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SIRENA SEAWAYS
Heavy contact with berth, Harwich International Port
22 June 2013

SUMMARY

At 1254[1] on 22 June 2013, the ferry *Sirena Seaways* made heavy contact with berth 3 at Harwich International Port. The impact caused considerable damage to the fore-end of the vessel, including penetrations below the waterline. The linkspan at berth 3 collapsed into the water; the supporting structures were severely damaged and were no longer useable. No one was injured and there was no pollution. *Sirena Seaways* was subsequently moved to another berth to disembark the passengers and vehicles.

Sirena Seaways's propulsion control records showed that the starboard propulsion system remained set at about 63% ahead throughout the accident. No defects were found with the propulsion control systems and it was considered most likely that the button to activate the back-up control system for the starboard propulsion system was inadvertently pressed during the early stages of the entry into the port. This bypassed normal control of the starboard propulsion system. The error was not noticed by the bridge team and the starboard propulsion system continued at 63% ahead for nearly 2 hours after the accident, hampering attempts to pull the vessel from the damaged berth.

Recommendations have been made to the vessel's owner to: review the need for regular bridge and crew resource management training; and, consider methods for warning passengers and minimising the risk of injury in a similar emergency.

[1] All times quoted in the report are ship's time (UTC +2) which was 1 hour ahead of British Summer Time.

Sirena Seaways

FACTUAL INFORMATION

Background

Sirena Seaways, a passenger and vehicle ferry of 22382 gross tons, was fitted with a controllable pitch propeller (CPP) on each of its two shafts. The power output from each CPP was controlled independently and was varied by a combination of propeller pitch and engine speed[2]. The power output from each shaft was controlled with combinator levers on the consoles at the centreline and at each bridge wing. The levers were graduated from 1 to 10; the actual power output from each CPP was shown on gauges at each control station. This was measured as a percentage from 0 to 100.

Narrative

Sirena Seaways departed Esbjerg, Denmark, at 1830 on 21 June 2013 for its regular crossing to Harwich in the UK. On board were 431 passengers and 58 crew members. The crossing was uneventful and the vessel maintained a speed of about 19kts.

At 1206 on 22 June, the vessel passed the Harwich Approach buoy; the port arrival section of the route checklist was completed. The master contacted Harwich VTS[3] to report his approach and was advised that the wind conditions at the berth were about 30kts from the south-west. High water Harwich was due to occur at 1220.

At about 1226, as the vessel passed the Platters light buoy **(Figure 1)**, the vessel's speed was reduced to 13kts, equivalent to a setting of about 63% on the CPP system. The master noticed that the bridge central console **(Figure 2)** indicator lights had not been returned to full brightness after being dimmed during the hours of darkness. While he rapidly pressed the console 'lights up' button, he complained about it to the chief officer (the OOW[4]) because a similar problem had led to a 'near-miss' incident about 7 months earlier. Less than 10 minutes later, *Sirena Seaways* came abreast of berths 8 and 9 FSR[5] deep water container terminal. As a very large container vessel was alongside, *Sirena Seaways*'s speed was further reduced to 11kts[6] and the master positioned the vessel close to the western side of the fairway.

The duty second engineer in the engine control room (ECR) had been joined by the chief engineer in preparation for arrival. At 1241, the second engineer noticed that the indicator on the ECR console for the starboard shaft back-up control system was lit. The second engineer had not seen the indicator lit before and asked the chief engineer to explain its significance. The back-up control system was not routinely used or tested and the chief engineer was unable to provide an answer. No further action was taken. Five minutes later, a public announcement was made for the passengers to begin making their way to the car decks in preparation for arrival.

At about 1251, the master went to the port bridge wing console **(Figure 3)** and took control of both the CPPs, the bow thrusters (BTs) and the helm from the central console. The port and starboard CPP indicator lamps and a bright white lamp adjacent to the CPP combinator levers illuminated to indicate that the port wing console had control of the propulsion. The master then informed the chief officer and helmsman that he had transferred control of the vessel to the port bridge wing. The sun was shining through the bridge windows and the master did not notice any other indicator lights on the port bridge wing console. Subsequent tests showed that a faint red light on the bridge wing console glowed when the starboard CPP back-up control system was engaged **(Figure 4)**.

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[2] The propulsion system was normally operated in 'combinator mode' with a computer programme adjusting propeller pitch and engine speed to give the required power output.

[3] Vessel traffic services

[4] Officer of the watch

[5] Felixstowe South Reconfiguration

[6] Harwich Haven Authority General Directions provide the maximum speed limits, 'over the ground', within the harbour and seaward approaches. The maximum speed limit beyond a line drawn between the cliff foot and North West Beach buoys was 8kts.

