operations encompass search and rescue of people who are or may be feared to be in distress at sea. Maritime environmental rescue operations encompasses measures for the purpose of protecting the marine environment when oil or other harmful substances have entered the water or there is an imminent threat of this. The Swedish Maritime Administration is responsible for maritime search and rescue and the Swedish Coast Guard for environmental rescue operations.

A municipality is responsible for rescue operations in those case where the central government is not responsible. The boundary of central government responsibility in water with regard to ports is worked out by the municipality following consultation with the relevant central government authorities and is described in the municipality's action programme in accordance with the Civil Protection Act.

Act on Measures against Pollution from Vessels

This act includes provisions prohibiting pollution from vessels, reception of harmful substances from vessels, the construction of vessels, supervision and other measures to prevent or limit pollution from vessels. The measures are restricted to being applicable to vessels.

Chapter 7 contains the provisions concerning special measures against pollution from vessels. If oil or another harmful substance is released from a vessel or it may be feared that this will take place, and there is reason to assume that Swedish territorial waters, Swedish airspace or other Swedish interests may be damaged appreciably as a result of this, the Swedish Transport Agency or the authority decided by the Swedish Government is able to issue the prohibitions and injunctions that are necessary in order to prevent or limit the pollution (Chapter 7, Section 5). If it is not possible to wait for the Transport Agency's decision, such

a decision may be made by the Coast Guard (Chapter 7, Section 3 of the Ordinance on Measures against Pollution from Vessels). Such a prohibition or injunction may also be issued by virtue of the Civil Protection Act if it is not possible to wait for the Transport Agency's decision (Chapter 6, Section 2).

If the party at which the decision is directed does not implement the measures that apply by virtue of the decision, the Transport Agency is permitted to enforce the decision at the expense of the operator or owner of the vessel. The same applies if a measure needs to be implemented immediately and cannot wait for the party at which the decision is directed to implement it.

1.6.2 Organisations involved in the rescue operation

Several organisations participated in the rescue operation through a large number of operational resources. Firefighting was implemented initially by the crews of ALMIRANTE STORNI and AMAK SWAN. The resources that participated came from organisations including the Maritime Administration, the Coast Guard, the Swedish Sea Rescue Society, the Greater Gothenburg Rescue Service, the Swedish Police Authority and Region Västra Götaland. Denmark provided a search and rescue helicopter and the Norwegian Coast Guard sent a vessel. A large number of private-sector organisations also participated, including tugboats from the company Svitzer and staff from the salvage company T&T Salvage, which had been engaged by the shipowner.

Other government agencies and organisations that were involved in dealing with the occurrence in other ways were the Transport Agency, Västra Götaland County Administrative Board, the City of Gothenburg, the Port of Gothenburg and Eastern Blekinge Rescue Service.

A brief description of the organisations that are of relevance to the investigation and the legal regulations with regard to areas of responsibility is provided below.

Shipowner

The shipowner is obliged to have an insurance policy that covers claims for damages under maritime law. The insurance obligation applies to vessels with a gross tonnage of at least 300 (Chapter 7, Section 2 of the Swedish Maritime Code). The insurance liability is limited to covering liability in the event of certain occurrences (cf. Chapter 9, Sections 1–4 of the Swedish Maritime Code). ALMIRANTE STORNI was subject to the insurance obligation.

Master

The master is ultimately responsible for the vessel and its crew. In the event of an accident involving a vessel, the master is obliged to do everything in their power to save those on board and protect the vessel and the cargo (Chapter 6, Section 6 of the Swedish Maritime Code).

The Swedish Maritime Administration

The Maritime Administration is responsible for maritime search and rescue in accordance with the Civil Protection Ordinance, i.e. operations when someone is or is feared to be in distress at sea, and for transporting sick people from vessels. This responsibility applies to Swedish territorial waters and the lakes Vänern, Vättern and Mälaren, with the exception of port areas. The Maritime Administration's remit also includes pilotage and vessel traffic monitoring and maritime traffic information services through the VTS.

Operations are led by an incident commander from the coordination centre JRCC³ in Gothenburg. In the event of a maritime search and rescue, an on-scene coordinator (OSC) may be appointed at one of the rescue resources involved in dealing with the accident. The OSC is tasked with providing status updates and coordinating the rescue resources on the basis of decisions made by the incident commander.

The Maritime Administration has its own SAR helicopters⁴ and pilot boats and collaborates in other respects with the Swedish Sea Rescue Society (SSRS) and other resources.

The Swedish Coast Guard

The Coast Guard is responsible for the environmental rescue operation in accordance with the Civil Protection Act. The Coast Guard has its own resources for environmental rescue operations, including vessels of various sizes.

An operation is led by an incident commander from the Coast Guard coordination centre, which is located in the same facility as the JRCC. Rescue resources during an operation can also be controlled through an OSC and an OSC-ER (on-scene commander – emergency responder). An OSC coordinates all resources on the scene in the event of an accident and an OSC-ER leads a limited part of the operation.

The Greater Gothenburg Rescue Service and the Western Rescue Region

The Greater Gothenburg Rescue Service is responsible for municipal rescue services and shall, in the event of accidents and the imminent threat of accidents prevent and limit injuries to people and damage to property or the environment (Chapter 3, Section 7 of the Civil Protection Act).

During a rescue operation there is a specially trained unit for operations on board vessels, which is called a MIRG⁵. This resource can be

³ Joint Rescue Coordination Centre – the Swedish Maritime Administration's maritime and aeronautical search and rescue centre.

⁴ Search and rescue – helicopters equipped for rescue missions.

⁵ MIRG (Maritime Incident Response Group) – Specially trained rescue unit from the municipal rescue service who are able to assist with rescue operation on board vessels. This resource is provided by the

requested by the JRCC or the Coast Guard and assists in the central government rescue operation. The MIRG is flown out by SAR helicopter or transported by boat.

The Western Rescue Region is a partnership between nine rescue services for the command and implementation of rescue operations. The Greater Gothenburg Rescue Service command centre serves as the command and control centre for the entire Western Rescue Region.

The Swedish Transport Agency

The Transport Agency has, among other things, technical and operational maritime expertise and has an emergency preparedness function that includes a duty officer function and on-call ship inspectors. The duty officer is contacted in the event of emergencies and is able to make decisions to send out an on-call ship inspector in order to assist in the event of an accident.

The Swedish Sea Rescue Society

The Swedish Sea Rescue Society (SSRS) is a voluntary organisation with maritime search and rescue personnel. The organisation is funded by membership fees and other contributions. The SSRS has rescue stations throughout the whole country and has over 200 lifeboats at its disposal. These can be called out by the JRCC or by SOS Alarm.

1.6.3 The alarm

At 14:34 hrs, the JRCC was informed by VTS Göteborg that there was a fire on board ALMIRANTE STORNI. The crew of the bunkering vessel AMAK SWAN had initially informed the VTS about the fire after they had alerted the crew of ALMIRANTE STORNI. The VTS had also called ALMIRANTE STORNI but did not get a response. Initially the JRCC was also unable to make contact with the vessel. However, AMAK SWAN responded and they were able to describe the situation to the JRCC and informed them that they would attempt to extinguish the fire.

The incident commander at the JRCC made the assessment that a life-saving operation may be required. A decision to instigate a maritime search and rescue operation was made (14:35 hrs) and a large number of resources were called out. In addition to an SAR helicopter, the SSRS was called out and a general call concerning the occurrence was made on VHF channel 16. The JRCC in Denmark was also contacted.

The JRCC informed the Coast Guard and contacted SOS Alarm in order to request the MIRG. SOS Alarm contacted the Greater Gothenburg Rescue Service command centre, which called out the MIRG and two additional firefighting units. SOS Alarm called out the MIRGs from the

Greater Stockholm Fire Brigade, the Greater Gothenburg Rescue Service and Eastern Blekinge Rescue Service through agreements with central government.

Eastern Blekinge Rescue Service and the Greater Stockholm Fire Brigade. However, the MIRG from Stockholm did not need to be deployed. The Coast Guard assisted by calling out one vessel and another of its vessels responded to the general call.

While this was taking place, the VTS had also informed Svitzer that there was a fire on board ALMIRANTE STORNI. Svitzer announced that they were able to assist the operation with tugboats equipped with water cannons. However, the tugboats were not called out by the JRCC and at 15:18 hrs Svitzer decided themselves to send out their tugboats.

1.6.4 Saturday 4 December

A large number of rescue resources were engaged initially for life-saving. However, no one needed to be rescued and the focus could instead be shifted to putting out the fire and preventing any environmental damage. Preparations to potentially bring the vessel into port were also instigated. There was a strong breeze and heavy swell in the area where ALMIRANTE STORNI was anchored, which made boarding difficult. The temperature was just below freezing.

Operational command and planning

Once the VTS had informed the JRCC, it took 20 minutes (14:54 hrs) before the JRCC made contact with ALMIRANTE STORNI. At that time the master informed the JRCC that the vessel did not need to be evacuated but that they needed help with firefighting. Nevertheless, the work to engage resources for a potential evacuation and life-saving operation continued. A large number of other vessels responded to the general call from the JRCC and all were asked to sail towards ALMIRANTE STORNI.

