Report on the investigation of

the grounding of

Berit

Trindelen Bank, near Gedser

Denmark

5 January 2006

Marine Accident Investigation Branch
Carlton House
Carlton Place
Southampton
United Kingdom
SO15 2DZ

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Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 13(9) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

1-in-3 watch	-	A watchkeeping routine shared by three officers whereby each works 4 hours on watch, followed by 8 hours off watch
2/O	-	Second officer
3/O	-	Third officer
6-on/6-off	-	A watchkeeping routine shared by two officers whereby each works 6 hours on watch, followed by 6 hours off watch
ARPA	-	Automatic Radar Plotting Aid
CHIRP	-	Confidential Hazardous Information Reporting Programme
COLREGS	-	The International Regulations for Preventing Collisions at Sea
CPP	-	Controllable Pitch Propeller
DOC	-	Document of Compliance
DPA	-	Designated Person Ashore
ECDIS	-	Electronic Chart Display and Information System
ECS	-	Electronic Charting System
GPS	-	Global Positioning System
ICS	-	International Chamber of Shipping
ISM	-	International Safety Management
ISPS	-	International Ship and Port Security
kW	-	kilo Watts
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Notice
NCN	-	Non-Conformity Note
nm	-	nautical miles
OOW	-	Officer of the Watch
SIM	-	Subscriber Identity Module (for mobile telephone)
SMS	-	Safety Management System

SOLAS	-	International Convention for Safety of Life at Sea
STCW 95	-	Standards of Training, Certification and Watchkeeping for Seafarers, 1995
TSS	-	Traffic Separation Scheme
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency (radio)

SYNOPSIS

At 0147 on 5 January 2006, the UK registered container vessel *Berit* grounded on the Trindelen bank, off Gedser in the Baltic Sea. She was on passage from St Petersburg to Rotterdam, via the Kiel Canal. The master managed to refloat the ship after about an hour using the ship's own propulsion.

Narrative

All times are ship's time (UTC +1)

The container feeder vessel *Berit* departed St Petersburg on 3 January 2006 partially loaded with 370 containers. The voyage began uneventfully, and on 4 January the Ukrainian 2/O completed a normal day, standing his 0000-0400 and 1200-1600 watches.

At 2345 on 4 January the 0000-0400 lookout reported to the bridge. The 2/O arrived shortly after and there was a brief handover between the second and 3/Os. The sea and weather conditions were good, with little other vessel traffic to cause concern.

At 0030 the 2/O sent the lookout down below to stand-by in the crew mess. The lookout understood this to mean he could get some rest so, after eating some food, he went to his cabin and was asleep by approximately 0100.

After the lookout left the bridge, the 2/O became distracted, initially by the VHF and subsequently by sending text messages using his mobile telephone. The ship's position was roughly checked on one occasion, as the 2/O walked passed the electronic chart display. At that time there was still some distance to run until the next planned alteration of course. It is claimed the text messaging became all engrossing, resulting in the planned course alteration at 0115 being missed, and consequently the ship grounded 32 minutes later at 0147.

The 2/O had been alerted to the imminent grounding by vibration of the ship. He rushed to the central controls, noticed the ship's speed indicated the ship had stopped, so reduced the pitch on the CPP to zero and called the master. The ship had run aground at 54° 31.17 N 012° 03.31 E.

After pumping out sufficient ballast the master, using the bow and stern thrusters as well as main propulsion, was able to refloat the vessel at 0245. After a diver survey revealed only two breaches of the hull into water ballast tanks, *Berit* was permitted to sail on to Rotterdam for temporary repair.

Analysis

The grounding of *Berit* occurred because the 2/O failed to make an alteration of course in accordance with the navigational plan. The 2/O was distracted for over 40 minutes prior to the grounding, missing the required waypoint.

The investigation has been unable to prove or disprove the reported cause of the distraction and there may be other explanations why the 2/O failed to monitor the ship's progress adequately. The OOW falling asleep was considered, but was thought improbable given that fatigue was unlikely with his watch routine, and with the lack of comfortable chairs on the bridge.

Although fully aware of the requirement for a lookout to be present on the bridge, the 2/O stood down the lookout as weather conditions were good and there was little shipping traffic. There was evidence, from *Berit*'s hours of rest records, that lookouts were often not used during the hours of darkness, and this had been highlighted in the last MCA ISM audit in December 2005. Neither the master nor the ship managers had noticed this problem prior to the audit. If a lookout had been present on the bridge, it is unlikely the 2/O would have become so distracted as to miss the alteration of course.

Steps had been taken on *Berit* to ensure an OOW stayed alert by the provision of a watch alarm. However, there is some evidence that the key to activate the system was not always removed, therefore permitting those on the bridge to disengage it.

Berit was also fitted with an electronic charting system (ECS). In this case, too great a reliance was placed on the basic information provided by the ECS, and the full functionality of the system was not employed. With no depth or no go areas, cross track error or waypoint alarms set on the ECS, the system was essentially passive, requiring no interaction with the OOW. The paper charts did not have regular positions marked, even though they were the primary means of navigation onboard. Fixes were recorded in the log, but these positions were only derived from the GPS. Good navigational practice requires that positions are cross-checked by independent sources. In this accident, with little demanded of the OOW, he became easily distracted and missed the required alteration of course.

Berit's master was fully aware that his crew regularly used mobile telephones onboard, but was not aware of any problems as a result. Therefore, there was no active management of the use of mobile telephones while on the bridge.

The safety management system under which *Berit* was operated placed a great deal of reliance on the master. The company's ISM documentation stated that navigational practices should be in accordance with the ICS bridge procedures guide, but there were no company or master's instructions on how its principles should be applied. In this instance, the ISM system had failed to detect either the poor navigational practices or the frequent absence of a lookout at night.

Recommendations

A recommendation has been made to the managers of *Berit* to review their ISM system to ensure that navigational practices, training with ECS and the use of mobile telephones and other personal electronic equipment are addressed.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *BERIT* AND ACCIDENT

Vessel details

Registered owner	:	H G Vöge
Manager(s)	:	Reederei H G Vöge
Port of registry	:	London
Flag	:	UK
Type	:	Hatchless container ship
Built	:	2001 in Hamburg
Classification society	:	Germanischer Lloyd
Construction	:	Steel
Length overall	:	125.08m
Gross tonnage	:	9981
Engine power	:	8400kW
Service speed	:	18 knots
Other relevant info	:	Single CPP, bow thruster and stern thrusters

Accident details

Time and date	:	01:47 5 January 2006 (UTC+1)
Location of incident	:	54° 31.17 N 012° 03.31 E, 4 nm SE of Gedser headland
Persons on board	:	12
Injuries/fatalities	:	None
Damage	:	Holed in way of No 3 & 4 ballast tanks, significant plating deflections and extensive scraping damage.

Figure 1

Berit

1.2 VOYAGE CYCLE

The container vessel *Berit* was operating on a regular trading pattern out of St Petersburg on a 3 week cycle at the time of the accident: one week she would sail from St Petersburg to Rotterdam and back; the next week she would sail to Rotterdam and Antwerp and back; and the final week she would sail to Hamburg and return again to St Petersburg.

1.3 NARRATIVE

(All times are ship's time, UTC+1)

1.3.1 Events leading up to the grounding

Early on 2 January 2006, *Berit* arrived in St Petersburg and commenced unloading. The 2/O went ashore from 0800 until 1000 to carry out a few tasks, including topping up his 'pay as you go' mobile telephone. Loading was completed at 0415 the following day, and *Berit* sailed at 1000. She had 370 containers onboard as well as some ballast, giving her a draught forward of 7.4m and aft of 8.3m.

