



Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation

Investigation Report 300/21

Very Serious Marine Casualty

**Fire in the engine compartment with subsequent
foundering of the fishing vessel FREYJA
in Schleswig-Holstein's Wadden Sea
during the night of 17 to 18 September 2021**

15 March 2023

This investigation was conducted in accordance with the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law, “Seesicherheits-Untersuchungs-Gesetz” SUG).

According to said law, the sole objective of this investigation is to prevent future accidents. This investigation does not serve to ascertain fault, liability or claims (Article 9(2) SUG).

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to Article 34(4) SUG.

The German text shall prevail in the interpretation of this investigation report.

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List of Abbreviations

AIS	Automatic identification system
BG Verkehr (DS)	German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication (– Ship Safety Division –)
BMDV	Federal Ministry for Digital and Transport
BMVI	Federal Ministry of Transport and Digital Infrastructure
BSH	Federal Maritime and Hydrographic Agency
BSU	Federal Bureau of Maritime Casualty Investigation
CEST	Central European Summer Time
DGzRS	German Maritime Search and Rescue Service
DWD	Germany's National Meteorological Service
EPIRB	Emergency position indicating radio beacon
FF	Volunteer fire brigade
GDWS	Federal Waterways and Shipping Agency
GmbH	Limited company
GMDSS	Global Maritime Distress and Safety System
IMO	International Maritime Organization
ISO	International Organization for Standardization
LKN.SH	Schleswig-Holstein State Agency for Coastal Protection, National Park and Marine Conservation
MRCC	Maritime Rescue Coordination Centre
PLB	Personal locator beacon
SchBesV	German Ordinance on Safe Manning
SchSV	German Ordinance for the Safety of Seagoing Ships
See-BV	Seafarers' Competencies and Proficiencies Regulations
SNRK	Rescue cruiser
SOLAS	International Convention for the Safety of Life at Sea
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
STCW-F	International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel
UTC	Universal Time Coordinated
VDR	Voyage data recorder
VTS	Vessel traffic service
WSA	Waterways and Shipping Office
WSP	Waterway police

1 SUMMARY

A fire broke out in the engine compartment on the German fishing vessel FREYJA, which was manned by two fishermen, on the evening of 17 September 2021. At the time of the accident, the fishing vessel was anchored in the Schleswig-Holstein Wadden Sea south-east of the island of Amrum. The rapid spread of the fire was accompanied by heavy smoke and left the two fishermen no time to fight the fire effectively but rather forced them to deploy the liferaft and abandon the fishing vessel.

The crew of a rescue helicopter that happened to be in the vicinity became aware of the accident and the liferaft after noticing a flare fired by the fishing vessel's skipper. The two shipwrecked fisherman, who had suffered minor injuries, were rescued quickly and taken to Heide Hospital.

It quickly became clear to the emergency services, which had been put on standby in the meantime, that further emergency measures were not necessary after the two crew members were rescued. The wooden vessel inevitably burnt out completely and foundered at about 0245¹.

The emergency services monitored a spreading oil slick on the following day but it was extremely fragmented and began to dissipate as the day progressed. The nature and extent of the water pollution caused by the wreck of the fishing vessel therefore rendered extensive pollution control measures unnecessary.

Three weeks after the accident, the remnants of the fishing vessel were salvaged with the help of a floating crane, transported to Husum on two service vessels and inspected there by the waterway police (WSP) and an investigation team from the Federal Bureau of Maritime Casualty Investigation (BSU).

Due to the severe damage to the fishing vessel caused by the fire and her foundering, and the fact that this category of vessel does not have a voyage data recorder, it was not possible to determine the cause of the fire.

¹ All times shown in this report are CEST (UTC + 2 hours).

2 FACTUAL INFORMATION

2.1 Photograph of the fishing vessel FREYJA



Figure 1: Fishing vessel FREYJA²

2.2 Ship particulars: Fishing vessel FREYJA

Name of ship:	FREYJA
Type of ship:	Fishing vessel
Flag:	Germany
Port of registry:	Wyk/Föhr
Fisheries code:	SW 008
Call sign:	DISO
Year built:	1971
Shipyard:	Schiffs- und Bootswerft Peter Bieritz, Friedrichskoog
Yard number:	88
Length overall:	17.35 m
Breadth overall:	5.21 m
Draught (max.):	1.75 m
Gross tonnage:	35
Engine rating:	221 kW
Main engine:	MAN D 2866 LXE47 diesel engine
Service speed:	8 kts
Hull material:	Wood
Minimum safe manning:	2

2.3 Voyage particulars: Fishing vessel FREYJA

Port of departure:	Büsum (Germany)
Planned port of call:	Büsum (Germany)

² Source: Martin Perkuhn, Schleswig-Holstein State Agency for Agriculture, Environment and Rural Areas; Fisheries Inspectorate Büsum.

Type of voyage: Coastal fishing in Schleswig-Holstein's Wadden Sea between the islands of Amrum and Japsand

Draught at time of accident: Not specified

Manning: 2

2.4 Marine casualty information

Type of marine casualty: Very serious marine casualty; foundered due to a fire

Date, time: 17/09/2021, approx. 2130 (fire breaks out)
18/09/2021, approx. 0245 (the burnt out wreck founders; mast protruding from the water)

Location: Schleswig-Holstein's Wadden Sea

Latitude/Longitude: ϕ 54°36.4'N λ 008°29.6'E (position at which the vessel foundered)

Ship operation and voyage segment: At anchor (fishing suspended)

Place on board: Fire in the engine compartment

Consequences: Fishing vessel foundered; two crew members with minor injuries (smoke poisoning or shock); water pollution due to escaping operating fluids (mainly diesel fuel)

Extract from Navigational Chart TERSCHELLING TO ESBJERG, DE50 (INT 1045), BSH³



Figure 2: Scene of the accident

³ BSH: Federal Maritime and Hydrographic Agency.

2.5 Shore authority involvement and emergency response

Agencies involved: DGzRS (incl. MRCC Bremen); Northern Helicopter GmbH; WSP Brunsbüttel; WSP Hamburg; the German Central Command for Maritime Emergencies (CCME) in Cuxhaven; VTS Cuxhaven; WSA Elbe-Nordsee; Federal Maritime Police; BSH; DWD⁴; Schleswig-Holstein State Agency for Coastal Protection, National Park and Marine Conservation (LKN.SH); Naval Air Wing 3, Nordholz; Volunteer Fire Brigade (FF) Pellworm; Taucher Frey GmbH, Hamburg; Fechner Marine Surveys, Hamburg; NF Seefracht GmbH, Mildstedt

Resources used: Rescue helicopter NORTHERN RESCUE 01; rescue cruisers ERNST MEIER-HEDDE and EISWETTE; WSP patrol boat BÜRGERMEISTER WEICHMANN; WSP coastal patrol boat SYLT; pollution control plane Do228; helicopter from the Federal Police; oil containment boat from FF Pellworm; floating crane ENAK; tug ARION; service vessels CATJAN and SANDSHÖRN

Actions taken: The two crew members were picked up by rescue helicopter and transported to Heide Hospital; abandonment of attempts to extinguish the fire due to suspected risk of explosion; exploratory actions with regard to the discharge of pollutants from the wreck of the fishing vessel; oil barrier set up around the wreck by FF Pellworm; publication of a temporary notice to mariners by WSA Elbe-Nordsee to warn shipping of the dangers posed by the wreck of the fishing vessel; inspection of the wreck by divers; partial dismantling of the wreck at the scene of the accident; salvage and removal of all parts of the wreck for disposal ashore

⁴ The weather and current data provided by the DWD and the BSH were used to forecast the spread of any pollutants escaping from the wreck.

3 COURSE OF THE ACCIDENT AND INVESTIGATION

3.1 Course of the accident

The German fishing vessel FREYJA had left the port of Büsum with a skipper and deckhand (fishing hand) on board at about 1330 on the day of the accident. At about 1730, they started fishing for crab about 25 nautical miles from Büsum as the crew flies in the Schmaltief channel, which runs between the North Frisian islands of Amrum and Japsand.

After nightfall, the skipper decided to suspend fishing for several hours at about 2115 and anchored the fishing vessel at the northern edge of the channel south-east of the island of Amrum at about 2135. The two fishermen then processed the most recent catch on the illuminated working deck in front of the wheelhouse with the main engine still running to generate energy and the auxiliary diesel engine in operation.

After a short while, they noticed an acrid smell and smoke coming from an open door on the aft edge of the wheelhouse. Due to the rapid development of smoke, the crew was unable to reach the engine compartment via the companionway behind this door in order to identify the source of the fire, which was evidently to be found there. Instead, the skipper switched off the main engine and the auxiliary diesel engine in the wheelhouse. He and the deckhand then made sure watertight integrity prevailed. After that, the skipper activated the extinguishing system for fires in the engine compartment by means of the device located in the compartment leading to the engine compartment companionway.

The two crew members then took the precaution of moving the liferaft from the aft deck to the bow of the fishing vessel. There was an explosion in the engine compartment immediately afterwards. The door to the companionway flew open with a loud bang. The resulting sudden influx of oxygen caused a massive fire to ignite, which spread from the engine compartment to the aft deck via the open door. The aft section of the fishing vessel was immediately enveloped in dense smoke, which made it impossible for the skipper to enter the wheelhouse to make a distress call from there. Instead, the two crew members threw the liferaft overboard, triggered its inflation mechanism by pulling out the ripcord and entered the liferaft once it was fully inflated. The two fishermen managed to move the liferaft away from the burning fishing vessel with some difficulty.

About 30 minutes after abandoning the fishing vessel, the two shipwrecked fishermen noticed a helicopter and set off a red flare to attract attention. The crew of the rescue helicopter, which was equipped with a winch and happened to be near the scene of the accident because of another mission, became aware of the burning vessel due to the distress signal. After consulting with MRCC⁵ Bremen, the helicopter was withdrawn from the originally planned mission and instead flew to the scene of the accident, where the liferaft was identified very quickly and the rescue of the two fishermen started. The latter were on board the helicopter by about 2246. The two fishermen were then immediately transported to a hospital in Heide for medical care and admitted there for a day as inpatients.

⁵ MRCC: Maritime Rescue Coordination Centre.

At the same time as these activities were unfolding, MRCC BREMEN transmitted a mayday relay⁶ and instructed two rescue cruisers to proceed to the scene of the accident. A WSP boat also made for the burning fishing vessel. After the two crew members were rescued, it quickly became clear to the emergency services that further action, in particular a rapid and effective firefighting operation, was out of the question due to the water levels in the tidal flats but above all because of a suspected risk of explosion on the fishing vessel. The wooden vessel inevitably burnt out completely and foundered at about 0245. Only the top of the mast protruded from the surface of the water (see **Figure 3**).