Because the MIRG had been called out, the Greater Gothenburg Rescue Service sent a cooperation officer to JRCC in order to coordinate the MIRG mission and to act as an advisor to both the JRCC and the Coast Guard. Later that day, the Greater Gothenburg Rescue Service sent an additional cooperation officer in order to relieve the officer coordinating the MIRG. A cooperation officer for pre-hospital care also came to the JRCC in order to prepare for a potential medical intervention. However, this person was able to conclude their assignment later that day. A cooperation officer from the Greater Gothenburg Rescue Service then remained at coordination centre for the rest of the operation.

To prepare for the eventuality of the fire on the vessel needing to be extinguished in port, the Greater Gothenburg Rescue Service began planning for a potential municipal rescue operation. Various possible berths were discussed with the Port of Gothenburg and berth 615 in Skandia Harbour was identified as possible to use. However, the berth needed to be prepared. At around four o'clock in the afternoon, the JRCC informed the master that it was possible to bring the vessel into port in order to fight the fire from land. The master announced that he

was not able to make that decision himself but would contact the shipowner.

The Coast Guard assisted the JRCC with resources and began a parallel environmental rescue operation (15:30 hrs). There were 600 tonnes of low-sulphur oil and, among other things, 1000 litres of hydraulic oil in the cranes that could be at risk of leaking out. The fire needed to be put out and it was clear that vessels with a substantial firefighting capability would be required. An inventory of the available resources was conducted and the vessel KBV 002 TRITON was called out at 16:30 hrs, but it would take more than 24 hours for them to reach the accident site. Consequently, the possibility of manning KBV 001 POSEIDON, which was located in Gothenburg and not active at that time, was investigated. After calling in personnel who were off duty, it was possible to man the vessel and leave port at around eight o'clock that evening.

The Coast Guard also made the assessment that additional maritime expertise was needed to support the planning of the environmental rescue operation. The Transport Agency's duty officer was contacted with a request that a ship inspector be sent to the Coast Guard coordination centre. However, the Transport Agency's duty officer's understanding was that they wanted a ship inspector to go out to the vessel. The Transport Agency made the assessment that a ship inspector would not be able to make a useful contribution because the vessel's seaworthiness was not under threat at that stage. Consequently, no inspector was sent at that stage.

During the day the JRCC maintained frequent contact with ALMIRANTE STORNI regarding whether there was a need to evacuate those on board. The master responded each time that the vessel did not need to be evacuated. The firefighting operation had begun to suppress the fire and the risk to those on board decreased accordingly. At 19:44 hrs the incident commander at the JRCC therefore decided to downgrade the maritime search and rescue from emergency to 'stand-by' because there was no imminent threat to the people on board. The 'stand-by' classification meant that the JRCC terminated the maritime search and rescue operation. However, the situation was monitored and the operation could be restarted if necessary. All resources that did not have tasks other than maritime search and rescue were informed that they could leave the site.

Following dialogue between the Greater Gothenburg Rescue Service and the City of Gothenburg, cooperation was initiated between several of the organisations involved. The City of Gothenburg convened a cooperation meeting which took place at 17:30 hrs. The aim was to share situation reports and prepare to potentially bring the vessel into Gothenburg. Aside from the City of Gothenburg and the Greater Gothenburg Rescue Service, the Coast Guard, the Port of Gothenburg, Västra Götaland County Administrative Board, the Maritime Administration, VTS Göteborg, the Police Authority and the Transport

Agency were also present. What emerged at this meeting included that the Port of Gothenburg and the Greater Gothenburg Rescue Service had begun looking at available berths and where it was possible to put the cargo. Concern was also expressed about how Gothenburg and the operations of the port might be affected if the vessel was brought into port.

Further cooperation meetings were held that evening. It emerged at that time that it was not possible to restrict the fire to the bow by heaving parts of the cargo overboard in order to create a firebreak. Spraying water did however suppress the fire. The Greater Gothenburg Rescue Service and the Port of Gothenburg stated that they had drawn up a plan to bring the vessel into port. The port had also begun preparing cranes for unloading the cargo. Yet there remained a number of unanswered questions relating to the handling of the unloaded cargo.

The Coast Guard wanted to have an SSRS boat close to ALMIRANTE STORNI for transport purposes and in the event that anyone was to fall into the water. Following contact with the Swedish Civil Contingencies Agency later that evening, it was also decided to request helicopter firefighting assistance.

Sequence of events at sea

When the crew of AMAK SWAN detected the fire, they quickly untied and moved a short distance away from the vessel. They started their water cannon, moved back towards ALMIRANTE STORNI and began spraying water on the fire. At the same time, the crew on ALMIRANTE STORNI had also started trying to extinguish the fire using the vessel's firefighting equipment. Since there had been no fire alarm from the detectors in the cargo holds closest to the fire, the sprinkler systems there were not activated.



Figure 27. Picture from AMAK SWAN shortly after the fire broke out. The crews of both vessels have begun trying to extinguish the fire. Image: Private.

The tanker FOX SUNRISE arrived at the site and relieved AMAK SWAN. They also came alongside the burning vessel and sprayed the fire with water. In turn, the Coast Guard vessel KBV 310 relieved FOX SUNRISE and continued the firefighting operation. The other vessels that were in the area did not have any firefighting equipment that was adapted to reach up to the fire with its water jets. However, they were on standby to conduct life-saving and were also able to convey information about the situation to the JRCC. Spraying water from KBV 310 had no effect in terms of extinguishing the fire, which instead grew in size.



Figure 28. The first Coast Guard vessel arrived just over an hour after the fire was detected. Image: Greater Gothenburg Rescue Service.

A number of pilot boats, commercial and private vessels responded to the general call and sailed to the accident site. JRCC Denmark sent an SAR helicopter and a Danish patrol boat. A Portuguese frigate also sailed to the accident site. To coordinate the maritime search and rescue resources, the JRCC needed an OSC on site and the crew of the SSRS boat HANS LAURIN were able to take on this role.

The fire was in the forward part of the vessel and the smoke was blowing in towards the vessel's superstructure because she was at anchor and lying with her bow pointing into the wind. To reduce the risk of the fire spreading towards the superstructure and to reduce the impact of the smoke, the crew began turning the vessel so her stern was pointing into the wind. Some smaller boats also assisted in turning ALMIRANTE STORNI. The vessel began to turn around one hour after the fire was detected (15:45 hrs).

The MIRG from Gothenburg was flown out on an SAR helicopter and a further seven firefighters from the Greater Gothenburg Rescue Service were taken out to the vessel on an SSRS boat. The SAR helicopter arrived at 15:40 hrs but it was not deemed to be safe to winch the MIRG down onto the vessel. Instead, they were winched down onto the ambulance boat RESCUER and, despite the heavy swell, they were able to board ALMIRANTE STORNI from there.

The MIRG from the Eastern Blekinge Rescue Service had transport problems. The Coast Guard aircraft that was to transport them was not authorised to transport compressed gas cylinders. This in turn led to delays and to it not being possible to fly them out to the vessel on an SAR helicopter when they arrived in Gothenburg. Land and boat transport had to be arranged instead, but the heavy swell prevented them from boarding once they arrived at the vessel. At the same time, it was decided that this unit did not need to be deployed.

The other firefighters who were transported out by the SSRS also got on board. However, the swell meant that they also needed to board via the ambulance boat RESCUER. The unit from the Greater Gothenburg Rescue Service who sailed out on their own boat were not able to conduct any firefighting or get on board the vessel. They submitted a situation report to the Greater Gothenburg Rescue Service command centre before returning to their fire station.

Beginning at around four o'clock, attempts were made to fight the fire from the SSRS boats, and these worked in parallel with boats from the Coast Guard and the first tugboat that arrived. Two further tugboats with water cannon arrived later that evening and the small boats were able to conclude their contribution to the firefighting operation. The crew of ALMIRANTE STORNI also concluded their attempts to extinguish the fire. One tugboat tied on to ALMIRANTE STORNI and kept her stern facing into the wind, while the other tugboats concentrated on fighting the fire. The fire, which had grown in size, was not being suppressed by the water being sprayed from the tugboats.

When the firefighters came on board they began preparing for a potential firefighting operation by gathering information about the cargo and the situation. They concluded that it was only possible to get at the fire by going down into the openings around crane 1. This was deemed to be far too dangerous because of the unsafe escape route and a high risk of collapse. In addition, the packages of timber were loaded in such a way that there were gaps between all the packages where the fire had been spreading and which were not accessible. The assessment was that it would only be possible to extinguish the fire by unloading the cargo in order to get at the seats of the fire.

The firefighters returned to the superstructure and the spraying of water from the tugboats was restarted. There they continued to cooperate with and advise the Coast Guard's OSC-ER.

Later on, the assessment was made that the MIRG and firefighting unit did not need to remain on ALMIRANTE STORNI. The firefighting unit from the Greater Gothenburg Rescue Service that had travelled out on an SSRS boat were able to board a pilot boat at midnight when the swell had died down. The MIRG was picked up by an SAR helicopter on Sunday morning.