The watch system onboard *Berit* was a standard 1-in-3 watch routine with the deck officers assigned the following duties:

Second officer	(2/O)	0000-0400 and 1200-1600
Chief officer	(C/O)	0400-0800 and 1600-2000
Third officer	(3/O)	0800-1200 and 2000-2400

After leaving St Petersburg, the voyage proceeded uneventfully, and on 4 January the 2/O stood his night watch. After his watch he had breakfast and then went to bed and slept until 1130. He then got up and had lunch before reporting to the bridge at about

1145 for his afternoon watch. After this watch the 2/O had his evening meal at 1700, before relieving the chief officer between 1730 and 1800 to allow him to have dinner. At 1800 the 2/O retired to his cabin, played some games on his computer and then slept from 2000 until about 2345. At 2345 the 0000-0400 lookout arrived on the bridge. The 2/O arrived on the bridge 10 minutes later and a brief handover, in English, took place with the 3/O. The 3/O and his lookout then left the bridge.

The logbook shows the vessel's position at 0000 on 5 January 2006 was 59° 32.6' N 022° 45.6' E **(Chart 1)**. There was a force 4 breeze from the north-north-east and sea state 3. Visibility was good, estimated to be more than 10nm. The vessel traffic conditions were deemed light, with only one vessel noted by the 2/O. This vessel was 10nm ahead, heading in the same direction. The ARPA radar was set on a range of 6nm, off-centred to provide a 10nm view ahead.

At 0030 the 2/O decided, given the reasonable weather and light density of vessel traffic, to send the lookout down below to 'stand-by' in the crew mess. The lookout understood this to mean he could rest so, after eating some food, he went to his cabin and was asleep by approximately 0100. As the lookout left the bridge, the ship had been approaching buoy DW78 of the channel marked for deep water Route T, **(Chart 1)**.

Just after passing the next buoy, DW76, the 2/O overheard some conversation between other ships on VHF channel 17 or 77 in his native Ukrainian tongue. When the conversation ended the 2/O spent 2-3 minutes on the VHF asking for news from the Ukraine.

A short while later, he received two text messages on his mobile telephone, which started a long text message dialogue. At some point in the exchange of text messages the 2/O walked from the starboard to the port bridge wing to obtain a stronger signal on his mobile telephone. As he did so, he observed from the electronic chart display that the ship still had some distance to run before reaching the next course alteration. This alteration, at buoy DW74, would take the ship into the Kadetrenden traffic separation scheme (TSS), **(Chart 1**).

Over 40 minutes later, the 2/O felt the ship vibrate, and he rushed to the centre console. Noticing the ship's speed over the ground indicated the ship was stationary, he immediately reduced the pitch on the CPP to zero and called the master. At 0147, the ship had run aground on the Trindelen bank, **(Chart 2)**.

1.3.2 Actions after grounding

The master was already awake and getting dressed when he received the call from the 2/O. He arrived on the bridge quickly and realised the ship was aground. He instructed the 2/O to call the chief engineer and chief officer. Having assessed that the ship was in no immediate danger, the master decided not to sound the general alarm.

Once on the bridge, the chief officer plotted the ship's position on the chart. There were no other fixes on the chart. The chief officer then calculated, using the ship's loading computer, how much ballast could be pumped out to lighten the fore end, while still meeting stability requirements. He advised the master and chief engineer that double bottoms 1 and 5, as well as wing tanks 1 and 2, could be pumped out. The chief engineer then started to pump this ballast overboard.

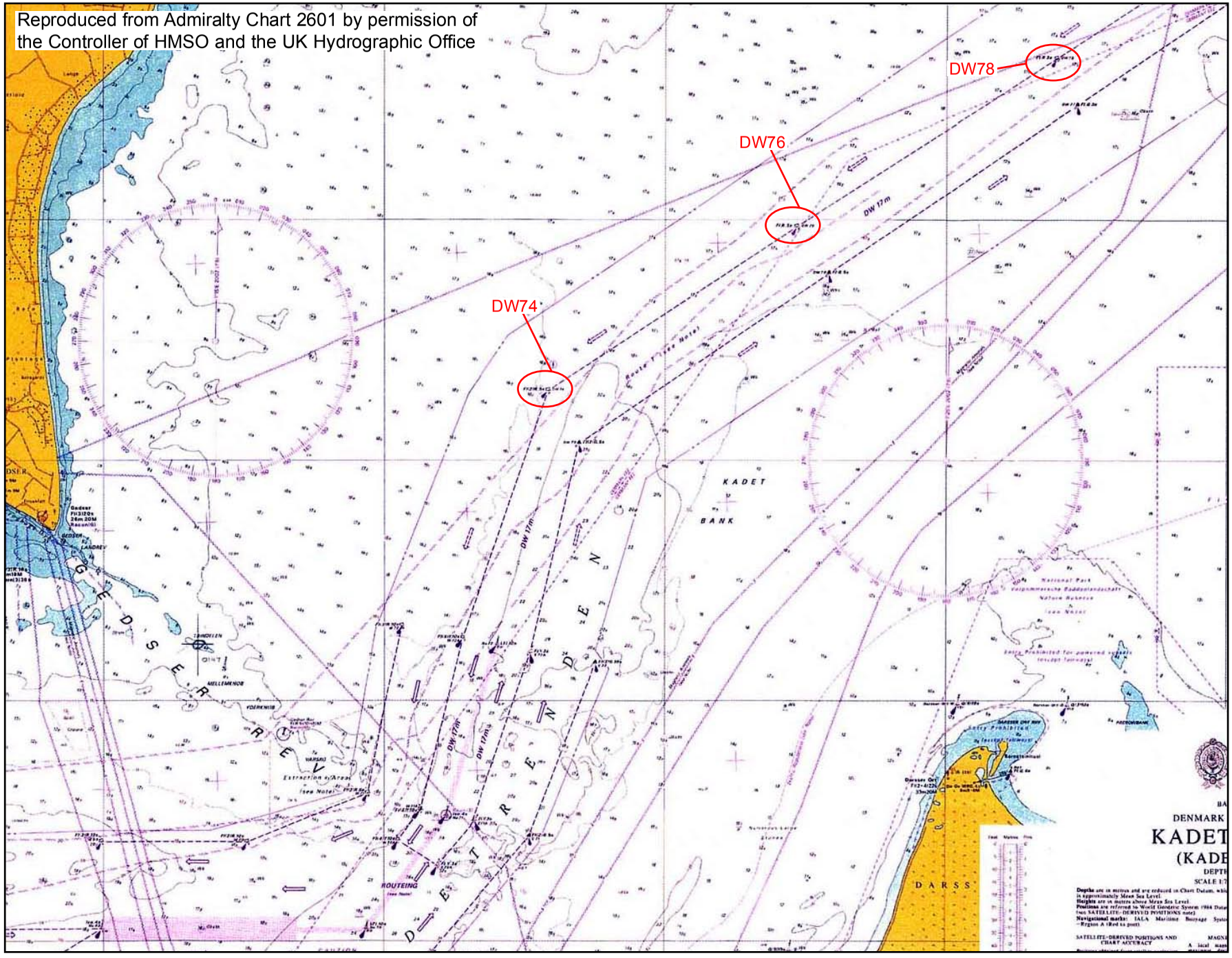
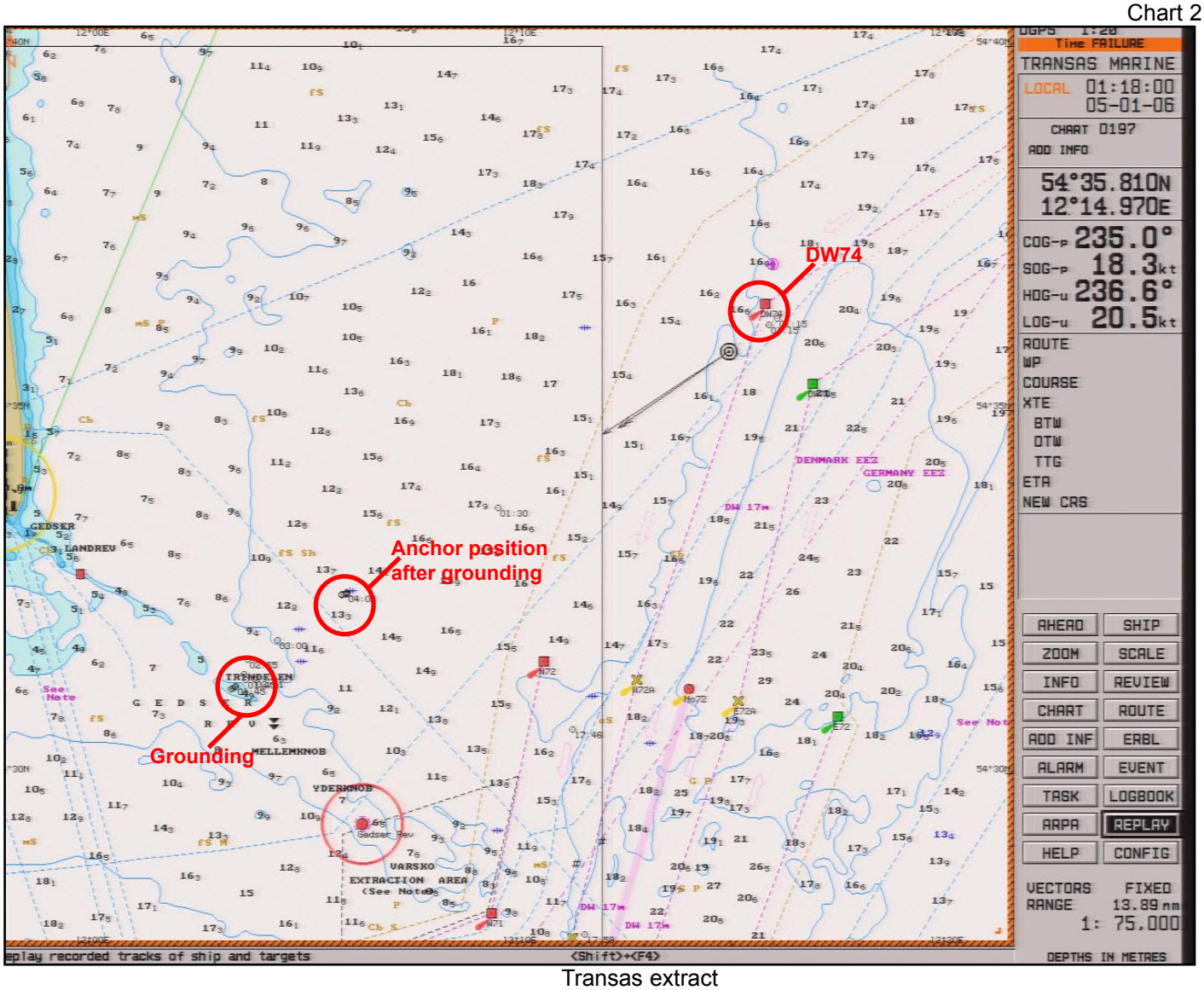

