ACCIDENT REPORT

Combined report on the investigation of the contact with a floating target by the wind farm passenger transfer catamaran

Windcat 9

while transiting Donna Nook Air Weapons Range in the south-west approaches to the River Humber on 21 November 2012

and

the investigation of the contact of

Island Panther

with turbine I-6, in Sheringham Shoal Wind Farm on 21 November 2012

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SERIOUS/LESS SERIOUS MARINE CASUALTY REPORT NO 23/2013 NOVEMBER 2013

Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2012 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 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 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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Windcat 9 cover image courtesy of Windcat Workboats Limited

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GLOSSARY OF ABBREVIATIONS, ACRONYMS AND TERMS

<	-	less than
ABP	-	Associated British Ports
AIS	-	Automatic Identification System
ALB	-	All Weather Lifeboat
BV	-	Besloten Vennootschap
C	-	Celsius
CCTV	-	Closed Circuit Television
CEC	-	Certificate of Equivalent Competency
CoC	-	Certificate of Competency
COG	-	Course Over the Ground
COLREGS	-	International Regulations for Preventing Collisions At Sea, 1972 (as amended)
CREL	-	Centrica Renewable Energy Division Limited
DNAWR	-	Donna Nook Air Weapons Range
DoC	-	Document of Compliance
DPA	-	Designated Person Ashore
DSC	-	Digital Selective Calling
DTE	-	Defence Training Estate
ENG 1	-	Engineer and Navigational Grade 1 (medical fitness certificate)
EPIRB	-	Emergency Position Indicating Radio Beacon
EU	-	European Union
GMDSS	-	Global Maritime Distress and Safety System
GPS	-	Global Positioning System
gt	-	gross tonnage
GW	-	gigawatt
HSE	-	Health, Safety and the Environment

ID	-	Identification
ILB	-	Inshore Lifeboat
IMCA	-	International Marine Contractors Association
ISM	-	International Safety Management (Code)
kg	-	kilogram
kHz	-	kiloHertz
km	-	kilometre
kt	-	knot
LID	-	Lynn and Inner Dowsing
LY2	-	The Large Commercial Yacht Code
m	-	metre
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MRCC	-	Maritime Rescue Co-ordination Centre
MSN	-	Merchant Shipping Notice
MW	-	megawatt
NATO	-	North Atlantic Treaty Organization
nm	-	nautical mile
NTM	-	Notice to Mariners
NWA	-	National Workboat Association
O&M	-	Operation and Maintenance
OREI	-	Offshore Renewable Energy Installations
PTU	-	Personnel Tracking Unit
PTV	-	Passenger Transfer Vessel
QHSE	-	Quality, Health and Safety, and Environment
RISE	-	Renewable Industry Safety Exchange
RNLI	-	Royal National Lifeboat Institution

RUK	-	RenewableUK
RWE	-	Rheinisch West-Falisches Elektrizitatswerk
RYA	-	Royal Yachting Association
s	-	second
SCV Code	-	Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards (MGN 280 (m))
SESRED	-	Siemens Energy Sector Renewable Energy Division
SFIA	-	Sea Fish Industry Authority
SMM	-	Safety Management Manual
SMS	-	Safety Management System
SOG	-	Speed Over the Ground
SOLAS	-	International Convention for the Safety of Life at Sea 1974, as amended
SSWF	-	Sheringham Shoal Wind Farm
STCW	-	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW Convention)
T	-	True
t	-	tonne
T&A	-	Training and Assessment
TBRA	-	Task-Based Risk Assessment
UKHO	-	United Kingdom Hydrographic Office
UTC	-	Universal Time Co-ordinated
VHF	-	Very High Frequency
VPF	-	Voyage Planning Form
VTS	-	Vessel Traffic Services
WCS	-	Windcat Crewing Services BV
WWL	-	Windcat Workboats Limited

TIMES: All times used in this report are UTC unless otherwise stated[1]

[1] Time variations were noted in the range of electronic evidence collected in the course of the *Windcat 9* safety investigation. To provide a common datum, timings from AIS data are used.

TERMS:

Besloten Vennootschap	–	Dutch legal term associated with company liability and the equivalent to the English “Limited”.
Cross-decking	–	personnel transfer ship-to-ship.
Monopile	–	the section of the wind turbine tower which is driven into the seabed to support the transition piece to which the main tower is attached.

FOREWORD BY THE CHIEF INSPECTOR OF MARINE ACCIDENTS

The offshore renewable energy sector has seen rapid growth in recent years. It is predicted to grow further, with new wind farms being built further offshore.

There are currently around 400 workboats operating in support of the offshore renewable energy sector. Many of these are high-speed craft which are used to transfer technicians and other personnel to and from the shore and around the various sites offshore. The crews that man these vessels are often recruited from the fishing or leisure industries. The skills needed to operate small high-speed craft safely are subtly different from those needed when operating in the fishing or leisure sectors and the skills gap is likely to grow as the renewable energy industry moves even further offshore in the future. As such, there is a clear potential for a rise in the number and severity of accidents unless action is taken to ensure that vessels' crews have the necessary competencies needed to operate their craft safely.

The two accidents featured in this report occurred on the same day but in different circumstances. However, they share many common safety issues especially with respect to the standard of watchkeeping observed by the crews of both vessels. In particular, the MAIB's investigations have highlighted a need for robust crew recruitment, training and assessment procedures to ensure the supply of mariners with the right skills. Flexible but rigorous watchkeeping practices are necessary together with recognition by the industry and regulator that the reliance on paper charts to navigate high-speed passenger transfer vessels is impractical and does not reflect the current custom of the trade.

Perhaps the most noteworthy outcomes of the two investigations is the conclusion that there is a compelling need for the burgeoning offshore renewable energy industry to produce a comprehensive best practice guide for operators of workboats and to develop an effective means for promulgating safety lessons across the industry. Recommendations have been made to industry stakeholders to progress these two aims in a collaborative way.

There is an opportunity for the offshore renewable energy industry to establish, at an early stage of its development, a shared safety culture which, if the opportunity is taken, will undoubtedly prevent accidents and save lives in the future.

Steve Clinch
Chief Inspector of Marine Accidents

PREFACE

Overview of the United Kingdom's offshore wind farm power generation development

Offshore wind power generation has a number of benefits consistent with the UK's main energy policy objectives. It improves energy security and helps to de-carbonise energy generation. Offshore wind power generation has also been identified as being one of the technologies that has the greatest potential to help the UK meet its obligations under the European Union's (EU) Renewable Energy Directive to take 15% of its energy consumption from renewable energy sources by 2020. Beyond 2020, the UK Government is committed to reducing greenhouse emissions by at least 80% by 2050 (relative to 1990 levels).

The UK leads the world in offshore wind installed capacity. Data from The European Wind Energy Association showed that at the end of 2012 the UK had the largest amount of installed offshore wind capacity in Europe (2.95 gigawatts (GW) representing 58.9% of the total). The July 2011 UK Renewable Energy Roadmap, updated in December 2012, identified that up to 18GW could be generated by 2020 with the potential of generating over 40GW of power by 2030.

Development of wind power offshore requires 'landowner' rights from The Crown Estate and separate statutory planning permission. Over the last few years, there have been changes to responsibilities for granting planning permissions for offshore wind projects. All renewable energy developments take place within a formal planning procedure. In England and Wales, offshore wind projects of over 100MW are identified as nationally significant infrastructure projects under the Planning Act, 2008 (as amended by the Localism Act, 2011). In Scottish waters, offshore wind farms are consented by Marine Scotland.

Landowner rights are granted by The Crown Estate through competitive leasing rounds, and generally comprise two linked agreements. The first agreement is an option to carry out site survey work over a development site, which is needed to design the project and to support submissions for statutory planning applications. Subject to a number of criteria, including obtaining planning permissions, the developer may exercise a Lease, which allows it to build and operate the wind project, subject to the planning permissions and other statutory consents. More recent leasing rounds (known as Round 3 and the Northern Irish Round) have granted an overarching zone development agreement that covers a large area within which the developer may apply for options to develop several smaller wind farms.

At the beginning of 2013 there was 1.5GW of offshore wind generating capacity in construction; and 2GW that had obtained planning consents. This operational capacity is mainly from earlier Round 1 and Round 2 leasing rounds that were started in 2001 and 2003 respectively. Leasing rounds carried out more recently by The Crown Estate, including the large Round 3 zones, are targeted at delivering further capacity.

Report on the investigation of the contact

with a floating target by the wind farm passenger transfer catamaran

WINDCAT 9

while transiting Donna Nook Air Weapons Range in the

south-west approaches to the River Humber

on

21 November 2012

SYNOPSIS

Just after 1712 on 21 November 2012, the wind farm passenger transfer catamaran *Windcat 9* made contact with a floating target in Donna Nook Air Weapons Range while on passage to Grimsby. The port hull was holed, causing extensive flooding, but there were no injuries.

At 1620, *Windcat 9* left Lynn and Inner Dowsing Wind Farm, situated 2.7 nautical miles off Skegness. On board were two crew (master and a deckhand), a supernumerary (trainee master) and 12 wind farm technicians. The vessel was on autopilot and the master was following a reciprocal course on his chart plotter to that of his outbound passage. At about 1650, the master was demonstrating to the trainee master how to adjust the plotter's range. In doing so he inadvertently moved the route, which took the vessel to within 0.75 cable of an unlit floating target.

The master, believing he was still on his reciprocal route, then applied port helm to get ahead of *Fastnet Tern,* another vessel returning to Grimsby. A short time later, he made another course correction, this time to starboard after he belatedly realised he was significantly to the west of the planned track. About 30 seconds later, while proceeding at 23.5 knots, *Windcat 9*'s port hull made contact with the target. Following the master's distress alert radio transmission, a number of vessels came to his aid. Soon afterwards, the passengers and crew were transferred to *Fastnet Tern.*

The investigation found that the master did not hold the correct qualifications and that navigation practices, including passage planning and monitoring, use of lookouts and knowledge of the navigation equipment were weak. In addition, the company's crew assessment procedures were not followed and the master had not been formally assessed to determine his suitability for his role. It was also noted that best practice guidance for managers and crew of offshore renewable energy passenger transfer vessels was limited and disparate, and there was no integrated method of promulgating lessons learned to the industry.

Windcat Workboats Limited has been recommended to review and amend its:

- Recruitment and qualifications check procedures.
- Procedures for the initial and continuation assessments of masters and crew and to determine standards for its assessors.
- Navigation instructions and to take measures to improve its crews' knowledge of navigation practices and the use of electronic navigational aids.

The National Workboat Association and International Marine Contractors Association, in collaboration with other industry bodies, has been recommended to:

- Further develop and expand its "Best Practice" guidance for crews of offshore renewable energy passenger transfer vessels to include guidance for owners/ managers.
- Advise the offshore renewable energy industry of its procedures for promulgating industry-related marine safety lessons to ensure these receive the widest possible distribution.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *WINDCAT 9* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Windcat 9*
Flag and Port of Registry	United Kingdom - Fleetwood
Classification society	Not applicable
MCA's Certifying Authority	MECAL Limited
Official number	914328
Type	Commercial vessel (catamaran)
Registered owner	Windcat Workboats BV
Manager	Windcat Workboats Limited
Construction	Aluminium
Length overall	17.25m
Breadth	6.1m
Gross tonnage	31.12
Minimum safe manning	2 – master and deckhand
Authorised cargo	4000kg – on strengthened deck
VOYAGE PARTICULARS	
Port of departure	Lynn and Inner Dowsing Wind Farm
Port of arrival	Grimsby
Type of voyage	Coastal
Cargo information	Not applicable at time of the accident
Manning	3 – master, trainee master and deckhand
MARINE CASUALTY INFORMATION	
Date and time	21 November 2012 at 1712
Type of marine casualty or incident	Serious marine casualty
Location of incident	53º 28.69'N 000º13.04'E in Donna Nook Air Weapons Range
Place on board	Not applicable
Injuries/fatalities	None
Damage/environmental impact	Port hull holed, forepeak, accommodation space and engine room flooded. No environmental impact.
Ship operation	On passage
Voyage segment	Mid-water

MARINE CASUALTY INFORMATION CONTINUED	
External environment	Dark, north-westerly force 5 winds, intermittent heavy showers, visibility approximately 2-4 miles, tide setting north at 1kt, 1-1.5m swell, sea temperature 9.0ºC.
Persons on board	2 crew, 1 supernumerary and 12 wind farm technicians

Courtesy of Windcat Workboats Limited

Windcat 9

1.2 BACKGROUND - LYNN AND INNER DOWSING WIND FARM

1.2.1 Development and operation

The Lynn and Inner Dowsing (LID) offshore, adjacent wind farm sites each comprise 27 wind turbines and are located 2.7 nautical miles (nm) off Skegness on the Lincolnshire coast. Glid Wind Farms Topco Limited, which is a joint venture between Centrica Renewable Energy Division Ltd (CREL) and the private equity firm, EIG Global Energy Partners, owns both sites.

Siemens Wind Power constructed LID Wind Farm, which became fully operational in March 2009. The combined installed generating capacity of 194MW is supplied to CREL's British Gas operations and is sufficient to meet the equivalent electrical power demands of 130,000 homes.

Siemens Energy Sector Renewable Energy Division (SESRED) was contracted to maintain the sites for the first 5 years of their operation, under the overall operation and maintenance (O&M) oversight provided by CREL.

1.2.2 CREL control room functions

CREL operated a marine operations control room (hereafter referred to as "control room"), whose primary function was to co-ordinate marine-related activities, predominantly within LID Wind Farm. The control room was constantly manned by a team of experienced marine co-ordinators and was located at Grimsby Fish Dock. The control room housed a comprehensive suite of Automatic Identification System (AIS) displays, communications equipment and a VisSim manpower accounting system[2]. The VisSim system could be configured to trigger an alarm if vessels entered a restricted area, whereupon the marine co-ordinator could advise the vessel of the approaching hazard. This was particularly useful during construction, when multiple operations occurred simultaneously.

The marine co-ordinator had the authority to call a "weather day", requiring vessels to return or to prevent them from sailing if the prevailing or forecasted weather conditions merited this[3].

1.2.3 Operation and maintenance

SESRED contracted Windcat Workboats Ltd (WWL) to provide two vessels to transfer personnel and stores in support of its O&M programme. *Windcat 9* and its sister vessel *Windcat 10* were on contract at the time of the accident. A third vessel was supplied by Windpower Support Ltd of Grimsby and was used as a back-up vessel for transporting visitors and for transferring tools and equipment to LID Wind Farm.

1.3 BACKGROUND - DONNA NOOK AIR WEAPONS RANGE

1.3.1 Range configuration and transit arrangements

Donna Nook Air Weapons Range (DNAWR) is owned, operated and maintained by the Ministry of Defence, Defence Training Estate (DTE). The range comprises a number of drying targets and a single floating raft target known as Target 3. The range is used by UK and Nato air forces for practice bombing, rocketry and gunnery. Ground forces also use the range for gunnery and mortar practice.

The sea extension of the range is approximately rectangular. The north-south and east-west boundaries are approximately 3.25nm and 6.0nm respectively. The northern limit of the range is marked by 3 buoys identified from west to east as DZ1, 2 and 3. The southern limit of the range is marked by 3 buoys identified from east to west as DZ4, 5 and 6. Each buoy is lit by a flashing yellow light, each flashing at a different interval **(Figure 1)**. The range of DZ1 to DZ5 lights is 4 nautical miles; the range of DZ6 light is 3 nautical miles.

On 8 January 2013, Trinity House carried out a routine survey of the buoys and found them to be in good condition and in their "as charted" positions. No defects had been reported between the accident date and the date of the survey.

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[2] VisSim is a trade name for the manpower accounting system. Crew and technicians swiped their individual cards through the Personnel Tracking Unit on joining and leaving vessels. The location of each person was displayed at the control room using AIS connectivity.

[3] The main criterion for calling a "weather day" was a significant wave height of at least 1.5m or 1.8m dependent upon vessel type.

Reproduced from Admiralty Chart BA 107 by permission of the Controller of HMSO and the UK Hydrographic Office

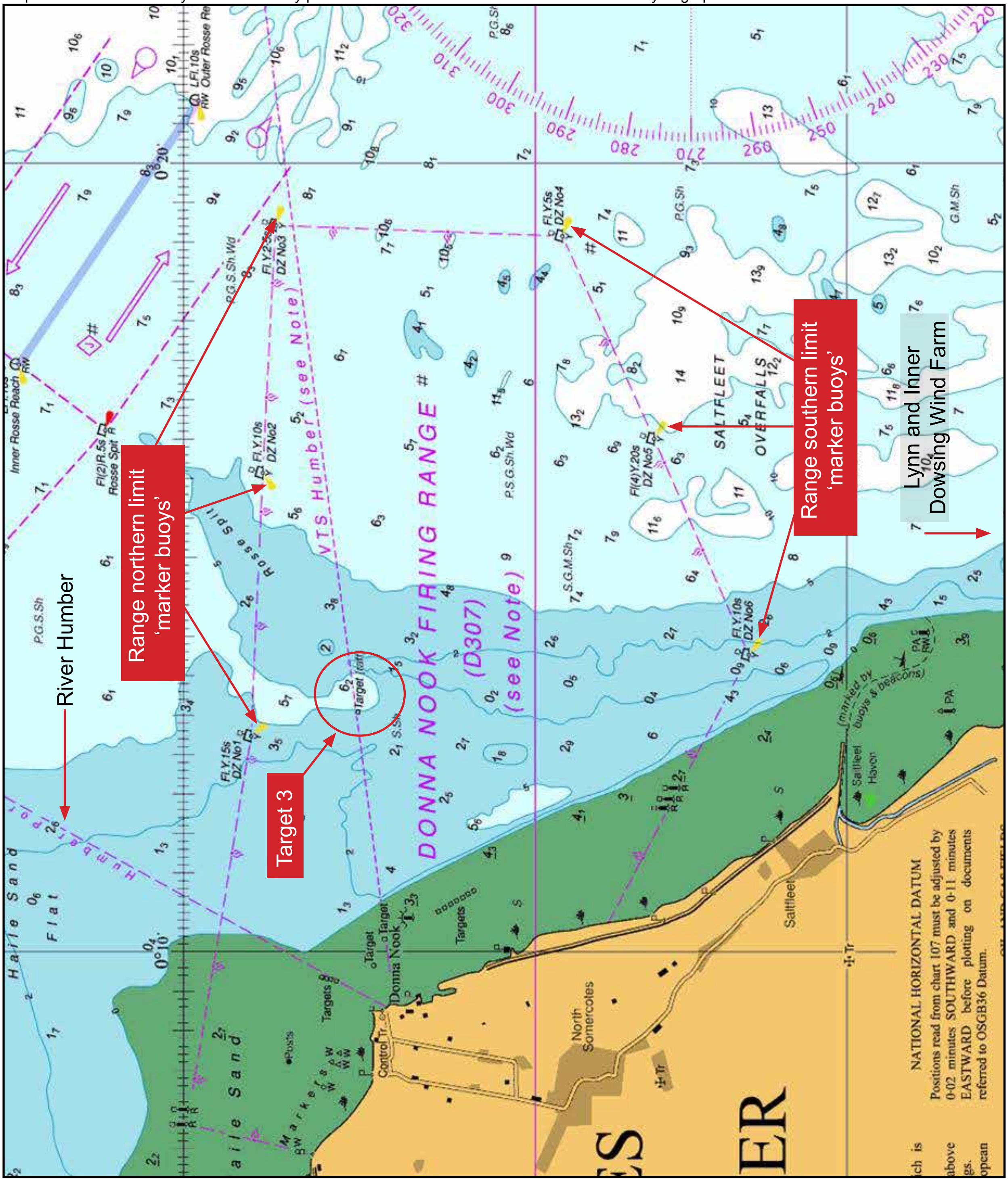


Figure 1: Chartlet showing features of Donna Nook Air Weapons Range

There were no restrictions on the right to transit the range. However, there was a need to exercise caution when red flags or red lights were displayed indicating the range was in use. It was established practice to contact the DNAWR control tower by very high frequency (VHF) radio, channel 16, before entering the range to confirm that it was safe to transit. Further transit advice was provided in the “Donna Nook Firing Range” notes on Admiralty chart 107 (Edition 11) – Approaches to the River Humber **(Annex A)**, which was the chart in use on board *Windcat 9* at the time of the accident. The target was also referred to in Section 7.9 of Admiralty Sailing Directions, NP 54, North Sea (West) Pilot.