Figure 3: Mast head of the foundered fishing vessel FREYJA protruding from the water⁷

After daybreak, units from the police, the fire brigade and the coastal protection services assessed the situation at the wreck and in particular any environmental hazards posed by it. According to information obtained in the meantime from the skipper, there were some 3,000 litres of diesel on board the fishing vessel. A large part of this was presumably burnt. The spread of an oil slick could nevertheless be observed from the air during surveillance flights by helicopter and pollution control plane. However, it was extremely fragmented and began to dissipate as the day progressed. Further surveillance flights were carried out over the next few days. In addition, FF Pellworm set up a temporary oil barrier around the wreck on behalf of the LKN.SH. Due to the nature and (relatively quickly diminishing) scale of the water pollution, the LKN.SH refrained from extensive pollution control.

Divers carried out a visual inspection of the wreck of the fishing vessel on 27 September 2021 in preparation for the planned salvage operation, which began on 6 October 2021 and was successfully completed with the help of floating crane ENAK on 9 October 2021. The hull of the FREYJA, which was stored on board the service vessel CATJAN, arrived in Husum on the afternoon of 10 October 2021.

⁶ Mayday relay: Forwarding of a received distress call (in this case, information from the helicopter about the sighted flare) in order to disseminate it.

⁷ Source: Federal Police/CCME.

3.2 Investigation

3.2.1 Course of events, sources and material details

The BSU was informed about the night-time fire and foundering of the fishing vessel FREYJA on the morning of 18 September. The investigation team approached the skipper shortly afterwards and also contacted the agencies involved in crisis management to find out about the accident and subsequent emergency measures. The investigation team sighted the vessel's file at the BG Verkehr (DS)⁸ for information on the fishing vessel's technical condition, survey results in this respect and current certificates. The BSU also contacted the engineering firm instructed to organise and carry out the salvage to obtain information on the progress of related activities.

The investigation team inspected the wreck of the FREYJA on 11 October 2021, which was stored on board the service vessel CATJAN and severely damaged by fire.

Fishing vessels of the size of the FV FREYJA are not required to be equipped with a voyage data recorder (VDR) under either international or national legislation. Accordingly, it was not possible to refer to recorded technical data from the machinery, in which the fire had undoubtedly broken out, during the investigation. This means that the BSU's enquiries had to be confined to an analysis of the aforementioned sources. The extensive findings of WSP Brunsbüttel, which the BSU was given sight of, were one important additional component. Nevertheless, even after considering all the information in its entirety it was still not possible to determine the cause of the fire on board the fishing vessel FREYJA.

⁸ DS: Ship Safety Division – organisational unit within the BG Verkehr. The DS's responsibilities include ship safety, protection of the marine environment, maritime labour law and maritime medicine on behalf of the federal government. It monitors compliance with international conventions on safety and environmental protection on the world's oceans. It is responsible for ships flying the German flag engaged in commercial maritime shipping, as well as fishing vessels and traditional ships.

3.2.2 Fishing vessel FREYJA

3.2.2.1 Basic information

The FREYJA is a fishing vessel designed for coastal fishing. She was constructed in 1971 at a German shipyard in a typical wooden build according to the standards of the time and equipped with a wheelhouse in her aft section. At the time of the accident, she had a safety certificate for fishing vessels issued by BG Verkehr (DS) on 7 December 2020, which was valid until 8 February 2025. Accordingly, the FREYJA met the structural and other equipment requirements for fishing vessels of less than 24 metres in length under Part 5 of Annex 1a to the Ordinance for the Safety of Seagoing Ships.

The fishing vessel's area of operation [referred to as trading area in the certificate] was defined in the above certificate as follows:

Fishing from German coastal areas or neighbouring coastal states up to a distance of 35 nautical miles from the coastline.

3.2.2.2 Surveys by the BG Verkehr (DS)

The safety certificate valid at the time of the accident was issued in part due to the findings of the periodic surveys, which are standardised in terms of content, of the vessel's safety installations and equipment on 17 February (entire vessel without machinery and underwater hull)⁹ and on 18 May 2020 (machinery)¹⁰, each by a surveyor from the BG Verkehr (DS). The BSU inspected the relevant records and reports kept in the vessel's file at the BG Verkehr (DS).

The respective predecessor documents from 2009, 2011, 2015 and 2017 were also evaluated for the purpose of interpreting and classifying information on the survey items of particular relevance to the accident (electrical system, fire protection equipment) in the aforementioned records and reports.

The following findings were made in the process:

As regards fire protection, the survey question as to whether the exhaust pipes in the area of the engines are completely insulated revealed that the turbocharger's exhaust gas outlet pipe reportedly required better insulation during the machinery survey in 2011. The shipowner was not set a deadline for rectifying this deficiency at the time. Moreover, the files of the BG Verkehr (DS) do not provide information about any unqualified follow-up survey. The aforementioned survey question was answered with an unqualified yes during the machinery survey in 2015.

⁹ The survey is carried out on the basis of a multi-page inspection schedule prepared by the BG Verkehr (DS), which the surveyor is required to complete, titled 'Vordruck F-Schiff für Fischereifahrzeuge unter 24 m Länge' [form f-ship for fishing vessels of less than 24 m in length].

¹⁰ The survey is carried out on the basis of a multi-page inspection schedule prepared by the BG Verkehr (DS), which the surveyor is required to complete, titled 'Vordruck F-Maschine für Fischereifahrzeuge unter 24 m Länge' [form f-machinery for fishing vessels of less than 24 m in length].

However, it was once more found during the survey in 2017 that the insulation on the exhaust side of the turbocharger was defective, with the survey report requiring its rectification as follows:

The turbocharger must be properly insulated on the exhaust side without delay.

The shipowner was also required to fit a wooden protective cover over the newly installed batteries in the engine compartment. Again, no specific deadline was set with regard to the aforementioned requirements, nor was a follow-up survey carried out before issuing the certificate.

The documents of the BG Verkehr (DS) do not indicate whether the inadequate insulation of the turbocharger's exhaust side found in 2017 was still the defect from 2011 (which had not been rectified in the meantime). Although this is opposed by the fact that the deficit in question was not recorded again in 2015, it seems almost inconceivable that a defect in the turbocharger's insulation would have reoccurred in 2017 if a similar technical shortcoming had been rectified only a few years earlier.

During the machinery survey on 18 May 2020, the surveyor noted that the turbocharger had still not been insulated. Referring to the survey report from 2017, the survey report stated in this regard:

The requirement for insulation of the turbocharger continues to apply. It appears that the vessel's former survey folder was not handed over when she was sold in 2019, meaning that the new owner was not informed about the outstanding requirement.

Once again, there is nothing in the files of the BG Verkehr (DS) to indicate that the shipowner was set a deadline for rectifying the deficiency. There is also no evidence to suggest that the safety certificate would only have been issued after a follow-up survey. On the other hand, the survey report confirmed that the deficiency raised in 2017 regarding the missing cover for the newly installed batteries had reportedly been rectified.

According to the relevant inspection schedules of the BG Verkehr (DS), the permanently installed fire extinguishing system for the engine compartment is one of the items of the vessel's safety installations and equipment surveyed, both for the entire vessel (without machinery and underwater hull) and for the machinery.¹¹

¹¹ See the comments in Chapter 3.2.2.4 below for the relevant technical details.

The FM 200 system in question is referred to for the first time in the machinery survey report ('Vordruck F-Maschine') of 9 February 2011. The 'Datum der letzten Prüfung durch einen zugelassenen Sachverständigen' [date on which an approved expert carried out the most recent survey] inspection item contains the statement *2/11 new*, indicating the system had been newly installed immediately before the survey. However, the vessel's file at the BG Verkehr (DS) does not contain any further information in this regard.

In the machinery survey report of 27 February 2015, the aforementioned inspection item is answered as follows: *'01/11'*. In contrast, the record of the vessel survey of 3 March 2015 ('Vordruck F-Schiff') states *'02.2015'* as the date of the most recent survey by an expert, while in the record of the 2017 survey of the machinery, *'2011'* was once more noted as the date of the most recent survey.

The discrepancy in question continues in the records of the vessel and machinery surveys carried out in 2020. In the record of the vessel survey carried out on 17 February 2020, the 'Welche Feuerlöschanlage ist vorhanden?' [what fire extinguishing system is present?] inspection item was answered with *'FM 200 01/15'*. It was also noted in the record that an expert had reportedly carried out an inspection most recently in *'02.2019'*. However, in the record of the machinery survey carried out on 18 May 2020, the year *'2011'* was again given as the date of the most recent survey of the fire extinguishing system.

When asked, the BG Verkehr (DS) advised that the information on the most recent survey in the vessel survey record ('Vordruck F-Schiff') reportedly only refers to the (portable) fire extinguishers on board. However, this is not readily apparent from merely reading the records in question, as the inspection items in the form in question immediately before query information on the presence of fire extinguishers on board, but again directly before that, information on any fire extinguishing system installed in the engine compartment is also queried. In any case, the reason behind the aforementioned note *'01/15'* after the fire extinguishing system's type designation (FM 200) in the ship survey record of 17 February 2020 also remains open.

3.2.2.3 Structural specifics

The FREYJA had a continuous bilge from the engine compartment to the foredeck. Access to the engine compartment was only possible via the aft entrance to the deckhouse (see white outline in **Figure 4**).



Figure 4: Access to the engine compartment in the aft section of the FREYJA's deckhouse and installation position of the EPIRB¹²

The engine compartment was not lined with steel plating or other fireproof material. As is generally the case with fishing vessels like the FREYJA, the cabling for the auxiliary diesel engine and starting system was laid within the engine compartment bilge. Regular inspection, maintenance or replacement of these cables was not carried out due to their poor accessibility. The cabling and its plastic insulation was not shielded from the chemical influences of the oil and water mixture naturally present in the bilge by a specially protected cable duct.

The 24 V lead-acid batteries needed to start the main engine and generally supply power on board, which were charged by the auxiliary diesel engine, were also located in the FREYJA's engine compartment. It is worth noting that these batteries are inevitably exposed to relatively high ambient temperatures in the engine compartment and that special ventilation of the batteries was neither required nor present. According to the skipper, the batteries had been replaced about a year before the accident. Moreover, their acid level was reportedly checked every fortnight.

3.2.2.4 Fire detection and extinguishing system

There was no fire detection system on board the FREYJA, nor was there a requirement for her to be fitted with one. A type-tested fire extinguishing system from an American manufacturer called Sea-Fire Marine (type: FM 200, model: FD1050), which was approved for use on board small fishing vessels in particular, was installed in the fishing vessel's engine compartment.

¹² Source of the photograph: Fechner Marine Surveys; see comments on the EPIRB in Chapter 3.2.4.

It consisted of a pressurised gas cylinder, which according to the manufacturer's specifications must be mounted vertically, a pressure gauge and a triggering device. The latter is activated automatically (when the activation temperature of 79 °C is reached at the releasing valve) in the type of system in question. Alternatively, it was possible to start the fire extinguishing system manually via a Bowden cable (see **Figure 5** below). On the FREYJA, the control lever required to operate the Bowden cable was mounted in the compartment leading to the engine compartment companionway¹³.

According to the manufacturer, the FD1050 model has a pressurised gas cylinder with a diameter of 25.4 cm and height of 66.0 cm. The amount of extinguishing agent contained in it is sufficient for fighting fire in spaces with a volume of up to 32.6 cubic metres. The extinguishing agent used is the synthetic extinguishing gas called heptafluoropropane¹⁴.