Reproduced from Admiralty Chart 2601 by permission of the Controller of HMSO and the UK Hydrographic Office
DW78
DW76
DW74
KADET
BANK
GEDSER
DARSS
DENMARK
KADET

Chart 2



Transas extract

At 0215, the Danish authorities called *Berit* on the VHF radio. The 2/O responded, stating the ship was aground and that steps were being taking to refloat her. After rousing the bosun, the chief officer went on deck and checked the depth of water using a lead line at three positions on the port and starboard sides of the ship. There was an average depth of 8.33m on the starboard side and 4.56m on the port side.

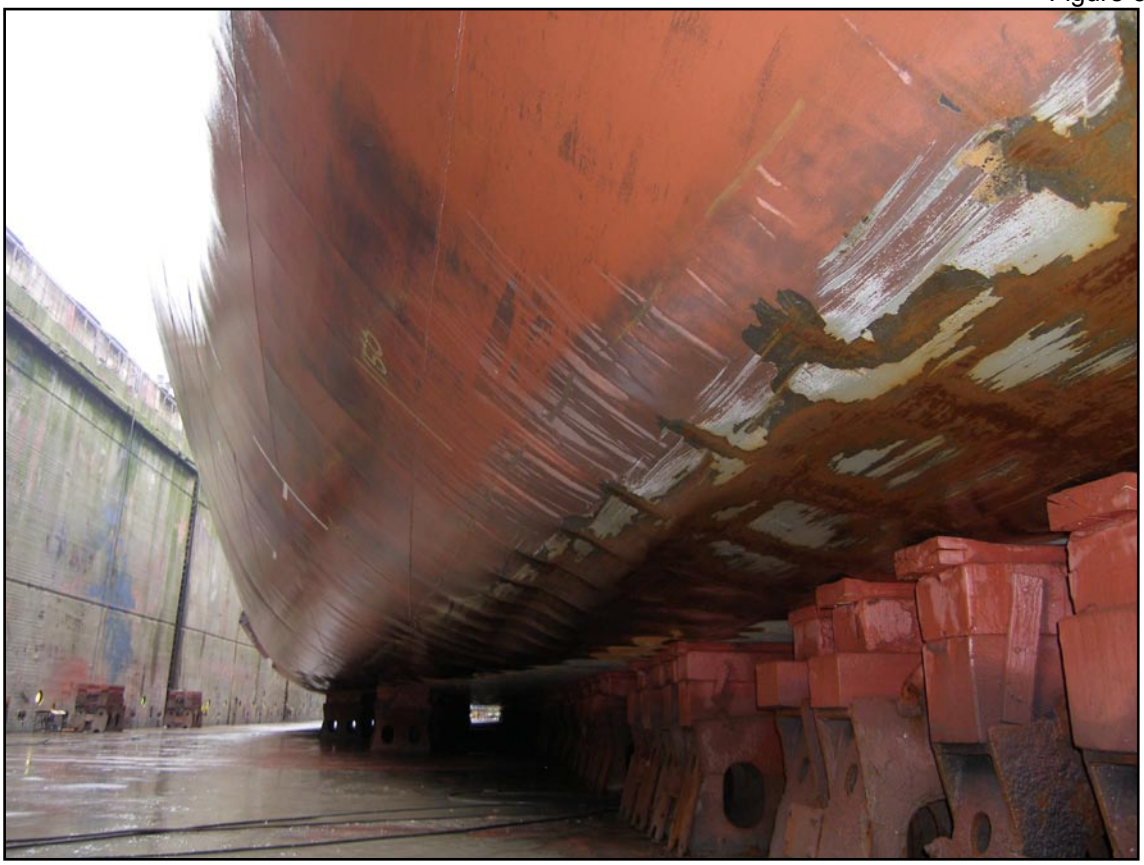
After discussions with the chief officer and chief engineer, the master started to try and manoeuvre *Berit* off the bank, using the controllable pitch propeller as well as the bow and stern thrusters.

At 0245, an hour after grounding and before all the maximum permissible ballast had been pumped out, *Berit* refloated and proceeded to anchor at 54° 32.49'N 012° 06.0'E **(Chart 2)**. The tank sounding system was checked by the chief officer, and no evidence of a breach of the hull was found. There was also no sign of any pollution on the sea surface. In accordance with standard national practice, the Danish authorities detained the ship until she had been declared seaworthy.

Figure 2

Damage to port side no. 3 water ballast outer tank

Figure 3



Damage to starboard side turn of bilge

Due to deteriorating weather, a diver survey of the hull while at anchor was not possible. After negotiations, and with a tug standing by, *Berit* proceeded to the port of Rostock, Germany, under her own power, to facilitate the diver survey of her hull. There, it was confirmed the hull had been breached in two places. The tank sounding system had not indicated any damage as the spaces affected had been full with sea water ballast before the grounding.