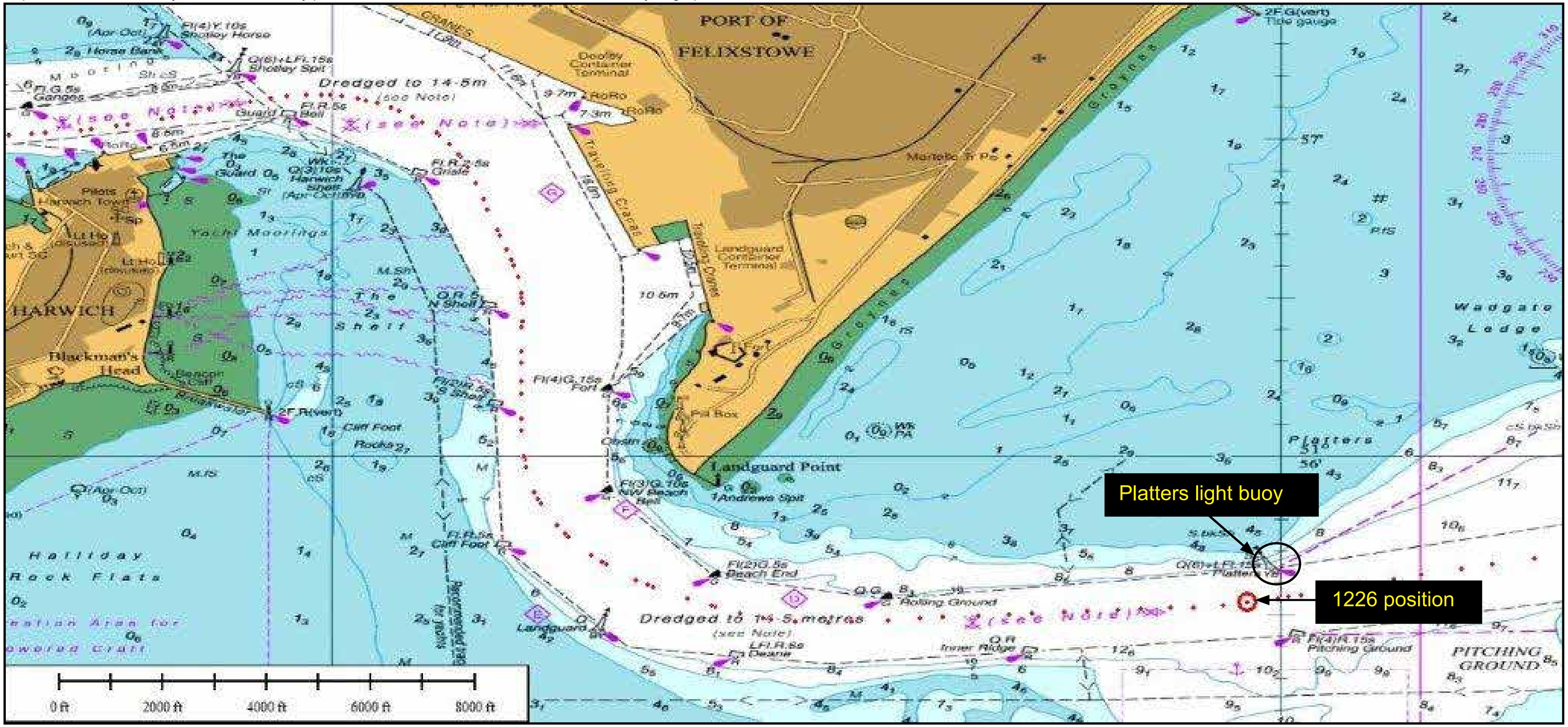

Figure 1: AIS track of *Sirena Seaways*

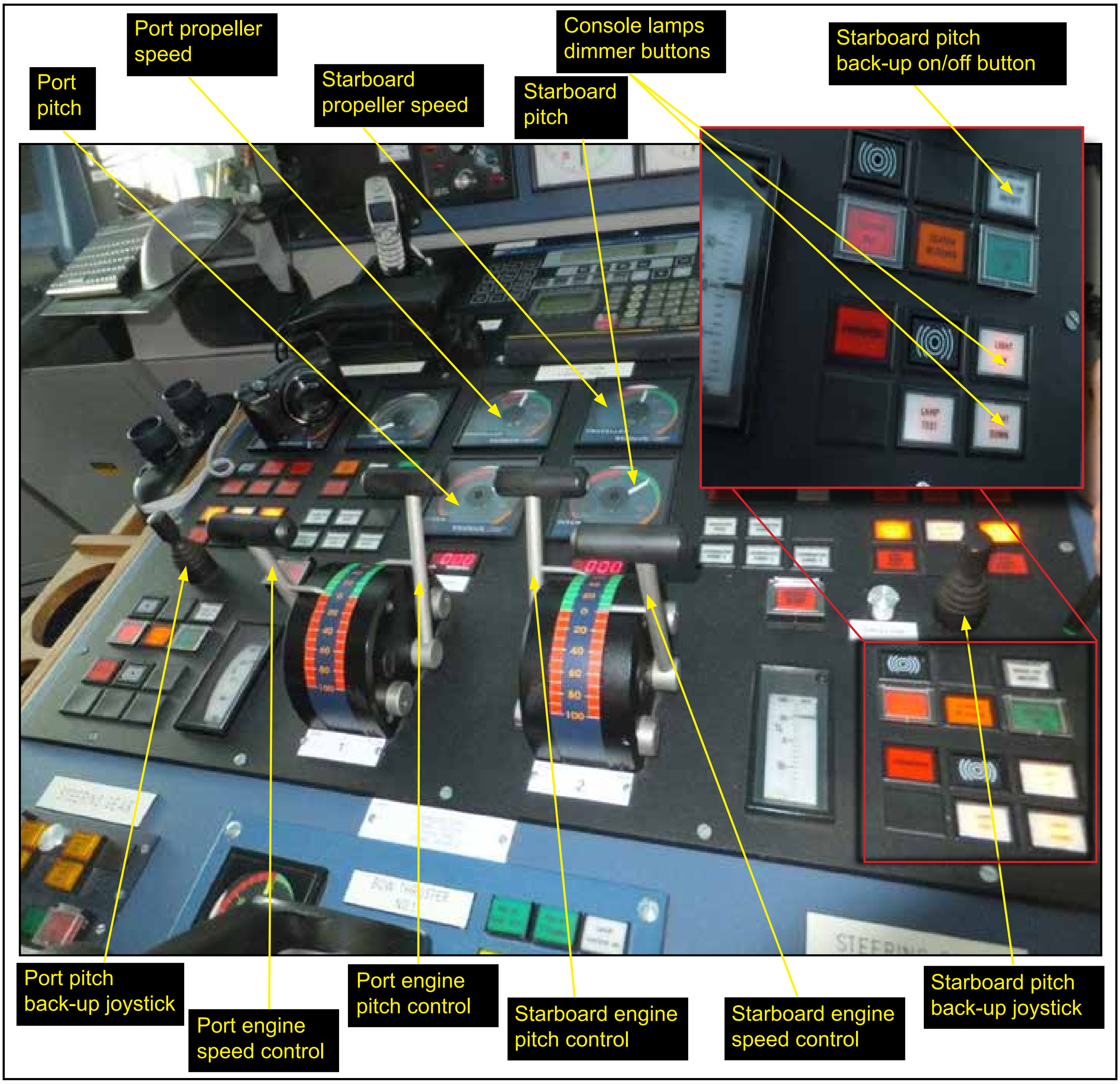

Figure 2: Bridge centre console

Figure 3: Port bridge wing console

Figure 4: Comparative brightness of bridge wing console indicator lights

Shortly after control was transferred to the port bridge wing, the helmsman left the bridge to go to his mooring station. The chief officer joined the master on the bridge wing to provide a radio communications link with the vessel's berthing teams and to support and double-check the master's actions. At about the same time, the master reduced the setting on both combinator levers to position 2. *Sirena Seaways*'s speed was about 9.5kts and its heading was approximately 260°, giving an approach angle to the berth of around 17°.

Sirena Seaways began to sheer to port and the master set the starboard CPP combinator lever to half astern and No 1 BT to thrust at full power to starboard. At a distance of about 6-7 cables[7] from the berth, the chief officer told the master that he thought the vessel was going too fast. The master replied that he needed sufficient speed to counteract the ebb tide and the strong wind that was blowing the vessel away from the berth.

At about 1253, at a distance of about 2 cables from berth 3, *Sirena Seaways*'s speed had reduced to around 9.2kts. The master realised that the vessel was not slowing as much as he had expected and so set No 2 BT to thrust at full power to starboard and moved the starboard CPP combinator lever to full astern. The chief officer, recognising that the vessel was going to make heavy contact with the berth, advised the master to go astern and ordered the berthing teams to clear the deck. As the vessel's heading swung past 250° and rapidly towards 240°, the master set full starboard helm and reduced the port CPP combinator lever to position 2 ahead and then, almost immediately, to full astern.

At 1254, at a speed of about 7.5kts, *Sirena Seaways* made heavy contact with berth No.3. The vessel hit and rode over one mooring tower, causing an adjoining walkway to collapse. Another mooring tower was pushed over and the vehicle loading linkspan was lifted off its supports as *Sirena Seaways* carried on until its bow made heavy contact with the concrete berth **(Figure 5)**. The linkspan's western end was pushed on to the quay **(Figure 6)** while the eastern end collapsed into the water, where it came to rest on *Sirena Seaways*'s bulbous bow. Almost immediately, the bilge alarms for No 2 BT space sounded, and the chief engineer stopped the BT remotely from the ECR.