1.3.2 Target 3

Target 3 was used as a bombing target and was positioned at 53º 28.69’N 000º13.04’E, approximately 2.25nm offshore. The foam-filled, 9m x 3m x 1.5m steel raft structure was painted “day-glo” orange and was secured to the seabed by a two-point swivel mooring. It was fitted with a large trapezoidal radar reflector; the uppermost point was 2.3m above the top of the raft’s base. A schematic of the target is at **Figure 2**.

1.4 NARRATIVE

1.4.1 Grimsby Fish Dock to LID Wind Farm

At 0600 on 21 November 2012, *Windcat 9*’s master, deckhand and a trainee master, who was on his first day of familiarisation training, arrived at Grimsby Fish Dock. As they boarded the vessel, they swiped their VisSim cards through the Personnel Tracking Unit (PTU) to record their location. Pre-departure checks were carried out in accordance with the appropriate checklist. No machinery or navigation equipment defects were identified.

The Simrad GB60 chart plotter was switched on and the five-waypoint, 31.5nm historical route, originally entered on 27 May 2012, from Grimsby Fish Dock to LID Wind Farm **(Figure 3)**[4] was selected. No passage plan checks were made to confirm the plotter’s waypoints. The radar display was set north-up on a range scale of 1.5nm.

At about 0645, *Windcat 9* proceeded to the Siemen’s Pontoon in the fish dock, where the master was provided with the names and contact details of the technicians to be transported, and the day’s schedule. Twelve SESRED wind farm maintenance technicians embarked and swiped their cards through the PTU. Their kit and stores were secured and the deckhand played the safety equipment and emergency procedures instructional video for the technicians on the passenger cabin television screens.

At 0720, the master contacted the control room on CREL’s private VHF radio channel, P1, and advised that the vessel had left the lock with 12 passengers and 3 crew on board. Soon afterwards, he notified Vessel Traffic Services (VTS) Humber of the vessel’s departure and of the crew and passenger numbers.

[4] The image shows a modified version of the stored route – it was not possible to recover the actual route for departure because it was later altered.

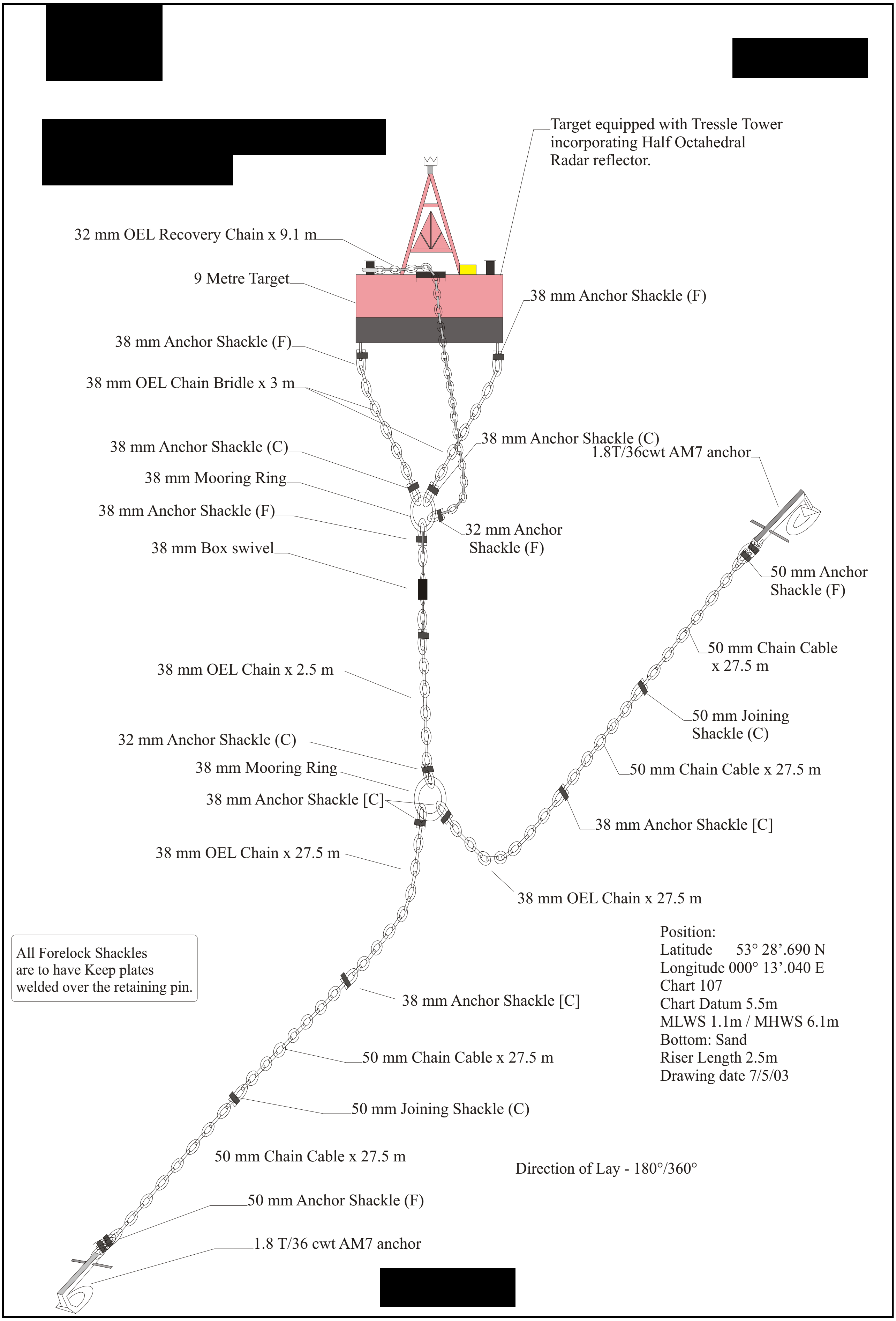


Image courtesy of Serco Marine Services

Figure 2: Donna Nook Air Weapons Range - Target 3

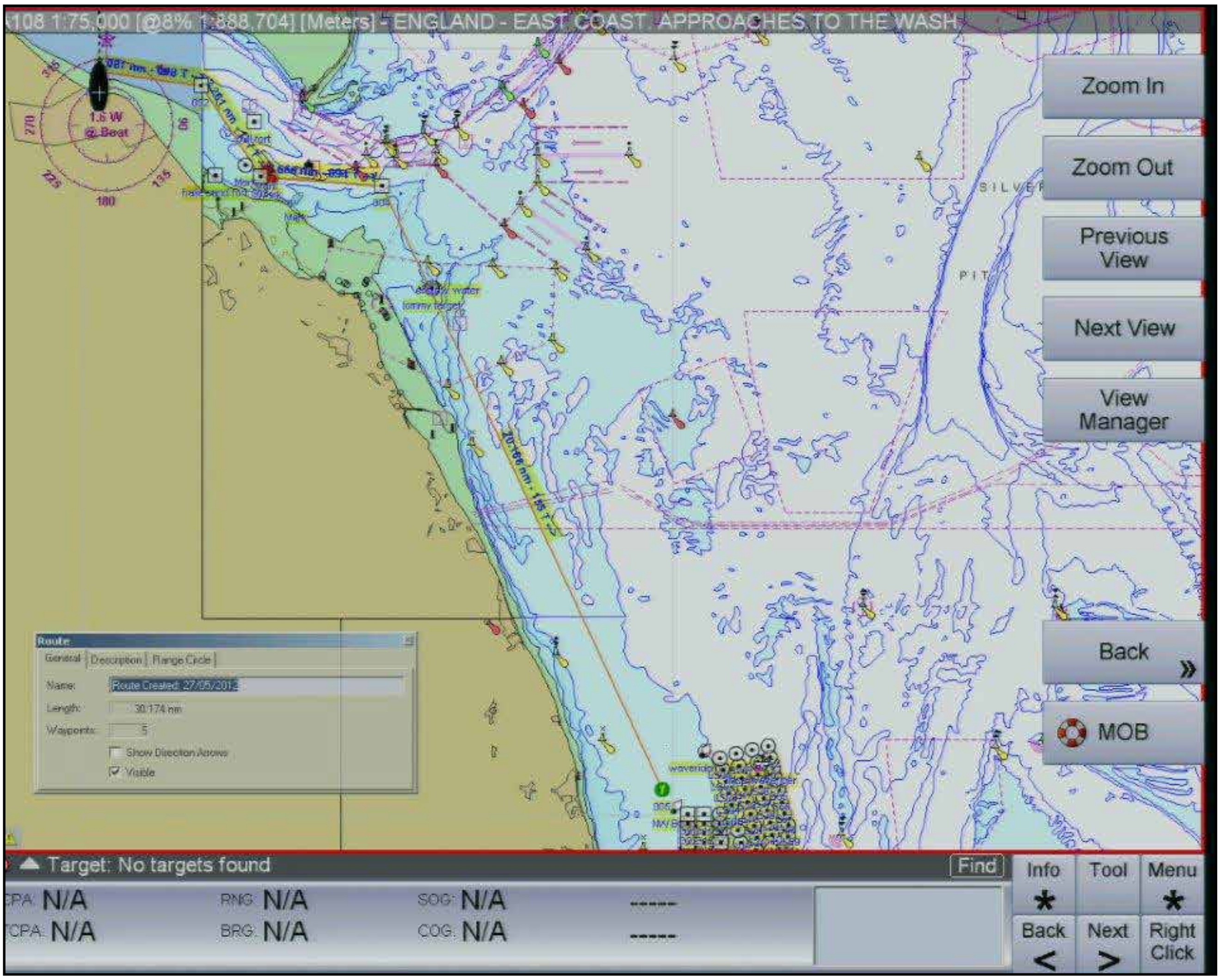


Figure 3: Modified version of chart plotter route to Lynn and Inner Dowsing Wind Farm planned on 27 May 2012

At 0745, *Windcat 9* passed Tetney Monobuoy and then approached DNAWR. The master monitored the vessel's position using the chart plotter and adjusted the radar sea and rain clutter settings to optimise the radar display. He attempted to contact the DNAWR control tower for approval to transit the range, but received no response[5]. At 0758, *Windcat 9* entered the range leaving DZ1 buoy about 0.5nm to starboard **(Figure 4)** in accordance with his normal practice.

At 0840, the master once again contacted the control room to advise that *Windcat 9* had entered LID Wind Farm. This report was required by the CREL Marine Co-ordinator's Brief to Transfer Vessel Masters instructions.

Throughout the day, technicians were transferred to and from the wind farm towers. During periods of inactivity, the master briefed the trainee master on emergency drill procedures, boat-handling and vessel documentation.

[5] There was no response from the range control tower as it was unmanned. None of the range's red flags or red lights were showing indicating that the range was not in use, therefore the master deemed it safe to transit in accordance with the range convention. See Section 1.3.1.

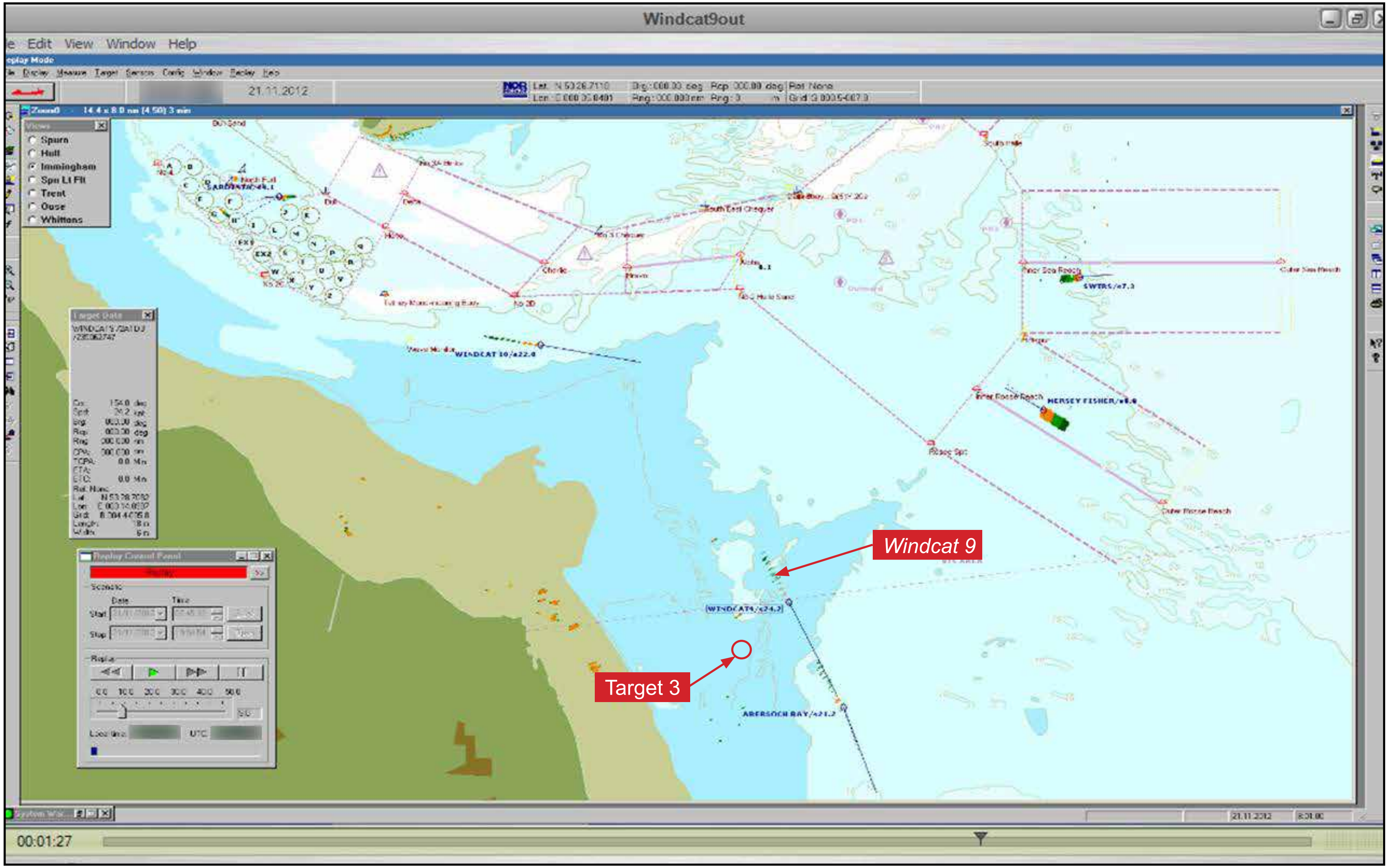


Figure 4: ABP Humber River Services radar recording - 21 November 2012

1.4.2 Events leading up to the contact

At 1620, the master notified the control room on VHF radio channel P1 that all technicians were on board and that *Windcat 9* was returning to Grimsby. The control room watchkeeper checked that all expected personnel were accounted for by viewing the control room's PTU display.

The master set a course of 340º (T) on the autopilot and a speed of about 20 knots for the passage back to Grimsby. As the technicians relaxed in the passenger cabin, the deckhand sat on a bench at the port side of the wheelhouse and the trainee master positioned himself at the starboard side of the wheelhouse. The chart plotter was set north-up and the master followed a reciprocal route to that of his outbound passage, adjusting the autopilot setting as necessary. The radar was also set north-up, on the 1.5nm range scale, and the sea and rain clutter were re-adjusted to deal with the steadily worsening weather and sea conditions. In accordance with his normal practice, the master used the chart plotter to navigate the vessel, referring occasionally to the radar display. He gave no instructions to the deckhand regarding any specific lookout requirements.

At about 1650, the master briefly demonstrated to the trainee master how to change the plotter's chart scale by using the tracker ball control. At that time the trainee master had positioned himself at the port side of the wheelhouse console adjacent to the radar display.

At 1654 the vessel's speed was 23 knots. At about 1700, the master attempted to contact the DNAWR control tower on VHF radio channel 16 for permission to enter the southern boundary of the range. In common with the morning's events, there was no response and *Windcat 9* entered the range.

The master continued to follow the chart plotter route towards waypoint 4. He did not notice that the route now passed through Target 3's 0.227nm radius guard zone, identified as "Tommy Target" on the chart plotter display, and within 0.75 cable of Target 3 **(Figure 5)**.

The master occasionally looked out of the wheelhouse window but did not refer to any specific visual references. He noticed on the chart plotter's AIS display that *Fastnet Tern,* another wind farm passenger transfer vessel, was about 0.75nm off *Windcat 9'*s starboard bow and proceeding towards Grimsby at 20 knots **(Figure 6)**. The master, believing *Windcat 9* was still on the planned reciprocal outbound route, decided he had enough sea room to cut the corner of the planned track to get ahead of *Fastnet Tern* for the passage up the River Humber towards Grimsby. He duly altered course to port by adjusting the autopilot setting. At 1709, AIS recorded *Windcat 9'*s speed over the ground (SOG) as 23.8 knots with its position 1.1nm from the target and 1.9nm from DZ1 buoy **(Figure 7)**. The master had not identified an echo from Target 3 on his radar display at this time.

Meanwhile, *Fastnet Tern*'s master noted that *Windcat 9*'s projected course would take it very close to Target 3. Believing *Windcat 9*'s master would alter course to avoid it, he gave no warning to him of the potential danger.