The ship's classification society, Germanischer Lloyd, permitted *Berit* to sail to Rotterdam at reduced speed to unload and conduct repairs. **Figures 2** and **3** show the damage that was sustained to the hull during the grounding. **Figure 4** shows the damage inflicted on the tips of the CPP blades. Temporary repairs were made in Rotterdam before *Berit* sailed in ballast to Gdansk for full repairs.

Figure 4

Propeller damage

1.4 CREW

1.4.1 Crew watch system

Berit operated with a crew of 12 including the master and three deck officers. The 1-in-3 navigational watch system did not include the master. This left the master free to conduct non-watchkeeping duties, although it was his normal practice to be on the bridge when the 3/O was on watch. The remainder of the deck crew consisted of a bosun, an able seaman and two ordinary seamen. With the exception of the bosun, the deck crew stood lookout duties during the hours of darkness, one assigned to each watch. However, when the master was on the bridge with the OOW during the hours of darkness, the lookout would often be stood down, returning to the bridge when the master left.

In port, the master and chief officer worked day shifts and the remaining two officers worked 6-on/6-off, as did the four seamen.

1.4.2 Master

The master, aged 59, was German and had started his seagoing career in 1965. He had known the owner of *Berit* for many years as they had attended nautical college at the same time. He first served as master in 1972. His career was predominately on coastal dry cargo vessels. He had been retained by Reederei H G Vöge, the ship manager of *Berit*, for the previous 11 years. He had brought *Berit* into service after her construction in 2001, and then had also completed the same task for her two sister ships which followed. As a result, the master had extensive experience of this particular design of container vessel. He returned as master of *Berit* in September 2005.

1.4.3 Chief officer

The chief officer, aged 46, was Ukrainian and had started at sea as a bosun in 1982. He went ashore in 1988 for 3 years before returning to sea in 1991, again as a bosun. He graduated from the Marine Academy in Odessa in 2000, and was employed as a 2/O via crewing agents, Marlow Navigation. He first served as chief officer in 2001. In January 2004, he was assigned to Reederei H G Vöge, and has been employed on their ships ever since as a chief officer. He obtained his master's certificate of competency in November 2004, and joined *Berit* on 20 December 2005 on a 4 month contract, as chief officer.

The chief officer's responsibilities included cargo loading/discharging, ship stability, deck equipment maintenance planning, hours of rest and overtime records and oversight of the safety officer.

1.4.4 Second officer

The 2/O, aged 27, was also Ukrainian. He had entered Kherson Maritime College in 1995 and graduated in 1998, which included time at sea as a cadet. He then worked ashore for 2 years before going to sea. In May 2000, he first went to sea as an OOW, and had served five similar contracts since, predominately on container vessels. He held a chief officer's qualification, which he achieved in October 2004. In June 2005 he signed on with the crewing agent Marlow Navigation and was assigned to *Berit* as 3/O. His contract on *Berit* had been due to expire in December 2005 but, at his request, this had been extended for 1 month.

As the time approached for the then 2/O to leave *Berit* in December 2005, the master recommended to the crewing agents that the 3/O be promoted to fill the vacancy. The master had been very pleased with the conduct of the 3/O, as he had been keen, eager to learn and had proved to be reliable. The 3/O also had held the responsibility of ship safety officer and again the master believed the 3/O had discharged this duty well. As the winter months approached, the master was keen to have a 2/O onboard who was familiar with the ship and the Baltic Sea. The master was also continually on the look out for young, reliable seafaring talent that could operate the ships of Reederei H G Vöge in the future. As a consequence of the master's recommendation, the 3/O was promoted to 2/O on 9 December 2005. This promotion occurred after the extension to his contract had been agreed.

The 2/O was the navigating officer, responsible for passage planning, chart and nautical publication corrections.

1.4.5 Third officer

The 3/O, aged 26, was Filipino, and had also been employed via Marlow Navigation. He had been a cadet for 3 years during his training. He had a chief officer's certificate, and had served as a 3/O for a 10 month contract prior to joining *Berit* on 9 December 2005. His familiarisation training had been carried out by the 2/O and master.

The 3/O also had the duty of ship's safety officer.

1.4.6 Deck crew

The two able seamen, one of which was the bosun, and two ordinary seamen were all Filipino. They were all employed via Marlow Navigation and usually worked 10 month contracts, interspaced with 3-6 months ashore. The ordinary seaman and able seaman, who were the lookouts before and after the grounding, were both experienced, with 5 and 7 years at sea respectively. Both had been served contracts on *Berit* prior to their employment at the time of the accident.

1.5 BRIDGE EQUIPMENT

1.5.1 Layout

Berit's bridge was spacious, had enclosed bridge wings, and a centre consol with 2 chairs for the watchkeepers. A navigational area with a forward facing chart table extended aft of the bridge on the starboard side, and a communications area filled the corresponding space on the port side **(Figure 5)**.

1.5.2 Navigational equipment

The equipment on the bridge was comprehensive and modern, as might be expected on a new container ship such as *Berit*. Two radar displays were fitted on the centre control console, with chairs sited immediately behind them **(Figure 6)**. The starboard radar was normally used while on passage, as it had an ARPA capability. A display for the 'Transas' electronic charting system (ECS) was positioned between the two radar displays. One of the vessel's two GPS sets was fed into the ECS providing position and waypoint information. The GPS units themselves were mounted above the chart table in the navigation area. The ECS alarms were not activated. However, when a waypoint was approached the GPS would sound an alarm. The GPS alarm was quiet and would self cancel after a short period of time. The ECS was not fed with an optional radar picture input.

Figure 5

Bridge viewed from port side

Figure 6

Centre console

1.5.3 Watch alarm

A watch alarm is an alarm system that is designed to alert the watchkeeper at pre-determined intervals. On *Berit,* the watch alarm was incorporated in the ship's autopilot **(Figure 7)**. It was activated by turning a key, which could be removed, ensuring the watch alarm remained on whenever the autopilot was engaged. The initial alerting period was 12 minutes, after which a visual alarm activated. This was followed, after a short period of time, by an audible alarm on the bridge. A short time later, if one of the reset buttons in the bridge had not been pressed, an alarm would sound in the officers' cabins. If the watch alarm had still not been reset after sounding in the cabins, the general alarm would sound.

The watch alarm could be reset before 12 minutes had passed, and the cycle would start again. Resetting the alarm could be achieved at one of 7 reset positions around the bridge: on the bridge wings, either side of the centre console, in the chart area, in the communications area and at the watch alarm control. The watch alarm was not generally used during the day, but was engaged from when the master left the bridge at night until his return in the morning. The key for the watch alarm was usually kept by the master.