At 1255 *Sirena Seaways*'s master informed Harwich VTS about the accident on VHF channel 71, and requested tug assistance. He then set both CPPs' combinator levers to about 10% ahead to hold the vessel in position. Shortly afterwards, the master made an announcement over the public address system, calmly informing the passengers and crew that the vessel had collided with the berth. During this time a port list developed, which reached a maximum angle of between 6° and 8°. The chief officer contacted the ECR and requested a recording of the vessel's tank soundings. The soundings were subsequently checked at regular intervals by the engineers, although a co-ordinated assessment of the vessel's overall condition did not occur.

In the meantime, other crew members had begun damage control operations. The chief officer remotely opened the ballast tanks' crossover valves to minimise the vessel's list. Other crew members quickly determined that the vessel's hull had been penetrated at several locations, including two holes below the waterline in No 2 BT space and the bulbous bow. The crew were instructed to block the hole in the starboard shell plate of No 2 BT space while ballasting operations reduced the rate of flooding **(Figure 7)** by trimming the vessel by the stern. When it was recognised that the list had not altered, and taking into account the location of the hull penetrations, the chief officer instructed the engineers to close the ballast system crossover valve and return the tanks' contents to their pre-accident condition.

The master's radio call to the VTS was overheard by the crews of several tugs which were operating within Harwich Haven and, by 1300, *Svitzer Intrepid* had arrived and been made fast to *Sirena Seaways*'s starboard quarter. It was followed by four other tugs **(Figure 8)**. The skipper of the tug *Svitzer Stanford* noted that *Sirena Seaways*'s propulsion was still thrusting ahead.

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[7] 1 cable = 185.2m

Reproduced from Admiralty Chart BA 1491-0 by permission of the Controller of HMSO and the UK Hydrographic Office