Windcat 9 continued on its course for a short time until the master glanced at the radar display and noted a radar echo from DZ1 buoy; he had still not identified a radar echo from Target 3. It quickly became apparent to him that *Windcat 9* was

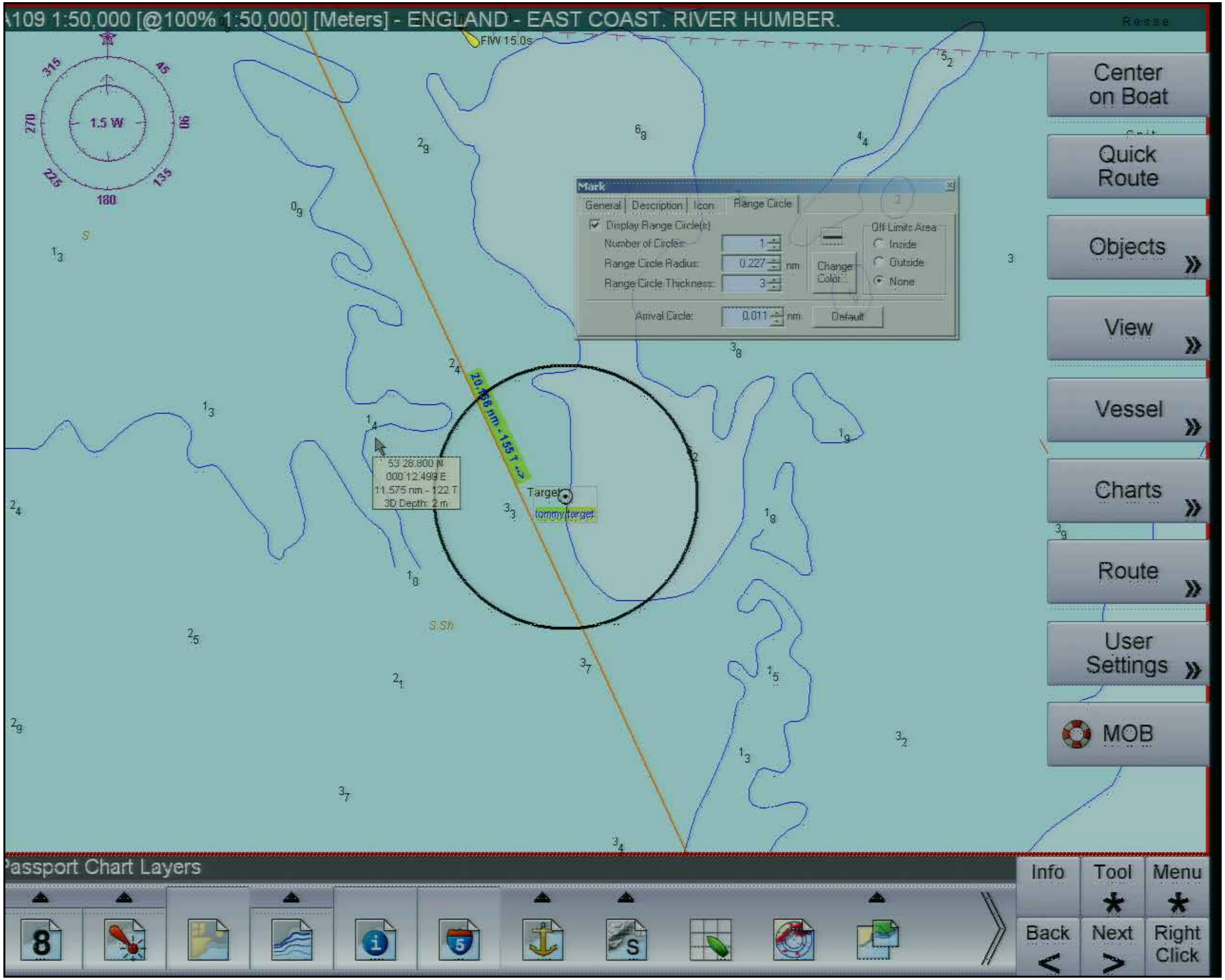


Figure 5: Route passing through “Tommy Target” guard zone

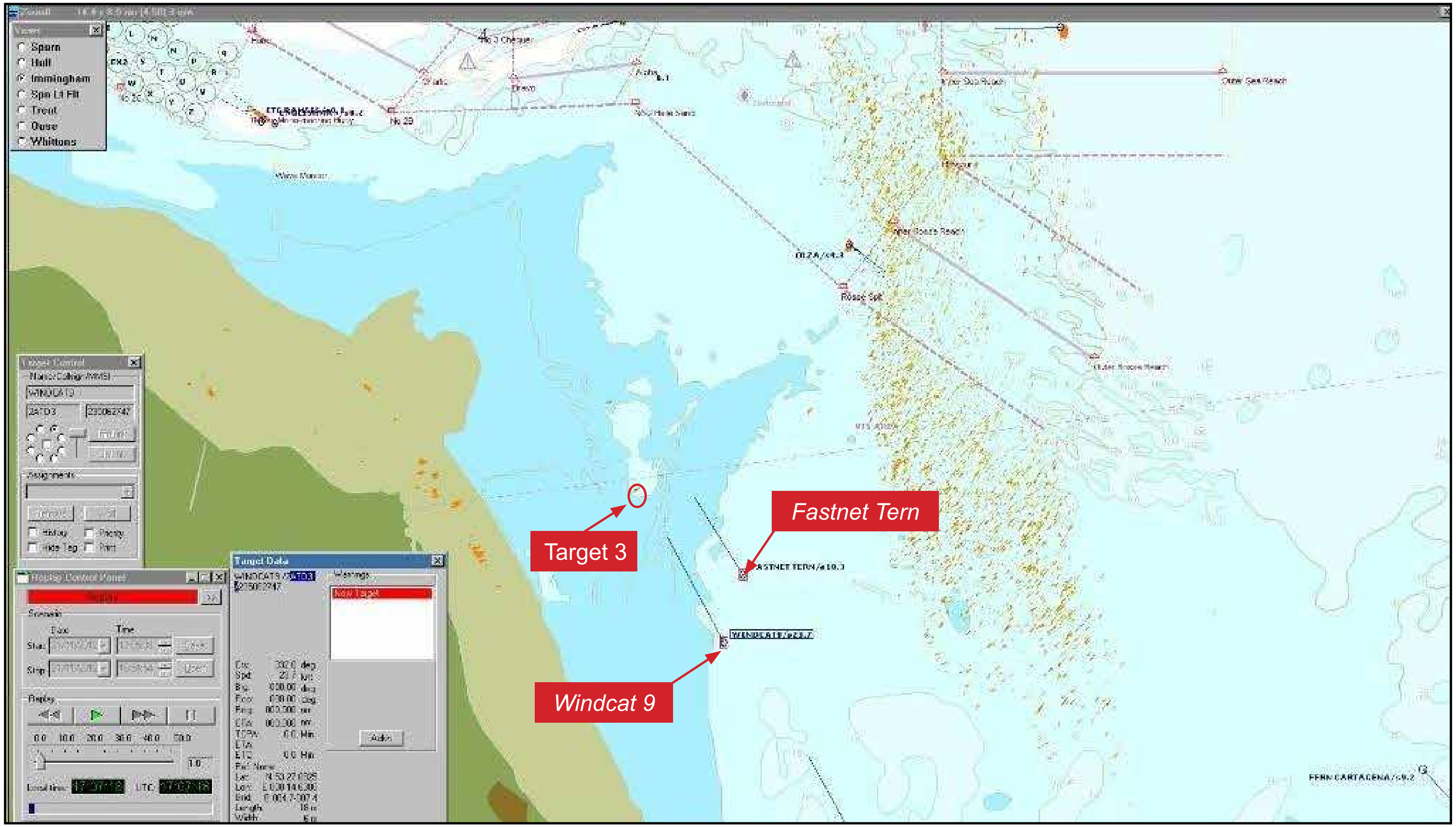


Figure 6: ABP Humber River Services radar recording - 21 November 2012 showing proximity of *Fastnet Tern* to *Windcat 9*

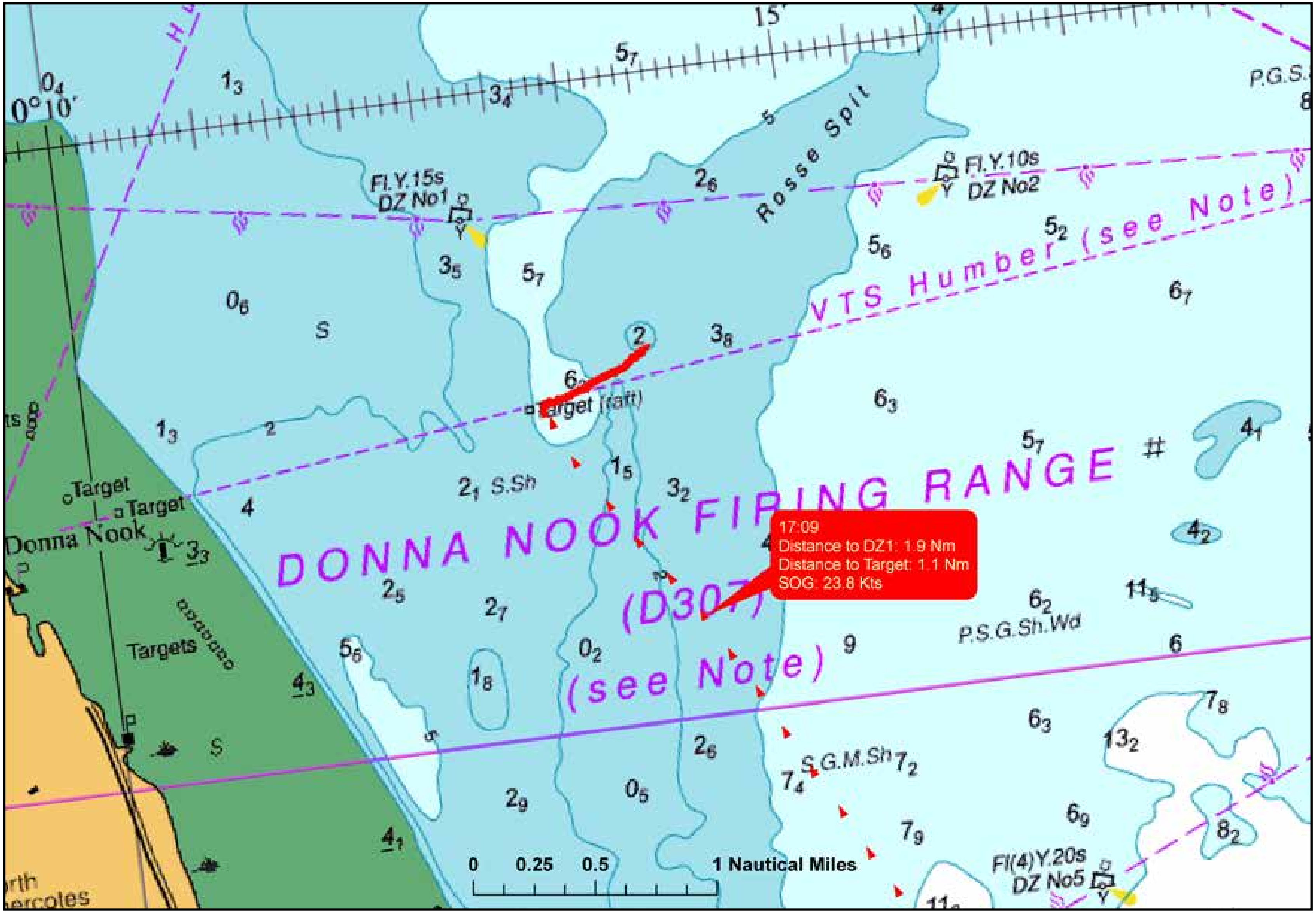


Figure 7: *Windcat 9*'s AIS track showing distances to DZ1 buoy and to Target 3 at 1709

significantly to the west of the planned reciprocal track. The master then looked through the wheelhouse window and, noting that the flashing yellow light of DZ1 buoy was fine on the starboard bow, realised that had *Windcat 9* been on the correct planned reciprocal track, the buoy should have been off the port bow. At 1711:14, *Windcat 9* was 1nm from DZ1 buoy and 445m from Target 3. Unsure of *Windcat 9*'s true position, the master opted to turn the vessel to starboard and head between DZ1 and DZ2 buoys.

By 1711:45, the master had applied starboard helm and *Windcat 9*'s SOG was 22.6 knots **(Figure 8)**.

At 1712:15 seconds, *Windcat 9*'s port hull made contact with Target 3. The vessel forced the target down into the water as she rode over it. There was very little vessel motion due to the impact although a number of the technicians were jolted from their seats **(Figure 9)**.

1.4.3 Post-contact phase

Immediately after the impact, the master disengaged the port and starboard engines from their gearboxes and stopped both engines as the port hull forepeak, accommodation space and engine room bilge alarms sounded.

The trainee master transmitted a VHF radio Digital Selective Calling (DSC) distress alert before going to check the integrity of the starboard hull compartments. In the meantime, the deckhand instructed the technicians to don their lifejackets and to remain calm and seated, before going to check the port engine room.

Fastnet Tern's master heard the alert and immediately altered course towards *Windcat 9*, arriving alongside it at 1716. He used *Fastnet Tern*'s searchlight to illuminate the deck of *Windcat 9*, which by now had adopted a 12-15º list to port. Soon afterwards, *Windcat 10* arrived and stood off ready to provide support, and its master notified WWL's Designated Person Ashore (DPA) of the situation.

Meanwhile, the technicians on board *Windcat 9* donned their survival suits as instructed by the master and moved onto the deck. The liferaft was prepared for deployment and the technicians took it in turns to operate the deck-mounted manual bilge pumps in an attempt to pump out the flooded compartments of the port hull. The deckhand confirmed to the master that the port hull forepeak, accommodation space and engine room were flooded. With the help of the trainee master, he then rigged the electrically-driven portable salvage pump to take its suction from the port hull accommodation space, this being the largest of the flooded compartments.

The master established communications with the masters of *Fastnet Tern* and *Windcat 10* and with the control room. Following receipt of the alert, Yarmouth Maritime Rescue Co-ordination Centre (MRCC) had difficulty communicating with *Windcat 9,* probably because of impact damage to *Windcat 9*'s VHF radio and/or antennae. Therefore, messages were relayed via the control room, on VHF radio Channel 16, to the trainee master, who had assumed responsibility for communications.

The efforts to pump out the flooded port hull compartments were unsuccessful and, at 1720, the master instructed the technicians to transfer to *Fastnet Tern.* At 1733, Yarmouth MRCC advised that the Humber All Weather Lifeboat (ALB) would be on

Figure 8: *Windcat 9*'s AIS track showing speed over the ground and course over the ground at 1711:14 and at 1711:45

Courtesy of Windcat Workboats Limited

Figure 9: Passenger cabin at the time of the impact

scene within 20 minutes. The master decided that nothing more could be done to deal with the flooding and he, the trainee master and deckhand transferred to the safety of *Fastnet Tern.* The control room was advised of the situation and that the vessel appeared to be stable and had settled with a 12-15º list to port **(Figure 10)**.

1.4.4 Recovery

At 1748, Humber ALB arrived on scene. *Windcat 9*'s master transferred to the lifeboat to provide advice to its crew. At 1802, Yarmouth MRCC gave approval for *Fastnet Tern* to continue its passage to Grimsby, where she arrived at 1850. The technicians and crew were accounted for using the VisSim system and were de-briefed by CREL and SESRED personnel.

At 1820, rescue helicopter R128 from RAF Leconfield arrived on scene and transferred two salvage pumps to *Windcat 9*, which were used by the lifeboat crew to try to pump out the port hull compartments. At 1850, the situation had stabilised sufficiently to allow Humber ALB to take *Windcat 9* under tow to Grimsby. At 2015, Cleethorpes ALB arrived on scene and escorted the tow, and *Windcat 10* was released from the scene by Yarmouth MRCC.

At 2150, *Windcat 9* was berthed alongside in Grimsby Fish Dock. The salvage pumps continued pumping overnight until the vessel was taken out of the water at Harris and Garrod Ltd ship repairers for survey and repair.


Courtesy of Mr Patrick Hennessy, master of *Fastnet Tern*

Figure 10: *Windcat 9* stable with a 12-15° list to port

On 25 January 2013, the Maritime and Coastguard Agency's (MCA) delegated Certifying Authority, MECAL Ltd, carried out a post-repair survey and *Windcat 9* returned to service on 7 February 2013.

1.5 ENVIRONMENTAL CONDITIONS

On 21 November 2012, it was neap tides with low water at Grimsby predicted to occur at 1713. At the time of the accident, there was a northerly tidal stream of less than 1 knot and a 1-1.5m swell. It was dark, the wind was north-westerly force 5 and there were intermittent heavy showers with visibility varying between 2 and 4 nautical miles. The sea water temperature was 9.0ºC.

1.6 DAMAGE SUSTAINED BY *WINDCAT 9* AND TARGET 3

1.6.1 *Windcat 9*

The contact damage sustained by *Windcat 9* was extensive throughout the port hull aluminium shell plating in way of the forepeak, accommodation space and engine room. The accommodation space also suffered frame damage. Numerous electrical fittings were water-damaged as was the port main engine.

Externally, the port shaft tube skeg was detached. The port propeller shaft was bent and the port propeller blades suffered major distortion. Composite images of the hull shell plate and external damage are at **Figures 11** and **12** respectively.

1.6.2 Target 3

Target 3 suffered extensive damage to one of its sides, which fractured a number of doubler plates as well as the original plating **(Figure 13)**. The impact caused the plates to be set back by about 1m and the deck to be raised by about 0.75m.

Figure 11: Composite image of the hull shell plating damage

Figure 12: Composite image of the external damage

Figure 13: Target 3 general damage

The radar reflector supporting structure was damaged and one set of bitts and a lifting eye plate were displaced **(Figure 14)**. The target's foam-filled cavity provided sufficient buoyancy to enable it to remain afloat despite the damage it had sustained.

1.7 REGULATIONS AND GUIDANCE

1.7.1 Vessel

Windcat 9 was subjected to the construction, general operations and manning requirements laid out in the MCA's Marine Guidance Note (MGN) 280 (M) – Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards (SCV Code).

The SCV Code was introduced in October 2004. It harmonised four previous vessel-type-specific codes applicable to small vessels in to a single document. In particular, it subsumed The Safety of Small Workboats and Pilot Boats – A Code of Practice.

1.7.2 Crew qualifications requirements

The required manning levels for *Windcat 9* are set out in Table 1 – Deck Manning Requirements Small Vessels in Commercial Use, of Annex 3 of the SCV Code. A copy of the Table is at **Annex B**.

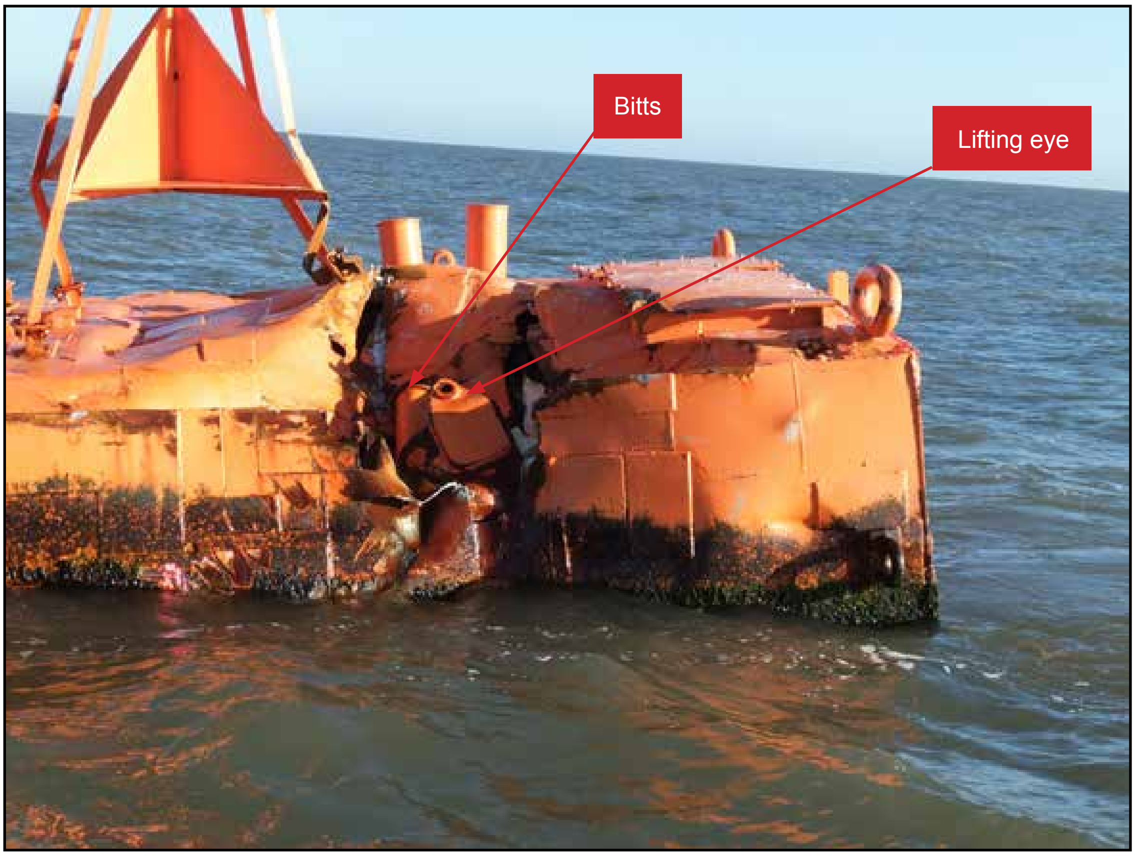


Figure 14: Target 3 damage showing displaced bitts and lifting eye

The minimum manning comprised a master and a second person deemed experienced by the master. As *Windcat 9* was a designated Category 2 vessel under the SCV Code (See Section 1.9.1) the master was required to hold one of the following qualifications:

- Certificate of Competency (CoC) – Yachtmaster Ocean
- CoC or Service – Yactmaster Offshore
- MCA Boatmasters Licence Grade 1, 2 or Modified Grade 3

Other qualifications may be acceptable to the MCA and are considered on a case-by-case basis. The table does not specifically identify fishing vessel CoCs as complying with the manning requirement. However, the MCA has formally recognised the need to provide such equivalence for UK-issued fishing vessel qualifications. Section 8 of MGN 411 (M+F) – Training and Certification Requirements for the Crew of Fishing Vessels and their Applicability to Small Commercial Vessels and Large Yachts covers the applicability of UK-issued fishing vessel CoCs for employment in accordance with the SCV Code **(Annex C)**.