This chemical extinguishing agent acts by removing the heat from the fire mainly through physical action (cooling), as well as by chemical intervention in the combustion process.



Figure 5: FM 200 fire extinguishing system¹⁵

According to the manufacturer's specifications, the extinguishing system must be inspected every two years. The inspection's primary focus is the tightness of the pressurised gas cylinder. It is determined whether the cylinder still contains the intended quantity of extinguishing agent by uninstalling and then weighing it. The

¹³ The compartment in question was located on the main deck level immediately behind the door at the stern of the wheelhouse (see Figure 4 above).

¹⁴ ISO designation: HFC 227ea; brand name, *inter alia*: 'FM-200'.

¹⁵ Source: Literature from the manufacturer, Sea-Fire Marine, Baltimore, United States.

skipper or a person he has appointed or a service company authorised by the manufacturer can carry out this inspection. The results of the inspection must be recorded. Moreover, a competent person must carry out a pressure test at twice the working pressure after ten years according to the manufacturer's specifications and the German Ordinance on Industrial Safety and Health. The system is emptied and dismantled in the process. A certified body tests the pressure cylinder in accordance with the specifications. The system is then assembled with a new valve head, refilled and checked for pressure loss.¹⁶

Both the skipper of the fishing vessel and the deckhand stated in their interviews after the accident that the skipper had operated the manual release device of the extinguishing system immediately after discovering the fire. However, the manufacturer has not included a display indicating that activation of the system was actually successful at the operator's position in question. Moreover, there was no noise or anything else to indicate to the skipper that his operation of the release lever actually caused the fire extinguishing system to activate. According to the manufacturer's agent in Germany, the noise of the flowing gas is so loud that the skipper of the fishing vessel would definitely have heard it, however.

3.2.2.5 Calls at a shipyard by the FREYJA immediately before the accident

In the period from 30 August 2021 to 17 September 2021, the FREYJA spent a total of three weeks in two different shipyards in Büsum for necessary repairs and maintenance works. The fishing vessel was in dry dock and maintenance works were carried out on the fishing gear. The underwater hull was then cleaned, damaged areas (including the cooling water outlet of the auxiliary diesel engine) were sealed and an antifouling paint was applied.


When the fishing vessel was about to leave the shipyard after the above works, technical problems suddenly arose with the auxiliary diesel engine. This was therefore dismantled and overhauled in an operation lasting several days. According to the crew, the auxiliary diesel engine worked perfectly again both during the subsequent test run at full load at the shipyard and on the fishing trip that immediately followed, which came to an abrupt end when the fishing vessel caught fire.

The defective insulation of the turbocharger's exhaust gas pipe, which the BG Verkehr (DS) had raised several times since 2011, was not part of the repair programme of the two shipyard companies.

¹⁶ Source: Information provided by the fire extinguishing system manufacturer's agent in Germany.

3.2.3 Crew of the FREYJA


The minimum safe manning document issued by the BG Verkehr (DS) on 11 September 2019, which is valid until 28 August 2024 (see **Figure 6** below), stipulates that a master, a so-called 'rating deck' and a chief engineer officer must be on board for the proper operation of the fishing vessel. According to the certificate, the duties of the chief engineer officer may be carried out by the holder of a certificate of competency in navigation if she/he also holds an equivalent engineer's licence (see green outline inserted by the author of the report in **Figure 6**). Further information on the type and content of the respective certificates of competency, certificates of proficiency and/or other information on the required professional qualifications of crew members are not noted in the minimum safe manning document.



Bundesrepublik Deutschland
BG Verkehr - Dienststelle Schiffssicherheit

Federal Republic of Germany
BG Verkehr - Ship Safety Division

Schiffsbesatzungszeugnis
Minimum Safe Manning Document



Ausgestellt im Namen der Bundesrepublik Deutschland von der Berufsgenossenschaft Verkehrswirtschaft Post-Logistik Telekommunikation nach Maßgabe der Bestimmungen von Regel V/14(2) des Internationalen Übereinkommens von 1974/88 zum Schutz des menschlichen Lebens auf See, in der jeweils geltenden Fassung.
Issued under the provisions of Regulation V/14(2) of the International Convention for the Safety of Life at Sea, 1974/88, as amended, under the authority of the Government of the Federal Republic of Germany by the Berufsgenossenschaft Verkehrswirtschaft Post-Logistik Telekommunikation.

Name des Schiffes: **FREYJA**
Ship's Name

Schiffsart: **Fischereifahrzeug**
Type of Ship fishing vessel

Heimathafen: **Wyk/Föhr**
Port of Registry

IMO-Nr.: ---
IMO-Number

Unterscheidungssignal: **DISO**
Distinctive number or letters

Bruttoreaumzahl: **35 BRZ**
Gross Tonnage

Hauptantriebsleistung: **221 kW**
Main Propulsion Power

Zeitweise unbesetzter Maschinenraum: **BF**
Temporarily Unattended Machinery Space

Einsatzgebiet: **Fischerei von deutschen Küstenplätzen oder der benachbarten Küstenländer aus bis zu einem Abstand von 35 sm zur Küstenlinie**
Trading Area

Betreibendes Unternehmen: ---
Operating Company

Auf Seereisen gilt das in diesem Dokument genannte Schiff als ausreichend besetzt, wenn auf ihm mindestens die in der nachstehenden Tabelle vermerkte Schiffsbesatzung vorhanden ist.
The ship named in this document is considered to be safely manned if, when it proceeds to sea, it carries not less than the number and grades / capacities of personnel specified in the table below.

Dienstgrad / Anzahl / erforderliches Befähigungszeugnis gem. STCW-Übereinkommen: <i>Grade or capacity / number of persons / certificate acc. to STCW-Convention:</i>					
Kapitän <i>Master</i>	1)	1	Leiter der Maschinenanlage <i>Chief Engineer Officer</i>	2)	(1)
Erster Offizier <i>Chief/Mate</i>	2)	---	Zweiter techn. Offizier <i>Second Engineer Officer</i>	2)	---
Nautische Wachoffiziere <i>Navigational Watchkeeping Officers</i>	2)	---	Techn. Wachoffiziere <i>Engineering Watchkeeping Officers</i>	2)	---
Schiffsmechaniker <i>General Purpose Rating</i>	3)	---	Schiffselektrotechniker/-elektriker <i>Electrical Technician / Electrician</i>	---	---
Schiffsmann Deck (wachbefähigt) <i>Rating Deck (watchkeeper)</i>	---	---	Schiffsmann Maschine (wachbefähigt) <i>Rating Engine (watchkeeper)</i>	---	---
Schiffsmann Deck <i>Rating Deck</i>	---	1	Schiffsmann Maschine <i>Rating Engine</i>	---	---
Koch <i>Cook</i>	---	---	---	---	---
		Gesamtzahl: 2 (3) <i>Total Number:</i>			

Etwaige besondere Anforderungen oder Bedingungen:
Special requirements or condition, if any:

(1) Kann durch den Inhaber eines nautischen Befähigungszeugnisses ersetzt werden, der auch das erforderliche Befähigungszeugnis für Schiffsmaschinisten besitzt / May be substituted, if Master or one Nautical Officer is in possession of an equivalent engineer's license

Fischereikennzeichen / Fishery identification letters and numers: SW 008

Ausgestellt in Hamburg am: **11.09.2019**
Issued at Hamburg on: 11.09.2019

Gültig bis: **28.08.2024**
Valid until: 28.08.2024

Figure 6: Extract from the fishing vessel FREYJA's minimum safe manning document

Apart from stating it was issued in accordance with the provisions of Chapter V Regulation 14(2) of the SOLAS Convention (see red outline inserted by the author of the report in Figure 6 above), the certificate refers to a legal framework, i.e. the STCW Convention, in only one place but with no further specification. The header of the summary table in the certificate (see blue outline inserted by the author of the report above in **Figure 6**) reads accordingly:

'Grade or capacity / number of persons / certificate acc. to STCW-Convention [sic:]'

The unspecified requirements of the minimum safe manning document were complied with on board the FREYJA on the day of the accident. In addition to the certificates of competency in navigation (BKü¹⁷ and NK 500¹⁸), the skipper also held a certificate of competency as an engine operator (TSM¹⁹). This means that he was entitled to perform the duties of chief engineer officer in addition to his role as skipper of the fishing vessel. Moreover, the skipper had completed basic safety training and was also qualified to operate survival craft and rescue boats, as well as to lead firefighting operations.

The FREYJA's deckhand did not have any certificates of competency in seafaring or fishing, nor any other relevant certificates of proficiency or credentials. He did not have an educational qualification for work in coastal fishing, either. Moreover, he had not participated in basic safety training. However, in the absence of a specific regulation in this regard, certificates of the kind mentioned above are not a formal prerequisite for performing the 'rating deck' role on coastal fishing vessels.

3.2.4 Radio equipment/EPIRB

In addition to the survey of a vessel's safety installations and equipment, an inspection of the radio equipment is required each year in order for the safety certificate for fishing vessels referred to above in Chapter 3.2.2.1 to be issued, maintained and renewed. Accordingly, in the case of the fishing vessel FREYJA, the most recent inspection of the radio equipment by an authorised engineering company prior to the accident was carried out on 25 February 2021. The 'Prüfbescheinigung GMDSS' [GMDSS inspection certificate] drawn up in this regard confirmed that all equipment components of the radio installation forming part of the outfitting requirements were present on board and in the condition stipulated at the time of the survey.

¹⁷ BKü: Certificate of competency as 'Skipper in coastal fishing' on fishing vessels of less than 24 metres in length.

¹⁸ NK 500: Certificate of competency as 'Master on near-coastal voyages' (international voyages on ships of less than 500 GT) according to Regulation II/3 of the Annex to the STCW Convention. Permitted to call at ports in Germany, the Kingdom of Denmark (with the exception of the Faroe Islands and Greenland), Poland and the European part of the Kingdom of the Netherlands.

¹⁹ TSM: Certificate of competency to work in the engine department for propulsion systems of less than 750 kilowatts power.

Accordingly, the FREYJA was equipped, *inter alia*, with an EPIRB²⁰ with integrated GPS receiver in accordance with the relevant national and international regulations.

The waterproof and buoyant EPIRB can be activated manually on board. It also releases from its holder automatically, i.e. by means of a hydrostatic release unit²¹, at the latest when a vessel founders at a depth of four metres, then floats to the surface and begins to transmit an alert signal continuously on a standardised distress frequency. This signal also includes the current GPS position of the beacon and information about the identity of the associated vessel. The distress signal is received by satellites of the COSPAS/SARSAT system and transmitted to a ground station, from where – depending on its geographical starting position – it is received by one or several MRCCs (maritime rescue coordination centre(s)), which are spread across the globe. The MRCC evaluates the signal and immediately initiates any search and rescue measures necessary if a false alarm can be ruled out.

Widely used in commercial shipping, an RLB-41 EPIRB from American manufacturer ACR Electronics was installed on board the FREYJA in the port-side aft section of the fishing vessel's deckhouse (see installation position above in **Figure 4** and the magnified image extracted from it below in **Figure 7**).