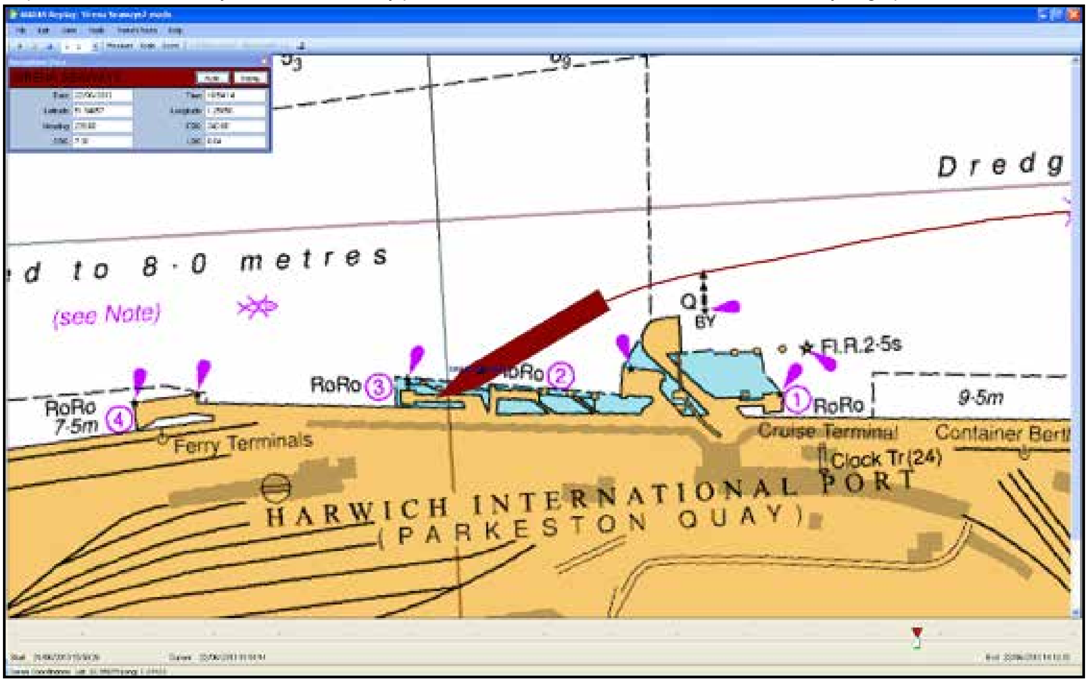

Figure 5: Vessel contact with berth 3

Image courtesy of Chris Vincent

Figure 6: Damage to berth 3

Image courtesy of *Sirena Seaways*

Figure 7: No 2 bow thruster partially submerged

Image courtesy of Richard F. Wage - Marinetraffic.com

Figure 8: Aftermath of contact with berth

Port staff requested *Sirena Seaways*'s master to keep the vessel in position while the damage to the berth and linkspan was assessed. The use of divers to inspect the damage was considered, but dismissed as being too hazardous. It was concluded that little could be done to minimise further damage and *Sirena Seaways*'s master was given approval to move his vessel.

At 1425, *Sirena Seaways*'s master set the starboard CPP combinator lever on the port bridge wing to half astern. After 20 minutes with no discernible movement of the vessel, the master requested *Svitzer Intrepid* to begin pulling, initially at 20% load. At about the same time, the chief officer noticed that the starboard CPP indicator on the port bridge wing was reading about 50% ahead. He informed the master and the engineers in the ECR. The chief engineer immediately stopped the starboard main engine using the emergency stop button on the ECR console. The electrician was then sent to the bridge to investigate the control settings.

Over the following 5 minutes the master, keen to pull the vessel clear of the berth, requested *Svitzer Intrepid* to increase its power from 20% to 100%. *Sirena Seaways* moved astern briefly, which caused the western end of the linkspan to slip off the quay and in to the water, where it sank, leaving the eastern end firmly lodged on *Sirena Seaways*'s bulbous bow. The master then asked *Svitzer Stanford* to also begin pulling at the starboard quarter, but no further movement occurred.

The electrician found that the starboard CPP back-up control button on the bridge centre console was lit **(Figure 2)**. He depressed the button and the light extinguished. He informed the chief engineer, and control of the starboard main engine (SME) was transferred to the ECR. At 1450, the SME was re-started from the ECR and pitch control was tested ahead and astern satisfactorily; control of the SME was then passed back to the bridge.

At 1500, *Sirena Seaways*'s master asked *Svitzer Intrepid* and *Svitzer Stanford* to begin pulling astern at 50%, increasing to 80%, while he set both CPP combinator levers to full astern. Over the next 30 minutes, four tugs assisted with various attempts to pull and twist the vessel free. At 1534, as the linkspan steelwork gradually bent outwards, *Sirena Seaways* eventually came free from No 3 berth.

Sirena Seaways was moved to No 2 berth, and at 1610 the passengers and vehicles commenced disembarking across the stern ramp. At the first opportunity, the police boarded the vessel and breathalysed the master. The result was negative. The following day, *Sirena Seaways* moved across the river to the port of Felixstowe, where temporary repairs were undertaken before the vessel sailed to Bremerhaven for repair **(Figures 9a** and **9b)**.

Senior officers

The master was 58 years old. He had obtained his Master's Unlimited Certificate of Competency (II/2) in 1979, and had worked for DFDS since he became a second officer in 1980. He had worked as master since 1997 on a range of DFDS vessels on several different northern European routes. The master first joined *Sirena Seaways* in March 2012. He had re-joined the vessel most recently on 21 June 2013 in Esbjerg. He held a valid Harwich Haven Authority Pilot Exemption Certificate (PEC); this had been re-validated on several occasions.

The chief officer was 37 years old. He joined DFDS in 2004 and had obtained a combined deck and marine engineering qualification. He gained his Master's Unlimited Certificate of Competency (II/2) in 2009. He had worked on various ships in the DFDS fleet and also held a valid Harwich Haven Authority PEC. He first joined *Sirena Seaways* in 2010 and, prior to the accident, had re-joined the vessel on 19 June 2013.

Figure 9a: Starboard bow damage

Figure 9b: Damage to upper section of bulbous bow

The chief engineer was 63 years old. He had worked with DFDS since his cadetship in 1967 and had been promoted through the engineering ranks on board DFDS vessels both in Europe and the USA. He had also worked ashore in the DFDS UK technical office team in Dover during 2011. The chief engineer had first joined *Sirena Seaways* in February 2013.

All the senior officers worked for 2 weeks on board followed by 2 weeks on leave. They had all attended crew resource management (CRM) training at various times in the past. The company did not have a regime for refreshing the training or for checking its effectiveness.