For non-UK CoCs, the qualification requirement may also be satisfied by applying to the MCA for a Certificate of Equivalent Competency (CEC) for the CoC which is held. On receipt of the evidence, the MCA makes a judgment whether or not the CEC satisfies the requirements of the SCV Code. Where appropriate, the MCA also provides advice on the need for additional qualifications to satisfy the intended employment regulations.

1.7.3 Hours-of-work provisions

Section 2.9 of Annex 3 of the SCV Code sets out the requirements for hours of work. The minimum hours of rest for anyone employed on board should not be less than:

- 10 hours in any 24-hour period; and
- 77 hours in any 7-day period.

Exceptions to this are allowed so long as health and safety are not compromised. Such exceptions may take into account more frequent or longer leave periods or the granting of compensatory leave.

1.7.4 Keeping a safe navigational watch

The MCA's MGN 315 (M) Keeping a Safe Navigational Watch on Merchant Vessels provides guidance on safe navigational watch procedures and refers to the International Chamber of Shipping's Bridge Procedures Guide as the established principal guide to best watchkeeping practice. MGN 315 (M) includes the following particular advice relevant to this accident:

- It is of special importance that at all times an efficient lookout is maintained so as to make a full appraisal of the situation.
- The lookout should be considered as an integral part of the bridge team and utilised to the fullest extent.
- The lookout should be apprised of the navigational situation with regard to expected traffic, buoyage and any other circumstance relevant to good watchkeeping.
- No other duties should be undertaken that would interfere or compromise the keeping of a safe navigational watch.
- The radar should be used at all times whenever restricted visibility is encountered or expected.
- The vessel's position, course and speed should be checked using all appropriate navigational aids and means necessary to ensure the vessel follows the planned track.
- Fixes should be carried out at frequent intervals by more than one method whenever circumstances allow.
- There should be no hesitation in using the vessel's engines in case of need.
- A qualification does not imply that the holder has achieved all the necessary management or operational experience particular to a vessel, its operation or operational area. It may be prudent to provide additional supervision to a qualified watchkeeper while particular operational experience is achieved.

1.8 OPERATING PATTERN AND CREW DETAILS

1.8.1 Operating pattern

Windcat 9 was normally manned by a master and a deckhand. They worked a shift pattern of 20 days on call followed by 10 days leave. The on-call working day was usually 12 hours long, the vessel departing Grimsby Fish Dock at about 0645 and arriving back at about 1845. During “weather days”, the crew undertook maintenance and general husbandry tasks.

1.8.2 Master

The master was an Irish national, who first went to sea in July 1992. In June 1999, he attended the 3-week Electronic Navigations Systems course at the National Fishery College at Greencastle, County Donegal, Ireland. He held an Irish Second Hand (Full) fishing vessel CoC issued on 10 August 2006 and had completed the necessary safety training courses. He was employed as a mate and skipper from 2006 until October 2011, during which time he fished off Chile and South Africa. He joined WWL in Barrow in February 2012 as a trainee master and transferred to Grimsby in March 2012 to complete his familiarisation training. He did not hold, and had not applied for, a UK equivalent qualification for his Irish CoC.

1.8.3 Deckhand

The deckhand had worked in the fishing industry from 1968 until 2008, when he joined WWL. He held the appropriate safety training course certificates issued under the International Convention of Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW Convention).

1.8.4 Trainee master

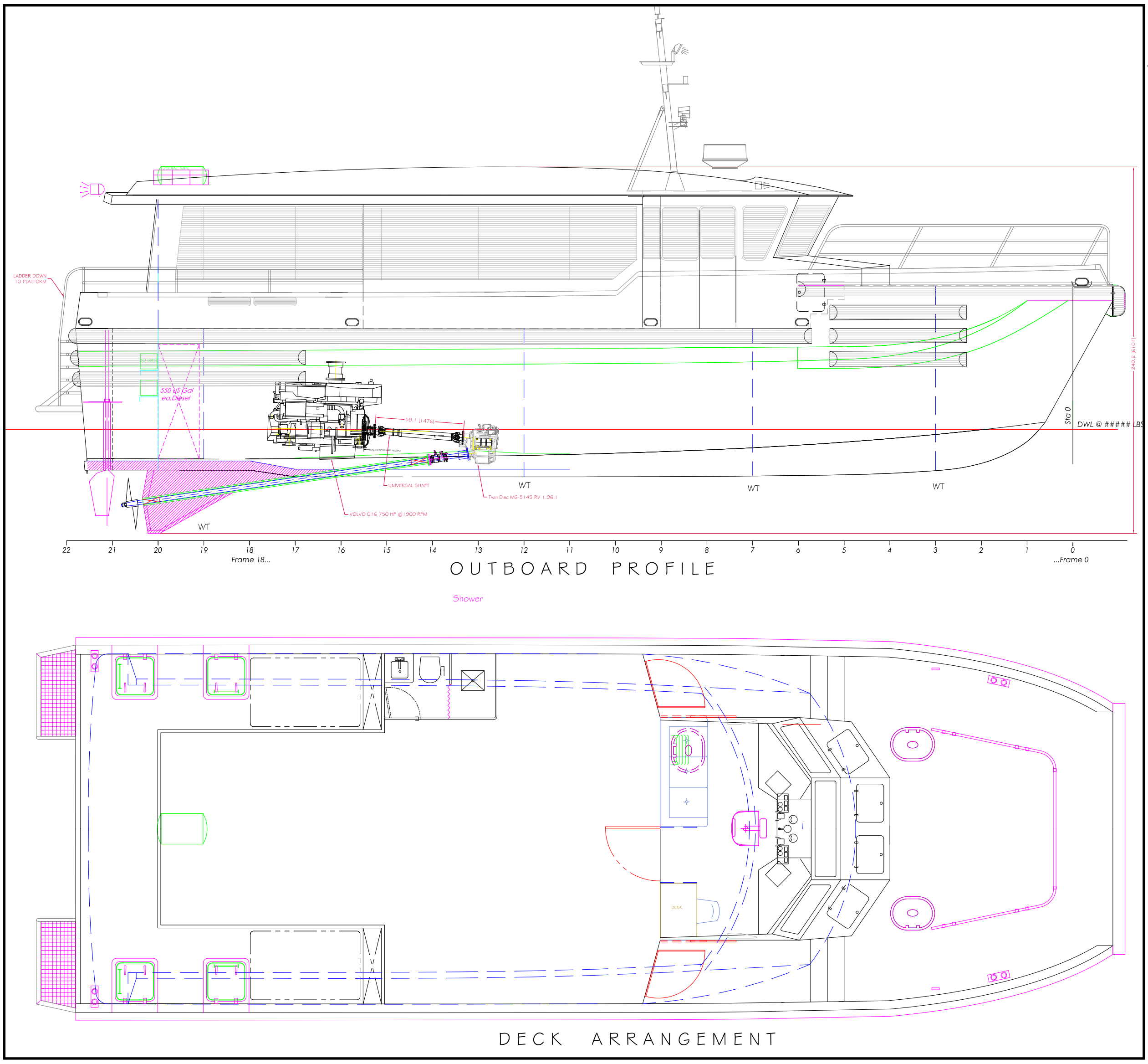
The trainee master was on his first day of familiarisation training for operations in the LID Wind Farm sites at the time of the accident. As a qualified master, he held a commercially-endorsed UK Yachtmaster Offshore CoC. He had served on various fishing vessels before joining WWL at Ramsgate as a deckhand in April 2012. He was accepted for training as a master, initially at Ramsgate, and then at Grimsby in November 2012.

1.9 OVERVIEW OF *WINDCAT 9*

1.9.1 General description

Windcat 9 was an aluminium catamaran workboat built in Canada in 2008. She was 17.25m length overall and was designated by the MCA as a Category 2 vessel for operations up to 60 miles from a safe haven. The strengthened deck was approved to carry 4000kg of deck cargo. She had a maximum speed of 30 knots and carried up to 12 passengers in a single passenger cabin immediately aft of the wheelhouse. The cabin could be separated from the wheelhouse by a blackout curtain. A single 16-man SOLAS liferaft, with hydrostatic release, was fitted at the transom.

The port and starboard hulls were identical and, from forward, comprised the forepeak, void space, accommodation, engine room and aft peak. A general arrangement drawing of *Windcat 9* is at **Figure 15**. Up to the time of the accident, the vessel had no propulsion or steering defects.



Courtesy of Windcat Workboats Limited

Figure 15: *Windcat 9* - general arrangement drawing

1.9.2 Survey and inspection

Windcat 9 was subject to annual examination and an out-of-water inspection every 5 years in accordance with the SCV Code. The last annual examination was carried out in Grimsby on 3 April 2012 by the MCA's delegated Certifying Authority, MECAL Ltd. Two defects were identified, neither of which contributed to the accident.

The MCA carried out an inspection on 20 November 2012. Three deficiencies were identified, one of which was that crew certificates were not available for verification. The other deficiencies had no bearing on the accident.

1.10 WHEELHOUSE LAYOUT

The wheelhouse navigation and control equipment was laid out for single person operation around a central console which provided an uninterrupted view through the forward window **(Figure 16)**.

The majority of the navigation equipment was manufactured by Simrad and comprised:

Simrad GB60 Glass Bridge System Chart Plotter computer-based plotting system with Global Positioning System (GPS) input	Simrad CX33 dual-purpose back-up chart plotter (6 inch display) incorporating a depth sounder and a Simrad GPS
Simrad RA52 Series radar transponder and display	Simrad RC25 fluxgate compass (in void space between hulls)
Simrad multi-frequency echo sounder	Simrad A180 AIS Type A transponder
Simrad AP35 autopilot	Ritchie power damp magnetic compass

Table 1: *Windcat 9* Navigation Equipment

At the time of the accident, the Simrad GB60 Glass Bridge System Chart Plotter was in use and the Simrad CX33 back-up chart plotter was switched on.

There were also two overhead monitors. One displayed the Closed Circuit Television (CCTV) images from cameras looking forward towards the bow, looking aft into the passenger cabin and to the port side of the wheelhouse. The second was for berthing purposes and displayed images from two cameras at the stern and one situated between the hulls.

The layout of the wheelhouse showing the positions of the key navigation equipment is shown at **Figure 17**. There were no reported defects relating to the navigation equipment.

1.11 SIMRAD GB60 GLASS BRIDGE SYSTEM CHART PLOTTER

The Simrad GB60 Glass Bridge System Chart Plotter (hereafter termed GB60) was originally fitted to all WWL vessels. The system had been in use for about 10 years and was being progressively replaced by the Simrad NSO system as part of the company's equipment upgrade programme. At the time of the accident, only *Windcat 9, 15, 16* and *18* were still fitted with the GB60 equipment.

The GB60 showed the vessel's position, speed and course in real time on the displayed chart which was based on information received from its GPS input. The chart plotter's display also provided AIS information.

The system could be configured to display guard zones, which could be arranged to provide visual and/or audio alarms. DNAWR Target 3 was identified on the chart plotter's display as "Tommy Target" and by a 0.227nm radius ring **(Figure 5)**.

Figure 16: View through the wheelhouse forward window

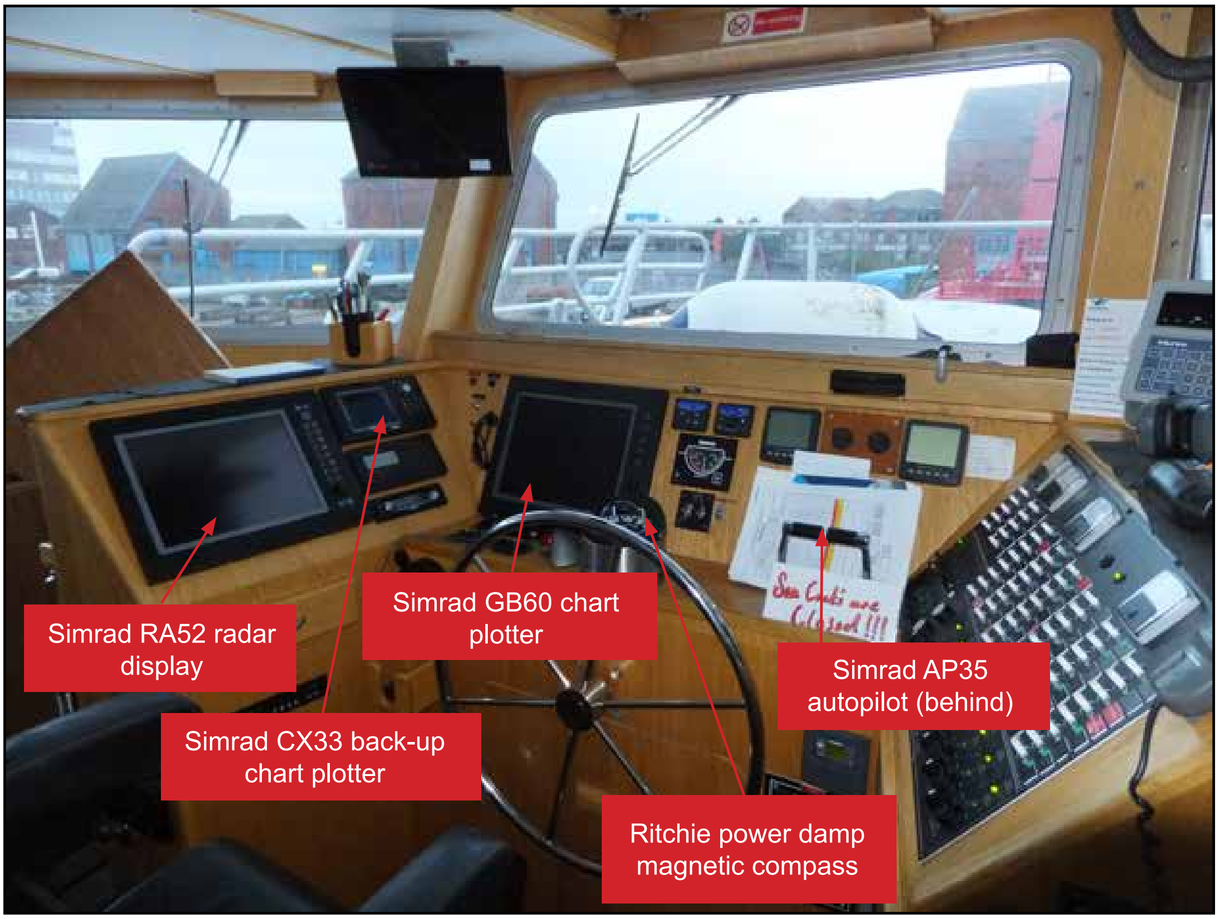


Figure 17: Positions of key navigation equipment

Planned routes could be stored and recalled as necessary. There were only two routes **(Figure 18)** stored on the system's log file. The 31.5nm route from Grimsby Fish Dock to LID Wind Farm, comprising five waypoints, was created on 27 May 2012 and was in use at the time of the accident. A 4053.294nm route was created on 13 November 2012 and had six waypoints extending through the mainland of the African continent. It is unknown why this route was planned and stored.

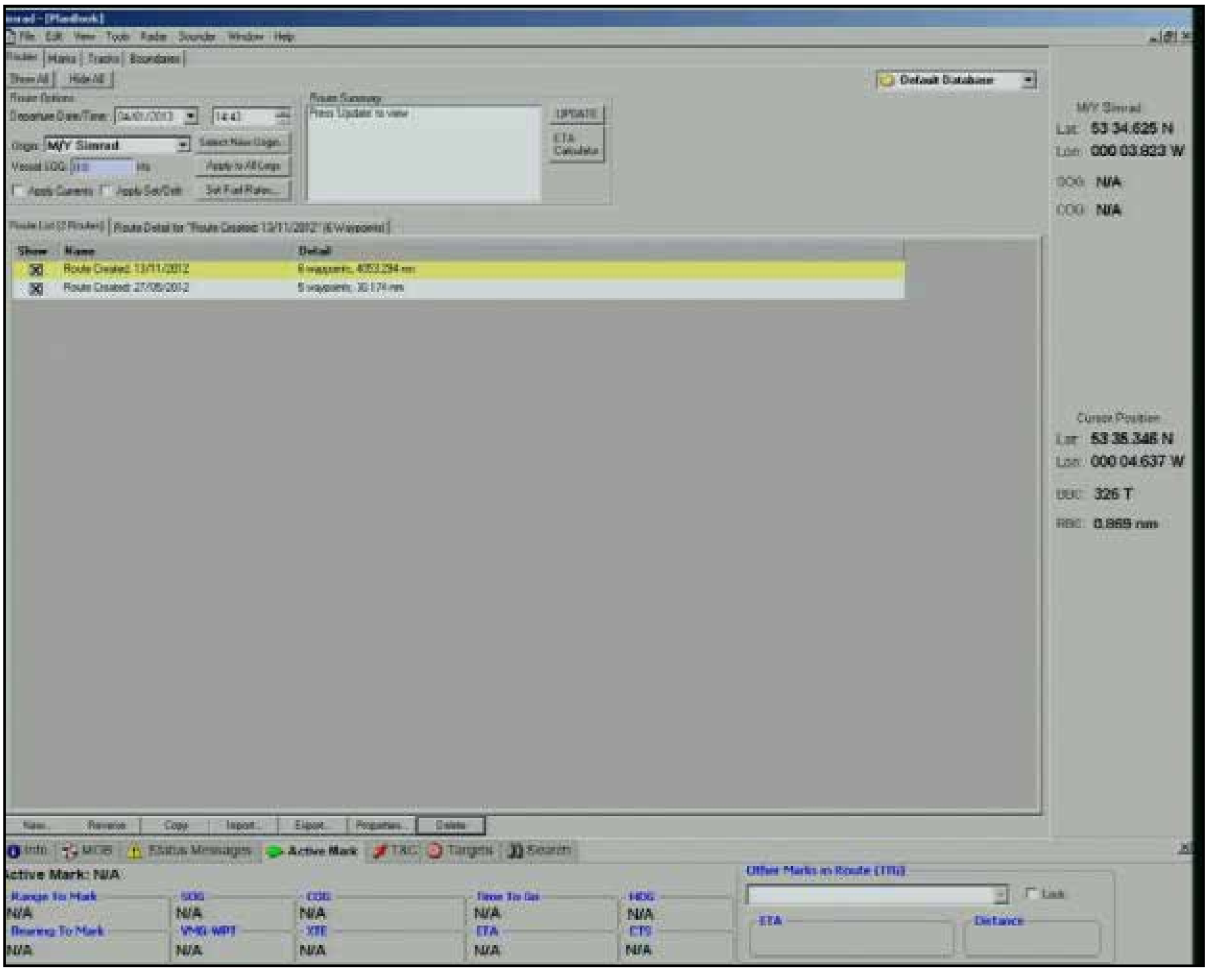


Figure 18: Routes stored on the chart plotter's log file

1.12 WINDCAT WORKBOATS

1.12.1 Company organisation

WWL is based in Lowestoft in Suffolk and was established in 2002. The company was reorganised in April 2012 to create a parent company. Windcat Holdings Ltd. WWL, Ijmuiden-based Windcat Workboats BV and Windcat Crewing Services BV (WCS), and Guernsey-based Windcat Workboats International Ltd became subsidiary companies.