Figure 7: Close-up of the fishing vessel FREYJA's EPIRB

²⁰ EPIRB: Emergency position indicating radio beacon.

²¹ Also known as "Hydrostatic Releasing Device".

With regard to the expiry dates of the EPIRB's internal device battery and hydrostatic release unit, the aforementioned inspection certificate from the engineering company contains the entries '12.28' and '03.21'.

It was not possible to find the EPIRB – which the skipper had not released from its holder and manually activated when abandoning the fishing vessel – when the wreck was salvaged. Moreover, an enquiry from the BSU to MRCC Bremen revealed that no distress signal had been received from the fishing vessel FREYJA's EPIRB in connection with the accident.²²

3.2.5 Lifesaving appliances and their use

The FREYJA was equipped with the lifesaving appliances required for the vessel type in question. According to the documents available from the BG Verkehr (DS), these were in good working order when the most recent survey of the fishing vessel was carried out.

The skipper and the deckhand released the liferaft installed on board from its mounting bracket and threw it overboard shortly after the fire broke out. The skipper then activated the raft's inflation mechanism by pulling out the combined painter/release cord. Both crew members were able to escape into the raft and thus from the danger area of the burning fishing vessel.

The deckhand of the FREYJA stressed in his testimony that the painter/release cord was reportedly extremely long. Accordingly, it had reportedly taken a while to pull it out of the liferaft's container far enough for the raft to finally inflate. The deckhand was evidently unaware of the fact that in addition to facilitating activation of the raft, the line also acts as a painter with a predefined length and by its very nature must therefore have certain measurements for this purpose, as stipulated.

3.2.6 Inspection of the wreck of the FREYJA by divers

Divers from Taucher Frey GmbH in Hamburg inspected the wreck of the FREYJA on 27 September 2021. An inspection agency called Fechner Marine Surveys, which is also based in Hamburg and was supporting the salvage effort, notified the BSU of the findings and planning for the removal of the wreck on 29 September 2021 by email as follows:

The condition of the fishing vessel was largely as expected. She lay slightly inclined to port at a depth of some 2.5 m to 3.0 m on the bottom and hardly anything had washed in. The fishing vessel's bow and rudder heel were clear. The keel was undamaged externally (as far as could be seen) and covered by about 30 cm of sand amidships.

The foredeck's appearance was generally inconspicuous but it was, for the most part, blocked by lines, nets, and the overturned processing equipment, meaning a detailed investigation by divers could not be carried out safely but would not have yielded any other material findings, either.

²² Source: Written reply from the head of MRCC Bremen dated 21 September 2021.

The fishing vessel's aft section, including engine compartment, was largely burnt out. The stern was completely burnt open down to the waterline. The deck planking in the fishing vessel's aft section was no longer present. The side shell of the upper-works had burnt down to about the waterline and/or been damaged by heat, more so on the port side than on the starboard side.

The wheelhouse had completely burnt down. The antenna platform on the wheelhouse roof had collapsed and fallen into the open engine compartment. The piping and masts/rubbing stake at the aft section had also collapsed into the engine compartment or gone overboard.

No fuel leaks or other oily substances were found or washed up/brought to the surface by the diver or his movements.

The burnt out, foundered fishing vessel is not fit for repair and will be scrapped. The wreck will be removed promptly, weather and tide permitting within the next two weeks. Based on current knowledge, this will involve:

- recovering the loose fish processing gear from the deck and around the foundered fishing vessel;*
- dismantling the masts, outriggers, fishing gear and nets;*
- dismantling the remaining fixed deck superstructure and solid ballast;*
- salvaging the underwater hull in individual parts by means of a hydraulic chainsaw, divers and hydraulic excavator;*
- lifting the main engine out of the engine compartment. To this end, rubber-metal vibration dampers in the foundation will be separated beforehand.*

During the salvage operation, active oil booms will be kept available for deployment if necessary.

Before the aft and machinery section are salvaged, oil booms will be deployed and contents of the fuel tank vacuum cleaned, if possible.

Sorbent sheets will be kept available in sufficient quantity.

According to current planning, the fishing vessel will be scrapped and disposed of properly at Messrs Machulez in Cuxhaven.

3.2.7 Survey of the salvaged remnants of the FREYJA

The FREYJA and associated debris, which had constituted an obstruction to navigation and required clearance, were successfully salvaged on 9 and 10 October 2021. There were certain derogations from the salvage plan described above for practical reasons.

Due to the fact that the wooden fishing vessel with a considerable amount of fuel on board (about 3,000 litres of diesel) had been fully engulfed in flames for about five hours before foundering almost completely, the wreck was no longer a homogeneous object that could be salvaged with reasonable effort. Consequently, the FREYJA, which was largely destroyed by fire, could not be lifted out of the water in one piece. Instead, the floating crane ENAK, which was used for the salvage operation, lowered individual parts of the wreck that had been dismantled during the salvage operation (e.g. the auxiliary diesel engine) on the service vessel SANDSHÖRN. The largest single remaining section of the fishing vessel's wreckage was her hull and bottom. The section in question was lifted out of the water using the floating crane ENAK's grab system and lowered onto the service vessel CATJAN (see below **Figure 8**).

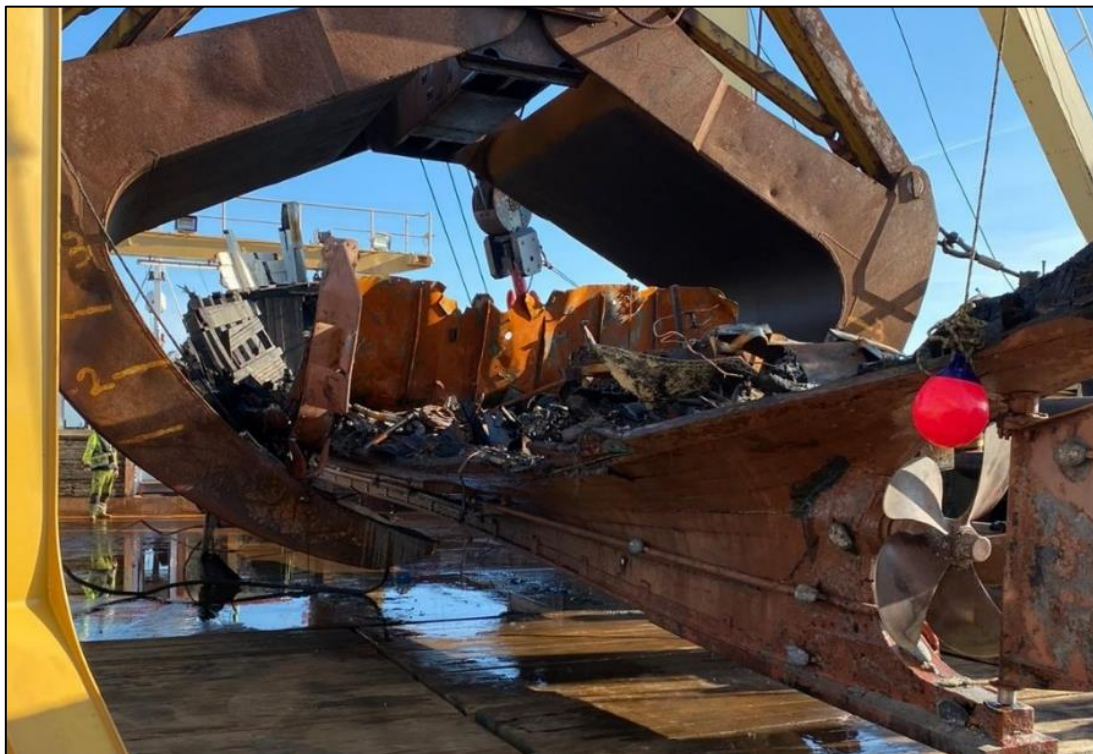


Figure 8: The FREYJA's hull being lowered onto the CATJAN by the ENAK

The CATJAN arrived at the port of Husum on the afternoon of 10 October 2021 and made fast at a berth there. The BSU's investigation team surveyed the remnants of the FREYJA's hull that had been lowered onto the CATJAN on 11 October 2021.

The following was found:

- the entire underside (or bottom of the hull), including – unless burnt – the stern and bow of the FREYJA had been stored on the CATJAN (**Figure 9**);



Figure 9: Burnt out wreck of the fishing vessel FREYJA on the deck of the CATJAN (in this case, the vessel's aft section with propeller and remnants of the engine compartment)

- the port and starboard sides of the hull exhibited differing degrees of destruction in that the remaining sides had a different height above the keel (**Figure 10 f.**). Although this observation is consistent with the impressions of the diver, it should be noted that the degree of destruction of the wreck is naturally also related to the salvage of the vessel and as such cannot be attributed solely to the course of the fire. Accordingly, it was not possible to reliably reconstruct the development and thus origin of the fire;



Figure 10: Frames in the area of the fish hold on the starboard side



Figure 11: Frames in the area of the fish hold on the port side

- the engine compartment was also destroyed. As regards the auxiliary systems, only one pump was left on the engine compartment bulkhead on the starboard side (**Figure 12 f.**);

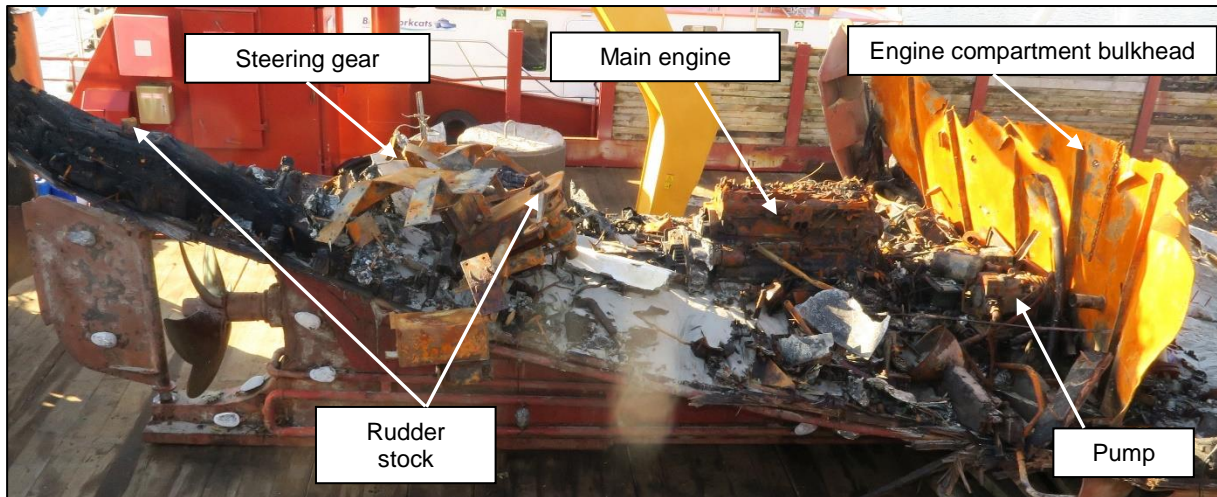


Figure 12: Engine compartment

- only fragments of the batteries, also located on the port side, were left (**Figure 13**);