Figure 7

Watch alarm control

1.6 MANAGEMENT OF *BERIT*

1.6.1 Overall management

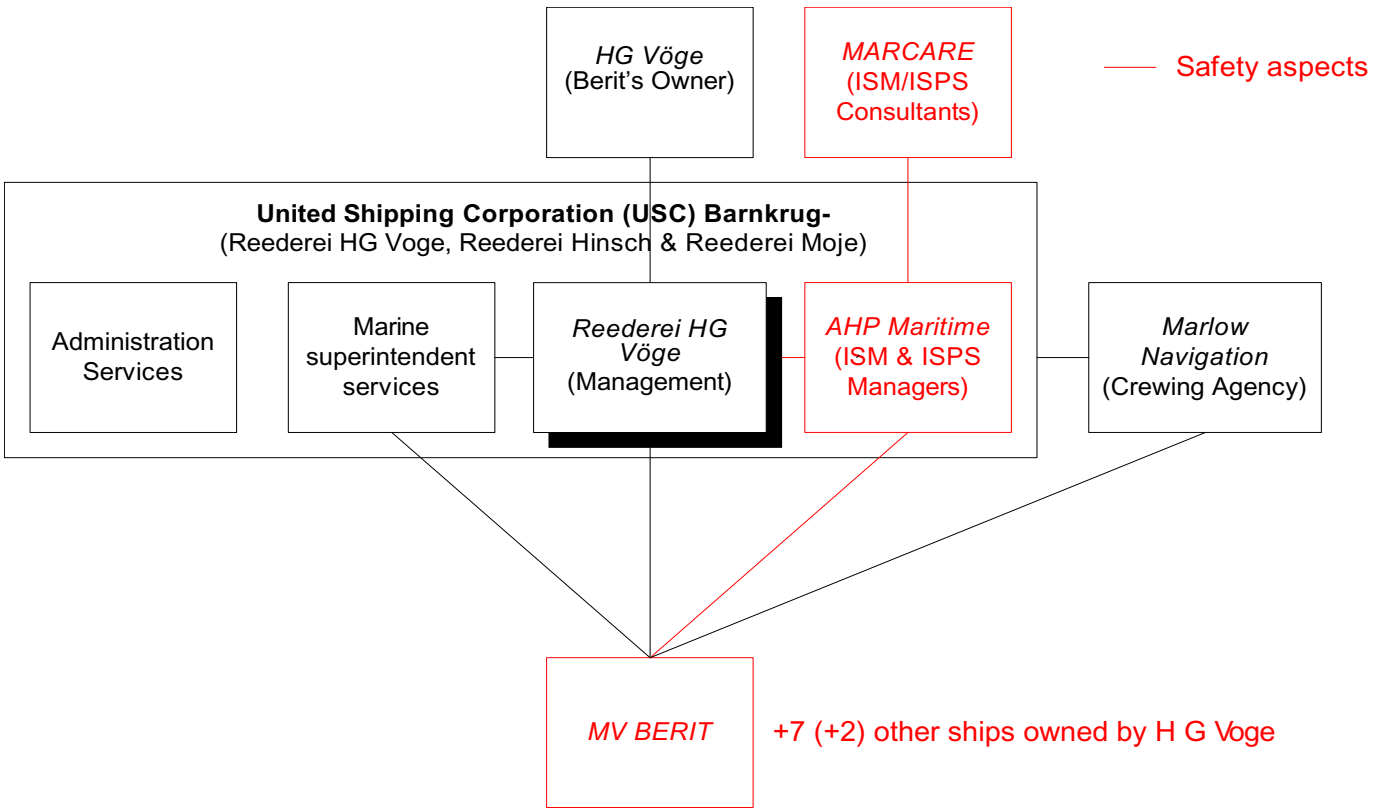
Figure 8 illustrates the complex management arrangement for *Berit* as described below.

Berit was owned by Mr H G Vöge and managed by his son and son's wife, trading as Reederei H G Vöge. Reederei H G Vöge managed a fleet of eight ships at the time of the accident, with a further two container ships scheduled for delivery in 2006, all owned by Mr H G Vöge. Six of their fleet were under the UK Flag at the time of the accident. The ships had previously operated under the Antigua and Barbuda Flag Administration, but in order to trade within the EU, they adopted an EU flag.

Reederei H G Vöge and two other small shipping companies, operating similar container ships, resided in the same office under the name of United Shipping Corporation (USC) Bankrug. A fourth ship management company was due to join USC Bankrug in 2006. This arrangement allowed these small shipping companies to share resources and lower operating costs. Shared resources included administration staff, safety and security management, and ship superintendency. Three superintendents were contracted to manage the maintenance and repair of all the vessels operated under USC Bankrug, but this number was due to increase with the expected new vessels.

Reederei H G Vöge retained some key seagoing staff, including many of the masters and chief engineers who sailed on their ships. The rest of the crew were supplied by a crewing agency, Marlow Navigation. Marlow Navigation worked closely with Reederei H G Vöge's ships to ensure appropriate, qualified crew were provided to the fleet as and when they were required.

Figure 8



1.6.2 Safety management

Berit's international safety management (ISM) document of compliance (DOC) was in the name of Reederei H G Vöge and was valid until 12 March 2006. However, the designated person ashore (DPA) resided in another company, AHP Maritime Services. The director of AHP Maritime Services was also the director of Reederei Hinsch, one of the other shipping companies in USC Bankrug. Having one DPA for all the ship managers removed the need for each company to have an individual DPA. At the time of the accident, the director of AHP Maritime Services was the listed DPA. However, maintaining that role, and also managing his own ships, proved difficult, so another employee was recruited in November 2005. At the time of the accident, the new employee was in the process of gaining enough experience to act as DPA, but he did not become acting DPA until March 2006.

Reederei H G Vöge's ISM system was initially created and maintained by Marcare, another external company. Marcare is a well established German maritime consulting and research company which has been in existence for over 10 years. They provide consultancy services for ISPS and ISM, as well as acting as the inspection and accident investigation division for the Antigua and Barbuda flag administration.

During the summer of 2005, Marcare conducted some ISPS consultancy for Reederei H G Vöge, during which a request was also made for them to review and condense the company's ISM system. After reviewing the system, Marcare proposed their own generic ISM system, tailoring it to the specific requirements of Reederei H G Vöge. Marcare was fully involved in introducing the new ISM system on to the H G Vöge fleet, the core document of which was the safety management system (SMS) shipboard main manual.

AHP Maritime Services conducted internal ISM audits of the ships under their charge, at least once a year. The DPA also intended to sail for 1 to 2 days on most of the vessels for which he was responsible, at least once a year. Informal checks were conducted at other times, especially if vessels were visiting ports near USC Bankrug's office. Marcare was often employed to provide an auditor to accompany the DPA at the annual ISM audits.

1.6.3 ISM external audit

The UK MCA had conducted one ISM audit of *Berit* prior to the accident, the ship having only adopted the UK flag during 2005. Previously, Germanischer Lloyd had conducted the ISM audits on behalf of the Antigua and Barbuda Administration. The MCA audit, conducted on 9 December 2005, raised four non-conformity notes (NCN) and three observations. The NCNs included evidence that the vessel often did not have a lookout at night, and that the master was not meeting his hours of rest requirement. The corrective actions for the NCNs were still in the process of being formally closed when the grounding occurred.

The evidence supporting the lack of lookouts, stemmed from the crewmen's documented hours of rest. During November 2005, at least 18 watches during the hours of darkness did not have lookout hours recorded. During most of December

2005, deck crew hours at night did correspond with standing a lookout. However, there were still inconsistencies in the hours of rest sheets, with no crewman recorded as standing the 0400-0800 from 25 December 2005 onwards. The lookout was also recorded as working when the grounding occurred on 5 January 2006, when he was not on the bridge.

1.7 BRIDGE PROCEDURES

Section 7.1 of the SMS shipboard main manual, provided some basic guidance on bridge operation and is reproduced at **Annex A**. Key importance was placed on the ship having a copy of the International Chamber of Shipping's (ICS) Bridge Procedures Guide onboard, and that ship personnel were fully familiar with its content. The ICS guide, last updated in 1998, imparts best navigational practice and includes generic checklists for bridge activities. The passage planning elements of the ICS guide are reproduced at **Annex B**, and the following extract refers specifically to monitoring of the ship:

3.3.1.2 Monitoring the progress of the ship

Good navigational practice demands that the OOW:

- *understands the capabilities and limitations of the navigational aids and systems being used and continually monitors their performance;*
- *uses the echo sounder to monitor changes in water depth;*
- *uses dead reckoning techniques to check position fixes;*
- *cross checks position fixes using independent sources of information: this is particularly important when electronic position-fixing systems such as GPS or Loran-C are used as the primary means of fixing the position of the ship;*
- *uses visual navigation aids to support electronic position-fixing methods i.e. land marks in coastal areas and celestial navigation in open waters;*
- *does not become over reliant on automated navigational equipment, including electronic chart systems, thereby failing to make proper navigational use of visual information.*

The SMS shipboard main manual included checklists for various evolutions, for example preparation for arrival in port. Standing orders, provided by Marcare, were also available for issue and amendment by the master as he saw fit. A copy of *Berit*'s bridge operation standing orders, which had been signed by the deck officers, is included at **Annex C**.