WWL managed the marine operations, including upgrades, refits, repairs and contracting of its vessels. WCS was responsible through Windcat Workboats International Ltd for crew recruitment, manning, training and crew assessments, including developing and reviewing the associated documentation.

1.12.2 Windcat Workboats Limited

At the time of the accident, WWL owned 30 vessels, with an additional three under construction. The vessels were based and operated around the UK, The Netherlands, Belgium and Germany, predominantly in support of offshore wind farm operations. The company's largest vessel was the high-speed passenger craft *Windcat 101,* which carried 45 passengers.

The day-to-day management of vessels and their crews was the responsibility of the respective site manager, who was located in each of the company's main marine operations areas. The site managers made arrangements for surveys, reported on technical and crewing matters, carried out mini audits (see Section 2.18.1) and occasionally went to sea to view emergency drills and to observe the conduct of the vessel and crew. Some site managers were also required to carry out crew assessments.

1.12.3 WWL Safety Management System

As WWL operated a high-speed passenger craft, it was required to comply with the requirements set out in the International Safety Management (ISM) Code. To do this, WWL developed a Safety Management System (SMS) and on 31 January 2012 the company was issued with an ISM Code Document of Compliance (DoC) valid until 17 October 2016.

Although the majority of WWL's vessels were not required to comply with the ISM Code, it was WWL's policy for its fleet to adhere to the requirements laid out in the SMS Manual. Each vessel held an electronic version of the Manual. Updates were forwarded to the vessel in an electronic "pdf" file format. The site manager was responsible for verifying the documentation during audits.

At the time of the accident, the SMS Manual was being reviewed to make it more specific to the company's smaller vessels.

1.12.4 Overview of the WCS recruitment process

Recruitment was effected by a combination of word-of-mouth and advertising. Once a manning requirement was identified by WWL, it was passed to WCS to find suitable candidates. Following successful qualification checks, candidates were subject to interview, which was frequently carried out by telephone by WCS office staff who had little or no practical marine operational experience. Successful candidates were then subject to a probationary 3-month period and allocated to a vessel by WCS for on-the-job training and subsequent assessment.

1.12.5 Independent audit of WCS

Following the initial findings of WWL's internal post-accident investigation, the company commissioned an independent audit of WCS. The audit was carried out during 2-3 January 2013 and focused on:

- Recruitment processes, including vetting, qualifications, knowledge and experience checks.

- Management of employees, including training, development, refresher course and mentoring arrangements.

- Certificate revalidation and options for alternative certification and assessment arrangements.

The findings and recommendations of the audit are discussed at Section 2.17.

1.13 NAVIGATION PRACTICES

1.13.1 Primary means of navigation

Paper charts were declared to be the primary means of navigation for WWL's vessels.

1.13.2 International Convention for the Safety of Life at Sea requirements

Chapter V – Safety of Navigation – of the International Convention for the Safety of Life at Sea (SOLAS), 1974, deals with navigational practices.

Regulation 19 – Carriage requirements for shipborne navigational systems and equipment – requires that all ships, irrespective of size, shall have nautical charts and publications to plan and display the ship's route and to plot and monitor positions throughout the voyage; an electronic chart display and information system may be accepted as meeting the chart carriage requirements.

Regulation 27 – Nautical charts and publications – identifies the need to carry adequate and up-to-date nautical charts and publications for the intended voyage.

Regulation 34 – Safe navigation and avoidance of dangerous situations – requires that before proceeding to sea, the master shall ensure that the voyage is planned using appropriate nautical charts and publications.

Regulation 1 – Application – permits the Administration to determine the extent to which Regulations 19 and 27 do not apply to vessels of less than 150gt.

1.13.3 MCA guidance

MGN 293 (M+F) – Alternative Arrangements for Meeting Paper Chart Carriage Requirements on MCA Code Vessels under 24 metres in Length and Fishing Vessels under 24 metres in Length – reiterates the UK paper chart carriage requirements for Coded vessels under 24m, as required under SOLAS Chapter V Regulation 19. The MGN also recognises the practical difficulties faced by operators of small vessels in using full-sized paper charts. As permitted by Regulation 1 of SOLAS, the MCA invites nautical chart producers to apply to have their respective non-standard sizes recognised by the MCA. Leisure charts produced by the United Kingdom Hydrographic Office (UKHO) and by Imray Laurie Norie and Wilson Limited are recognised by the MCA as meeting the alternative chart carrying requirements.

SCV Code, Section 19.1 – Nautical Publications **(Annex D)** requires that charts and other nautical publications are carried to plan, display, plot and monitor a vessel's position throughout its voyage. The reference also states that:

"An electronic chart plotting system, complying with the requirements detailed in Marine Guidance Note MGN 262 may be accepted as meeting the chart carriage requirements…

In October 2006, MGN 262 was replaced by MGN 319 (M+F) – Acceptance of Electronic Chart Plotting Systems for Fishing Vessels Under 24 metres and Small Vessels in Commercial Use (Code Boats) up to 24 Metres Load Line Length. If an electronic chart plotting system is declared by a vessel's owner/manager to meet the chart carriage requirements, it has to comply with the specifications[6] developed by the Sea Fish Industry Authority (SFIA). To identify acceptable systems, the manufacturers or their agents are required to provide a signed statement confirming their equipment meets the SFIA standards. The statement is required to be carried on board for scrutiny by MCA and Certifying Authority surveyors.

Both the GB60 electronic chart plotting system and its replacement, the NSO, were issued with an EC Declaration of Conformity relating to electromagnetic compatibility. No other certification was held or had been applied for.

1.13.4 Passage planning

The passage planning requirements for voyages outside the normal operating areas were detailed at SMS section SMM 07-01 – Passage Planning. Separate guidance was provided at SMS section SMM 07-02 – Passage Planning to Working Field **(Annex E)**.

The passage plan was required to be documented on Form MARF001 – Voyage Planning Form (VPF). The VPF was reportedly completed after the route had been planned on a paper version of Admiralty Chart 107 – Approaches to the River Humber. The waypoint positions and route were then transferred to the electronic chart plotter. It was reported that the data recorded on the completed VPF **(Annex F)** was that used to plan the route held on the chart plotter's data log file, dated 27 May 2012, which was in use at the time of the accident.

The VPF identifies that caution should be exercised when transiting between waypoints 4 and 5 because of the presence of the target buoy (Target 3).

1.13.5 Paper charts

WWL's Quality, Health and Safety, and Environment (QHSE) department was responsible, through the site manager, for ensuring the most recent paper versions of Admiralty charts were available on board all vessels for their respective areas of operation. SMS section SMM 07-24 – Navigational Charts and Publications – required masters to access the UK Hydrographic Office website to check Notices to Mariners (NTM) for applicable chart corrections. However, in practice, the QHSE department sent out weekly chart corrections for action by masters.

Admiralty charts 107, 108 and 1188 were carried on board *Windcat 9*. Admiralty chart 107 – Approaches to the River Humber, Edition 11, Edition Date – 21 May 2009 was in use at the time of the accident.

[6] Mini-Electronic Chart Display and Information System (Mini-ECDIS) – Operational and Performance Requirements with Reference to MGN 262 (M+F).

Chart corrections were scheduled to be checked as part of the full vessel and mini audit procedures. The QHSE department was also responsible for the issue of 6-monthly plotter chart updates. A chart correction log held on board *Windcat 9* recorded that the latest correction made to Admiralty chart 107 was 5395/11 dated 1 December 2011.

1.13.6 Lookouts

Although Section 2.2 of SMM 07-17 Watchkeeping at Sea mentions lookout duties as part of the master's responsibilities, the SMS did not specifically cover the nomination, or the duties, of lookouts. Additionally, neither WCS's Training Manual, Section 5 – Crewmembers Training Program [sic] nor Section 6 – Crew Training Program Checklist [sic] covered the duties of lookout despite it being custom and practice to use the deckhand to undertake the duty.

1.14 WWL'S INDUCTION, TRAINING AND ASSESSMENT PROCEDURES

1.14.1 Documentation

WWL's SMS, Section SMM 06-03 – Training, dealt with training issues. The reference identified that WCS had the responsibility for identifying, managing and recording training and assessment needs for new and existing employees.

The training requirements, for implementation by WCS, were set out in Windcat Workboats – Training Manual (hereafter termed, Training Manual). Training was divided into three separate areas – induction, training and assessment. Section 2 – Site Induction and Vessel Induction, Section 3 – Master's Training Program [sic] and Section 8 – Periodic Assessment – All Crew Members **(Annex G)**, of the Training Manual are relevant. From this broad guidance, a training matrix was generated covering all employee requirements that identified the type of training required, the duration and the provider.

The latest edition of the Training Manual was Version 2.1 dated 20 July 2011. The "Revision Date" was declared to be 1 April 2012 on the front cover of the Training Manual. However, the start of the revision was delayed until September 2012 due to WWL staff changes resulting in higher priority tasking. The proposed completion date has been revised to April 2013.

Windcat 9's master followed the company's standard training procedure as set out in Sections 2 and 3 of the Training Manual.

1.14.2 Induction procedure

New personnel to a particular wind farm site or vessel were required to complete the Site and Vessel Induction procedure under the guidance of a WCS-nominated Training and Assessment (T&A) master. Site induction specifically related to the vessel's wind farm operations. These included protocols for entering and leaving wind farms, mooring and emergency procedures.

Vessel induction included an introduction to navigation equipment, vessel controls and handling, safety equipment, maintenance procedures and client equipment.

Windcat 9's master completed the induction process on 8 April 2012.

1.14.3 Training

WWL's training syllabus for a new master to the company was detailed in Section 3 of the Training Manual. Training included use of the vessel's equipment, and emergency, administration and operational procedures, including docking against wind turbines and the transfer of personnel.

Sub-section 2.2 of Section 3 of the syllabus covered navigation equipment. The instruction required that a demonstration be given to ensure the trainee had a good practical knowledge of the navigation aids including the plotter and radar. It also required that cross-reference be made to the relevant equipment manuals.

Training usually took about 2 weeks, depending upon an individual's progress as judged by the T&A master. On completion, the Master's Training Program Checklist, at Section 4 of the Training Manual, was completed by the T&A master and returned to WCS.

Windcat 9's master undertook his training during the period 28 February – 12 March 2012.

1.14.4 Assessment of new masters

The SMS did not refer to any initial or continuation assessment procedures to determine the suitability of either masters or crew for their respective roles.

However, Section 8 of the Training Manual did cover the company's assessment procedures. The instruction required that new masters and crew be assessed within 3 months following completion of their initial training, and annually thereafter.

The results of the assessment were required to be recorded on WCS's Progress Report for Masters checklist. Regarding the navigation equipment assessment, the checklist required that a master:

> *"1. Performs good practice of all navigation equipment.*
>
> *2. Performs good practice on VHF and other radio communications.*
>
> *3. Demonstrate ability to complete chart corrections."* [sic]

WWL's site managers played a part in the assessment of masters and crew. They regularly visited vessels alongside and went to sea to conduct drills and mini audits. Where appropriate, concerns were reported to WCS.

Windcat 9's master had not been subjected to any formal assessment. The issue of assessments is discussed further at Section 2.15.

1.14.5 Validation of assessor's competence

Section 10 of the Training Manual listed 14 T&A masters. Their nomination was based on their professional vessel operating experience and knowledge of WWL's procedures. The instruction implied that the masters were responsible for conducting the other masters' performance assessments. The Section also stated that the competence of the T&A masters was in turn to be determined by the company's only Senior Assessor. The Training Manual did not state what form was to be used to record the assessment of T&A masters.

1.15 CREL AND SESRED INDUCTION PROCESSES

Both CREL[7] and SESRED required all vessel crews involved in wind farm contract work to undergo their own wind farm site-specific induction training. Both induction programmes were supported by comprehensive presentations that focused on health and safety issues, but also included site emergency procedures and passenger transfer to wind tower procedures. The presentations did not cover vessel-specific operating procedures.

CREL also provided a control room marine co-ordinators briefing. The briefing included guidance on the River Humber transit, management of passengers, transfer of personnel to wind towers and reporting procedures.

Windcat 9's master attended the CREL induction training and the marine co-ordinators briefing on 26 March 2012 and SESRED's induction training on 27 March 2012.

1.16 VESSEL CHARTERING PROCEDURES

1.16.1 CREL

CREL did not have a dedicated Marine Manager. The CREL Safety Manager had overall responsibility for marine-related issues with the day-to-day management delegated to CREL's Offshore Safety Manager.

CREL's Marine Management Manual, Section 4 – Hire Vessel Fit for Purpose, laid out the requirements that were to be met when chartering a support vessel. Ordinarily, a material audit was carried out using the International Marine Contractors Association (IMCA) Marine Inspection Checklist for Small Workboats.

The audit also included a check on the vessel's documentation but made no assessment of the capabilities of the crew. However, the manual required all crew to be fully trained for their duties, thereby leaving the assessment of the crew to the vessel's owner/manager.

A nominated manager was required to assess the vessel's suitability against the CREL Offshore Risk Assessment Procedure. If acceptable, the Vessel Acceptance Sheet was signed off. In *Windcat 9*'s case, this was done on 18 April 2008. A follow-up Transfer Vessel Inspection was carried out on 3 November 2011.

1.16.2 SESRED

A dedicated Marine Operations Manager, supported by a Marine Operations Co-ordinator, was responsible for SESRED's marine-related operations.

[7] In accordance with CREL's Marine Management Manual, Section 4.2.4 – Training.

While SESRED was currently developing a marine management manual, the existing Crew Transfer Vessel Management document provided instructions on the performance and activities for each crew transfer vessel chartered by SESRED. For SESRED-chartered vessels, an audit was carried out using the IMCA checklist in common with CREL's procedures.

Appendix A – Minimum Crew Transfer Vessel Requirements (UK) dated 21 November 2012, to the Crew Transfer Vessel Management document stipulated a wide range of conditions with which the vessel and its crew were required to comply. In particular, item 4 required a:

> *"Well experienced crew and properly qualified Vessel Master** [sic]*"*

The asterisk qualified the statement as follows:

> *"Vessel should have minimum two crew members including Master who has certificates approved by the Vessel's flag state and accepted by Maritime authorities in area of operation, certifying their competencies to navigate the vessel. Minimum requirements for Master's certification shall be Master 200gt STCW 95* ***A-II/2****. Minimum requirements for first crew member to be OOW STCW 95* ***A-II/1****. Deck hand or crew members shall be a qualified Banksman Slinger."* [sic]

1.17 WWL INTERNAL AUDITING PROCEDURES

WWL's internal auditing procedures are detailed at SMM 12-03[8] - Internal Audits of the SMS **(Annex H)**. The company theoretically operated a two-tier auditing process comprising full vessel and mini audits.

1.17.1 Full vessel audits

The full vessel audit was based on IMCA's Marine Inspection Checklist for Small Workboats. The SMS required that vessels were audited annually by trained auditors. The audits were intended to be conducted approximately 6 months after the annual Certifying Authority's examination, as reflected in the QHSE Plan 2013 and 2013 Audit Schedule. The planning documents were developed during the latter half of 2012 for implementation in September 2012 as part of the ongoing review of the SMS. Prior to this, there was no formally documented auditing schedule.

There were no records that *Windcat 9* had been subjected to a full vessel audit.

1.17.2 Mini audits

The SMS required that mini audits were carried out by site managers, the operations manager or members of the QHSE department at least twice a year. The mini audits were intended to check a vessel's organisation, material condition and operation of equipment, where appropriate.

The QHSE Plan 2013 is the planning tool used to schedule the mini audits in 2013. Until September 2012, there was no mini auditing schedule. Each mini audit was supported by its own specific audit form. Relevant to this case is the radio and

[8] Revision 1 dated 1 August 2008.

navigation mini audit. A copy of the Navigation Skills report form, QHSEF 023 Revision 1 dated 31 August 2012 used to report on the outcome of the radio and navigation mini audit, is at **Annex I**.

Mini audits were intended to cover the following areas:

- Training evaluation
- Crew documentation
- Vessel condition
- Radio and navigation
- Fire prevention
- Lifesaving appliances
- Crew familiarisation, training and drills

Mini audits were carried out on board *Windcat 9* on 1 February, covering lifesaving appliances, and on 1 June 2012 covering vessel crew knowledge and drills respectively.

1.18 MARINE-RELATED RISK ASSESSMENTS

1.18.1 WWL

Each of WWL's vessels was provided with a copy of the company's Task-Based Risk Assessments (TBRA). At the time of the accident, there were 57 risk assessments in place, 34 of which were directly related to vessel operation.

TBRA 0020 – Night/Dark Operations, dated 8 November 2012 **(Annex J)**, was the only assessment which recognised the risk of a collision with another vessel and/or with a wind turbine monopile. Risk assessments are discussed at Section 2.18.2.

1.18.2 CREL and SESRED

Both CREL and SESRED had a comprehensive set of risk assessments, which largely related to the transfer of technicians and contractors to and from the wind turbine towers. Risk assessments associated with the vessel were in support of personnel transfer and not related to vessel operation, with the exception of dealing with a manoverboard emergency.

1.19 ORGANISATIONS INVOLVED WITH OFFSHORE RENEWABLE ENERGY PASSENGER TRANSFER VESSELS

1.19.1 RenewableUK

RenewableUK (RUK) is the UK's leading, not-for-profit, renewable energy trade association. Its role is to encourage, influence and work with policy-makers in the development of the renewable energy sector. It also provides discussion fora for its members and interested parties as well as raising awareness of the industry among the general public.

RUK also promulgates incident reports and alerts through its Renewable Industry Safety Exchange (RISE) system. The purpose of the RISE system is to facilitate the collation, sharing and dissemination of health and safety incident reports, lessons learned and best practice across the whole of the renewable energy industry supply chain. Scottish Renewables[9] uses RUK's RISE system to promulgate its safety issues.

1.19.2 National Workboat Association

Formed in 1994, the National Workboat Association (NWA) is charged with representing its membership's views on legislative and training issues. To this end, the NWA has been active in assisting the MCA in developing various codes of practice and promoting industry best practice. In addition, the NWA is taking forward an initiative to develop procedures to collate workboat industry accident data with the intention of promulgating safety alerts.

Of the 300-400 vessels operating in support of the offshore renewable energy industry, approximately 45% of their owners are members of the NWA. This represents about 60% of the total number of vessels involved.

Both WWL and Windcat Workboats BV are members of the NWA.