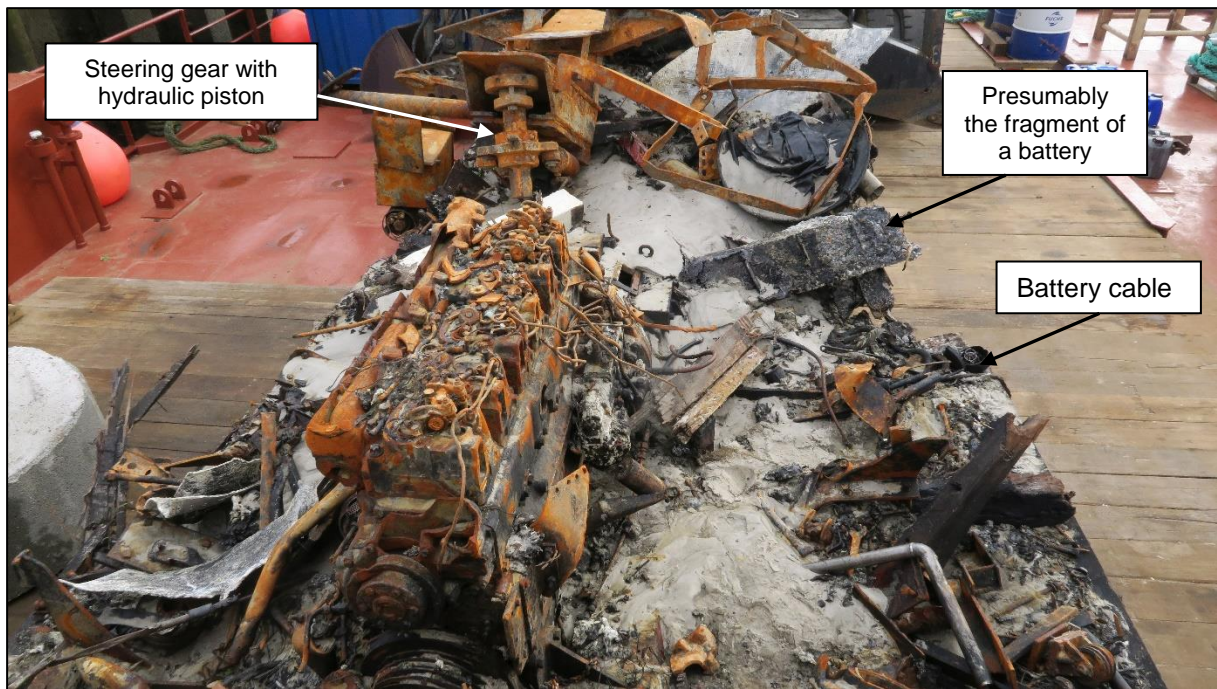


Figure 13: View of the main engine toward the stern

- the fire damage decreased toward the bow. No fire damage was visible in the remaining hull after the crew's accommodation. All in all, the debris gave the impression that the fire load on the port side of the engine compartment was greater than on the starboard side;
- it was striking that plastic and rubber parts on the floor of the engine compartment that could ignite or melt had not burnt or melted. The door to the engine compartment that was open may have allowed the heat to dissipate at the beginning. The heat was subsequently probably able to escape through the burnt deck above the engine compartment.



Figure 14: Fish hold and pump compartment



Figure 15: Fish hold, pump compartment and accommodation

It is important to note that it was not possible to draw any conclusions as to the cause of the fire from the wreck in the condition found.

4 ANALYSIS

4.1 Cause of the fire

The fire on board the FREYJA resulted in the destruction of most of the fishing vessel. The fire-induced foundering of the vessel made it impossible to identify usable evidence of the cause of the fire or the exact starting point of its development during the investigation of the wrecked parts.

The statements of the crew merely permit the conclusion that the fire broke out inside the engine compartment. Possible causes include battery problems (excessive release of explosive oxyhydrogen gas into the atmosphere of the warm and poorly ventilated engine compartment), contact of lubricant or fuel with hot surfaces, defective insulation of heat-conducting engine components or even a short circuit in the electrical cabling.

In particular, the fact that cabling, conventionally encased in plastic, runs inside the bilge of the fishing vessel with no special additional protection is a risk factor. The insulation of the cables in the bilge is naturally exposed to the chemical influences of the oil and water mixture found there. In this respect, it cannot be ruled out that there has been an undetected degradation of the layers of insulation over the years, subsequently leading to a short circuit that caused the fire.

However, it is important to stress that the above considerations are purely hypothetical. The bleak condition of the wreck of the FREYJA did not permit any reliable conclusions as to the actual cause of the fire.

4.2 Firefighting

According to the statements of the crew, after the discovery of the suspected engine compartment fire, watertight integrity was immediately established for the relevant area and the fire extinguishing system manually activated. Over the course of the investigation, it was not possible to clarify why the fire could not be successfully fought by the fire extinguishing system, which was sufficiently dimensioned for the engine compartment's size. Several scenarios are open to consideration. For example, it is conceivable that the pressurised gas cylinder contained an insufficient amount of extinguishing agent or was even completely empty due to leakage at the time the system was activated. However, it is also conceivable that the remote activation of the system did not work, i.e. that the extinguishing agent was not released at all. The manufacturer's agent pointed out – and not with regard to the FREYJA accident, in particular – that in his experience the remote release by means of the Bowden cable was reportedly blocked on many vessels because skippers would leave the safety pin in the locking position due to hesitancy or a lack of knowledge.

Although the design of the firefighting system alternatively provides for automatic (thermal) activation, it is possible that this trigger mechanism was also defective or that the system was positioned such that it did not come into contact with hot gases (in time).²³

²³ The manufacturer's agent told the BSU that a defect in the automatic triggering mechanism was reportedly 'hardly' possible. Instead, he believes that an unfavourable positioning in the room may have been responsible for the system not being activated automatically (i.e. thermally).

4.3 Survey records of the BG Verkehr (DS)

4.3.1 Defective insulation on the exhaust side of the turbocharger

The survey records of the BG Verkehr (DS) show that there have been deficiencies in the insulation of the turbocharger's exhaust gas pipe since 2011 at the latest. The respective surveyor has identified and recorded these in writing several times over the years. However, in each case, neither a deadline was set for rectifying the defect, nor was a follow-up inspection carried out in this regard. Instead, it was repeatedly certified by issuing a safety certificate that the FREYJA was in a safe condition and complied with the regulations.

The BG Verkehr (DS) justified this decision to the BSU by stating that insulation of the exhaust side of the turbocharger was not required by Part 5 of Annex 1a to the Ordinance for the Safety of Seagoing Ships (SchSV) and as such reportedly not included in the safety certificate issued for fishing vessels of less than 24 metres in length.

However, the BSU does not share this view for the following reasons. According to point 3.1 Part 5 of Annex 1a to the SchSV, the provisions of the Cape Town Agreement²⁴ apply to the category of vessel in question, i.e. also to the fishing vessel FREYJA, apart from exemptions not relevant here and irrespective of the date on which the keel was laid down. Regulation 3(1) of Chapter IV Part A of the regulations of the Torremolinos International Convention of 1977, revised by the Torremolinos Protocol of 1993 (referred to below as 'the Torremolinos Protocol') lays down the following with regard to the operational safety of the technical installations on fishing vessels:

*'Main propulsion, control, steam pipe, fuel oil, compressed air, electrical and refrigeration systems; auxiliary machinery; boilers and other pressure vessels; piping and pumping arrangements; steering equipment and gears, shafts and couplings for power transmission shall be designed, constructed, tested, installed and serviced to the satisfaction of the Administration. **This machinery and equipment, as well as lifting gear, winches, fish handling and fish processing equipment shall be protected so as to reduce to a minimum any danger to persons on board. Special attention shall be paid to moving parts, hot surfaces and other dangers.**'*²⁵

Since the exhaust side of a turbocharger can reach temperatures of some 1,000 °C, a high risk of fire exists in the event of contact between the extremely hot surfaces of non-insulated components and highly flammable liquids. Added to that is the considerable heat radiating from the hot surface of the turbine casing, which can damage surrounding components. The insulation encapsulates the turbocharger and provides reliable protection against fire hazards and burns due to accidental contact. In addition, heat radiating onto surrounding components is prevented.

²⁴ Cape Town Agreement of 2012 on the Implementation of the Provisions of the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977; entered into force in the Federal Republic of Germany by Ordinance of 22 February 2016 (Federal Law Gazette 2016, Part II No. 5, pages 175 ff).

²⁵ Emphasis added by the author of the report.

The viewpoint of the BG Verkehr (DS) communicated in its comments on the draft investigation report, namely that Regulation 3(1) of Chapter IV Part A of the Torremolinos Protocol referred to above and the provisions on the operational safety of the technical installations on fishing vessels contained therein are not applicable with regard to the FV FREYJA because Chapter IV only applies to fishing vessels of at least 45 metres in length according to its Regulation 1, is not very convincing.

The unambiguous wording of point 3.1 Part 5 of Annex 1a to the SchSV opposes such a restrictive interpretation of the provision in question. The reference provision reads as follows:

Unless otherwise provided in the following regulations, the provisions of the Cape Town Agreement shall apply to vessels under Regulation 1, irrespective of the date on which the keel was laid down, with the exception of Chapter I Regulations 3(4), 4(2), 12, 13, 14 and Chapter IX Regulation 3(3) of the Annex.

According to the relevant point 1.1, vessels under Regulation 1 Part 5 of Annex 1a to the SchSV are *fishing vessels of less than 24 metres in length flying the German flag.*

The spirit and purpose as well as the internal logic of point 3.1 Part 5 of Annex 1a to the SchSV also oppose the interpretation of the BG Verkehr (DS) that this provision would only refer to certain chapters of the Torremolinos Protocol. The German legislator has extended the rules of the Torremolinos Protocol, which apply internationally to fishing vessels of at least 24 metres in length, to include fishing vessels of less than 24 metres in length in its national regulatory area by means of point 3.1 Part 5 of Annex 1a to the SchSV. However, simultaneously considering the differentiations in the Torremolinos Protocol for individual objects of regulation, which are linked to certain lengths of fishing vessel, as decisive in the national scope of application would be absurd.

The following arguments also support the BSU's interpretation:

1.) If those regulations of the Torremolinos Protocol, which apply (internationally) only to vessels of at least 45 metres in length, were not applicable to German fishing vessels of less than 24 metres in length from the outset, there would be no reason to explicitly lay down the non-application of Chapter IX Regulation 3(3) of the Torremolinos Protocol in the aforementioned reference provision, as Chapter IX applies in any case only to vessels of at least 45 metres in length according to Regulation 1 therein.