CPP system

The CPP system comprised a LIPS mechanical and hydraulic system and a Wartsila Wichmatic II electronic propulsion control system. The propulsion control system **(Figure 10)** could be operated from the bridge centre and two wing consoles, and from the ECR console. CPP pitch orders were sent, via the combinator levers and computer, to the CPP hydraulic actuators in the engine room. A feedback signal, measuring the response to the order, was sent back to the computer to ensure matching of the demand and response signals. Indicators at each of the control consoles displayed this information to the operator.

If a computer failure or other electronic system fault occurred, back-up systems for port and starboard pitch controls could be operated from the bridge centre console. The back-ups were stand-alone systems; separate from the emergency pitch controls that were located near the CPP actuators in the engine room. Each back-up control system was activated with a push-button switch and operated with its own joystick lever. The joysticks bypassed the computer system and operated the CPP hydraulic actuators directly **(Figure 10)**. Commands from the back-up control systems overrode those from the combinator levers on all the consoles. When control was changed over to a back-up control system, the CPP pitch remained set at the last input until it was altered by the back-up control joysticks. Separate indicator lamps, to show that back-up control had been selected on the port and starboard CPPs, were fitted on the bridge centre and wing consoles. There were no back-up control joysticks on the bridge wing consoles.

The transfer of pitch control from the bridge centre to a bridge wing console was achieved by operating the ‘manoeuvre change’ button at the wing console **(Figure 4)**. The combinator lever was then adjusted to match the pitch setting on the centre console combinator. Once the two combinator levers were aligned, the computer transferred control and the wing console ‘manoeuvre change’ lamp was lit. This occurred regardless of whether the back-up system was engaged or not, and so could present a false impression that control of the CPP had been passed to the wing console.

Emergency drills to practise the response to a control system failure on *Sirena Seaways*’s CPP system were conducted by using the emergency pitch controls at the hydraulic actuator positions. The section on preventative maintenance in the Wartsila operators’ manual required the back-up system to be tested as part of weekly tests. However, testing of the back-up system was not in *Sirena Seaways*’s Planned Maintenance System (PMS), and the crew, although aware of the back-up mode, had little practical knowledge of its operation.

The brightness of the bridge centre console indicator lamps could be changed for night or daytime operation with the ‘lights-down’ or ‘lights-up’ buttons located on the centre console just above the starboard CPP back-up control button **(Figure 2)**. Several of the buttons on the control consoles were protected from inadvertent operation by hinged covers, but no protective covers were provided for the back-up control buttons.