The final level of instruction for the ship's crew was the master's handwritten sea order book, which was kept above the chart table. The front page of the book emphasised: safety first, using all nautical equipment while on duty; informing the master of any defects; and, always ensuring the watch alarm was set on sea voyages. On 11 December 2005, the master had made an entry reiterating the requirement for a watchman during the hours of darkness, as a result of the deficiency highlighted in the MCA ISM audit.

1.8 REQUIREMENTS FOR NAVIGATION

1.8.1 General

On 1 July 2002, a substantially revised SOLAS Chapter 5, 'Safety of Navigation' came into force. The UK Merchant Shipping (Safety of Navigation) Regulations 2002 [S.I. 2002 No. 1473] effectively implemented the provisions of Chapter V of SOLAS. Unusually, the Statutory Instrument did not refer directly to the content of the SOLAS regulations, but provided force of law to an MCA publication, "Safety of Navigation, Implementing SOLAS Chapter V, 2002", which contained the SOLAS regulations verbatim, with guidance notes and 25 Annexes. Of particular relevance to navigational practice is the annex on voyage planning, which is reproduced at **Annex D**.

1.8.2 Lookout requirements

Defined in STCW 95, and in SOLAS V, Part 3:

14. The lookout must be able to give full attention to the keeping of a proper lookout and no other duties shall be undertaken or assigned which could interfere with that task.

15. The duties of the lookout and helmsperson are separate and the helmsperson shall not be considered to be the lookout while steering, except in small ships where an unobstructed all round view is provided at the steering position, and there is no impairment of night vision or other impediment to the keeping of a proper lookout. The officer in charge of the navigational watch may be the sole look out in daylight provided that on each such occasion:

.1 the situation has been carefully assessed and it has been established without doubt that it is safe to do so.

.2 full account has been taken of all relevant factors including, but not limited to:

- *state of the weather*
- *visibility*
- *traffic density*
- *proximity of dangers to navigation, and*
- *the attention necessary when navigating in or near traffic separation schemes; and*

.3 assistance is immediately available to be summoned to the bridge when any change in the situation so requires.

The COLREGS also require that every vessel at all times maintains an effective lookout. Rule 5, states:

> *"**every vessel** shall **at all times** maintain a **proper lookout** by **sight and hearing** as well as by **all available means** appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and risk of collision."*

MGN 1767 (M) Section 3, Paragraph 21.2 uniquely clarified lookout requirements at night:

‘ *…the UK does not consider it safe for the officer of the navigational watch to act as sole lookout during periods of darkness or restricted visibility’*

1.8.3 Electronic charts

Electronic charting has been in existence for many years. The IMO ECDIS performance standards were published in November 1995, which enabled flag administrations, on a case by case basis, to accept ECDIS as an option for meeting chart mandatory carriage. In July 2002, SOLAS V regulation 19 came into force under UK merchant shipping legislation, which then explicitly allowed a type approved ECDIS to be employed as the primary means of navigation, as long as there was also an approved back up arrangement in case the ECDIS failed.

Berit had an ECS, not an ECDIS. Therefore, paper charts were still the primary means of navigation. The ECS was simply a navigational aid.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 CAUSE OF ACCIDENT

The grounding of *Berit* occurred because the 2/O failed to make an alteration of course in accordance with the navigational plan. The 2/O was distracted for over 40 minutes prior to the grounding, missing the required waypoint.

During the investigation, the cause of the distraction was given as the sending of consecutive text messages on a mobile telephone. The investigation was unable to verify or discount this version of events as the mobile telephone used was 'pay-as-you-go' with no itemised bill, and there was no text message history available on the telephone itself. Considering the exceptional length of time that passed while reportedly using the mobile telephone, and the inability to verify this, it is possible the 2/O might have been distracted by another activity, or even have fallen asleep. These options are discussed further in Sections 2.3 and 2.4.

2.3 DISTRACTION

Sending a text message is a very popular and common method of communicating which can be regarded as being quick and easy when compared to a telephone conversation. Both processes are distractions that need to be avoided while on watch. However, the act of sending a text message on a mobile telephone requires concentration. Unlike a telephone conversation, the operator has to look at the screen on the telephone and, often, use both hands to hold and key in the text. While talking on a telephone, an operator can see to walk around, and can usually monitor instruments and displays; when sending text messages, he cannot.

The act of sending a text message has a finite duration. Once the telephone operator has pressed the 'send' key he is free to attend to other issues. A text 'conversation' that lasted 40 minutes, during which the telephone operator did nothing else significant, despite having demanding duties to perform, would be highly unusual. The investigation therefore considered whether the OOW was engaged in something more engrossing, such as playing a computer game on a mobile telephone, gaming machine or personal computer.

Computer games are popular, especially with the younger generation. They are competitive, absorbing and highly demanding of time. They are also becoming increasingly accessible, with ever more complicated games becoming available on mobile telephones and on dedicated hand-held games consoles, at relatively low cost. There is no evidence to suggest the 2/O was playing a computer game for the 40 minutes he was not concentrating on the ship's progress. Had he done so, this would have been a deliberate decision, rather than him being distracted from his duties.

2.4 FATIGUE

An alternative reason why the 2/O was unable to keep a safe navigational watch was that he fell asleep, hence missing the turn and continuing on his original course until he ran aground.

Berit had a satisfactory watchkeeping regime in place, with ample deck officers, and a master free from watchkeeping duties able to oversee his OOW activities. The hours of rest records indicated all the OOWs had sufficient hours of rest in accordance with the regulations. If the 2/O had been fatigued, it would most likely have been through him not achieving good quality rest during his designated rest period.

All the chairs on *Berit*'s bridge had low backs, and none had headrests. This would have hindered getting comfortable for sleep, and probably only a deeply fatigued person would have been able to sleep for any extended period.

From the preceding arguments, it is considered relatively unlikely that the 2/O fell asleep.

2.5 COMPLACENCY

The 2/O was familiar with *Berit*, having joined the ship in June 2005, and he had navigated this part of the Baltic on numerous occasions. However, since his promotion on 9 December 2005, the 2/O had only conducted 13 night passages standing the 0000-0400 watch. Previously, as the 3/O, he had stood the 2000-2400 watch, and the master had been present on the bridge for a substantial part of his watches. The master then had been perfectly content with the 3/O performance. Now, with no supervision, in calm weather, light traffic density, route familiarity and vessel familiarity, the 2/O might have become complacent about his duties. It is vital that OOWs do not lose sight of their responsibilities while they have the conduct of the vessel.

2.6 DEFENCES FOR ENSURING A SAFE NAVIGATIONAL WATCH

2.6.1 Lookout

As detailed in Section 1.8, STCW 95, SOLAS Chapter V and the COLREGS, all require that every vessel at all times maintains an effective lookout. The lookout must be able to give their full attention to the keeping of a proper lookout, and no other duties should interfere with this task. However, in certain particular circumstances during daylight hours, the master may consider that the OOW can act as sole lookout. In this accident, the lookout was stood down at 0030, leaving the OOW as the sole lookout during the hours of darkness until the grounding occurred at 0147. This was a direct contravention of the regulations.

Evidence from the MCA ISM audit in December 2005 shows that the standing down of lookouts from the bridge was not unusual on *Berit*. Following this audit, the master added an instruction in his sea order book reiterating the requirement for a lookout, which all the officers signed. The hours of rest records showed some improvement in December 2005 up until the accident, but there were still some lapses. The 2/O had been fully aware of the requirement for a lookout during the hours of darkness, and had also been reminded by the master's recent instruction.