2.) According to its wording, the aforementioned reference provision only applies (but then always) *unless otherwise provided in the following regulations*. Accordingly, Regulation 7 Part 5 of Annex 1a to the SchSV contains provisions at points 7.1 (waiver of a permanently installed means of communicating between engine compartment and wheelhouse) and 7.4 (stipulation that a generator attached to the main engine is sufficient as the main source of power for fishing vessels of 18 metres in length) which are substantive simplifications as compared to the stipulations contained in Chapter IV Part B Regulation 7 and Part C Regulation 16(1)(a) of the Torremolinos Protocol. At the same time, the wording of points 7.1 and 7.4 leaves no doubt about the fact that

there are specific negative distinctions between both cases and the above requirements in Chapter IV of the Torremolinos Protocol for vessels of at least 45 metres in length that apply internationally. However, there would be no need for these two distinctions if the (international) rules of Chapter IV for German vessels of less than 24 metres in length did not apply from the outset in spite of the requirements of point 3.1 Part 5 of Annex 1a to the SchSV.

Moreover, the need for effective protection against the hazards arising from the hot surface of engine parts is also put into specific form in SOLAS Chapter II-2 Part B Regulation 4 point 2.2.6.1 by the requirement that surfaces with a temperature of more than 220 °C on which fuel may escape in the event of damage to the fuel system must be insulated. Although the SOLAS regulations do not apply to fishing vessels, the BSU believes that the aforementioned point 2.2.6.1 of Regulation 4 can easily be used as an aid for the interpretation of the Torremolinos regulation, which is presumably deliberately worded in a very open-ended manner.

The inadequate insulation of the exhaust side of the turbocharger, which impaired ship safety and was, quite rightly, repeatedly raised by the surveyors of the BG Verkehr (DS), was therefore a safety deficiency. Moreover, without an explicit (additional) reference to this aspect of safety in Part 5 of Annex 1a to the SchSV, the safety certificate should not have been issued due to the deficiency in question both for technical reasons and on the basis of the relevant legal requirements.

4.3.2 Inspection of the permanently installed fire extinguishing system

The presence of a permanently installed fire extinguishing system in the engine compartment was recorded during each survey of the BG Verkehr (DS).

The question concerning the date on which an approved expert carried out the most recent survey was answered in 2011 with the statement *2/11 new* and in the course of the subsequent surveys of the fishing vessel's machinery (most recently in 2020) with the statement '2011'.

The files of the BG Verkehr (DS) do not contain any indication as to when the firefighting system was duly approved for the first time. There is also no indication in the files – and in particular the survey records contained therein – that the manufacturer's specification that the system be inspected every two years by the skipper was complied with or that the BG Verkehr (DS) verified such compliance.

4.4 Manning level and qualifications of the crew

4.4.1 Minimum safe manning document (legal basis)

The fishing vessel FREYJA had a valid minimum safe manning document at the time of the accident. The certificate had been issued by the BG Verkehr (DS), which is responsible for vessels flying the German flag.

The statement on the certificate that it was reportedly issued in accordance with SOLAS Chapter V Regulation 14(2) (a) and the reference to the STCW Convention (b) are difficult to understand, however.

(a) Reference to Chapter V Regulation 14(2) SOLAS

Chapter V Regulation 14(1) and (2) SOLAS read as follows²⁶:

*'1. Contracting Governments undertake, each **for its national ships**, to maintain, or, if it is necessary, to adopt, measures for the purpose of ensuring that, from the point of view of safety of life at sea, all ships shall be sufficiently and efficiently manned.*

*2. **For every ship to which chapter I applies**, the Administration shall:*

.1 establish appropriate minimum safe manning following a transparent procedure, taking into account the relevant guidance adopted by the Organization;

and

.2 issue an appropriate minimum safe manning document or equivalent as evidence of the minimum safe manning considered necessary to comply with the provisions of paragraph 1.'

Since Chapter I SOLAS does not apply to fishing vessels according to Regulation 3(a)(vi) therein, the fishing vessel FREYJA's minimum safe manning document cannot be one in accordance with Regulation 14(2).

Accordingly, the obligation under international law to take measures for the adequate and proper manning of fishing vessels is based solely upon Chapter V Regulation 14(1) SOLAS. Indeed, according to the first sentence of Chapter V Regulation 1(1), this provision applies to all vessels and to all voyages.²⁷

²⁶ Emphasis in the following extract by the author of the investigation report.

²⁷ Note: The exemptions laid down in this respect in Chapter V Regulation 1 SOLAS are irrelevant with regard to the safe manning of fishing vessels.

(b) Reference to the STCW

The reference to the STCW Convention in the minimum safe manning document is also erroneous. According to Article 3(b) of this Convention, its regulations, i.e. in particular the internationally binding requirements set out in the STCW Code for training, the issuing of documents of compliance (certificates of competency) and watchkeeping on board ships, do not apply to fishing vessels.

The International Convention of the International Maritime Organization (IMO) on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), which was adopted on 7 July 1995 and entered into force on 29 September 2012, established a standard in the above areas for the fisheries sector comparable with the rules applicable to merchant shipping. However, in accordance with Article 3 of the Convention, material elements of the STCW-F only apply to deep-sea fishing and – depending on the respective national regulations²⁸ – coastal fishing, and even then only from a vessel length of 24 metres.²⁹ Moreover, in contrast to many other states, Germany has not yet ratified the STCW-F.

Accordingly, only the national regulations of Sections 8 ff. in conjunction with Sections 2 and 4 to 7 of the German Ordinance on Safe Manning (SchBesV) applicable to fishing vessels constitute the legal basis for issuing the minimum safe manning document. This means that the basis for the proper manning of a ship and for issuing an official certificate in this respect are the below obligations of the ship operator laid down in **Section 2 SchBesV**:

'Section 2 Obligations of the Shipowner³⁰

(1) The shipowner shall man the ship with due regard to the number, competence and qualification of the crew members so as to ensure

1. the safety of the ship,

2. the safe watchkeeping,

3. the observance of the provisions of health and safety at work, including the restrictions on working hours, of on-board medical care and of marine environmental protection,

²⁸ See Article 2(7) in conjunction with Chapter I Regulation 14 STCW-F.

²⁹ See Chapter II STCW-F.

³⁰ Emphasis in the provision referred to by the author of the investigation report.

4. the maintenance of public safety and order on board and

5. the language communication among the crew members.

Moreover, for the manning of the ship, the operational requirements, especially the type of ship, the level of automation, the equipment, the intended use, the sequence of ports, the route and the type of freight carried shall be taken into account.

(2) Without prejudice to his obligation under paragraph 1 and of the obligations of the master under Section 3, the shipowner shall ensure that

1. the ship is manned according to the safe manning document issued pursuant to Section 8 (1),

2. the orders of the Berufsgenossenschaft [social accident insurance institution] in accordance with Section 9 (2), first sentence, are complied with and

3. the safe manning document is carried on board.'

With regard to the specification of the basic requirements for crew members tasked with ship safety on board a ship, **Section 44 of the German Regulations on the Competencies and Proficiencies of Seafarers in the Maritime Shipping Industry (See-BV)** lays down the following:

'Section 44 Certificate of proficiency regarding the basic requirements of safety on board (basic safety training)³¹

(1) Seafarers who are employed in any capacity on board the ship as part of the ship's crew on a permanent or temporary basis in the operational management of the ship with assigned safety or pollution prevention duties shall, upon request, be issued a certificate of proficiency in basic safety training (SGA). 'Notwithstanding the master's obligation under Section 23 of the Maritime Labour Act to conduct a safety briefing for all persons on board who are not passengers, **one crew member, to whom duties regarding the ensuring of ship safety and the prevention of environmental pollution on board are to be assigned, must be the holder of a certificate of proficiency certifying completion of basic safety training.**'

(2) To obtain a certificate of proficiency in accordance with the first sentence of subsection 1, candidates must demonstrate that they have completed an approved course of training in:

1. **personal survival techniques** in accordance with the requirements set out in table A-VI/1-1 of the STCW Code;

2. fire prevention and **fire fighting** in accordance with the requirements set out in table A-VI/1-2 of the STCW Code;

3. elementary **first aid** in accordance with the requirements set out in table A-VI/1-3 of the STCW Code; and

³¹ Emphasis in the following extract by the author of the investigation report.

4. **personal safety** and social responsibilities in accordance with the requirements set out in table A-VI/1-4 of the STCW Code.

(3) For service on fishing vessels, a certificate of proficiency in accordance with subsection (1) may, upon request, be issued for holders of a certificate of competency as described in Section 33 without reference to regulation VI/1 of the Annex to the STCW Convention.'

Section 9a SchBesV provides the relevant provision for determining the requirements a ship's crew must satisfy in order to ensure safe watchkeeping prevails on board. It reads as follows:

'§ 9a Ensuring safe watchkeeping

(1) The shipowner and the master have to ensure that all crew members detailed for watchkeeping know and adhere to the regulations, principles and instructions contained in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers of 7. July 1978 (BGBl 1982 II S. 297, [298]) as amended (STCW Convention) so that it is assured that watches are stood at all times in a manner that is adequate to the prevailing circumstances and conditions and without temporal interruptions.

(2) Furthermore, the master has especially to ensure that, under the master's general direction,

1. officers in charge of the navigational watch during their periods of duty shall be physically present on the navigating bridge or in a directly associated location such as the chartroom or bridge control room at all times, and are responsible for navigating the ship safely,

2. officers in charge of an engineering watch under the direction of the chief engineer officer, shall [be] immediately available and on call to attend the machinery spaces and, when required, shall be physically present in the machinery space during their periods of responsibility,

3. an appropriate and effective watch are maintained for the purpose of safety at all times, while the ship is at anchor or moored and, if the ship is carrying hazardous cargo, the organization of such watches takes full account of the nature, quantity, packing and stowage of the hazardous cargo and of any special conditions prevailing on board, afloat or ashore, and

4. appropriate and effective watches are maintained for the purpose of security.

Sentence 1 number 1 does not apply on fishing craft in coastal fishing and in high sea fishing.'

Section 13(3)(2) of the German **Ordinance for the Safety of Seagoing Ships** is another regulation concerning safe watchkeeping. Although this requirement is directed 'only' at the officer in charge of the navigational watch of a ship flying the German flag by stipulating that she/he is responsible *for manning the lookout with a suitable person in pilotage waters and in the period from sunrise to sunset*, this provision logically includes the requirement for the shipowner to provide a crew that enables the officer in charge of the watch to comply with her/his aforementioned obligation.

4.4.2 Minimum safe manning document (practical implementation on board the FREYJA)

In the minimum safe manning document issued for the FREYJA, the aforementioned requirements of Section 2 SchBesV are not put into specific form by referring to certain provisions or other instructions. The certificate merely contains the note that the skipper may perform the role of chief engineer officer in an amalgamation of functions if she/he is a qualified engine operator. Apart from that, the minimum safe manning document does not contain information on the type, content or legal basis of the required certificates of competency for either the skipper or the chief engineer officer.

However, the formal requirements for this are provided by Section 33(2) for the skipper and by Section 38(2) of the German Seafarers' Competencies and Proficiencies Regulations (See-BV) for the chief engineer officer in conjunction with Section 20(5) See-BV.³² As a holder of the BKü and TSM certificates of competency, the skipper of the FREYJA met the qualification requirements laid down in the above provisions for the role of skipper and (in an expressly approved amalgamation of functions) chief engineer officer.