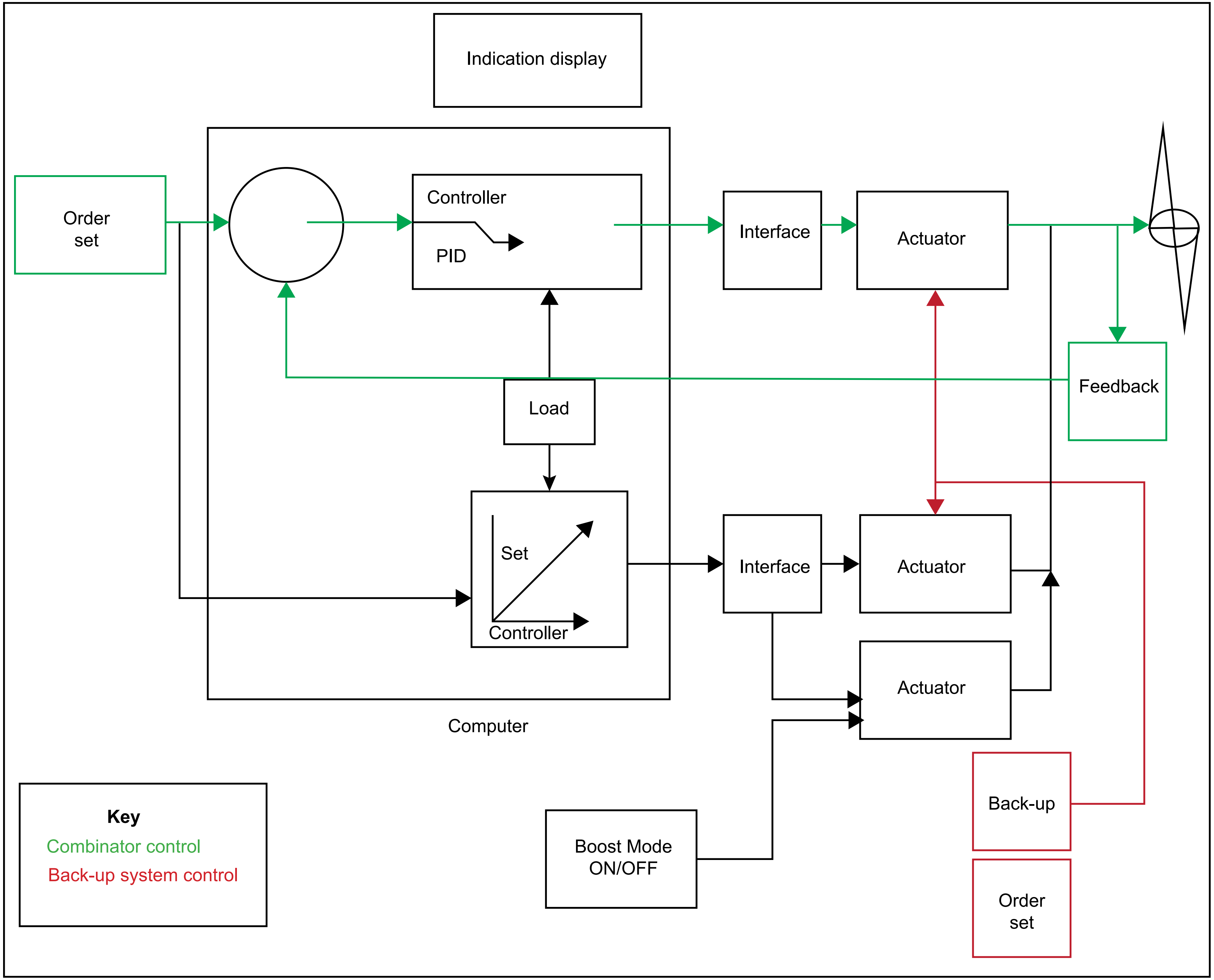

Figure 10: Pitch control system

Bridge control console ergonomics

The layout of the propulsion control consoles had been designed specifically for *Sirena Seaways* and was based on a Wartsila console template dating from 2000, before the vessel was built. The layout gained type approval from RINA[8] on 15 November 2000 and from ABS[9] on 29 January 2001. No similar systems were delivered after the end of 2001.

In 2001, the IMO[10] published SOLAS[11] Amendment 2000. This included a total revision of Chapter V – Safety of Navigation, which became effective in 2002. Regulation 15 - *Principles relating to bridge design, design and arrangement of navigational systems and equipment and bridge procedures*, includes the following requirements:

- .3 enabling the bridge team and the pilot to have convenient and continuous access to essential information which is presented in a clear and unambiguous manner, using standardized symbols and coding systems for controls and displays;
- .4 indicating the operational status of automated functions and integrated components, systems and/or sub-systems;
- .5 allowing for expeditious, continuous and effective information processing and decision-making by the bridge team and the pilot; and
- .7 minimizing the risk of human error and detecting such error if it occurs, through monitoring and alarm systems, in time for the bridge team and the pilot to take appropriate action.

Wartsila's more recent propulsion control consoles have addressed this requirement by introducing multifunction displays with interactive schematic diagrams which show the status of the systems being controlled. The process of transferring control between consoles has also been simplified by having one push-button for transferring all the manoeuvring controls between each of the consoles.

ISM Code and safety management system

The ISM Code[12] requires every shipping company to develop, implement and maintain a safety management system. One of the objectives of this system is for companies to:

> '*assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards*':

The safety management system on board *Sirena Seaways* included plans for shipboard operations in accordance with the ISM Code. The bridge procedures for port arrivals included the requirement for crew to:

> '*Be sure that engine pitch controllers are correctly handed over to the different manoeuvring consoles.*'

The bridge checklist for the Esbjerg to Harwich route included the departure and arrival checks to be carried out by the bridge officers, though these did not include a specific requirement to confirm that the propulsion controls had been transferred correctly.

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[8] Registro Italiano Navale

[9] American Bureau of Shipping

[10] International Maritime Organization

[11] International Convention on Safety of Life at Sea

[12] The International Safety Management Code

Bridge procedures guidance

The Bridge Procedures Guide, published by the International Chamber of Shipping, describes best practice in the safe conduct of navigation. The guidance includes:

1.2.7.2 Coordination and communication

A bridge team which has a plan that is understood and is well briefed, with all members supporting each other, will have good situational awareness. Its members will then be able to anticipate dangerous situations arising and recognise the development of a chain of errors, thus enabling them to take action to break the sequence.

Previous incident and near miss

On 4 December 2008, *Sirena Seaways* entered the port of Esbjerg. The master requested control of the port and starboard CPPs to be transferred to the port bridge wing console and tested that control had been passed. Although both 'manoeuvre change' lights were very dim, the master perceived that they were lit. He reduced pitch on both CPP combinator levers without checking for a corresponding change to be shown on the pitch indicators. When the vessel's speed did not significantly reduce, he set both combinator levers to about 65% astern. He then complained to the chief officer that the vessel was not responding. The chief officer saw that the starboard pitch control had not been transferred successfully and was still at about 45% ahead. The transfer was quickly carried out and 100% astern pitch was set on both CPPs but the vessel's forward momentum could not be halted before its bow hit the dock wall. This resulted in damage to the dock wall, the bulbous bow, and a 1.0m x 0.5m hole at deck 5. Subsequent tests found no faults with the propulsion control system and the cause was attributed to the 'manoeuvre change' lights being too dim. The vessel's electrician later connected an additional white lamp in parallel with the port and starboard "manoeuvre change" indicators to emphasise when control had been passed to the console.

On 19 November 2012, a near-miss report was completed after attempts to alter the propulsion control settings on the centre console were unsuccessful while *Sirena Seaways* was on passage. The problem occurred because the console indicator lights had been dimmed during the night watch and were not brought up to full brightness in daylight. The near-miss report stated that this resulted in reduced manoeuvrability and no clear overview of the console information. The preventative measures included a discussion about the issue with all the deck officers and the introduction of a requirement that the OOW must ensure that the indicators could be read correctly. The near-miss report was sent to the vessel's managers, DFDS A/S, who assessed the preventative measures to be suitable.

Similar accidents

On 27 April 2000, the cross-Channel ro-ro passenger ferry *P&OSL Aquitaine* struck No 7 berth in Calais at 7kts after a loss of control to her port CPP[13]. One hundred and eighty passengers and 29 crew were injured, including 5 with bone fractures and several who were rendered unconscious.

On 10 March 2006, the ro-ro passenger-vehicle ferry *Red Falcon* made heavy contact with the linkspan in Southampton[14]. The two propulsion units had been de-synchronised due to a problem with one main engine, and had not been re-synchronised prior to arrival at the berth. Consequently, one engine was still thrusting ahead. Eleven people were injured. A previous similar accident had occurred to the vessel in 1994.

[13] Report on the investigation of the impact with the quay by passenger ferry ***P&OSL Aquitaine*** at Calais on 27 April 2000. MAIB report No 27/2001

[14] Report on the investigation of ***Red Falcon***'s contact with the linkspan at Town Quay, Southampton, on 10 March 2006. MAIB report No 26/2006.