The vessel KBV 001 arrived at around ten o'clock in the evening and relieved one of the tugboats. The spraying of water from three vessels then continued for the rest of Saturday. Substantial volumes of water were used and water entered the forward cargo hold. However, it was possible to pump this out using the vessel's bilge pumps and it did not affect the stability of the vessel.

1.6.5 Sunday 5 December

The environmental rescue operation continued and the JRCC remained on stand-by for a potential maritime search and rescue operation. Additional vessels with a greater firefighting capability gradually arrived at the scene. Preparations to allow the fire to be extinguished in port continued. The wind speed increased somewhat during the day and the swell continued to create difficulties when boarding. It was also slightly colder, which caused problems involving ice build-up.

Operational command and planning

Just after midnight a cooperation meeting was held again involving the same parties as the previous meetings. The situation report from the Coast Guard was that the firefighting was suppressing the fire and that it did not appear to be spreading aft. However, more time was needed for firefighting before a better assessment of the situation could be made.

Various methods for extinguishing the fire were frequently discussed. None of the methods were deemed feasible. It was instead decided that the fire would be suppressed to such an extent that it was possible to bring the vessel into port in order to extinguish the fire completely.

However, the Port of Gothenburg needed time in order to prepare for the vessel's arrival.

The JRCC remained on stand-by for a maritime search and rescue and continued to monitor the operation. They also drew up a plan for evacuating the 25 people on board if necessary.

The Coast Guard contacted the Transport Agency's duty officer again in the morning and requested that a ship inspector be sent to the coordination centre. The inspector was needed for reasons including to assist with stability calculations. The inspector was sent out this time and arrived at eight o'clock the same morning.

The Coast Guard also brought together resources that would be able to lighter oil from the vessel and deal with any potential oil spill. Pumping bunker oil aft from the wing tanks next to cargo hold 3 was also considered. However, this was not done as it would require the oil to be heated, which would result in there being a large quantity of flammable gas in the tanks.

The Coast Guard sent a request to the Civil Contingencies Agency to use its forest firefighting helicopters. Sweden's neighbouring countries were given prior warning of potential resource requirements because the firefighting operation was expected to take some time. The Coast Guard also encouraged the shipowner to take its share of the responsibility for dealing with the fire. The shipowner engaged the salvage company T&T Salvage, which was tasked with both assisting with the firefighting operation and drawing up a salvage plan.

The Greater Gothenburg Rescue Service contributed to the central government environmental rescue operation and continued its preparations for a possible municipal rescue operation.

Sequence of events at sea

Four tugboats and the vessel KBV 001 were on site. One of the tugboats kept the stern pointing into the wind and the other vessels sprayed the vessel with water. The spraying suppressed the fire, but it flared up again when they attempted to reduce the flow of water. There were no indications that there was a fire in the cargo hold underneath the fire in the deck cargo. Nor was the fire spreading aft and was instead restricted to an area around crane 1. The vessel KBV 002 arrived later that evening and relieved one of the tugboats involved in the firefighting operation at 20:30 hrs.

The vessels that were spraying water suffered some problems with icing. Consequently, the Coast Guard had to stop spraying water at regular intervals in order to break off ice from parts of the vessel.

The helicopters from the Civil Contingencies Agency water-bombed the fire in the morning but this had no effect because the wind was too strong, which resulted in the water being dispersed too much.

The SSRS still had one boat in the area. Among other things, they checked the draught measurements on the vessel. The draught had increased in the bow and decreased in the stern, which indicated that water was entering the forward cargo hold. However, the bilge pumps on the vessel were operable and were able to pump the water out. The SSRS remained on site around the clock throughout the entire rescue operation.

The vessel was overflowed by both a police helicopter and aircraft from the Coast Guard, which documented it using thermal imaging in order to direct the firefighting and gain an impression of what effect it was having.

A team from T&T Salvage came out to the vessel in the evening. The team consisted of a salvage master and four firefighters.

1.6.6 *Monday 6 to Friday 10 December*

Water continued to be sprayed on the fire out at the anchorage over the following five days. The two largest Coast Guard vessels, KBV 001 and KBV 002, and several other vessels participated. It was possible to restrict the spread of the fire to the bow. A number of meetings were held each day with the concerned parties in order to prepare for the vessel being brought into port. The temperature gradually increased and rose to just above freezing before the weekend. The wind also decreased in strength during this period.

Operational command and planning

The Coast Guard personnel who were involved in the firefighting operation on site felt that action other than simply spraying the vessel with water now had to be taken. There was concern that the firefighting equipment would break. However, none of the methods used to fight the fire at sea that had already been discussed or new ones that were proposed were deemed possible to implement. It was also vital that the vessel be moved to a more sheltered place because the weather was forecast to deteriorate after Sunday 12 December. At the beginning of the week the assessment was made that the fire was too large to allow the vessel to be moved and that extensive water spraying needed to continue.

The Coast Guard sought assistance from the Norwegian Coast Guard, which announced they would be able to contribute one vessel. The vessel LOKE VIKING, which had a substantial firefighting capability and other salvage functions, was engaged by the shipowner.

It was clear that the cargo had to be unloaded in port in order to allow the fire to be extinguished completely. However, the question was to which port the vessel would be taken and when it would be possible to bring it there. Consequently, the cooperation meetings continued during the week in order to come to a decision. On Wednesday at 17:00 hrs,

the County Administrative Board took over the leadership of these meetings and initiated a risk analysis in order to find a suitable port. On Thursday, once this analysis was complete, the concerned parties made the assessment that Skandia Harbour was the port that was most suitable for accommodating the vessel.

The salvage company that had been engaged, T&T Salvage, drew up a salvage plan in cooperation with the pilots on the evening of 9 December. After some adjustments were made this was accepted by the Transport Agency, the Coast Guard and the Greater Gothenburg Rescue Service. The Transport Agency then instructed the master of the vessel to request a port of refuge. After the application for a port of refuge was received on Thursday 9 December, the Transport Agency made the decision on Friday 10 December that the vessel would put into the Port of Gothenburg in accordance with the salvage plan. The pilots then planned the forthcoming move together with the Coast Guard, the master and the salvage company. The vessel was to be moved on the morning of Saturday 11 December.

Following the Transport Agency's decision, a cooperation meeting was held with participants including the Port of Gothenburg, the Coast Guard, the agent of the shipowner, T&T Salvage, the environment department and the Greater Gothenburg Rescue Service in order to share situation reports and plan the work in detail.

On the Saturday morning a briefing was held involving the Coast Guard, the Maritime Administration's pilots and the Greater Gothenburg Rescue Service. The pilots' assessment was that it was possible for the vessel to put into port under her own steam with the assistance of tugboats. In addition to LOKE VIKING, the Coast Guard vessels would also follow her all the way into port. The vessel KBV 001 would also be able to remain with ALMIRANTE STORNI in port if this was requested by the Greater Gothenburg Rescue Service. The Greater Gothenburg Rescue Service also sent a request to the Civil Contingencies Agency for assistance in the form of high-capacity pumps.

The JRCC remained on stand-by for a maritime search and rescue throughout the week and continued monitoring the situation. They kept their plans for evacuation up to date and assisted by providing various forms of transport.

Sequence of events at sea

The vessels KBV 001 and KBV 002 and two tugboats sprayed the vessel with water throughout this period. One tugboat kept the stern of ALMIRANTE STORNI pointing into the wind the entire time. At the beginning of the week the fire flared up immediately when the spraying of water was discontinued. However, the fire did not spread and there was also no temperature increase identified in the hull. The Coast Guard therefore made the assessment that the fire was under control.

There continued to be problems with ice build-up on the Coast Guard vessels at the beginning of the week but no major problems with the firefighting equipment arose during this period.

The Coast Guard vessels had to press their sterns into ALMIRANTE STORNI in order to keep the water jets targeted somewhat consistently. This caused damage to the fixed fenders on the sterns of the Coast Guard vessels. These were initially replaced with large loose fenders. However, the loose fenders could not be kept in place and were torn off. These fenders were replaced with large tractor tyres, which worked better. Aside from the problems with the fenders, there were also problems with visibility because of the large number of water jets. On one occasion, this resulted in the vessel KBV 002 lying alongside ALMIRANTE STORNI without this being detected and a minor collision between the two vessels occurred.

Thermal imaging from the police helicopters and Coast Guard aircraft was used during the week to monitor the spread of the fire and the effect of the firefighting. Drones from the municipal rescue service were also used to conduct inspections using thermal imaging cameras.

The team from T&T Salvage also monitored the fire. The assessment was that the ongoing water spraying was sufficient to suppress the fire but not to put it out. They made suggestions about how to direct the water cannon and proposed that a new assessment be made after 24 hours.

The MIRG officer left the vessel on Monday evening.

Svitzer wanted its three tugboats to return to work in the port at the beginning of the week but the Coast Guard was of the opinion they were required for firefighting. The Norwegian Coast Guard vessel KV BERGEN and LOKE VIKING arrived at the anchorage on Wednesday evening. KV BERGEN had a similar capacity to the water cannon on the Swedish Coast Guard vessels and LOKE VIKING had three times the capacity. They joined in with firefighting immediately and one tugboat was thus able to leave the firefighting operation.