The minimum safe manning document also lacks further information on the nature and extent of the professional qualifications of the 'rating deck' required therein. However, this is not surprising because a formally regulated certificate of proficiency is not required for the role in question.

As stated above in Chapter 3.2.3, the skipper had completed basic safety training and was also qualified to operate survival craft and rescue boats, as well as to lead firefighting operations. The FREYJA's deckhand did not have any certificates of competency in seafaring or fishing, nor any other relevant credentials. Moreover, he had not participated in any basic safety training. However, in the absence of a regulation in this regard, certificates of the kind mentioned above are not a formal prerequisite for performing the 'rating deck' role on coastal fishing vessels.

In the view of the BSU, the FREYJA's minimum safe manning document fails to meet the requirements for its issue laid down in Section 2(1)(1)(1) and (3) and (2) Schiffsbesetzungsverordnung.

³² Section 20(5) See-BV states that certificates of competency and other professional documents of compliance for service on ships issued by another Member State of the European Union or State party to the Agreement on the European Economic Area may be recognised if the holders of a certificate of competency prove that they have knowledge equivalent to that required of the holder of a comparable German seafarer's qualification.

The requirement that only one person must be on board who has completed basic safety training within the meaning of Section 44 of the German Seafarers' Competencies and Proficiencies Regulations does not take into account the fact that in the course of an accident it may be this very person who is no longer able – due to injury, for example – to initiate firefighting measures and to take the action needed for her/his own survival and to rescue the second crew member.

In contrast, the BG Verkehr (DS) justified the legality of issuing the minimum safe manning document for the fishing vessel FREYJA to the BSU in a written statement as follows:

In this context, Section 2(1) SchBesV focuses solely on the responsibility of the shipowner. Section 44 See-BV requires a certificate of proficiency with regard to the basic safety requirements on board, which is only specified for a crew member, to whom duties regarding the ensuring of ship safety and the prevention of environmental pollution on board are to be assigned. These tasks are assigned by the shipowner within the framework of its obligations under Section 2 SchBesV, and not by the DS. Under the current regulatory position, this means that the DS can neither demand corresponding certificates of proficiency for a 'rating deck' on fishing vessels, nor professional qualifications as a fish farmer.³³

The BSU cannot follow this line of reasoning. When it is already evident from the application for the minimum safe manning document that a shipowner is not satisfying its obligations under Section 2(1) SchBesV with regard to proper assignment of duties on board, it is incumbent upon the BG Verkehr (DS) to refuse to issue the requested minimum safe manning document or to issue it only subject to conditions.

This is also consistent with the legal position laid down in Section 8(1) SchBesV, which states that the 'Berufsgenossenschaft' [social accident insurance institution] shall issue a minimum safe manning document at the request of the shipowner if the requirements of Section 2(1) and (2) and Sections 4 to 7 are met.³⁴ Accordingly, ancillary provisions may be imposed for the minimum safe manning document subsequently.

It follows beyond doubt that the BG Verkehr (DS) has the right and the duty, i.e. a clear mandate with sufficient powers under the existing rules and regulations, to examine, *inter alia*, whether the manning applied for by the shipowner actually complies with the requirements defined in Section 2(1) SchBesV when issuing the document. The minimum safe manning document may only be issued if its requirements are met.

The aforementioned provision (Section 8(1) SchBesV) and, in particular, the option contained therein of imposing ancillary provisions for a (requested) minimum safe manning document (even subsequently) clearly opposes the fact that the shipowner should determine which (minimum) qualification crew members must hold in terms of ship safety and occupational health and safety on the basis of its own decisions, which can only be reviewed to a limited extent or possibly not at all. Although it is true that the shipowner is responsible for safe manning according to Section 2 SchBesV, this does not change the fact that it is a prerogative of the BG Verkehr (DS) to verify –

³³ The emphasis in the statement was made by the BG Verkehr (DS).

³⁴ Emphasis added by the author of the report.

based on Section 2 SchBesV and in conjunction with the relevant provisions (e.g. Section 44 See-BV) – that the shipowner actually fulfils this responsibility. From the perspective of the BSU, it is not necessary to grant more extensive legal powers than hitherto in order for the BG Verkehr (DS) to be able to fulfil – on the basis of applicable regulations – its inspection mandate.

The statements of the FREYJA's deckhand, in which he describes the emergency measures taken after the fire was discovered on board the fishing vessel, vividly demonstrate that the assignment of tasks relating to safe ship operation should not be limited to the skipper alone in the case of crews comprising only two people. The deckhand, too, must at least be able to demonstrate the completion of basic safety training within the meaning of Section 44 See-BV in order to sufficiently meet safe manning requirements within the meaning of Section 2(1)(1) and (3) SchBesV.

After the accident, the deckhand reported, *inter alia*, that the liferaft thrown into the water had only inflated after the skipper had pulled a very long line out of its container thrown into the water. Due to a lack of appropriate training, the deckhand was evidently completely unaware that part of the usual procedure for manually activating the liferaft is to pull a relatively long combined painter/release cord out of the liferaft container so as to trigger the inflation mechanism at the end of this procedure.

Consequently, had the fishing vessel's skipper suffered a serious injury and possibly lost consciousness at the beginning of the accident, the deckhand would have been left to his own devices and completely out of his depth when attempting to provide first aid, fight the fire and ensure safe evacuation by activating and using the liferaft.

From the perspective of the BSU, it is at least doubtful that the minimum safe manning document issued for the FREYJA reflects the guarantee of safe watchkeeping required for its issue in Section 2(1)(2) of the German Ordinance on Safe Manning. These concerns arise from the fact that the 'rating deck' stipulated as the only other crew member according to the document does not need navigational watch proficiency. This seems problematic, as the 'rating deck' in question is simultaneously the only crew member available to support the skipper of the fishing vessel in estuary mode and during the period from sunset to sunrise as a stipulated lookout, i.e. as part of the navigational watch.

4.5 EPIRB

According to information given by MRCC Bremen, no distress signal was received from the EPIRB after the FREYJA accident. Since the fire on the fishing vessel started in the engine compartment and then spread from the stern across the vessel and the entire wheelhouse fell victim to the flames, it is reasonable to assume that the EPIRB, which was in plastic housing, duly mounted on the wheelhouse and not removed from its holder by the skipper before abandoning the fishing vessel, burnt. Accordingly, it was inevitably unable to automatically detach from its holder, float up and transmit a distress signal when the fishing vessel foundered.

5 CONCLUSIONS

During the investigation into the very serious marine casualty involving the fishing vessel FREYJA, it was not possible to determine the cause of the fire. Nevertheless, important findings were made or those from previous investigations confirmed, which can serve as a basis for safety recommendations.

5.1 Fire protection/firefighting – survey procedures of BG Verkehr (DS)

It has once more been confirmed that the outbreak of fire on board a ship represents a particular danger to the life and limb of the crew, to the vessel and to the environment due to the structural characteristics and inherently limited technical and manual options for firefighting. Accordingly, fire prevention measures are extremely important on watercraft.

It is generally known that in addition to the improper execution of welding operations and self-ignition of cargo, technical faults in electrical systems or cabling, battery problems and self-ignition of propellants or lubricants due to contact with hot surfaces are all possible causes of fire on board a ship.

In addition to the requisite special care during periodic inspections, maintenance and competent repair of hazardous systems and equipment on board, the survey procedures of BG Verkehr (DS) play a central role, especially with regard to the safety of fishing vessels.

Over the course of their service life, which often spans many decades, some of these vessels have undergone various changes of ownership. Accordingly, but also because of changing regulations and standards, various structural changes and technical modifications are inevitably made on fishing vessels over the years. Past investigations of the BSU have repeatedly confirmed that these have unfortunately not always been carried out with the necessary care and expertise. Moreover, it is not always possible to readily identify any technical deficiencies or their wear-induced development on a ship. This is all the more true because on vessels of the category in question there does not have to be any technically qualified personnel on board who are familiar with the maintenance and care of the machinery apart from the skipper, whose primary concerns are navigating the vessel and fishing.

The cause of the fire in the FV FREYJA's engine compartment could not be clarified. Therefore, no statement can be made as to whether or not the technical deficit that presumably caused the fire was already present and possibly identifiable when the vessel was last surveyed. It is also only possible to speculate on why effective firefighting with the fire extinguishing system failed.

Irrespective of this, the BSU believes it is necessary for the above reasons to recommend to the BG Verkehr (DS) that its surveyors be made aware of the vital importance of inspecting the technical equipment on board with regard to the fire hazards it poses. The same applies to the need to carefully check the portable and fixed fire extinguishing equipment on board for any defects and compliance with service intervals during ship surveys.

If and insofar as deficiencies or omissions are identified during such inspections, care must be taken to ensure that these are actually remedied professionally and within a defined period by the shipowner or on its behalf. In cases where conditions pertaining to fundamental aspects of safe ship operation are ignored, such conduct must not be 'rewarded' with the issue or renewal of a safety certificate.

5.2 Manning and qualifications

The BSU's investigation revealed that the minimum safe manning document issued by the BG Verkehr (DS) for the fishing vessel FREYJA did not comply with the relevant legislation in either form or content. Fortunately, this did not have adverse consequences for the course of the accident. Nevertheless, the BSU believes it is urgently necessary for the BG Verkehr (DS) to review the formal and material aspects of issuing minimum safe manning documents for coastal fishing vessels and adapt them according to the legal and actual requirements.

Even if one would assume that the legal requirements to which the BG Verkehr (DS) can refer do not provide sufficient grounds for influencing the content of a minimum safe manning document more than has been the case to date, this cannot mean that such documents will continue to be issued despite obvious substantive shortcomings. Rather, such a view would result in an obligation of the BG Verkehr (DS) to report the legal concerns relating to the scope of the inspection and regulatory competences to the supervising Ministry for Digital and Transport (BMDV). It would then be incumbent upon the BMDV to dispel these concerns or, if shared, align the relevant requirements for issuing minimum safe manning documents with actual safety requirements.

The current state of affairs, in which only one of the two crew members required on a coastal fishing vessel (notably the skipper) has skills and abilities in the field of ship safety (in particular, survival techniques, firefighting, handling and use of lifesaving appliances) and medical care (elementary first aid) constitutes a substantial risk to safety, as he can become incapacitated at any time.

With regard to the need to ensure safe watchkeeping and, in particular, man the bridge with a lookout at least in estuary mode and at night, it is also doubtful whether this requirement can be met by a crew member who does not have an officially approved watchkeeping qualification.

The question also arises as to how it is compatible that the German legislator (Federal Ministry of Food and Agriculture in agreement with the Federal Ministry of Education and Research) has created the vocational profile of fish farmer (in this case in the field of coastal fishing and middle-water fishing), whose extensive training programme includes safety and conduct on board³⁵ on the one hand, but on the other hand there is evidently no obligation to stipulate such trained (and thus also qualified for watchkeeping) personnel as part of the minimum safe manning at the support level on board coastal fishing vessels.