On 6 February 2010, the ro-ro passenger-vehicle ferry *Isle of Arran* struck the linkspan at Kennacraig, West Loch Tarbert, Kintyre at a speed of over 8kts[15]. The accident occurred after control of the starboard propeller pitch was lost due to a mechanical failure. Contributory to the accident was that the pitch control system was not tested before the vessel was committed to the final approach. There were no injuries to the 14 passengers or 24 crew on board.

ANALYSIS

Control console ergonomics

Sirena Seaways's entry to Harwich port began quite normally. However, a simple unnoticed error meant that the master and OOW on the bridge were not in full command of the vessel's propulsion system.

System records showed that the starboard CPP back-up control button was pressed during the entry into the port. The ship's electrician later deactivated it when he was sent to the bridge while attempts were being made to tow *Sirena Seaways* off the berth. Once activated, the starboard CPP back-up control system bypassed any subsequent attempts to control the starboard CPP with the combinator levers on either the centre or wing consoles. The starboard CPP remained set at its last order, at about 63% ahead.

The starboard CPP back-up control button was positioned closely to the 'lights up' button and it was not fitted with a protective cover. Given the time at which it was activated, it was most likely that it was pressed inadvertently as the brightness of the centre console indicator lamps was increased.

This mistake was partly disguised by the modifications carried out after the accident in Esbjerg in 2008, which were intended to prevent misunderstandings over which console had control of the propulsion systems. However, the new bright white 'in-command' lamp simply affirmed that combinator lever control had been passed between consoles; it did not confirm that the combinator levers actually had control of the CPP, and it was lit regardless of whether the back-up control system was active.

Both the original design and the subsequent modification on the bridge wing consoles provided a false sense of security to the operator. This was made more likely in bright sunlight when it was harder to see the glow of the back-up control lamp on the bridge wing console. The only method of checking CPP control was to monitor the indicators to see that the power output from each shaft corresponded with the order given.

The operation of the back-up control system, and its effect of isolating the combinator levers, was not readily apparent to the crew because the back-up system was never used as part of maintenance tests, in training drills or during genuine CPP control system failures. This was evident from the chief engineer's response to the second engineer's question about the back-up control light on the ECR panel.

With the changes to SOLAS and introduction of improved ergonomic designs in bridge systems, a considerable amount of work has been carried out to reduce the opportunity for human error. The design of the propulsion control consoles installed on *Sirena Seaways* preceded the revised regulation and did not include the more recent improvements in ergonomic design. Nevertheless, the ISM Code requires companies to identify and assess risks on board its vessels. This risk was evident after the accident in Esbjerg in 2008 and the near-miss in 2012. While action was taken after both these events, it focused on the precise circumstances of those events. A more encompassing review of the risks associated with the operation of the control system might still have missed the potential for someone to press the back-up control button inadvertently. However, it ought to have concluded that effectively ignoring the back-up control system - which had great potential to cause a hazard - and tolerating the poor indication that it was active, was an unacceptable risk.

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[15] Report on the investigation of the contact by ***Isle of Arran*** with the linkspan at Kennacraig, West Loch Tarbert, Kintyre, on 6 February 2010. MAIB report No 13/2010

The dangers of complacency in routine operations

The officers and crews of ferries are particularly vulnerable to complacency and historically it has been a common theme in ferry accidents. Active measures must be sought to combat its insidious effects. The UK Chamber of Shipping, in co-operation with the National Maritime Occupational Health and Safety Committee, produced the 'Guidelines to Shipping Companies on Behavioural Safety Systems'. It included the following definition:

> *Complacency - a feeling of calm satisfaction with your own abilities or situation that prevents you from trying harder*

The senior officers had completed the approach to Harwich many times without any accidents or incidents occurring. Although the vessel's speed was higher than the 8kts specified in Harwich Haven Authority's General Directions, due to the challenging wind conditions and ebb tide, the bridge team was experienced and the vessel was operating within its capabilities.

The combination of the regularity and similarity of each voyage, the lack of incidents, and the crew's confidence in the vessel's performance, created the potential for a reduction in safety awareness. However, the crew had insufficient knowledge about the back-up control system and used an arrival checklist which was not robust enough to ensure that thorough checks and tests were conducted. Consequently, the inadvertent error in operating the back-up control button, which resulted in the starboard CPP remaining at about 63% pitch ahead, was not noticed by the bridge officers for nearly 2 hours after the accident.

While the operation of the back-up control system had been noted by the engineers in the ECR 13 minutes before *Sirena Seaways* struck the berth, they did not find out why it was active or check with the bridge team to see if they were having any problems. A readily diagnosable error was effectively ignored.

The misplaced feelings of being comfortable in these circumstances were a consequence of complacency. This was evident in a number of areas, including insufficient attention to:

- checking that the correct buttons on the bridge console had been operated;
- ensuring that the correct indicator lights were lit on the bridge wing console;
- testing the bridge wing combinator levers and checking the pitch feedback indicators and vessel speed;
- monitoring the gauges and indicators to ensure they matched the commands being given;
- repeating and verifying helm and propulsion orders, and cross-checking to ensure that the orders had been correctly applied;
- making sure that the vessel's speed was appropriate; and
- investigating unusual or unexpected indication lamps.

Consequently, the potential to identify the incorrectly operated back-up button was missed by both the bridge and engineering teams, and recognition of the high speed of the final approach was too late to abort the arrival, diagnose the problem and prevent the accident.

Complacency in communications between the teams led to a breakdown in the shared situational awareness of the vessel's propulsion system. Good communications would have ensured that errors were effectively detected and managed. The errors identified indicate that the crew were not working as a cohesive team.