1.19.3 The Crown Estate

The Crown Estate is one of the largest property owners in the UK and owns virtually the entire seabed out to the 12-mile territorial limit, including the rights to explore and utilise the natural resources of the UK continental shelf (excluding oil, coal and gas). The Energy Act 2004 vested rights to The Crown Estate to license the generation of renewable energy on the continental shelf within the Renewable Energy Zone out to 200nm. It also part-funds certain aspects of offshore wind projects and provides support to developers and to RUK.

Through its energy and infrastructure portfolio, The Crown Estate works closely with developers and key stakeholders in improving safety in relation to marine operations. Although personnel transfer and structure centric, there is also a keen interest in the safety of passenger transfer vessel operations.

1.19.4 G9

In February 2012, nine of the world's largest renewable energy providers[10] formed a new safety forum known as the G9 Offshore Wind Health and Safety Association Limited. Its primary purpose is to create and deliver world-class safety standards to the rapidly developing offshore wind industry.

In many cases, site development is a multi-national activity. In recognition of the need for a common approach, G9 established its "Focal-Point" team. The Team comprises leading European health and safety professionals, who engage with stakeholders to share lessons learned and identify industry best practice within the offshore wind industry.

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[9] Scottish Renewables is the equivalent and only renewable energy trade association in Scotland. All renewable energy developers in Scotland and offshore are members.

[10] Centrica Renewable Energy Ltd, Scottish Renewables, Scottish and Southern Energy Renewables, Statoil, Vattenfall, e.on, Statkraft AS, Dong Energy UK and Rheinisch West-Falisches Elektrizitatswerk (RWE) AG

1.19.5 International Marine Contractors Association

A long-established, not-for-profit international association, IMCA represents offshore, marine and underwater engineering companies. It provides a comprehensive range of Codes of Practice and guidelines, which are recognised by regulators and used extensively by the Association's clients.

IMCA intends to develop competence frameworks, training solutions and guidance on the transfer of personnel specifically for mariners involved in the offshore renewable energy industry.

IMCA also has an established, free-of-charge, website-based, safety flash system, providing incident reports and up-to-date industry news.

1.20 INDUSTRY GUIDANCE

1.20.1 ABP Humber Estuary Services

On behalf of the Competent Harbour Authority, ABP Humber Estuary Services has responsibility for the safe operation of the harbour under the requirements set out in the Port Marine Safety Code. In response to wind farm passenger transfer vessel concerns, on 15 March 2013 it issued Notice to Mariners – H30-2013 – River Humber Wind Farm Transfer Vessels, which introduced the publication – "Recommended Route for Wind Farm Transfer Vessels" **(Annex K)**.

ABP Humber Estuary Services has also established a programme of regular liaison meetings with wind farm developers' marine managers/co-ordinators and control room staff to promote best practice.

1.20.2 NWA publications

In February 2013, the NWA published its Deck Training Record Book following extensive collaboration and consultation with stakeholders. The publication was endorsed by the Maritime Skills Alliance, and is based on the Merchant Navy Deck Rating Record Book. The comprehensive document is intended to be used by workboat ratings and trainees and can be easily tailored to a particular vessel type. It is also intended to be a monitoring document for the planned NWA Apprenticeship Scheme and provides evidence to prospective employers on the level of knowledge and experience attained.

In June 2013, the NWA published its Training Record Book for candidates aspiring to be awarded the recently introduced Master (Workboat) <500gt CoC[11]. The publication had been developed following extensive consultation with industry stakeholders. It is designed to ensure that candidates receive systematic practical training and experience in the tasks, duties and responsibilities required for the CoC, as well as providing a comprehensive record of achievements.

The NWA has also produced a first draft "Best Practice Guide for Offshore Energy Service Vessel Crews". The Guide is aimed at its membership and is intended to provide clear guidance on the training standards of vessel crews. The work on developing the Guide is ongoing.

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[11] In June 2013, the MCA introduced the CoC under MGN 496(M+F) Certificate of Competency for Master Workboat less than 500GT unlimited.

1.20.3 RUK publications

In April 2012, RUK published its Vessel Safety Guide – Guidance for Offshore Renewable Energy Developers. The comprehensive document is aimed at providing contracting guidance for developers in the selection and management of vessels. It also provides guidance on the health and safety aspects, crew qualifications, certification and regulations relating to vessel operations. It does not set out to describe methods of vessel operation, crew selection and training, or crew assessments.

On 13 March 2013, RUK released its publication – Offshore Wind and Marine Energy Health and Safety Guidelines. The guidelines are aimed at providing health and safety advice for developers involved in all aspects of the offshore energy industry, including marine co-ordination and vessel selection. The guidelines have been developed by taking into account existing and emerging industry best practice within the framework of UK health and safety legislation. Although Section A.1.9 deals broadly with maritime regulations, it is not the intention of the guidelines to deal specifically with the health and safety requirements of seafarers.

RUK also published its Approved Training Standard – Marine Safety Training document in 2012. It sets out the syllabus and arrangements for the delivery of basic training and competence assessment for Marine Safety Training – Vessel Transit and Transfer by an approved RUK training provider.

1.21 INDUSTRY TRAINING

Industry training is predominantly targeted at those personnel transiting and transferring to offshore renewable energy structures and vessels.

A small number of training providers deliver this training to the standards set out in RUK's Approved Training Standard - Marine Safety Training, which recognises and is in alignment with the Global Wind Organisation training standards. The 2-day course[12] includes a variety of theory and practical sessions covering, among other subjects, environmental issues, hazards, transfer arrangements, evacuation, wind tower and vessel emergencies and survival first-aid. On successful completion of the course, the candidate is awarded the "Renewable UK approved – Marine Safety Training – Vessel Transit and Transfer" certificate, which is valid for 2 years. RUK recommends that anyone transferring to an offshore renewable facility attends the course, though other safety-related courses can be considered as partially fulfilling this requirement, as detailed in RUK's Offshore H&S Guidelines.

East Coast Training Services provides a bespoke half-day practical course for masters and crews of transfer vessels. The non-mandatory course comprises the approach, manoeuvring and securing to a dummy wind tower transition piece, and the transfer of personnel.

[12] Candidates must hold a current RUK Working at Height & Rescue – Wind Turbines certificate as a pre-requisite for attending the course.

1.22 SIMILAR ACCIDENTS

The MAIB's accident database records an increasing number of incidents involving wind farm passenger transfer vessels. These have been predominantly close-quarters situations, groundings, and light contacts with wind towers, quaysides and other vessels. The following wind farm transfer catamaran accidents are relevant to this investigation.

1.22.1 Grounding – 23 December 2009

A catamaran was on passage to a wind farm in daylight and in good visibility. One of the five passengers suggested a different passage to the master. The vessel was slowed down as the master entered a new waypoint into the plotter. When he next looked at the vessel's cursor on the chart plotter, he noticed that the vessel was heading towards a sandbank, where the vessel subsequently grounded. The vessel refloated on the rising tide with no damage.

The new route was removed, the master underwent additional training and revised passage instructions were promulgated by the vessel's owners.

1.22.2 Contact – 29 October 2010

A workboat had departed a wind farm in the Baltic Sea in daylight and moderate visibility. The crew were unsure of the vessel's position and as they were checking the chart plotter, the vessel made contact with a wind turbine transition piece.

There was no significant damage but the company issued guidance on the need to maintain an effective lookout.

1.22.3 Close-quarters situation – 22 April 2011

A wind farm workboat was returning to port at 25 knots, in daylight and hazy conditions, which reduced the visibility to about 2nm. A patrol vessel was in the immediate vicinity. As the vessels closed, the workboat failed to give way in accordance with the International Regulations for Preventing Collisions at Sea (COLREGS) resulting in a passing distance of less than a cable.

It was found that the lookout was engaged in other duties and that the master failed to effectively monitor the vessel's passage despite the navigation aids being fully operational. The owner re-evaluated its master's training and assessment procedures.

1.22.4 Contact – 1 October 2012[13]

An 18m workboat was on passage to a wind farm, with stores on board. It was dark but the visibility was good as the master handed the con to the deckhand, instructing him to follow the course on the plotter. As the master made refreshments, the deckhand decided to take a shorter inshore route than normal. As the deckhand focused on adjusting the chart plotter's range, the workboat made contact with a charted floating object.

[13] This accident was not reported to the MAIB as required by The Merchant Shipping Regulations (Accident Reporting and Investigations) Regulations 2012. This has been brought to the attention of the vessel's owner.

The vessel suffered hull shell plate penetration, causing flooding of two compartments. There were no injuries and the vessel was able to make its own way back to harbour.

It was found that passage planning was inadequate, there was no route planned on the paper chart, the limitations of the chart plotter were not understood and the route that was on the chart plotter was not followed.

The company subsequently instigated procedures to ensure that masters were fully conversant with the electronic navigation equipment fitted to its vessels.

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 ACCIDENT OVERVIEW

On returning from LID Wind Farm, *Windcat 9*'s master believed that he was following the reciprocal route to that which he used during the morning. Because the passage was not being properly monitored, he lost situational awareness. It was not until after he had finished demonstrating the chart plotter's controls to the trainee master and had altered course to port to cut the corner to get ahead of *Fastnet Tern,* that he realised *Windcat 9* was significantly west of the planned reciprocal track. He opted to turn the vessel to starboard to regain the reciprocal route. He did this without confirming the vessel's true position in relation to the potential hazards, either by visual or electronic navigation means. The manoeuvre resulted in the high-speed contact with Target 3. Had the final course alteration not been made, *Windcat 9* would have passed very close to the target, but would not have made contact with it.

2.3 ROUTE FROM LID WIND FARM ON 21 NOVEMBER 2012

The master had been following the chart plotter's standard route to and from LID Wind Farm since it was entered into the plotter's log file on 27 May 2012. The route took the vessel between DZ1 and DZ2 buoys and to within about 0.5nm of Target 3.

2.3.1 Historical routes

Six historical, outbound and return, AIS tracks for *Windcat 9*, covering the period 14-18 November and 20 November 2012 were plotted on Admiralty chart 107 – Approaches to the River Humber **(Figure 19)**. The tracks showed that *Windcat 9* consistently passed between DZ1 and DZ2 buoys and to within about 0.5nm to the east of Target 3. On the basis that the master assumed his vessel was following the normal reciprocal route, he would have expected *Windcat 9* to pass safely to the east of Target 3 as she had on previous occasions.

2.3.2 AIS track for the passage from LID Wind Farm – 21 November 2012

Referring to **Figure 20**, *Windcat 9*'s AIS positions (red arrows) can be seen diverging to the west of the historic outbound AIS track from 1654. This is coincident with the time at which the master was demonstrating the chart plotter's range options to the trainee master using the tracker ball control. The track (in solid blue) shows a steady course over the ground (COG) of 329º, passing through Target 3's 0.227nm radius guard zone, until the master altered to port at 1709 to get ahead of *Fastnet Tern*. The master then noticed a radar echo from, and the flashing light of DZ1 buoy and realised that *Windcat 9* was significantly west of the planned reciprocal track. By 1711.45, he had altered course to starboard in an attempt to pass between DZ1 and DZ2 buoys and regain the safe reciprocal route. However, 30 seconds later *Windcat 9* made contact with Target 3.

Reproduced from Admiralty Chart BA 107 by permission of the Controller of HMSO and the UK Hydrographic Office

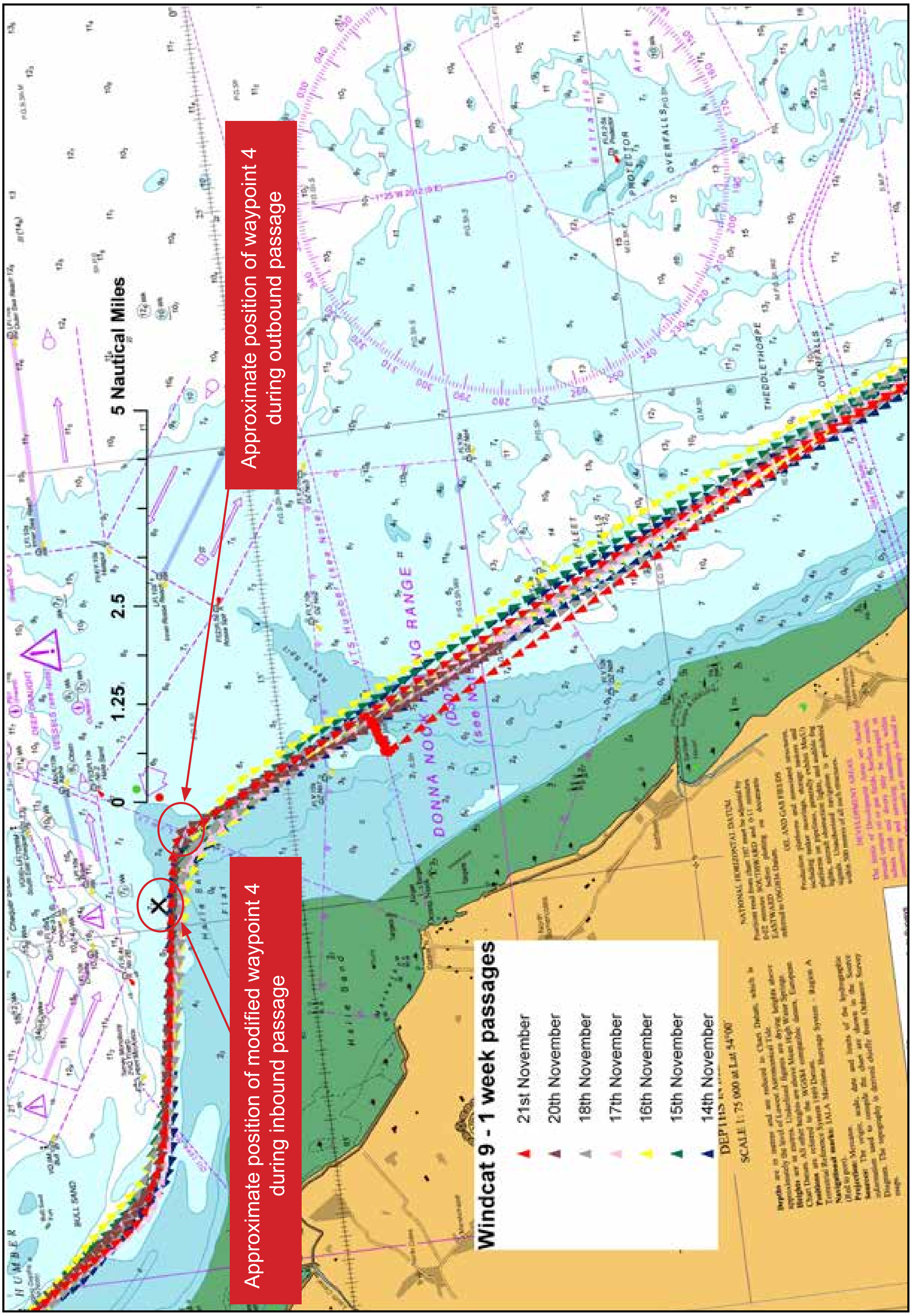


Figure 19: *Windcat 9* - historical AIS tracks for the period 14-18 November and 20 November 2012

Reproduced from Admiralty Chart BA 107 by permission of the Controller of HMSO and the UK Hydrographic Office

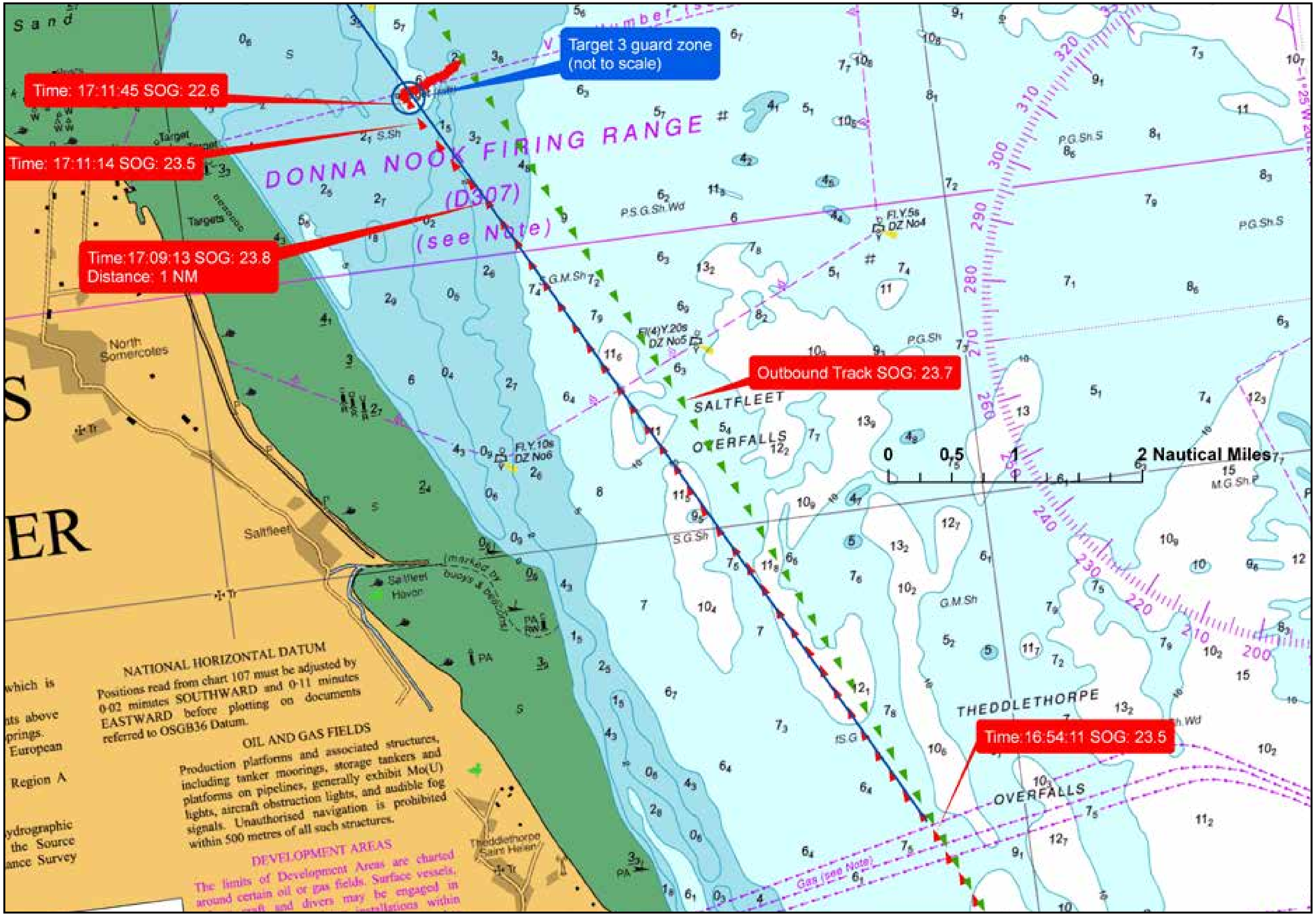


Figure 20: Diverging reciprocal route passing through Target 3's guard zone

In considering the cause of the initial route divergence, checks were made of the positions of the five waypoints. It was found that waypoint 4 had been moved to the west **(Figure 19)** and that the master had been following a route towards the modified position of waypoint 4 from 1654 until he made the course alteration at 1709.