1.6.7 Saturday 11 to Tuesday 14 December

ALMIRANTE STORNI was able to put into Skandia Harbour under her own steam. The temperature was around two degrees Celsius and there was a moderate easterly wind. It was possible to unload the deck cargo in port without any major firefighting operation and the rescue operation was concluded on Tuesday 14 December.

Operational command and planning

A plan for moving the vessel was put together early on the Saturday morning. The move began according to plan. The JRCC had produced an evacuation plan for various scenarios and monitored the vessel's voyage into port. No life-saving operation was required and the JRCC concluded the maritime search and rescue at 11:01 hrs.

Once the vessel had crossed the geographic boundary dividing the responsibility for the rescue operation between central government and the municipality, the Greater Gothenburg Rescue Service decided to initiate a rescue operation (10:30 hrs) and requested that the Coast Guard assist the municipal rescue operation. A decision was also made that the firefighting in port would be part of the salvage operation and not a municipal rescue operation. The assessment was that the salvage company had a good capability to handle the unloading and firefighting once the vessel was in port. The Greater Gothenburg Rescue Service would initially participate in the firefighting by renting out firefighting resources to the salvage company. The municipal rescue operation would be focused on command, planning and cooperation and would only involve operational measures if the salvage company was unable to deal with the situation itself.

Meetings involving concerned parties were held continuously in the port in order to check on the situation and deal with issues relating to unloading and firefighting. The work in the port continued without any firefighting operation being required other than that of the salvage company, and the municipal rescue operation was concluded at 13:20 hrs on Tuesday 14 December. The Coast Guard had concluded its rescue operation earlier on Sunday 12 December.

Sequence of events at sea and in port

At 06:00 hrs on Saturday morning, LOKE VIKING began the work of pulling up ALMIRANTE STORNI's anchor⁶. Two pilots had been driven out to LOKE VIKING and two pilots to ALMIRANTE STORNI. The salvage company T&T Salvage also provided reinforcements in the form of additional firefighters on board the vessel. The Coast Guard issued a general call that they were commencing the operation and that all vessels participating in the firefighting were to stop spraying water. KV BERGEN returned to Norway.

Once the anchor had been taken up, ALMIRANTE STORNI left the anchorage under her own steam at 07:30 hrs. The vessels KBV 001, KBV 002, three tugboats and LOKE VIKING followed the vessel in to berth 615 in Skandia Harbour. A police helicopter followed the voyage and was able to report that there was only a small amount of smoke

⁶ As a consequence of the fire, the hydraulics for the capstan on ALMIRANTE STORNI were not working and the chain therefore had to be broken and the anchor salvaged.

emanating from the deck cargo. Two of the tugboats sprayed water on the cargo during the move.

At the same time as *ALMIRANTE STORNI* moored, 11:00 hrs, the cargo was sprayed with water and booms were placed around the vessel when berthed in order to deal with any spills. The vessel KBV 001 put into the same port area in order to be able to assist in any firefighting operation. The vessel KBV 002 and the other Coast Guard vessels concluded their missions and all the tugboats were able to leave.

The salvage company began unloading the cargo and gradually extinguished smaller fires that still remained. The company had engaged firefighting resources from private companies and from the Greater Gothenburg Rescue Service. Both the damaged cargo and the undamaged cargo amidships began being unloaded. The cargo from the area of the fire was lifted using a claw and sprayed with water on the quay. Cargo was unloaded in order to create a firebreak and restrict the fire from potentially spreading aft. During the unloading there was only a small amount of smoke and no strong fire flared up.

Greater Gothenburg Rescue Service were on stand-by to intervene if the salvage company was unable to cope with the firefighting operation. The municipal rescue operation was also reinforced by the Civil Contingencies Agency in the form of a high-capacity pump and personnel.

1.7 Damage

1.7.1 *Damage to ALMIRANTE STORNI*

In addition to damage to the cargo, the fire caused damage to the ship in the area where the cargo had burned:

- The seals on cargo hold hatches 1 and 2, and on the doors to deckhouses and manholes had melted.
- Extensive areas of burned off paint.
- Damage to hydraulic and electrical systems.

The firefighting operation also caused damage to the vessel:

- The powerful water jets caused damage including to the cabins and equipment on cranes 1, 2 and 3.
- The Coast Guard vessels pushed their sterns against the side of the vessel, which caused indentations in the hull. The hull on the starboard side was indented approximately 0.5–3 m between frames 160 and 190 below the main deck. Two cracks in the hull that were approximately 1 m in length had formed along the longitudinal axis of the vessel (see Figure 29). There was also a smaller indentation on the port side between frames 185 and 187.



Figure 29. The hull damage on the starboard side.

1.7.2 Damage to the cargo

Of the almost 10,600 packages and just over 42,700 m³ of timber in the cargo, 2,229 packages and 9,119.428 m³ of timber were deemed to be totally or partially damaged. About 21 per cent of the cargo was therefore damaged.

1.7.3 Damage to other vessels

The Coast Guard vessels KBV 001 and KBV 002 suffered minor damage to their sterns. KBV 002 also sustained damage in the form of indented steel plate and pushed-in frames on the port side approximately amidships at the level of deck 2 (see Figure 30).

Some of the tugboats that participated in the firefighting also sustained some minor damage. This mainly involved electronics and antennae that were damaged by the water.



Figure 30. Damage to the port side of the vessel KBV 002. Image: Swedish Coast Guard.

1.8 Regarding ships in need of assistance and places of refuge

A number of noted shipping accidents that resulted in major environmental damage took place around the turn of the millennium, including those involving the vessels ERIKA (Brittany 1999) and PRESTIGE (northwest Spain 2002). The failure to limit the impact of these was due to factors including the vessels not being granted permission to enter port in order to deal with the accident while protected from bad weather. These vessels were instead wrecked and there were major oil spills along the coast. As a result of these accidents a process began within the EU to make it possible for ships in need of assistance to put into a place of refuge, port or anchorage.

Directive 2002/59/EC of the European Parliament and of the Council establishing a Community vessel traffic monitoring and information system and repealing Council Directive 93/75/EEC (Vessel Traffic Monitoring Directive) was adopted on 27 June 2002.⁷ Among other things, this directive stated that EU member states had to draw up plans to accommodate ships in distress. These plans had to include necessary arrangements and procedures for ensuring that ships in distress were able to go to a place of refuge immediately.

The Vessel Traffic Monitoring Directive was amended through Directive 2009/17/EC in order to further improve the possibilities of providing support to ships.⁸ This directive introduced more detailed requirements for dealing with ships in need of assistance. For example, there was more clarity about what the plans were to contain, including details about which authority decides whether to accept or refuse a ship in a place of refuge and the assessment procedure for this decision. With regard to the potential costs, a requirement was introduced that a ship without insurance cannot be denied a place of refuge. A member state may request proof of insurance but this may not lead to the accommodation of a ship in need of assistance being delayed.

More detail about the content of the plans is provided in Article 20a and the following information shall be included:

- The identity of the authority or authorities responsible for receiving and handling alerts.
- The identity of the competent authority for assessing the situation and making a decision on acceptance or refusal of a ship in need of assistance in the place of refuge selected.
- Information on the coastline of EU member states and all elements facilitating a prior assessment and rapid decision regarding the place of refuge for a ship, including a description of environmental, economic and social factors and natural conditions.

⁷ For the Government's deliberations in conjunction with implementation, please refer to Govt Bill 2003/04:88.

⁸ For the Government's deliberations in conjunction with implementation, please refer to Govt Bill 2009/10:231.

- The assessment procedures for acceptance or refusal of a ship in need of assistance in a place of refuge.
- The resources and installations suitable for assistance, rescue and combating pollution.
- Procedures for international coordination and decision-making.
- The financial guarantee and liability procedures in place for ships accommodated in a place of refuge.

1.8.1 Sweden's implementation of the Vessel Traffic Monitoring Directive

Government Bill 2003/04:88 deals with the implementation of the Vessel Traffic Monitoring Directive. In this bill, the Government concluded that the Swedish regulatory framework already contained provisions that cover the requirements under the directive. With regard to, for example, implementation of Article 20, which deals with the accommodation of ships in need of assistance, the assessment was made that no legislative changes were required. However, a future ordinance would state that it is incumbent upon the Maritime Administration to prepare the plans stipulated in this article. Furthermore, the bill stated that, with respect to the requirements under Article 20, the Government intended to review the accommodation of ships in distress in order to potentially improve the possibilities of taking effective action in these contexts (Govt Bill 2003/04:88, p. 17).

The Vessel Traffic Monitoring Directive was amended through Directive 2009/17/EC⁹ of the European Parliament and of the Council. The implementation of this directive is dealt with in Government Bill 2009/10:231. The aim of this directive was to improve the possibilities of providing assistance to ships in distress in places of refuge (Govt Bill 2009/10:231, p. 24).