Managing emergencies

The master and senior officers demonstrated a calm response to the emergency. This is a valuable trait; however, it must be based on a clear understanding of the situation. Although senior officers had undertaken CRM training, the principles were not applied effectively. This was evident both from the way the master and chief officer worked together and the extent of communication between the bridge and engineering teams. Discussion between senior deck and engineering officers centred around evaluating the effects of the damage and the most appropriate response. Had they communicated effectively, they should have realised that the starboard CPP was still thrusting ahead and that it would be unwise to attempt to move the vessel until it was confirmed that they had full control of the propulsion system.

Each party had valuable information to impart, but it was not exchanged. Consequently, none of the senior officers appreciated the overall situation until nearly 2 hours after the collision.

Passenger warnings

The passenger announcements were made in a calm, measured way, which helped to reassure the passengers and maintain their co-operation.

The passenger stairwells on *Sirena Seaways* connected the public decks and provided the route back to the vehicle decks. Use of the stairwells was not restricted at any time during the voyage. The passengers had been requested to prepare for disembarkation and many would have been using the stairs at the time of the impact. A similar accident on board *P&OSL Aquitaine* in 2000 led to many passengers being injured as they fell down the stairs. It was likely that the linkspan and associated steelwork at Harwich acted as a 'crumple zone' for *Sirena Seaways*, absorbing the energy of the impact and preventing the sudden deceleration that might otherwise have resulted in significant injuries.

The passengers and the majority of the crew were not given any prior warning of the impending impact. Consequently, there was little or no time for them to sit down, brace themselves against being knocked off their feet or thrown down stairwells, or to move away from glass partitions. It is important, just as the mooring teams were warned to move clear, that the passengers and other crew are given an opportunity to prepare themselves for an unintended impact.

CONCLUSIONS

- The starboard CPP back-up control button was inadvertently operated 28 minutes before the accident, probably while the bridge centre console 'lights-up' button was being pressed.
- The error in operating the back-up button was not noticed by the bridge team prior to the accident.
- The engineers in the ECR noticed the back-up system indicator lamp was lit but did not attempt to clarify with the bridge team why it had been operated.
- The design of the propulsion control indicators on the bridge wing consoles, and the subsequent modification, allowed both the in-command lights and the back-up lights to be lit simultaneously even though the back-up system was in control.
- The glow from the back-up indicator lamp on the bridge wing console was insufficient for it to be noticed by the bridge team.
- The design of the bridge consoles pre-dated changes in SOLAS Chapter V which required improved ergonomics on bridge control systems.
- The pitch indicators on the bridge wing were not monitored to check that the bridge wing console had positive control of the propulsion.
- The bridge team's recognition of the high speed of approach was too late for action to be taken to prevent the collision.
- No warning was given to the passengers and crew (other than the mooring teams) prior to the impact with the linkspan.
- The impact caused multiple hull penetrations, including some below the waterline, and demolished much of the infrastructure at berth 3, Harwich International Port.
- The bridge team did not notice that the starboard CPP remained driving at 63% ahead for about 2 hours after the accident.
- The CPP back-up control system was not routinely used or tested on board, and it was not included in the planned maintenance system.
- There was little discussion between senior deck and engineering officers to evaluate the effects of the damage or agree the most appropriate response to the emergency.
- Complacency in communications between the teams led to a breakdown in the shared situational awareness of the vessel's propulsion system and indicates the crew were not working as a cohesive team.

ACTION TAKEN

DFDS A/S has:

- Carried out an investigation of the accident and circulated the resulting report and recommendations throughout its fleet to share the lessons learned.
- Fitted protective covers to prevent inadvertent operation of the CPP back-up control buttons.
- Ensured that operation of the CPP back-up control system is fully understood by the bridge officers and included its periodic testing in the planned maintenance system.
- Raised awareness within the company of the importance of good bridge procedures and the potential for complacency to develop.
- Ensured that propulsion transfers between control stations are positively cross-checked and pitch control checks are conducted.
- Carried out a review and update of its pre-arrival and pre-departure checklists and procedures.
- Modified the bridge wing console indicator lamps to improve clarity
- Conducted an ISM audit of the vessel.

RECOMMENDATIONS

DFDS A/S is recommended to:

2014/106 Review the need for regular bridge and crew resource management training to ensure that crew maintain vigilance against the potential for a decline in performance when working on repetitive operating patterns.

2014/107 Consider ways in which passengers and crew can be rapidly informed about an impending accident to minimise the potential for injuries.

Safety recommendations shall in no case create a presumption of blame or liability

SHIP PARTICULARS

Vessel's name	*Sirena Seaways*
Flag	Denmark
Classification society	ABS
IMO number	9212163
Type	ROPAX
Registered owner	DFDS A/S
Manager(s)	DFDS A/S
Year of build	2002
Construction	Steel
Length overall	199.4m
Registered length	Not applicable
Gross tonnage	22382
Minimum safe manning	Not applicable
Authorised cargo	Passengers and vehicles

VOYAGE PARTICULARS

Port of departure	Esbjerg
Port of arrival	Harwich
Type of voyage	Short international
Cargo information	431 passengers
Manning	58

MARINE CASUALTY INFORMATION

Date and time	22 June 2013 1254 (UTC+2)
Type of marine casualty or incident	Serious Marine Casualty
Location of incident	Harwich International Port
Place on board	Not applicable
Injuries/fatalities	None
Damage/environmental impact	Widespread fore-end damage to the vessel including penetrations above and below the waterline. Number 3 berth linkspan demolished, along with damage to several mooring towers, walkways and the concrete berth. No pollution.
Ship operation	On passage
Voyage segment	Arrival
External & internal environment	Wind: south-west Beaufort 7
Persons on board	489