2.4 GB60 CHART PLOTTER

While on passage, the chart plotter was the master's primary means of navigation. It therefore follows that a full understanding of the controls and capability of the equipment was essential in ensuring the safe navigation of *Windcat 9.*

2.4.1 Inadvertent movement of waypoint 4

Examination of the chart plotter found that the route entered on 27 May 2012 had not been locked. Consequently, when the master demonstrated the chart plotter range control to the trainee master, and placed the cursor on either the route between waypoints 4 and 5, or on waypoint 4, he inadvertently moved waypoint 4 to the west. This was easily done and, because the master was not effectively monitoring the vessel's passage, the consequence of his action went unnoticed until about 1 minute before the contact.

2.4.2 Limitations of the GB60 chart plotter relative to the accident

The information contained in the chart plotter's log file can be misleading. If a waypoint on a saved route is moved, either intentionally or inadvertently, there is no record of the date the change occurred, and the original date the route was created is retained. The co-ordinates of the moved waypoint are recorded on the chart plotter database log file but the log file does not record the position from which the waypoint was moved.

The GB60 was not designed to display a "save route" dialogue prompt box when moving from the route planning mode to the navigating mode. However, Section 13.3 of the GB60 operator's manual provided instructions on how to lock the route and stated:

> *"After finishing a route, the route and waypoints should be locked to prevent accidentally deleting or moving any key route information."*

Simrad has replaced the GB60 chart plotter with its NSO model. This incorporates a safeguard against inadvertent movement of waypoints and routes by providing an on-screen "save route" prompt whenever the user exits the route planning mode. All WWL vessels are now fitted with the NSO system.

2.5 MASTER'S KNOWLEDGE OF THE CHART PLOTTER'S FUNCTIONALITY

The master had frequently used chart plotters during his previous work on fishing vessels. In this case, he was familiar with the basic operation of the GB60 chart plotter but was unaware of a number of its features which directly relate to this accident.

2.5.1 Relevant chart plotter features

In particular, the master was unfamiliar with how to lock and unlock waypoints, and how to set up guard zones and their associated visual and audible alarms. Although Target 3 disappeared from the chart plotter's display at a point when the range was increased, the guard zone ring remained visible. Crucially, the master was also unaware that waypoints could be moved using the tracker ball cursor by "picking up" an unlocked waypoint or a route between waypoints.

2.5.2 Conclusion

Had the master been familiar with these features then he might have taken the precaution to check the route was locked. In addition, if the guard zone had its alarm features activated, the master would have been alerted to the danger. It is possible that he would then have reduced speed, or come to a stop, to determine his true position and take appropriate corrective action thereby making the contact far less likely.

2.6 PASSAGE MONITORING

One of the key responsibilities of anyone in charge of a navigational watch is to effectively monitor the vessel's passage using all appropriate means at his/her disposal. Such means include making full use of visual cues, paper charts, chart plotters, radars, AIS information and lookouts.

2.6.1 Passage monitoring from LID Wind Farm – general

Section 4.0 of MGN 315 (M) highlights the following:

> *"… during the watch check the vessel's position, course and speed using all appropriate navigational aids and means necessary to ensure that the vessel follows the planned track."*

WWL's TBRA 0020 – Night/Dark Operations highlights the risks and identifies control measures related to passage monitoring, including the need for a competent master to be in control and the deckhand to carry out lookout duties.

It might be argued that the master did monitor *Windcat 9*'s passage towards Grimsby until his alteration of course at 1709, because he followed what he thought was the correct route on the chart plotter. However, other than monitoring *Windcat 9*'s GPS position in relation to the planned reciprocal track and identifying AIS contacts on the plotter's display, the use of guard zone alarms, visual cues, radar and a dedicated lookout did not receive sufficient attention.

The master did not routinely monitor the passage by radar and was not expecting to encounter anything at close range. He also became distracted by his desire to demonstrate use of the chart plotter's range controls to the trainee master. In view of the environmental conditions, the vessel's speed and the close proximity of navigational hazards at that time, the master's attention should have been focused on monitoring the vessel's progress against the passage plan rather than conducting training.

2.6.2 Visual cues

The visibility at the time of the accident was reported to be variable at between 2 and 4 miles. *Windcat 9*'s master had an uninterrupted view through the wheelhouse windows **(Figure 16)**, as did the deckhand. Had the master chosen to use visual cues to check *Windcat 9*'s position before deciding to alter course to port at 1709 (when the DZ1 buoy was at 1.9nm range), the 4-mile range flashing yellow lights of DZ1 and DZ2 buoys, marking the northern limit of DNAWR, would probably have been visible. He might then have recognised that *Windcat 9* was already significantly west of the planned reciprocal track, and provided him with an opportunity to take alternative action, including bringing the vessel to a stop to determine *Windcat 9*'s true position.

A further visual cue that *Windcat 9* had deviated from the planned reciprocal track was its heading, which would have been to port of the normal heading for the planned reciprocal track towards waypoint 4. If he had been monitoring *Windcat 9*'s heading, the master should have been alerted to this, particularly as he would have needed to alter the autopilot setting to port at 1654 to keep *Windcat 9*'s GPS position on the modified reciprocal route displayed on the chart plotter.

2.6.3 Radar

Windcat 9's radar was set to display north-up on a range scale of 1.5nm and the rain and sea clutter controls had been adjusted by the master to deal with the steadily worsening weather conditions. It was reported that during the passage, Target 3 was never identified on the radar display, but that the smaller DZ1, 2 and 3 buoys were. This is inconsistent with other accounts that report that Target 3 was always identified by radar, but that its radar echo routinely disappeared at about 0.3-0.5nm depending on the weather conditions. It is also contrary to the re-enactment carried out the following day, albeit in better weather conditions, when a radar echo from Target 3 was clearly shown on a radar display set on the 1.5nm range scale.

Figure 21 shows that at 1707 *Windcat 9* was 1.5nm from Target 3, whose radar echo should have been displayed. At 1710, *Windcat 9* was 1.5nm from DZ1 buoy, a radar echo from which was reported as being displayed. While adjustment of the radar set's sea and/or rain clutter controls could have suppressed a radar echo from Target 3, it does not explain why a radar echo from DZ1 buoy was displayed without any further radar adjustments being made.

Travelling at 23.5 knots, it would have taken *Windcat 9* less than 4 minutes to travel 1.5nm, the range scale in use on the radar. Intermittent use of a higher radar range scale for the purpose of collision avoidance or fixing the vessel's position by an alternative means, in accordance with best practice, might have enabled the radar echoes from Target 3 and DZ1 buoy to have been detected at a distance of more than 1.5nm. This would have provided for earlier recognition that the vessel had deviated significantly from the planned reciprocal track.

2.6.4 Use of lookouts

Section 8 of MGN 315(M) provides comprehensive guidance on lookouts.

The deckhand automatically assumed lookout duties as part of his routine tasks. The master did not give him any specific instructions and there was an assumption that the deckhand would alert the master to any concerns. However, the deckhand did not identify any hazards to the master.

Reproduced from Admiralty Chart BA 107 by permission of the Controller of HMSO and the UK Hydrographic Office

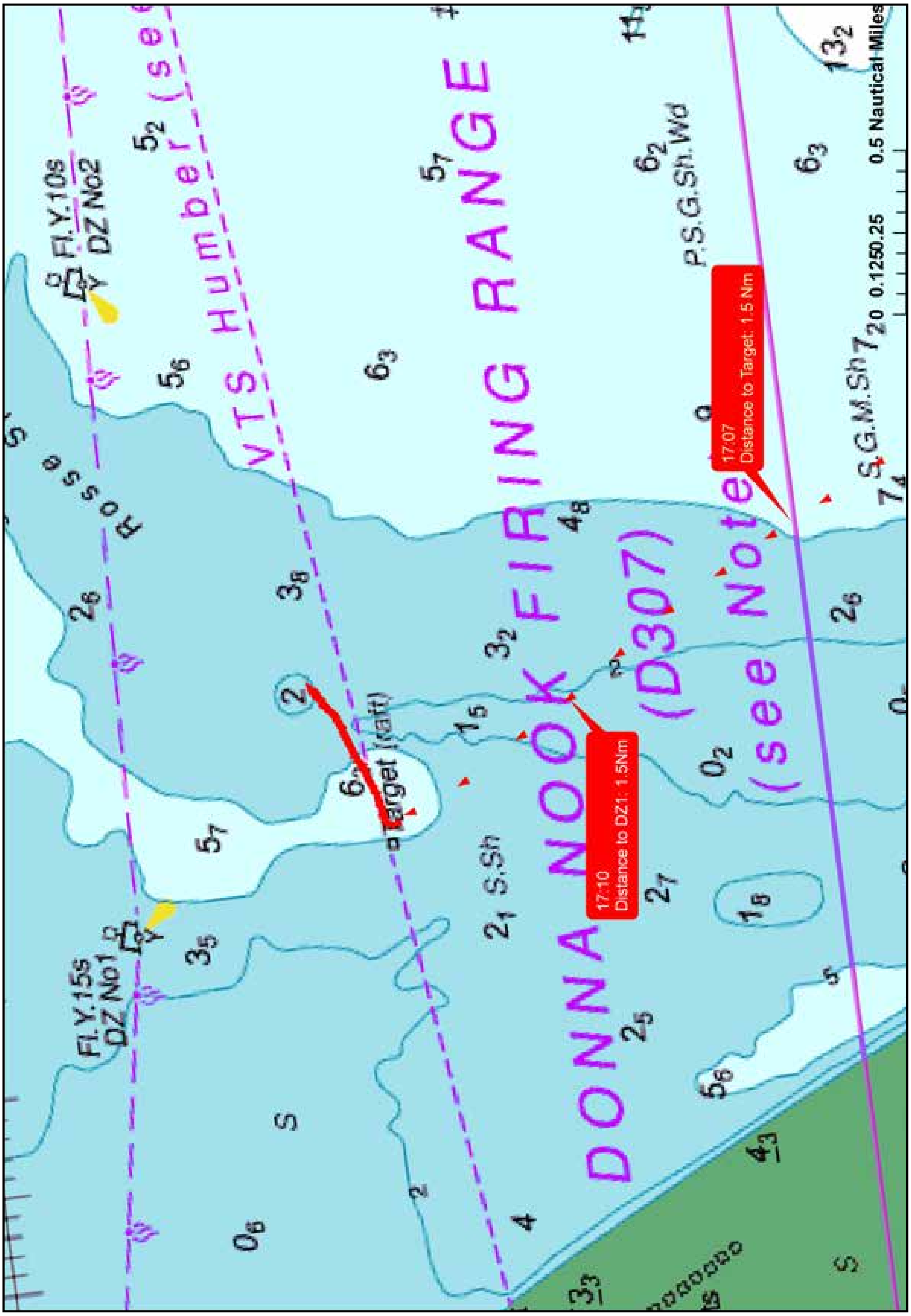


Figure 21: AIS tracks showing positions 1.5nm from Target 3 and DZ1 buoy

It would have been prudent for the master to have instructed the deckhand to be particularly vigilant while he demonstrated the operation of the chart plotter to the trainee master. Had he done so, the deckhand might have identified that *Windcat 9* was off track in relation to the flashing light of DZ1 buoy, prompting earlier corrective action to have been taken.

It is particularly important during high-speed operations, especially in darkness or in reduced visibility, that the lookout is properly incorporated into the 'bridge team', and is not involved in other duties which could distract him/her from their primary role. Section 1.22 highlights examples where the lack of an effective lookout was contributory.

It was noted that the SMS did not specifically describe the lookout's duties or formally nominate anyone other than the master to take that role. The SMS – Section SMM 07-17, paragraph 2.2 – Watch Keeping at Sea [sic] **(Annex L)** implied that the watchkeeper (the master) had the responsibility for lookout duties. However, in practice the deckhand also assumed lookout duties.

2.6.5 Conclusion

The master did not effectively monitor the passage of *Windcat 9.* This was due to distraction when demonstrating the chart plotter to the trainee master, the lack of a proper briefing to the lookout, and his not making appropriate visual references to the flashing light of DZ1 buoy and to the displayed radar information.

2.7 PASSAGE PLANNING

When reviewing *Windcat 9*'s passage planning, a wide number of discrepancies were noted between the paper chart passage plan, the information recorded on the VPF, and the modified version of the 27 May 2012 route held on the plotter's data log file. The paper chart and VPF positions were superimposed on the chart plotter together with the modified route and are shown at **Figure 22**. Although waypoint 6 is listed on the VPF it was not evident on the chart plotter.

There was no company requirement to periodically check plotter routes against the paper chart, that routes were locked and that guard zone alarms were set. There were also no specific instructions about the use of the back-up chart plotter.

2.8 PRIMARY MEANS OF NAVIGATION

The SCV Code implies that paper charts are intended to be used as the primary means of navigation (see Section 1.13.3).

Although WWL declared that paper charts were indeed the primary means of navigation, in practice the chart plotter was used for this purpose. It is impractical to expect the master of a catamaran, travelling in excess of 20 knots, to leave the conning position to consult a paper chart, full-sized or otherwise to determine the vessel's position. It can be argued that the deckhand could take the con at this time, but this would compromise his lookout duties.

It is reasonable to use paper charts for passage planning purposes and then use the chart plotter for passage monitoring provided that an ability to navigate safely is not compromised. The SCV Code gives owners an option to declare that the electronic

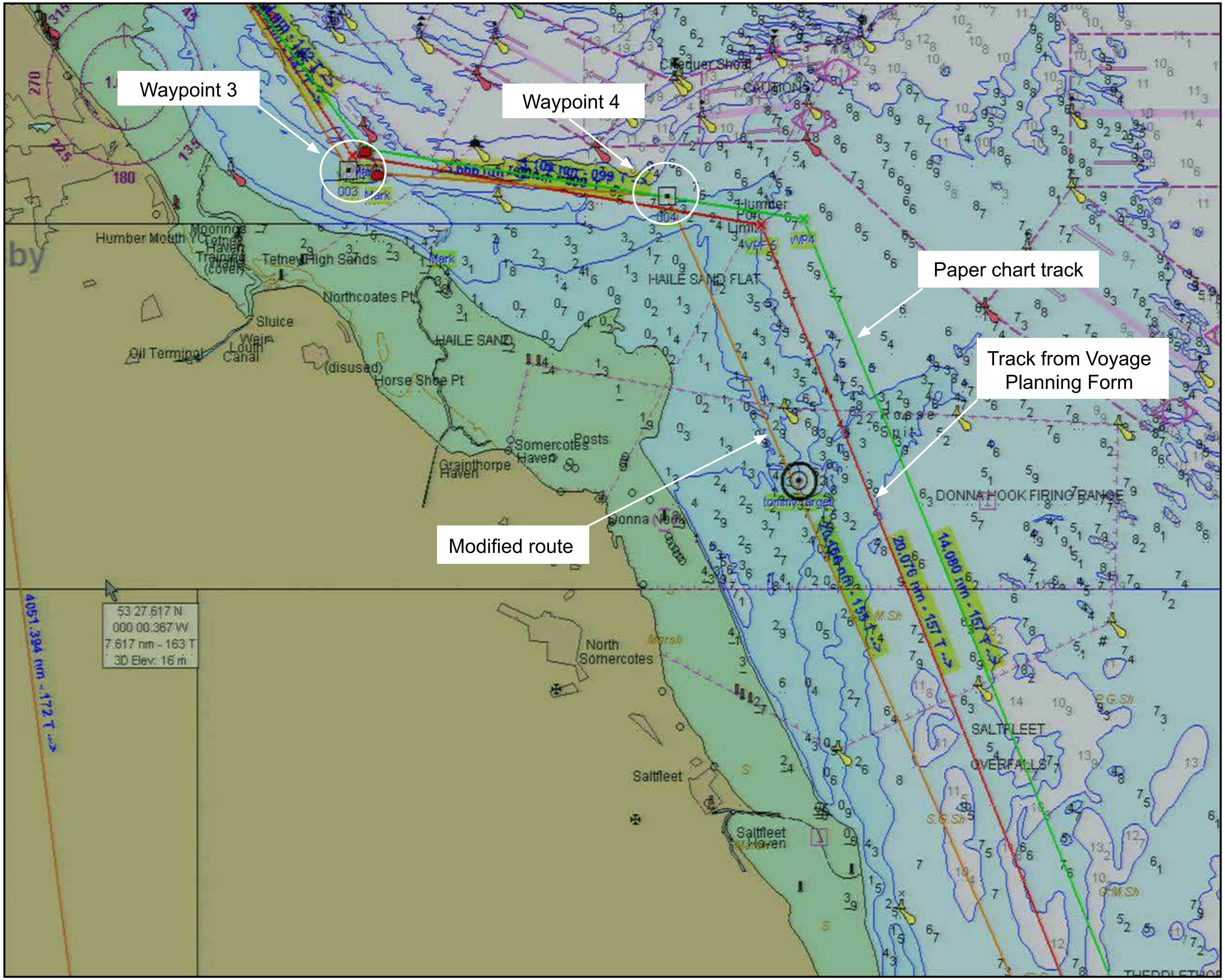


Figure 22: Paper chart, Voyage Planning Form data and chart plotter tracks

chart plotter meets chart carriage requirements as long as it is certified as described at Section 1.13.3. Despite this option being published in MGN 319 (M+F), it does not appear to have been widely recognised and no certification was held or applied for by WWL with respect to the GB60.

Given the general design and operational requirements of passenger transfer vessels (PTVs) throughout the growing offshore renewable energy sector, an electronic chart plotter is effectively the only practical primary means of navigation in terms of passage monitoring. However, without knowledge of which specific types of chart plotter meet chart carriage requirements, the extent to which safe navigation is currently being compromised is uncertain and uncontrolled.

2.9 CHART ISSUES

Diligent navigation chart management and prompt chart corrections are an integral part of establishing good navigational practices.

2.9.1 WWL's paper chart correction procedures

Admiralty chart 107 Edition 11 was in use at the time of the accident. However, Edition 12, dated 10 May 2012, with chart corrections up to Notice to Mariners 2010 -175 included, was available some months before the accident but had not been issued to *Windcat 9*.

The chart correction procedures were poorly attended to and were incomplete. Admiralty chart 107 was corrected to 5395/11; the associated Notice to Mariners was dated 1 December 2011. Correction 1452/12, dated 29 March 2012, had not been made. Corrections 308/11, 2976/12 and 4269/12 had been made to the chart but had not been recorded at the bottom of the chart: in accordance with convention and good practice **(Figure 23)**.

Black ink was used for some of the corrections and, in some cases, the full correction tracings were transposed onto the chart instead of using the correct method. This process was contrary to the SMS and the conventions described in the UKHO publication NP294 – "How to Correct your Charts the Admiralty Way". The method used caused the chart to be cluttered, which could easily have led to confusion and obscuration of the chart's symbology **(Figure 24)**.

According to the SMS, the master had responsibility for identifying chart corrections by accessing the UK Hydrographic Office's website and for ensuring the latest edition chart was in use. However, in practice, the company's QHSE department issued the charts and chart corrections. No audit of the vessel's navigational practices had been undertaken, either as part of the company's 'full' or 'mini' audit scheme, and so the weaknesses in the chart correction process had not been identified.

2.9.2 Identification of DNAWR Target 3

DNAWR Target 3 was placed in position in November 1974 and, at the time, was fitted with a flashing light, which illuminated during the hours of darkness. However, owing to the raft's usage, the light often became unserviceable. To avoid confusion regarding its operational state, it was decided that Target 3 should remain unlit and navigation charts were duly amended to reflect this.