Work with plans in accordance with the Vessel Traffic Monitoring Directive

Under the Vessel Safety Ordinance as it is currently worded, it is incumbent on the Transport Agency to prepare plans and otherwise accomplish the duties set out in Article 20a of the Vessel Traffic Monitoring Directive. This ordinance also states that the plans shall be prepared after agreement has been reached with the Maritime Administration and the Coast Guard (Chapter 6, Section 1c).

According to the Transport Agency, the work of preparing plans is being done in two stages. Stage 1 has been completed and involved working out recommended places of refuge. The remaining work involving planning, decision-making process, cooperation and management will be completed in stage 2. This work had not yet started in autumn 2022.

⁹ Directive 2009/17/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system.

On 31 January 2014 the Transport Agency made its first decision concerning places of refuge¹⁰ but this only encompassed anchorages. In March 2021, the Transport Agency made a revised decision concerning places of refuge. This indicated primarily ports (including the Port of Gothenburg) as places of refuge due to the possibilities of obtaining assistance. Otherwise, the selection was based on factors including an even geographic spread, the water depth in fairways and ports, and minimal environmental impact. Other criteria and parameters may need to be taken into account in the operational proceedings. Each occurrence needs to be assessed on the basis of the specific circumstances and externalities that are present at that specific time. The implications of being identified as a place of refuge are not described in the Transport Agency's decision.

The Coast Guard and Maritime Administration's report 2005

In accordance with what was stated in the bill, the Coast Guard and Maritime Administration were tasked by the Government in May 2004 with investigating how the accommodation of ships in distress could be improved. Consultation was also to have taken place with the Swedish Rescue Services Agency (now the Civil Contingencies Agency) and the Swedish Association of Local Authorities and Regions. A report in this assignment was submitted to the Ministry of Enterprise and Innovation in 2005.

The report highlighted problems including with the geographic breakdown in the Civil Protection Act and the possibility to encroach on the rights of others in conjunction with measures targeted at ships. It was established that there was a lack of clarity about the extent to which coercive measures can be directed at a port. The report also brought up problems relating to the definition of a port and compensation claims in the event of damage to a port. The report contained proposed legislative changes in order to ensure that Sweden complies with the requirements under the Vessel Traffic Monitoring Directive and to guarantee the efficiency of operations. None of the proposals in the report have been implemented or investigated further.

Agreement concerning cooperation by authorities

On 27 February 2020, the Coast Guard, Maritime Administration and Transport Agency entered into an agreement concerning cooperation by authorities in the event of maritime shipping accidents or incidents where discharges may damage Swedish territory.¹¹

The aims of this agreement include clarifying, on the basis of statutory responsibilities, cooperation between the authorities and the role of each authority. The overarching goal is to make the response to maritime accidents and incidents more efficient.

¹⁰ TSS 2014-316

¹¹ Swedish Transport Agency file number TSA 2020-36

The agreement includes the following.

The master is ultimately responsible for taking the requisite action in the event of an accident. The authorities shall primarily act as a support function for the master. Decisions to take action in respect of a stricken vessel shall normally be made in accordance with the Act on Measures against Pollution from Vessels. If there is no legal and actual potential to enforce a decision, the Civil Protection Act may be applied. Cooperation shall take place between the concerned authorities in respect of which measures shall be implemented and, where applicable, by virtue of which piece of legislation.

The Transport Agency and the Coast Guard shall agree to cooperate in a joint staff that is led by the Coast Guard. The Maritime Administration shall participate when needed. It is incumbent on the Coast Guard's duty officer to make contact at an early stage with the Transport Agency's duty officer so that they are able to participate in staff meetings.

1.9 Occurrences involving similar questions

Of the occurrences that SHK has investigated in recent years, a number of investigations have, in one way or another, dealt with questions that touch on cooperation between various authorities within the rescue operation, of which NOSSAN (RS 2015:07), KERTU (RS 2016:10), STERNÖ (RS 2018:02) and MAKASSAR HIGHWAY (RS 2019:04) can be mentioned specifically.

Cooperation and division of responsibilities between the concerned authorities is discussed to some extent in all of these reports, while preparedness is discussed in KERTU and STERNÖ, and the term place of refuge (port of refuge) in KERTU.

1.10 Port State Control after the occurrence

On 3 February 2022, in conjunction with the vessel being unloaded in Lysekil, the Transport Agency conducted a Port State Control. The deficiencies identified and notes made indicate there was a remark about insufficient safety measures for moving between the aft and forward parts of the vessel. In this remark it was noted that these circumstances were in place as early as the time of departure from the port of loading.

2. ACTIONS TAKEN

The Swedish Coast Guard has conducted an internal evaluation and the occurrence has been used as a case study during refresher training of its incident commanders, with a focus on the rescue operation criteria. Lessons learned from this occurrence will also be used to develop the capabilities of senior officers, which is prioritised in the operation plan for 2023. The vessels KBV 001 and KBV 002 have been repaired and equipped with larger fenders than those previously mounted in the stern in order to provide better protection for the vessel.

3. ANALYSIS

3.1 Scope

An analysis of the spread and the cause of the fire has been conducted in order to establish the cause of the accident. In addition, the actions on the part of the vessel and the shipowner to deal with the fire are also addressed. However, specific emphasis has been placed on the public-sector rescue operation and the management of ships in need of assistance.

3.2 Spread and cause of the fire

3.2.1 *Spread of the fire*

The fire was at its most intense between the port gunwale and the deckhouse next to crane 1. The fire spread from there primarily forward and to starboard. On the port side the fire spread along the cargo hold coaming towards the forecastle (the foredeck). In the starboard direction, the fire spread between crane 1 and the coaming of cargo hold 1 out towards the gunwale. On the starboard side the fire spread a short distance forward and aft. Vertically the fire spread through the entire depth of the cargo between the crane and the port gunwale. Otherwise the vertical spread was stopped deeper into the cargo during the firefighting operation (see Figure 31).

The fire has spread between packages of timber and down towards the cargo hold coaming. The structure of the cargo, with horizontal and vertical spaces between the packages of timber, allowed for good oxygenation of the fire and ventilation of the smoke. The fire could therefore easily spread in the cargo.

The fire also spread down into cargo hold 1. On the port side there was severe carbonisation of the timber, with soot and damage to the paint in the cargo hold. Otherwise there was soot and damage caused by melting on the packaging of the timber. The fire alarm in the cargo hold was

activated after the fire was discovered. All in all, this indicates that the fire did not start in the cargo hold and instead spread down into it.

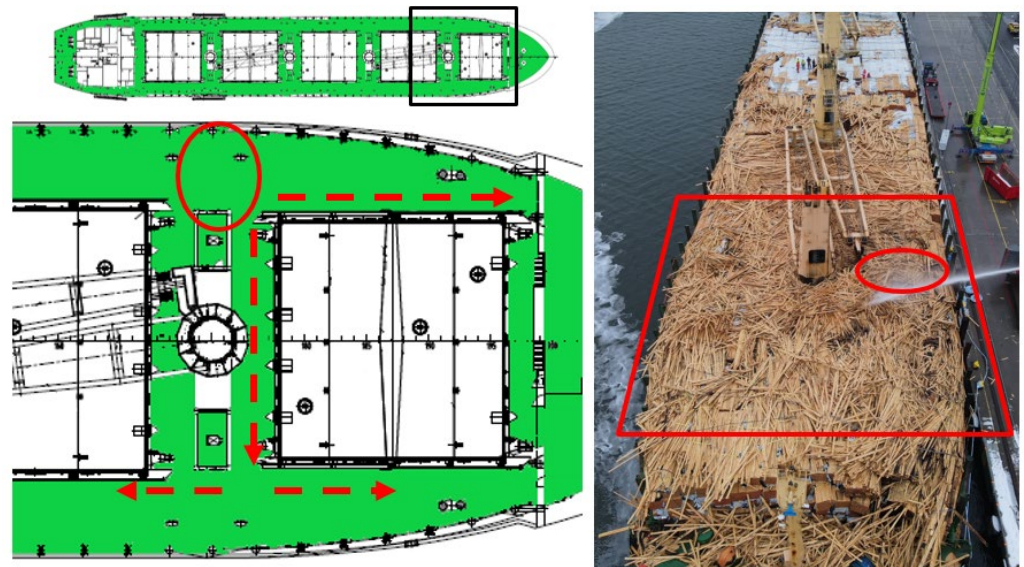


Figure 31. The area within the circle is where the fire has burned longest. The fire has spread in the deck cargo in the area encompassed by the square. The dashed lines indicate the main direction in which the fire spread. Left image: Photograph courtesy of the owner of ALMIRANTE STORNI.

3.2.2 Cause of the fire

The fire is deemed to have started in the area on the port side of crane 1. The pattern of the fire in the form of soot and fire damage to the vessel and the timber cargo indicates that the fire has spread from this area, not to it. It has not been possible to establish when the fire started but, based on the information available, the assessment is made that the fire has started close to when it was detected. No smell of smoke was noticed during the daily rounds on the cargo conducted by the crew or in conjunction with the preparations for bunkering. Nor were there other indications of fire before the fire was detected.