5.3 EPIRB

The fishing vessel FREYJA's EPIRB was almost certainly destroyed in the course of the fire before she foundered. Moreover, since the skipper – presumably due to the considerable dynamism of events – failed to release the EPIRB from its holder and activate it manually before abandoning the vessel, an automated distress call, which would have included the FREYJA's identity in addition to the position of the accident, was not transmitted.

Unlike the accident in 2016 involving the German fishing vessel CONDOR³⁶, which remained undetected for several hours and in which two fishermen tragically drowned, the fact that the FREYJA's EPIRB did not transmit a distress signal had no negative impact on the fate of the two shipwrecked crew members. They managed to get into a functioning liferaft, attracted attention by firing a flare and thus set the rescue sequence in motion.

Even though it is thanks to fortunate circumstances that the failure of the EPIRB was not disastrous for the shipwrecked fishermen in the FREYJA accident, the BSU believes the assessment it made during the investigation into the accident involving the fishing vessel CONDOR as regards the equipment of small fishing vessels with only one EPIRB being an avoidable safety risk was fully confirmed.

Findings in this regard in the investigation report on the foundering of the fishing vessel CONDOR were as follows³⁷:

'Since it is neither possible to rule out a technical failure on an EPIRB nor the possibility that one may be prevented from reaching the surface for mechanical reasons, for whatever specific reasons, the BSU believes that the only logical conclusion to be drawn from the accident in this regard is to require redundancy in the future, i.e. duplication of the EPIRB system for vessels within the meaning of the Guideline for fishing vessels. The accident involving the FV CONDOR has dramatically demonstrated that a constructive total loss can occur at lightning speed in the case of small vessels, in particular. The generally very few crew members are not able to make a distress call or take the EPIRB off the vessel/manually activate it when ordered to abandon a distressed vessel in such situations. In view of the absolute necessity to set the

³⁵ See Section 4(4)(3) and Annex to Section 3(C)(3) of the German Ordinance on Vocational Training for Fish Farmers.

³⁶ See Investigation Report 44/16 of the BSU on the very serious marine casualty 'Foundering of the fishing vessel CONDOR on 6 February 2016 about 3.5 nm east of the Baltic Sea Island of Fehmarn', published on 5 October 2017; reference: https://www.bsu-bund.de/SharedDocs/pdf/EN/Investigation_Report/2017/Investigation_Report_44_16.pdf?__blob=publicationFile&v=1.

³⁷ See Chapter 5.3 of Investigation Report 44/16 (p. 136 f.).

rescue sequence in motion immediately, the aspect of an automated alarm system that works flawlessly becomes all the more important.

*As regards an additional safeguard for automated activation of the rescue sequence, one alternative to a second EPIRB from a technical point of view would be to equip the lifejackets/floatation waistcoats used by crew members of small fishing vessels with a satellite- or AIS-based emergency transmitter, i.e. a PLB (**p**ersonal **l**ocator **b**eacon).*

The advantage of such a solution over duplication of the conventional EPIRB system would be that when activated both the position of the accident and the casualty's actual position in the water would be transmitted to the rescue services. On the other hand, the disadvantage here is that the enhancement in safety is inevitably dependent upon crew members actually using their floatation waistcoats or carrying a PLB not integrated with a floatation waistcoat with them at all times, unlike the EPIRB.³⁸

Accordingly, in the investigation report on the foundering of the fishing vessel CONDOR, the BSU addressed a safety recommendation to the Federal Ministry of Transport and Digital Infrastructure (BMVI)³⁹ with regard to amending the outfitting requirements for EPIRBs with the following wording:

'The Federal Bureau of Maritime Casualty Investigation recommends that the BMVI review the possibility of revising the carriage requirement for an EPIRB on vessels that fall within the scope of the Guideline for fishing vessels < 24 m in length⁴⁰ (according to Article 6(1)(6) of the Ship Safety Ordinance). The equipment of two EPIRBs instead of one would mean a significant increase in safety for these vessels, in particular.⁴¹

Inter alia, this recommendation was discussed at the 27th session of the Maritime Safety Committee⁴² on 9 November 2017 with the BSU and delegates from the Ministry, the BG Verkehr (DS) and the BSH in attendance. It was widely rejected by the aforementioned bodies, which argued that it was disproportionate and its introduction would be difficult to enforce.

³⁸ On the topic of PLBs, see the comments in Sections 4.3 and 5.2, and especially the BSU's Safety Recommendations 6.1 and 6.2 of Investigation Report 262/14 of 12 April 2017 on the very serious marine casualty involving the 'Foundering of the fishing vessel ANDREA and death of a crew member in the Baltic Sea off Lippe on 16 August 2014' addressed to the Federal Ministry of Transport and Digital Infrastructure (BMVI) and the Ship Safety Division (BG Verkehr). Reference: https://www.bsu-bund.de/SharedDocs/pdf/EN/Investigation_Report/2017/Investigation_Report_262_14.html.

³⁹ The BMVI has since been renamed BMDV (Federal Ministry for Digital and Transport).

⁴⁰ In the course of an amendment to the German Ordinance for the Safety of Seagoing Ships (SchSV) made in the meantime, the (national) safety requirements for fishing vessels of less than 24 m in length are now addressed – largely unchanged in content – in Part 5 of Annex 1a to Section 6(1)(5) SchSV.

⁴¹ See Safety Recommendation 7.4 of Investigation Report 44/16 (p. 141).

⁴² Annual meeting of a committee composed of delegates from the BMDV, the BG Verkehr (DS), the BSH, the GDWS, the BSU, as well as various classification societies, in which current maritime safety issues and, *inter alia*, the necessary consequences of the findings of maritime safety investigations are discussed.

The BSU once more takes the accident involving the fishing vessel FREYJA and the fact that the EPIRB installed on board did not fulfil its intended purpose as an opportunity to suggest that the national equipment requirements for fishing vessels of the size and design of the FREYJA (i.e. covered fishing vessels of at least 15 metres in length) should include duplication of this important safety component. Against the background of their extremely low manning and an operating range of no less than 35 nautical miles from the coastline, it is precisely such vessels that would enjoy a significant increase in probability of success in terms of the automated initiation of the rescue sequence if they were equipped with not just one but two EPIRBs. Although it should be borne in mind that despite the duplication of this important component of the safety equipment, both EPIRBs may not be activated under certain circumstances due to fire on board or, for example, the vessel foundering in an insufficient depth, this risk could be reduced by positioning the 'reserve EPIRB' appropriately. In that regard, it would be appropriate to mount the holder of the second EPIRB in the immediate vicinity of the liferaft's launching gear. If crew members have enough time to manually detach the liferaft from its mounting bracket and throw it overboard, they could also use this opportunity to detach an EPIRB positioned in the immediate vicinity from its holder with a single quick movement and activate its emergency transmitter by simply throwing it into the water.

The BSU therefore maintains the assessment it made in 2017 that cost, but also the risk that even a second EPIRB on board does not completely guarantee operability, should not be given precedence over the valuable, potentially lifesaving increase in safety that duplicating the system can deliver in an emergency.

6 ACTIONS TAKEN

The BG Verkehr (DS) has advised the BSU that it will amend the reference to SOLAS Chapter V, Regulation 14 in the subtitle of the minimum safe manning document discussed in Chapter 4.4.1(a) of this investigation report accordingly. The reference at the beginning of the summary table (see Chapter 4.4.1(b) of this investigation report) has already been amended. The points at which required certificates of competency can and must be put into specific form are also being reviewed.

7 SAFETY RECOMMENDATIONS

The following safety recommendations do not constitute a presumption of blame or liability in respect of type, number or sequence.

7.1 German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication (BG Verkehr) – Ship Safety Division –

The Federal Bureau of Maritime Casualty Investigation makes the following recommendations to the BG Verkehr (DS):

7.1.1 Minimum safe manning document for fishing vessels (formal requirements)

The summary table containing the personnel required for shipboard operations in the minimum safe manning document should include specific information on the necessary documents of competency and/or proficiency for each post and reference the relevant regulations.

7.1.2 Minimum safe manning document for fishing vessels (substantive requirements)

When issuing a minimum safe manning document, careful consideration should be given to the fact that the minimum crew complement stipulated and their required qualifications are actually sufficient to ensure, in particular, ship safety and compliance with occupational health and safety regulations for the benefit of everyone on board. Without exception, every crew member should have participated in basic safety training before being deployed on board. In this context, it is also recommended that on covered fishing vessels outside so-called restricted passive coastal fishing⁴³, at least one crew member at the support level be required to have professional qualifications as a fish farmer. Should the BG Verkehr (DS) maintain its opinion that the relevant regulations are not sufficient to make the corresponding requirements, then it is suggested that this be reported to the Federal Ministry for Digital and Transport (BMDV) so that the latter can review and if necessary adapt the legal position.

7.1.3 Performing surveys on and issuing safety certificates for coastal fishing vessels of less than 24 metres in length

During the (periodical) surveys of the ship's safety installations and equipment, surveyors from the BG Verkehr (DS) should pay particular attention to the fire hazard posed by technical installations. The same applies to the existence and proper state of operation and maintenance of portable and permanently installed fire extinguishing equipment. If deficiencies are identified, the safety certificate should initially be issued only on a provisional and temporary basis. The safety certificate should not be allowed to have its full official effect up to the normal expiry date until it is demonstrated (by follow-up survey or the provision of other supporting documents) that all safety-related deficiencies have been rectified within the time limit.

⁴³ See Section 9b SchBesV.

7.2 Federal Ministry for Digital and Transport (BMDV)

The Federal Bureau of Maritime Casualty Investigation recommends that the BMDV amend the provision on required radio equipment for fishing vessels of less than 24 metres in length contained in point 10 of Part 5 of Annex 1a to Section 6(1)(5) of the Ordinance for the Safety of Seagoing Ships. With regard to the outfitting requirements for covered fishing vessels of at least 15 metres in length engaged in coastal fishing up to a distance of 35 nautical miles from the coastline, a requirement of duplication should be considered for the EPIRB with integrated GPS receiver.⁴⁴

⁴⁴ Renewal of Safety Recommendation 7.4 in BSU Investigation Report 44/16 of 5 October 2017.

8 SOURCES

- Accident report of the skipper
- Information from the German Central Command for Maritime Emergencies (CCME)
- Information from MRCC Bremen
- Mission log of the DGzRS
- Report on the preparations for the salvage of the fishing vessel FREYA (including dive video) of 29 September 2021; Fechner Marine Surveys, Hamburg
- Navigational charts and ship particulars, Federal Maritime and Hydrographic Agency (BSH)
- Ship's file of the fishing vessel FREYJA (maintained by the German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication (BG Verkehr – Ship Safety Division –))
- Technical information on the FM 200 fire extinguishing system; literature from the manufacturer, Sea-Fire Marine, Baltimore, United States
- Information from the agent of the manufacturer of the FM 200 fire extinguishing system in the Federal Republic of Germany
- Photograph of the fishing vessel FREYJA; Martin Perkuhn, Schleswig-Holstein State Agency for Agriculture, Environment and Rural Areas; Fisheries Inspectorate Büsum
- Investigations by Waterway Police (WSP) Brunsbüttel
- Comments on the draft report