The hours of rest records were not only used to ensure the crew were receiving their required rest. Further time sheets derived from the hours of rest records were submitted by the chief officer to the company office to calculate overtime payments. Unlike many instances that arise during MAIB investigations, the hours of rest records did appear to try and reflect reality. In this case, the regular lack of a lookout, recorded in the hours of rest records, was not noticed by the master or the company's management. In reality, the only review of rest records by the company's managers occurred during internal audits.

The lookout believed he had been stood down, and so had gone to bed. In this scenario, it would appear that the 2/O saw the lookout as superfluous, and felt the lookout's time would be better spent resting. The 2/O recalled that he had sent the lookout to stand-by in the crew's mess. In either case, the OOW instructed the lookout to leave the bridge.

The lack of a lookout on the bridge at night or in restricted visibility is an all too common occurrence in MAIB investigations and was highlighted as a major concern in the MAIB Bridge Watchkeeping study. The MCA was recommended to take the conclusions of the study to the IMO, with one of the aims to review:

> *The requirements of STCW 95 to change the emphasis with respect to the provision of a designated lookout to ensure that a lookout is provided on the bridge at all times, unless a positive decision is taken that, in view of daylight and good visibility, low traffic density and the vessel being well clear of navigational dangers, a sole watch keeper would be able to fulfil the task.*

This action was still progressing within the IMO at the time of the grounding of *Berit,* but the outcome will hopefully make the regulations on the use of lookout even more succinct.

2.6.2 Watch alarm

Steps had been taken on *Berit* to try and ensure an OOW stayed alert by the inclusion of a watch alarm, which has been described in Section 1.5.3. A watch alarm serves two key purposes. It alerts the officers (on some vessels the entire crew) if the OOW becomes incapacitated and is unable to cancel it. Also, the very act of regularly cancelling the alarm keeps the OOW awake and partially occupied. However, MAIB is aware that watchkeepers find watch alarms irritating and frequently switch them off when they can. If, in this accident, the master had left the key to the watch alarm in the consol, then it is quite possible the OOW would have disabled the alarm. It is thought unlikely the watch alarm was engaged in the time up to the grounding, as the 2/O would have obtained an idea of the passage of time, if he had been cancelling it every 12 minutes. To be effective, it is essential that the watch alarm is fully operational, and that the OOW cannot disable it for his own convenience.

2.6.3 Navigational practice

The company SMS required that *Berit* was navigated in accordance with the ICS Bridge Procedures Guide, which provides excellent, but generic guidance. Three navigational aspects are relevant to this investigation (ICS Guide reference in brackets):

a) Planning a safe passage (Sections 2.3 & 2.5, copied at Annex B of this report)

b) Monitoring ship's progress along the planned track (Sections 2.5.1 of Annex B and 3.3.1.2, copied at Section 1.7 of this report)

c) Checking accuracy by use of all available means (Section 3.3.1.2).

2.6.3.1 Passage Planning

As *Berit* operated a regular service around a few ports, the 2/O had inherited the passage plan from his predecessor. The plan, however, contained no instructions to the OOWs on the conduct of the passage, nor how frequently the ECS/GPS data should be checked or verified. That the 2/O accepted this incomplete plan, and did not amend it, possibly indicates he had a less than complete understanding of his duties and responsibilities as navigating officer.

2.6.3.2 Monitoring Progress

As *Berit* was fitted with an ECS, not an ECDIS, the primary means of navigation onboard was the paper chart. The company's bridge standing orders for position monitoring only required that the vessel's position was fixed regularly, and the master was content that the OOWs relied on the ECS and that fixes could be put on the paper chart retrospectively. In reality, GPS derived positions were only noted in the log every 2 hours, or after a course change. Unfortunately, the ECS on *Berit* was only used passively and not to good effect. There were neither instructions on how the OOW should monitor the ECS, nor for the setting and use of depth, cross track error or waypoint alarms and alerts. The only navigation alarm operational on *Berit* was the GPS waypoint alarm, but in this accident it was ineffective.

His lack of interaction with the ECS or other navigation equipment ultimately led to the 2/O being under stimulated or bored; the precursor to falling asleep or becoming easily distracted. In this accident, the 2/O's workload was light, and he allowed himself to become distracted using his mobile telephone. However, had he been monitoring his vessel's position and track properly, as required to maintain a safe navigation watch, this in itself would have provided some stimulation to ensure he remained alert.

The ineffective use of the ECS may also indicate a training shortfall. If a ship is fitted with any electronic navigation equipment, it is important that the operators can use the system and its available safety tools to full effect. As navigating officer, the 2/O should have had a comprehensive knowledge of the ECS's capabilities, in order to ensure the ship's position was monitored properly and to be able to pass best practice on to the other OOWs.

2.6.3.3 Checking navigational accuracy

In this accident, too great a reliance was placed on the ECS, with the OOW neglecting to plot or verify positions by any other means. GPS positions are not always accurate and ECS displays can provide misleading information in the hands of inexperienced users when, for example, the chart datum is not properly understood. Good navigational practice demands that positions are cross-checked by independent sources of information, particularly when the primary means of position fixing is GPS. In this accident, there was no evidence of position fixing using anything other than GPS, indicating poor basic navigational practice. On *Berit*, there were no instructions on how the accuracy of the GPS and ECS were to be checked.

2.6.3.4 Local instructions

Both the MCA voyage planning guidance **(Annex D)**, and the ICS Bridge Procedures Guide highlight the requirements for good navigation, but they only provide generic instructions. To be effective, a ship's SMS needs to add to the generic instructions to make them relevant to a vessel's specific circumstances and equipment. There are many ways of providing these instructions: detailed addendum to the SMS, Fleet Standing Orders or Senior Master's Orders where there are sister ships, Master's Standing Orders, etc. However, whichever method is chosen, its implementation must be checked. In this case, Reederei H G Vöge delegated this responsibility to *Berit*'s master, and were content he had taken the necessary action.

2.7 MOBILE TELEPHONES ON THE BRIDGE

Although unable to be independently verified, the 2/O's mobile telephone appears to be a significant contributory factor in this accident.

The 2/O had several mobile telephone SIM cards for the different countries that *Berit* passed on her passage through the Baltic, to ensure his call costs were minimised. The 2/O was not alone, and many of the crewmen had mobile telephones onboard to enable them to keep in touch with loved ones and friends. Since mobile telephone networks are designed primarily for land use, the quality of signal reception will vary with the ship's proximity to the transmitter masts. Each time reception was regained, there could be a flurry of activity as new text messages, voice messages and electronic mail were received.

The master was fully aware of the crew's extensive use of mobile telephones onboard. However, he was not aware of any problems as a result, and viewed any enforced limitations on their use as potentially a restriction on the crew's civil liberties. He, therefore, relied on the professionalism and common sense of the crew not to use their telephones at inopportune moments. Some officers would not take their mobile telephone on watch, but the 2/O did. Ultimately, the distraction of the mobile telephone, and its consequent use, led to the 2/O neglecting his duties and not keeping a safe navigational watch for over 40 minutes.

Mobile telephones have become a necessity in modern shipping operations, with many ships having an official mobile telephone on the bridge to communicate with agents and managers. However, mobile telephones can place an additional burden on the bridge team, who may feel obliged to answer the telephone at inappropriate times, such as when navigating in busy or confined waters. This is in direct contravention of STCW 95 Section A-VIII/2 26, which states "the officers in charge of the navigational watch shall not be assigned or undertake any duties which would interfere with the safe navigation of the ship."

The UK Confidential Hazardous Information Reporting Programme (CHIRP) and the MAIB investigation into the *Attilio Ievoli* grounding in June 2004 have both provided evidence highlighting the problem of mobile telephone usage while on watch. Concerned about this issue, in October 2005 the MCA issued MGN 299 (M+F) - 'Interference with Safe Navigation Through Inappropriate Use of Mobile Telephones' **(Annex F)**. Reederei H G Vöge had no policy onboard their vessels on the use of either official or personal mobile telephones.