It has been possible to exclude several possible causes

The area was examined in order to obtain evidence with which to establish the cause of the fire. It has been possible to exclude several possible causes. It is not plausible that the timber cargo was ignited due to heating from a fixed light fitting, nor is it plausible that combustible material was ignited by the light fittings. No portable lighting or electrical devices that were plugged into the electricity supply were found. Nor were there any technical traces or other information to suggest that the fire could have been started deliberately.

An extension cable was plugged in in the deckhouse

Consequently, the investigation came to focus on the extension cable that was plugged into the electrical outlet in the deckhouse (section 1.5.2). During the fire scene investigation, it was not possible to find any remaining parts of the cable in the place where it was torn off. Nor

was any equipment found that could have been connected to the cable. The results of further investigation included obtaining information from witnesses and photographs taken during loading. This information suggests that the extension cable found during the fire scene investigation is the extension cable that was connected to the floodlight on the quay during loading in Orrskär.

Parts of the extension cable were deemed to have been live when the fire started

The extension cable was probably live when the fire started. This assessment is made on the basis of the following circumstances:

- The switches and circuit breakers for the outlet in the deckhouse where the extension cable was were in the ‘on’ position at the time of the fire scene investigation.
- No information has emerged that suggests the switches could have been switched off after loading and switched on prior to the fire scene investigation.

The circuit breakers did not trip when the extension cable fell in the water in conjunction with the vessel’s departure from Orrskär. This may be due, for example, to the brackish water of the Baltic Sea not having been sufficiently conductive to trip the circuit breakers or the cable having been pinched under the cargo and breaking. However, it should have been possible to trip the circuit breakers upon making contact with the saltier water at the anchorage. The fact that this did not take place suggests that the part of the extension cable that was hanging down into the water was torn off.

An electric arc probably occurred in the pinched cable

The extension cable has thus probably been pinched under the cargo. The insulation around the electrical conductors (metal wires) in the cable may have been pressed and thinned out or damaged in some other way such that an electric arc has occurred between the conductors. An electric arc is an electrical discharge that flows through the air between two conductors and reaches a temperature of several thousand degrees. An electric arc can occur during brief contact between the conductors or through a conductive bridging between nearby conductors through, for example, salt and dirt. The electric arc can then continue without the conductors being in direct contact as long as the distance between them is not too large. A circuit breaker normally trips rapidly if there is a direct metallic connection between two conductors. However, if the current is passing through an electric arc and electrical conductors with substantial impedance (electrical resistance), the current may be too low to trip the circuit breaker. The impedance in an electric cable increases with the length of the cable.

The impedance in the vessel's electric cables is deemed to have resulted in the circuit breakers not tripping

The electric cables were approximately 180 metres long from the power source in the engine room to the deckhouse by crane 1 and had various cross-sectional areas. The extension cable from the deckhouse was approximately 5 metres long (see Figure 32). The voltage in the vessel was 220 V phase-to-phase voltage with loads connected between phases. The circuit breaker for the electric cable (a miniature circuit breaker) was 16 amps and was located by crane 2. Rough calculations based on these values indicate that the impedance in the electric cables and the extension cable was so high that the current that arises in the event of an electric arc was lower than the miniature circuit breaker's threshold for tripping.

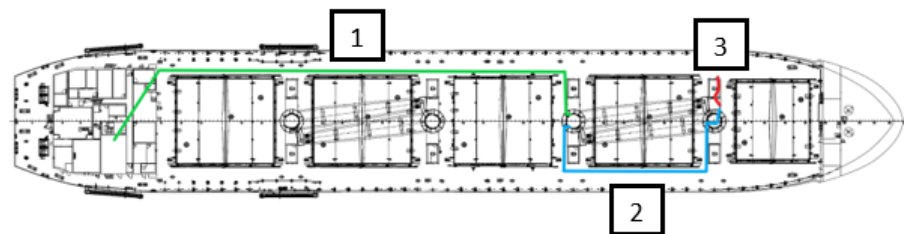


Figure 10. Lengths of the electric cables in the vessel and the extension cable. The electric cable marked with 1 had cross-sectional areas of 3x6 mm² and was approximately 120 metres, the electric cable marked with 2 was 3x2.5 mm² and approx. 60 metres, no. 3 was the extension cable and was 3x1.5 mm² and approx. 5 metres.

An electric arc probably caused the fire

The conclusion is that an electric arc probably came into contact with the plastic packaging or the wood and ignited the material. However, it has not been possible to determine when or in which part of the extension cable an arc first occurred.

3.3 Roles and actions of the vessel and shipowner

Vessels should report directly to the JRCC in the event of an occurrence, but the alarm was raised in this case by the bunkering vessel AMAK SWAN alerting VTS Göteborg. Despite the JRCC not being alerted directly by ALMIRANTE STORNI, it was still possible to activate the rescue operation at an early stage. The vessel quickly received assistance from other units and it was possible early on to turn the vessel so that smoke from the fire did not reach the bridge, with the bridge and accommodation being in the stern of the vessel.

The failure of ALMIRANTE STORNI to alert the JRCC directly, combined with the master's perception that he did not have the authority to decide to bring the vessel into port, demonstrate conditions that could have contributed to the rescue operation being delayed. This was not the case during the present occurrence because the alarm was still raised at an early stage and because shipowner quickly took action. It is also understandable that the master of ALMIRANTE STORNI focussed on

getting the firefighting operation on board up and running. The actions of the crew on board were also initiated without delay.

3.4 Rescue operation

Despite a fire that was difficult to reach and challenging weather conditions, injuries to people and damage to the environment and property were minimised. The decisions made and actions taken have, in the prevailing circumstances, largely been relevant. Nevertheless, there are both operational aspects and conditions that should be reviewed. Some of these issues are addressed below.

3.4.1 *Alerting of rescue resources*

The alerts issued by the JRCC, SOS Alarm and within the Coast Guard were generally implemented without delay and were mainly directed at relevant resources. It is worth noting, however, that the tugboats with firefighting capabilities in the Port of Gothenburg were not contacted by the JRCC or the Coast Guard at an early stage. Instead, the tugboat operator itself decided to send out the tugboats about one hour after the initial information about the fire was provided by VTS Göteborg. The extent of the fire could possibly have been limited further had the tugboats been on site one hour earlier. Nevertheless, the delay in the contribution from the tugboats was not decisive to the firefighting operation as a whole. It can also be noted that only one SSRS station with boats that did not have firefighting capabilities was alerted by the JRCC. In this case, the SSRS instead made its own decision to send out boats that had the capability to contribute to the firefighting operation.

3.4.2 *The Swedish Coast Guard's rescue operation*

The vessel KBV 002, the operational vessel with the greatest firefighting capacity that the Coast Guard was able to deploy, took more than 24 hours to reach the accident site. However, it was possible to man the vessel KBV 001, which was not operational and was in the Port of Gothenburg, with volunteers relatively quickly. Nevertheless, it still took over seven hours for this vessel to join the firefighting operation. In the event a major occurrence that requires substantial resources, it should be possible to deploy these as early as possible. However, the Coast Guard's resources and preparedness at an overarching level are not within the scope of this investigation.

The conditions for a rescue operation should be evaluated

The Coast Guard conducted a rescue operation for almost eight days and had extensive resources on site. By the end of the maritime operation the fire had been suppressed and was deemed to be under control. The shipowner had at this point engaged a number of resources that were on site, including the vessel LOKE VIKING, which had a firefighting capacity three times that of the large Coast Guard vessels. It cannot be ruled out that it may have been feasible for the shipping company to take over responsibility for the maritime firefighting

operation. The Coast Guard's incident commander continually reassessed whether the criteria for a rescue operation were met and saw no reason to conclude the rescue operation. However, it may be important to thoroughly evaluate on the basis of the operation in question how the criteria can be assessed. Any opportunities to reduce the burden on public-sector rescue resources could potentially result in more efficient use of resources and better preparedness for other accidents.

For comparison, the Greater Gothenburg Rescue Service made the assessment that the shipowner had resources that were good enough to deal with the fire and protect the surroundings, but not sufficient should the sequence of events develop unfavourably. Accordingly, the shipowner was deemed capable of dealing with the fire when it was the size it was at the time the vessel entered the municipality's area. The Greater Gothenburg Rescue Service decided that there was a rescue operation and had certain resources in place but did not need to take over responsibility for the firefighting.

However, the question of whether a rescue operation is required or if it is possible for the shipowner and master to implement emergency measures in the event of maritime accidents is complex. An assessment must be made of both the size of the accident in relation to the capability of the individual and the consequences should the accident escalate before a rescue operation can be reinstated. In order to ensure the public sector is prepared, the responsibilities of the public sector and those of the shipowner must be continually weighed up with the aim of reducing the burden on public-sector resources in order to free up resources in readiness for other accidents. Consequently, these questions should be evaluated by the Coast Guard even though no recommendation to this effect is being made.

A multi-authority evaluation should be conducted

The management of this vessel fire was one of the most extensive in modern times in Sweden and provided opportunities for unique lessons to be learned. It is therefore essential that an extensive evaluation is conducted in order to produce evidence that can be used to guide potential improvements within various aspects of the management of such occurrences (see also section 3.5). Aside from lessons learned from the occurrence in question, other evidence should be used in an evaluation, for example the agreement concerning cooperation by authorities between the Coast Guard, Maritime Administration and Transport Agency (TSA 2020-36). However, it is important that the municipal aspects are also taken into account.

The Coast Guard played a central role in the management of the occurrence. It is therefore recommended that the Coast Guard take the initiative and, in cooperation with the Transport Agency, the Greater Gothenburg Rescue Service, the Maritime Administration and other

relevant organisations, evaluate the management of such occurrences. This evaluation should encompass aspects including the following:

- Responsibilities and roles.
- Legal prerequisites for decision-making.
- Assessment of the rescue operation criteria during an ongoing operation.
- Forms of cooperation.
- The need for joint training and exercises.

Choice of method should be evaluated

During the firefighting operation, the wind and sea conditions made it difficult for the Coast Guard to keep the jets of water directed at the target. The method used to keep the Coast Guard vessels in position was to push their stern against the sides of the hull of ALMIRANTE STORNI. Aside from damage to the Coast Guard vessels, this method caused a relatively large amount of damage to ALMIRANTE STORNI. The indentations and cracks that formed on the starboard side could have had serious consequences. If the sea state had not eased and there had therefore been a continued need to press against the hull, it is not possible to rule out the damage having led to water penetration.

Both the method itself and the choice of fenders or other rub guards should be evaluated. The Coast Guard has stated that the fenders on KBV 001 and KBV 002 have been changed with the aim of protecting these vessels. However, it is vital that an evaluation is conducted of how a damaged vessel can be protected from further damage during a similar firefighting operation to the one in question. The Coast Guard is therefore recommended to evaluate firefighting methods and the design of its vessels for this type of operation.

3.5 Accommodation of ships in need of assistance

In the event of a maritime accident, a delay in bringing a ship into a place of refuge can have serious consequences, which is why the Vessel Traffic Monitoring Directive was developed. This directive requires EU member states to designate competent authorities, to prepare plans for the accommodation of ships in need of assistance, to make decisions on the accommodation of ships in need of assistance and to have procedures for financial security and compensation.

The analysis has assumed that the conditions for a rescue operation are met when a ship in need of assistance is to be brought into a place of refuge. The analysis also assumes that decisions may need to be made against affected ships or ports.

The sections below contain a brief account of relevant articles in the Vessel Traffic Monitoring Directive and how the requirements in its articles relate to the Swedish regulatory framework and the implementation of measures.

Finally, conclusions and recommendations are described in an overall assessment that contains links to how the occurrence in question was managed (section 3.5.5).

3.5.1 Competent authority

EU member states shall designate one or more competent authorities which have the required expertise and the power, at the time of the operation, to take independent decisions on their own initiative concerning the accommodation of ships in need of assistance (Article 20).

There is currently no formally designated competent authority in Sweden. Required expertise for dealing with a ship in need of assistance is spread among four different organisations: The Coast Guard, the Maritime Administration, the Transport Agency and the municipal rescue service. Each of these organisations is able to take action within its area of responsibility.

The Transport Agency is able to order a vessel to put into a certain port by virtue of Chapter 7, Section 5 of the Act on Measures against Pollution from Vessels. This decision only applies to the vessel and cannot be enforced if the port opposes the measure.

Under Chapter 6, Section 2 of the Civil Protection Act, an incident commander is able to encroach on the rights of others in the event of a rescue operation. The Maritime Administration's incident commander is able to implement measures in the event of a maritime search and rescue operation and the Coast Guard's incident commander in the event of an environmental rescue operation. In a port, the municipal rescue service's incident commander is able to implement measures in the event of a municipal rescue operation (section 1.6.1).

However, there are certain limitations on what measures the rescue authorities are able to implement against a vessel pursuant to Chapter 6, Section 2. Prohibitions or injunctions as referred to in Chapter 7, Section 5 of the Act on Measures against Pollution from Vessels may only be issued pursuant to Chapter 6, Section 2 of the Civil Protection Act if it is not possible to wait for the Transport Agency's decision. Examples of those prohibitions and injunctions mentioned in the section include prohibition against commencing or continuing loading, unloading, lightering or bunkering and an injunction against lightering oil or other hazardous substance. Consequently, certain interventions in the event of a maritime environmental rescue operation pursuant to the Civil Protection Act are, in this sense, subsidiary¹² in relation to the Act on Measures against Pollution from Vessels (Govt Bill 2002/03:119, p. 86).

¹² Act, the provisions of which shall not be applied if there is a divergent provision in another act or ordinance, the provisions of which shall be applied instead.

In conjunction with a central government rescue operation, if a ship is brought into a municipality's geographic area of responsibility, responsibility is transferred from the central government rescue body to the municipal rescue service (Govt Bill 2002/03:119, p. 75). According to the legislative history, the reason for this rule is because the municipalities generally have good resources for rescue operations in port areas. The bill also states that the Government has made the assessment that it is the municipalities that are best able to assess the appropriateness of bringing a damaged ship or ship in distress into a certain port (Govt Bill 2002/03:119, p. 75).

Responsibility in the event of a maritime accident when a ship in need of assistance needs to be brought into port is therefore shared. This means that, in order for this to be possible to implement, the organisations responsible for a rescue operation must cooperate, which is also explicitly regulated in Chapter 1, Section 6 of the Civil Protection Act.

In a port it is the municipal rescue service that is responsible for the rescue operation once a ship is brought across the geographic boundary from the maritime area for which the central government is responsible. Accordingly, it is SHK's understanding that only the municipal incident commander is able to commandeer the port for a ship in need of assistance. Nonetheless, the Coast Guard has stated that it is their understanding that they are able to make decisions concerning encroachments on the rights of others even outside of central government waters when they are conducting an environmental rescue operation. For example, this can refer to a decision against a port to accommodate a vessel, even though responsibility for the operation is transferred once the vessel enters the port. However, it has been pointed out in previous investigations¹³ that the legal situation is unclear (section 1.8.1).

It can be noted that the legislative history of the Civil Protection Act points out that the Vessel Traffic Monitoring Directive had been adopted and that the work to identify plans for ships in distress is the first stage of the work to implement the directive into Swedish law (Govt Bill 2002/03:119, p. 76). No further deliberations were made in the bill.

As established initially, responsibility for a ship in distress is divided among a number of authorities. The management of the fire on board *ALMIRANTE STORNI* demonstrates that there are reasons to investigate this division of responsibility. There are also reasons to clarify how cooperation between affected authorities shall take place in order to streamline the management of similar occurrences. However,

¹³ *Rapport angående behovet av förändringar i fråga om mottagande av fartyg i nöd* [Report on the Need for Changes in the Matter of Accommodation of Vessels in Distress], p 22.

such measures may require legislative changes and therefore require further investigation.

3.5.2 *Plans for the accommodation of ships in need of assistance*

Under Article 20a, EU member states shall draw up plans for the accommodation of ships in order to respond to threats presented by ships in need of assistance in the waters under their jurisdiction, including, where applicable, threats to human life and the environment. The content of the plan shall include assessment procedures for acceptance or refusal of a ship in need of assistance in a place of refuge. The plan shall be prepared after consultation of the parties concerned. The aim of the plan includes enabling necessary decisions to be made quickly.

The Transport Agency, which is responsible for drawing up the plans, has decided on a number of recommended places of refuge. No other decisions have been made regarding plans for the accommodation of ships in need of assistance. Consequently, no such detailed plan as specified in the directive has been prepared for occurrences in Swedish waters. The Transport Agency has stated that it is not currently working actively on this matter. The reason for this is that it has limited resources and that it has not been possible to prioritise this matter.

The plans shall be drawn up by the Transport Agency after agreement has been reached with the Maritime Administration and the Coast Guard. Bringing a ship in need of assistance into a place of refuge will, in many cases, affect municipal interests. How the municipal interests are to be taken into account in the work with the plans is not regulated in the Vessel Safety Act and should therefore be clarified.

3.5.3 *Decisions concerning the accommodation of ships*

The competent authority or authorities shall decide on the acceptance of a ship in a place of refuge following a prior assessment of the situation carried out on the basis of the plans. The authority or authorities shall ensure that ships are admitted to a place of refuge if they consider such an accommodation the best course of action for the purposes of the protection of human life or the environment (Article 20b).

As described in a previous section, there is no formally designated competent authority (section 3.5.2) nor any prepared plans (section 3.5.2). In this type of occurrence, consensus is required between the central government and municipal rescue services in order to make the decisions required in order for a ship that is in central government waters to enter a port. Consensus must be achieved that the measure is the best way to protect human life or the environment. The person making the decisions at the Transport Agency and the municipal rescue service must also achieve consensus. Therefore, close cooperation between these authorities is required to achieve consensus and to manage the risks associated with the measure.

Under Chapter 1, Section 6 of the Civil Protection Act, municipal and central government rescue authorities shall coordinate their activities and cooperate with one another and with others who are affected. However, there are no regulated or established forms for how cooperation is to be implemented in this context. The agreement concerning cooperation by authorities between the Coast Guard, the Maritime Administration and the Transport Agency regulates cooperation to some extent but does not cover municipal organisations. There are therefore reasons to revise this agreement. If municipal organisations are involved in a revision of this agreement, this can be an important step towards more formally regulated decision-making in accordance with the article in the directive.