Personal communications equipment is increasingly available around the world. Further, modern mobile telephones are becoming highly sophisticated and now host games, video, e-mail, and web access, beside basic tele-communications. There is likely to be a growing temptation for OOWs to become distracted by such equipment at times of low activity. It is important, therefore, that the potential risks involved are considered, and active management policies put in place to ensure mobile telephones are not used at inappropriate times.

2.8 ISM SYSTEM

The ISM Code details the policies, responsibilities and principles that a ship's SMS must fulfil. *Berit*'s SMS met the requirements of the ISM Code **(Annex G)**, and the ISM manual on *Berit* covered general safety management principles. The ISM manual did not provide detailed guidance, the generation of ship specific procedures being left to the master. Therefore, to be fully effective, the ISM system relied heavily on the ship's master. Company ISM audits had been conducted and, on the previous two occasions, had not highlighted any significant deficiencies. However, the failure to notice the discrepancies in the hours of rest records might be indicative of insufficient management oversight at the right levels.

The preamble in the ISM Code states:

> *The cornerstone of good safety management is commitment from the top. In matters of safety and pollution prevention it is the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result.*

In Section 6 it also states:

> *6.4 The Company should ensure that all personnel involved in the Company's SMS have an adequate understanding of relevant rules, regulations, codes and guidelines.*

By the delegation of safety management to AHP Maritime Services, the ISM documentation to Marcare and ship specific instructions to the master, Reederei H G Vöge's focus on the SMS would appear to have been diluted, and in the specific case of navigation safety, the SMS has been found wanting.

What is evident from this investigation is that poor navigational practices and routines had been allowed to evolve on board *Berit*. Further, there was a total absence of ship specific guidance in this area. The ISM manual referred to the ICS Bridge Procedures Guide, but this document, while detailing clearly what needs to be done, does not and cannot specify how on each and every ship any specific task should be done. The ISM system had not highlighted this and, therefore, needs review if bridge navigational standards are to be improved and maintained at acceptable levels on *Berit* and the rest of the Reederei H G Vöge fleet.

2.9 SIMILAR ACCIDENTS

The MAIB Bridge Watchkeeping study, mentioned in Section 2.5.1, was initiated after the grounding of the general dry cargo vessel *Jambo* in June 2003. One of the aspects highlighted by this study of 66 collisions, near collisions, groundings and contacts, was the problem of OOWs acting as sole lookouts. *Jambo* herself ran aground after missing a course change when the OOW fell asleep, the OOW having sent the lookout down to conduct other duties.

The chemical tanker *Attilio Ievoli*, referred to in Section 2.6, grounded on her passage out of the Western Solent in June 2004. The master was not paying attention to the navigation of the vessel, having been distracted while using the ship's mobile telephone.

The most recent similar accident concerned the general cargo vessel *Lerrix*, which ran aground on 10 October 2005 while negotiating the same Kadetrenden TSS as *Berit*, albeit while travelling in the east bound lane. An alteration of course was missed when the master fell asleep while alone on the bridge. He had stood down the lookout an hour or more before his watch ended. The master was using ECS on his own laptop as his primary means of navigation. Significantly fatigued, with no active stimulation from the ECS and no watch alarm, the master's comfortable, warm, dark environment provided the ideal conditions for falling asleep.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES

The following safety issues have been highlighted by the investigation. They are not in any order of priority, but simply listed in the order in which they appear in Section 2.

1. The 2/O might have become complacent and lost sight of his responsibilities as an OOW. [2.5]

2. There was no lookout on the bridge with the 2/O from 0030 until the time of the grounding at 0147. [2.6.1]

3. The 2/O was fully aware of the requirement for a lookout. [2.6.1]

4. In the 3 months prior to the accident, there was evidence that lookouts had not been correctly employed during the hours of darkness. [2.6.1]

5. Both the master and vessel's managers failed to notice the hours of rest records indicated a lack of a lookout at night. [2.6.1]

6. The watch alarm might not always have been activated as required by the master's standing orders. [2.6.2]

7. Although great reliance was placed on the ECS, it was used passively, requiring little interaction with the OOW. [2.6.3]

8. The GPS position of the vessel was rarely checked by alternative means. [2.6.3]

9. Poor navigational practice was evident onboard. [2.6.3]

10. The 2/O was unable to maintain a safe navigational watch as he was reportedly distracted on his mobile telephone for over 40 minutes. [2.7]

11. There was no company or ship policy on the use of personal communications equipment while on the bridge. [2.7]

12. The ISM manual was generic to the whole Reederei H G Vöge fleet and relied heavily on the master of *Berit* to generate the ship specific procedures for shipboard operations. [2.8]

13. The ISM system had not highlighted and prevented the poor navigational and watchkeeping practices that had evolved on *Berit.* [2.8]

SECTION 4 - ACTION TAKEN

In response to the grounding of *Berit*, **Reederei H G Vöge** has issued a safety memorandum [01-2006] to the fleet, ordering masters to ensure:

- '*At times of restricted visibility, i.e. dusk til dawn, fog…. a watchman has to be on the bridge*
- *The bridge alarm is enabled and that the OOW has no possibility to disable it, e.g. disabling key has to remain with the captain at night*
- *Standing orders are checked in order to be sure that these orders are included.'*

Reederei H G Vöge, in response to the ISM audit in December 2005, has provided instructions to its fleet, including:

- *'That standing orders have to be reviewed, especially the part with the bridge lookout at times of restricted visibility*
- *That masters review their rest/work hours reports'.*

The **master of *Berit*** has amended his standing orders on 11 December 2005:

- '*To all officers: always have one man on bridge duty after start of sea passage.'*

and on 15 January 2006:

- *'All standing orders valid! Position has to be entered on paper chart every 30 minutes*.'

With regard to the watch alarm, the on-off key has been removed by the master and secured, leaving the watch alarm permanently activated whenever the autopilot is engaged.

Concerned about some worrying trends of poor watchkeeping developing prior to the grounding of *Berit,* **the MCA** has issued MGN 315(M) - Keeping a Safe Navigational Watch on Merchant Vessels, in February 2006 **(Annex E)**. It reiterates the guidance on keeping and maintaining a safe navigational watch.

Revision of the Bridge Procedures Guide by the **International Chamber of Shipping** working group was underway at the time of this accident. The safety concerns highlighted by the grounding of *Berit* have been included in the revision, covering in particular:

- Passage planning.
- Operation of ECDIS and other electronic navigational aids.
- The use of mobile telephones and other similar electronic devices.

SECTION 5 - RECOMMENDATIONS

Reederei H G Vöge is recommended to:

2006/183 Review and amend its ISM documentation to ensure that, where necessary, specific guidance is given to its staff and crews on the performance of their duties. The review, in particular, should consider:

- A policy on the inappropriate use of mobile telephones and other personal electronic equipment
- Instructions on the safe conduct of navigation, the monitoring of passage, and the need to verify positional data by all available means
- Training of OOWs in the use of the ECS to ensure its functionality is fully utilised.

Marine Accident Investigation Branch
July 2006

Berit Bridge Operation - extract from SMS Shipboard Main Manual

Passage Planning - extracts from International Chamber of Shipping - Bridge Procedures Guide

Berit Bridge Operation Standing Orders

MCA voyage planning guidance (Annex 24 of MCA publication ‘Safety of Navigation, Implementing SOLAS Chapter V, 2002’)

MGN 315 (M) Keeping a Safe Navigational Watch on Merchant Vessels, published February 2006

MGN 299 (M+F) Interference with Safe Navigation Through Inappropriate Use of Mobile Phones, published October 2005

International Safety Management Code (ISM Code) 1994 Edition