3.5.4 *Financial guarantees and compensation*

According to the Vessel Traffic Monitoring Directive, the absence of an insurance certificate shall not in itself be considered sufficient reason for a member state to refuse to accommodate a ship in a place of refuge (Article 20c).

A ship's insurance is an important aspect of enabling costs to be managed. However, bringing a ship in need of assistance into a place of refuge also involves other financial aspects that can affect how this is managed.

There is no explicit regulation of how questions pertaining to compensation are to be dealt with in conjunction with the accommodation of ships in need of assistance. The Swedish Maritime Code contains various rules concerning compensation. For example, Chapter 10 and Chapter 10a contain rules relating to damage caused by oil. The general provisions of the Tort Liability Act apply to other matters that fall within the scope of tort law. There may be other ways of obtaining compensation. For example, there are several different international conventions that regulate how costs are to be compensated in the event of various types of occurrence.

The Coast Guard regularly claims compensation for costs it has incurred in conjunction with environmental rescue operations. In most cases, this is done under the provisions of Chapter 10a of the Swedish Maritime Code. The Civil Protection Act regulates compensation for municipalities that have participated in a central government rescue operation (Chapter 7, Sections 1–3). It may be unclear where the boundary for deciding whether the costs are attributable to the operation lies. If the action of bringing the vessel into port is unsuccessful and, for example, the entrance to a port is blocked, major societal costs will probably arise over a long period.

In accordance with the Civil Protection Act, an incident commander shall take into account the costs of the operation and weigh these up against what is to be rescued. The uncertainty of assessing where the boundary between the costs of the operation and the costs of any

complications of the operation lies may make it difficult for an incident commander to make decisions.

To ensure the accommodation of ships in need of assistance is handled efficiently, it is necessary to clarify what potential there is for the organisations involved to obtain compensation. These matters are, however, so extensive and complex that they do not fall within the scope of this investigation and should instead be investigated separately.

3.5.5 *Overall assessment*

A ship in need of assistance may need to get to a place of refuge very quickly in order to avoid harm to people and the environment. It can be a question of hours rather than days. When ALMIRANTE STORNI was to be brought into port, it took several days before the organisations involved were able to come to an agreement and a decision could be made. The reasons why it took a long time included the lack of plans for dealing with this type of occurrence, as well as the fact that no one person was responsible for management at a level that encompassed all of the authorities involved. As established in the sections above, there is, to a great extent, a lack of regulation of how authorities and other organisations should act in the event of this type of occurrence. There are also no regulations relating to what it means for a port to be designated as a place of refuge. Established plans and clear decision-making procedures for the accommodation of ships in a place of refuge could have streamlined the management of the fire.

The regulations regarding the efficient accommodation of ships in need of assistance should be revised

The previous sections indicate that there is a lack of national regulation in a number of respects relating to the requirements of the Vessel Traffic Monitoring Directive. The review of the Swedish implementation of the Vessel Traffic Monitoring Directive conducted by the Maritime Administration and the Coast Guard in 2005 indicated that a number of legislative changes were required. These issues have also been highlighted by SHK in the final report RS 2016:10 (KERTU) in which the Ministry of Enterprise and Innovation was recommended to evaluate applicable legislation concerning vessels' port of refuge, particularly as regards the authority to order a port to accept a vessel in distress and financial guarantees for ports. A recommendation was also issued to the Ministry of Justice to evaluate applicable legislation concerning the boundary between central government and municipal responsibility for rescue operations in ports and channels in conjunction with maritime accidents.

Neither report regarding the need for changes with respect to the accommodation of ships in distress nor the recommendations made by SHK have led to any legislative changes. The management of the fire

on board ALMIRANTE STORNI demonstrates that there is still a need for more clarity on these matters.

As has been established above, these matters need to be investigated in more detail than is possible within the scope of this investigation. It cannot be ruled out that legislative changes may be required in order to ensure the efficient accommodation of ships in need of assistance. Consequently, this should be investigated further by the Government.

The investigation should address the following:

- Necessary legislative changes that may be required in order to ensure the efficient accommodation of ships in need of assistance.
- The potential to provide financial compensation to affected organisations.
- The forms for decision-making in cases relating to the accommodation of ships.
- The conditions for cooperation between the relevant rescue authorities and the Transport Agency.
- How to ensure the participation of affected municipalities in the work to draw up plans for the accommodation of ships in need of assistance.

There may be a need to look at other issues that relate to the accommodation of ships and the list above should only be seen as examples that may need to be addressed.

There is a need for plans for the accommodation of ships in need of assistance

There is the potential within the existing regulatory framework to improve the management of ships in need of assistance. An essential part of this is the plans that the Transport Agency is to draw up. The Transport Agency has begun working on this, but this work should be prioritised and completed promptly.

The plans are to be prepared following consultation with the Maritime Administration and the Coast Guard. Other questions about responsibility and regulation of costs also need to be dealt with. In many cases, these questions concern areas for which municipalities are responsible. Consequently, the Civil Contingencies Agency and the Swedish Association of Local Authorities and Regions¹⁴ should also participate on the question of how affected municipalities and their rescue services can be involved in the work. It is also important that the lessons learned from ALMIRANTE STORNI are brought into this work.

¹⁴ Swedish Association of Local Authorities and Regions – membership and employers’ organisation for all of Sweden’s municipalities and regions that provides advice to civil servants and elected representatives on all matters within areas in which municipalities and regions operate.

The Transport Agency is therefore recommended to prioritise and expedite completion the work to draw up plans for the accommodation of ships in need of assistance. Representatives from the affected municipal rescue services, the Civil Contingencies Agency and the Swedish Association of Local Authorities and Regions should be included in this work.

4. CONCLUSIONS

4.1 Findings

- a) The vessel ALMIRANTE STORNI arrived at Anchorage A off Gothenburg in order to bunker.
- b) ALMIRANTE STORNI was fully loaded with cut timber, a large portion of which was being carried as deck cargo.
- c) During the bunkering, the crew on the bunkering vessel detected smoke and then flames emerging from the deck cargo on ALMIRANTE STORNI.
- d) A maritime search and rescue operation began but no people needed to be rescued.
- e) An environmental rescue operation was also initiated and a firefighting operation was conducted that involved substantial public-sector and private-sector resources.
- f) Despite extensive attempts being made to extinguish the fire by spraying it with water, it was not possible to put it out and it soon became clear that to do so would require the cargo to be unloaded in port.
- g) It took several days before the concerned parties were able to agree to bring the vessel into the Port of Gothenburg.
- h) Once in port, parts of the cargo were unloaded and it was possible to extinguish the fire.
- i) The Vessel Traffic Monitoring Directive contains provisions on the management of ships in need of assistance.
- j) The Swedish Transport Agency is the authority that is tasked with drawing up plans in accordance with to the Vessel Traffic Monitoring Directive. The work on these plans has not been completed.

4.2 Causes

The fire was probably caused by an electric arc occurring in an extension cable that was pinched and damaged by the cargo of timber. The way in which the packages of timber were loaded meant that the fire was able to increase in intensity and spread.

The extension cable had been left live. The risk of fire was not identified when the extension cable was torn off and therefore no action was taken to deal with this risk.

5. SAFETY RECOMMENDATIONS

The Swedish Government is recommended to:

- Investigate and, where necessary, take the action required to ensure the efficient accommodation of ships in need of assistance (section 3.5.5). *(SHK 2023:01 R1)*
- Investigate and, where necessary, take action to bring about the legislative changes required in order to ensure that affected municipalities are included in the work to draw up plans for the accommodation of ships in need of assistance (section 3.5.5). *(SHK 2023:01 R2)*

The Swedish Transport Agency is recommended to:

- Prioritise and expedite the completion of the work to draw up plans for the accommodation of ships in need of assistance. Representatives from the affected municipal rescue service organisations, the Swedish Civil Contingencies Agency and the Swedish Association of Local Authorities and Regions should participate. The aim of this work should be to streamline the administration and decision-making processes concerning the accommodation of ships in need of assistance (sections 3.5.1, 3.5.2 and 3.5.5). *(SHK 2023:01 R3)*

The Swedish Coast Guard is recommended to:

- Initiate cooperation with the Swedish Transport Agency, Greater Gothenburg Rescue Service, Swedish Maritime Administration and other relevant organisations in order to evaluate the operation with respect to aspects including the legal circumstances, the process of bringing vessels into port, assessment of the rescue operation criteria during an operation, forms of cooperation, allocation of roles and need for joint training and exercises (sections 3.4.2 and 3.5). *(SHK 2023:01 R4)*
- Evaluate firefighting methods and the design of vessels for this type of operation (section 3.4.2). *(SHK 2023:01 R5)*

The Swedish Accident Investigation Authority respectfully requests to receive, by **18 April 2023 at the latest**, information regarding measures taken in response to the recommendations included in this report.

On behalf of the Swedish Accident Investigation Authority,

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