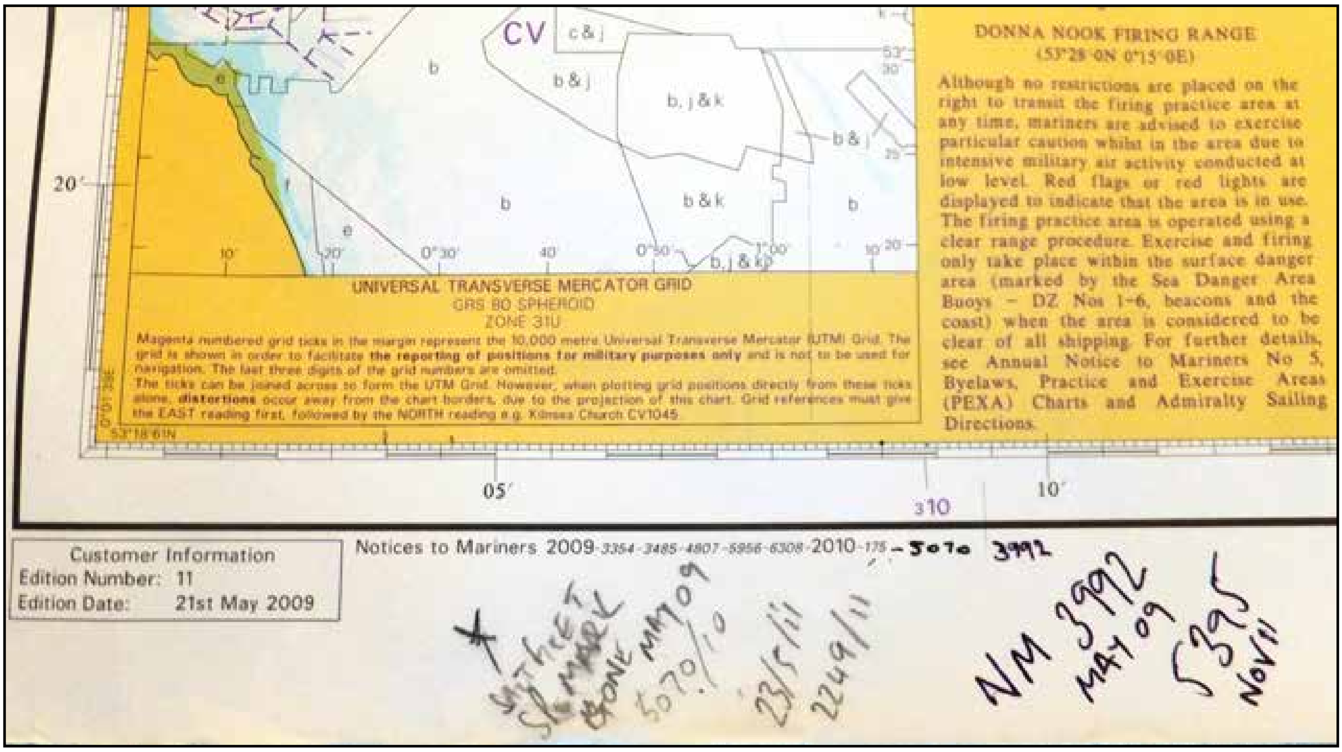


Figure 23: Chart correction annotations on Admiralty chart 107 - Approaches to the River Humber

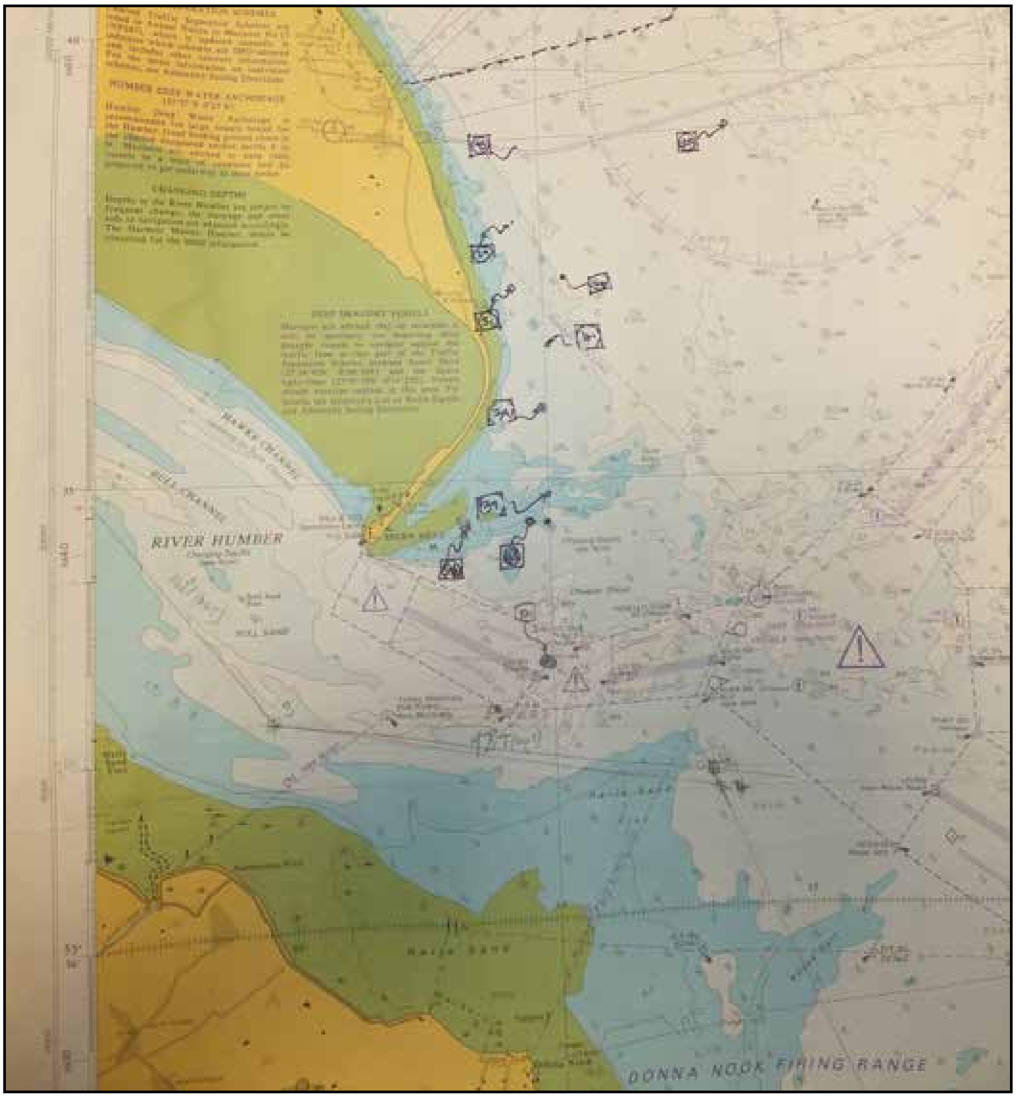


Figure 24: Chart corrections

The “day-glo” orange finish of Target 3’s structure and the height and size of the radar reflector make it relatively easy to see in clear daylight, and identifiable on radar. While regular users of the area are aware of the location of Target 3, visitors, and in particular those vessels without radar such as leisure craft, may well be unable to identify the target in poor visibility and darkness.

Admiralty chart 107 – Approaches to the River Humber, identifies Target 3 by a small black square with “Target (raft)” in small-sized font. The square is located on a magenta dotted line marking the VTS Humber limit with the consequence that Target 3 is difficult to identify on the chart and puts at risk mariners who are unfamiliar with the area. While the chart notes describe the transiting arrangements for DNAWR, they do not make any reference to the unlit Target 3.

2.10 PERSONAL FACTORS

The master was in good health, his last medical examination being in May 2012. He had not been prescribed any medication which might have affected his performance, and there is no evidence to suggest he was under the influence of alcohol or non-prescriptive drugs.

2.11 WORKING PATTERNS

There is the potential, given the commercial pressures, shift patterns, distances to and from wind farm sites and the small number of crew, for passenger transfer vessel crew to become unduly fatigued. Vessel owners/managers and offshore renewable energy developers/operators should be mindful of this issue and take appropriate measures to mitigate this risk.

In this case, the crew commonly worked a 12-hour day. Analysis of *Windcat 9*’s Daily Log showed they had worked for 83 hours during the 6-day period 14-19 November with a “weather day” called on 20 November. The hours of rest gained during this period were therefore only just in excess of the minima stated in the SCV Code. However, this does not take into account the periods of rest gained while the vessel was drifting or tied up to wind turbines during the working day. Neither the master nor deckhand identified fatigue or working patterns as a concern.

Fatigue is not considered to have been a contributory factor in this accident.

2.12 TRAINING AND QUALIFICATIONS ISSUES

2.12.1 Industry-specific training

There is no mandatory industry-specific training for either masters or crew of passenger transfer vessels to prepare them for the intensive boat-handling demands and associated operations in the offshore renewable energy sector. As indicated at Section 1.21, there is a training provider that delivers a bespoke half-day course for masters and crew, but the take-up for the course is slow and, hence, there is a need for a comprehensive company training scheme.

2.12.2 Qualifications issues

Masters and crew generally enter the industry with the core qualifications required by the SCV Code. Those from the fishing industry will hold their fishing vessel CoCs and will have completed the Seafish mandatory safety training courses. While these national safety courses exceed the requirements laid out in the SCV Code, they are not recognised outside the UK because they are not directly comparable to certificates issued in accordance with the international STCW standards.

Consequently, owners and managers of vessels working in the offshore renewable energy sector increasingly require their masters to hold qualifications in accordance with The Large Commercial Yacht Code (LY2). This is because masters of coded vessels of <200 gross tonnage (gt) are also required to hold an STCW Personal Safety and Social Responsibilities certificate, a Global Maritime Distress and Safety System (GMDSS) Restricted Operators Certificate and an Engineer and Navigational Grade 1 (ENG1) medical fitness certificate. They are also required to pass the associated MCA oral examination. Holding these qualifications enables compliance with regulations outside the UK and, in doing so, it opens up the employability of UK registered vessels and crews, especially in Europe.

SESRED requires that masters of vessels it charters hold a Master <200gt STCW 95 A-II/2. In addition, it requires that the first crew member is to be qualified as an Officer of the Watch, STCW 95 A-II/1 (see Section 1.16.2). While many masters already hold the qualification, the first crew member requirement is considerably in excess of the existing SCV Code requirements.

2.12.3 Master coded vessels <200gt CoC and implications

As one of the conditions for the award of the Master <200gt CoC, candidates must have passed the Yachtmaster Offshore practical examination. The previous experience and minimum sea-time requirements for the award are:

- 50 days' sea time including 5 days as master.
- 2,500 miles of sea passages including five passages over 60nm, including two overnight and two as master.

The GPS and chart plotter section of the shore-based Yachtmaster Offshore syllabus is a minimum of 3 hours duration. It covers the following subjects to the depth of knowledge indicated at the footnote[14]:

- Principles of operation and limitations of use (A)
- Raster and Vector charts (C)
- Datum (C)
- Importance of confirmation of position by an independent source and keeping a separate record of position (A)
- Importance of paper charts (B)

[14] A - Full knowledge, B – Working knowledge, C – Outline knowledge

The implication of these requirements is that a newly qualified Yachtmaster Offshore, holding a <200gt CoC, might have had only 50 days' sea-time experience and only 5 days as a master when recruited as a master of an offshore PTV carrying up to 12 passengers at high speed. In addition, the master might only have had 3 hours' training in GPS and chart plotter techniques, if the candidate has chosen to complete the shore-based Yachtmaster Offshore course in preparation for the practical examination.

Masters transferring to the wind farm PTV sector will not necessarily have experienced high-speed operations, which present new and significant challenges. In particular, many of WWL's current masters have migrated from the fishing industry. They have been used to transiting at relatively slow speeds, commonly at 8-12 knots and towing their fishing gear at about 4-5 knots. Consequently, moving into the wind farm PTV industry places new demands on them.

The transit speed of PTVs is commonly 20-25 knots. "Thinking time" is considerably reduced when compared to fishing operations, and navigating at this speed, at night, leaves little margin for error and for corrective action to be taken.

Given the operational requirements of PTVs that necessitates the use of chart plotters as a matter of course and relatively high speed compared to more conventional vessels, the importance of providing additional PTV-specific training is clear.

It therefore follows that owners and managers of PTVs must have a comprehensive, formally documented, crew induction, training and assessment procedure, to satisfy themselves that crews are competent in all respects to undertake their duties.

2.13 INDUCTION PROCEDURES

Both CREL and SESRED's induction procedures (Section 1.15) were comprehensive. They prepared new PTV masters and crews with the level of knowledge required to understand the health and safety issues that need to be considered during personnel transfer procedures and emergencies.

WWL's induction process was sufficient to give masters and crew a satisfactory introduction into the site requirements and vessel's layout, controls, equipment and general procedures.

2.14 TRAINING PROCEDURES

2.14.1 CREL and SESRED's training procedures

The mandatory CREL and SESRED induction training did not attempt to verify marine skills. The developers considered that masters and crews would hold the appropriate qualifications and therefore would have the necessary core skills. Vessel-specific training was considered to be the responsibility of the vessel owner/manager. Similarly, CREL and SESRED's vessel-contracting audits covered the material aspects of the vessels but did not seek to assess crew competencies.

2.14.2 WWL's training procedures

The principle of conducting onboard training under the instruction and supervision of an experienced master is entirely appropriate. The training master considered that *Windcat 9*'s master at the time of the accident had completed the required training as recorded on the Master's Training Program – Checklist.

Although the checklist identifies training subject headings, at the time of the accident there was no amplifying information about the scope of the training that was to be provided. Consequently, this was left to the judgment of the training master. As an example, the "Deck/Bridge" section required the training master to confirm the following:

> *"Bridge and deck equipment explained, acknowledged & understood".*

The only other item touching on navigational aids was in the "Navigation" section which required an answer to the following:

> *"Have manuals of navigational equipment been sighted and utilized in case required?"*

Evidence suggests that *Windcat 9*'s master received some training on the chart plotter's functionality during his familiarisation period. However, it is of concern that Section 3 – Master's Training Program – Navigation Equipment section of the Training Manual stated the following minimum requirement:

> *"…A basic understanding of the operation of all navigation equipment is necessary…"*

This standard is inappropriate. Masters should have a thorough understanding of all navigation equipment and should be able to demonstrate a high level of competence in its use and interpreting the information displayed. In order to achieve this, there is a need for the level of navigation equipment knowledge required of a new master to be clearly defined at the training stage.

Depending on personalities, some training masters may find it difficult to point out areas of weakness to trainee masters. It is therefore essential that there is a diligent, constructive and unbiased assessment process.

2.15 WWL'S ASSESSMENT PROCEDURES AND RELATED DOCUMENTATION

2.15.1 Assessors

Initial assessment of personnel following a period of training and subsequent continuation assessment, is a well-established process for determining the suitability of a person for his/her role. It is also an important management tool for identifying the need for additional training, or procurement of equipment, to help ensure a vessel's safe operation.

It is important that those conducting assessments have the necessary skills to undertake the role in an objective and unbiased manner.

There was no evidence of any WWL documented professional standards required for an assessor. There were also no specific terms of reference laying out the assessor's role, required competencies or responsibilities.

Although Section 10 of the Training Manual nominated 14 T&A masters, neither their role nor responsibilities were defined in either the SMS or the Training Manual.

2.15.2 Assessment procedure

Assessing a master up to 3 months after he or she has completed initial training enables poor practices to be established before an assessment is made. In this case, *Windcat 9*'s master had not been assessed since joining the company 9 months previously. His poor understanding of the chart plotter would have inevitably been passed on to the trainee master, potentially resulting in a decline of standards. It was also inappropriate for an un-assessed master to have been appointed to train a new master.

Post-training assessments were not routinely conducted within 3 months, and no one had taken on the responsibility of checking whether suitable and timely assessments were being conducted.

An effective way to ensure standards are not compromised is to conduct the assessment immediately on completion of the training period, and not to allow a new master to operate independently until this has been done.

In practice, the T&A masters only completed the post-training checklist. The assessment of masters was supposedly undertaken by the company's only Senior Assessor for whom there were no formal terms of reference. However, the Senior Assessor's position had been vacant since 6 April 2012. Attempts to recruit a person with appropriate skills and experience of the industry and vessel types had been unsuccessful.

It was not until November 2012, that WWL decided to use in-house personnel as an interim measure. Priority at that time was given to assessing masters who had recently completed their probation period, whose employment contract was coming to an end or about whom site managers had concerns. It is unclear how many assessments took place between April 2012 and 21 November 2012, the date of the accident.

The result of this confusion was that *Windcat 9*'s master had never been formally assessed to determine his suitability for his role. Consequently, his knowledge of the vessel's systems and, most importantly, his competency in using the navigation equipment, was based purely on the knowledge and the quality of information passed on by the master who mentored him during his 2-week training period. WWL had not recognised the risks associated with not carrying out assessments. Had the master been formally assessed, the need for additional training on the navigation equipment and general navigation procedures might have been identified.

2.15.3 Assessment documentation

The assessment documentation was also confusing. None of the documentation used the term "assessment".

The form Progress Report for Skippers was, in effect, an assessment form. However, it is unclear whether this form was to be used in assessing the competence of T&A masters for their specific roles as well as the routine assessment for all masters. At the time of the accident, there were no detailed criteria against any of the assessment areas to explain the standards or knowledge required. For example, Item 1 in the Navigation Equipment section stated:

"Performs good practice of all navigational equipment" [sic]

The meaning of this statement to satisfy this important requirement is unclear. It would be clearer if there was a cross-reference to specific checklists where appropriate.

The company had a navigation skills report form **(Annex I)** for use during mini-audits (see Section 1.17.2). However, there was no reference to it in the Progress Report for Skippers where, arguably, it should have been the metric by which standards were assessed.

The quality of the assessment-related documentation was poor, and it lacked sufficient detail and explanation for it to be an effective management tool.

2.16 THE MASTER'S LACK OF QUALIFICATION

The employment of unqualified personnel can easily compromise the safe operation of a vessel and place the crew and any passengers in danger. A master or crew member can be vulnerable when in a position of responsibility for which he/she is untrained and unprepared.

Windcat 9's master held an Irish Second Hand (Full) fishing vessel CoC. Holders of non-UK CoCs intending to work on UK registered vessels are required to hold a CEC for the CoC they hold. The master had not applied for a CEC to work on board a UK registered vessel and was therefore not eligible to serve as the master of *Windcat 9*. Had the master applied for a CEC, the MCA would have issued one only for employment on UK registered fishing vessels.

WCS wrongly interpreted that *Windcat 9*'s master's Irish Second Hand (Full) fishing vessel CoC satisfied the equivalence requirement laid out at Section 8 of MGN 411 (M+F) **(Annex C)**. This was likely to have been partly due to the personnel manager of WCS not having English as her first language, and misunderstanding the status of the master's qualification and the requirement to hold a CEC. WCS's crew certification procedures omitted the need to specifically check CEC requirements.

There are a number of MCA "M" notices covering the CoC and CEC issues that can lead to confusion. It is therefore important that the MCA is consulted where there is doubt.

Had the MCA been consulted on this occasion, it should have identified the additional qualifications and/or training required. This may have given the opportunity to improve the master's navigational skills and knowledge of electronic navigational aids, making the accident less likely.

2.17 WCS – INDEPENDENT AUDIT FINDINGS

The independent audit of WCS (Section 1.12.5) identified that a number of improvements were required to address shortcomings in general management procedures. It also identified the need for improvement in the following areas which related to the accident:

- Personnel vetting, certification verification and revalidation procedures.
- The need for personnel, additional to the personnel manager, to be involved in crew recruitment procedures to remove the single point of interpretation of national requirements.
- Crew assessment procedures.
- Communications between WCS and WWL's management, in particular with the operations manager.

2.18 WWL – AUDITS AND RISK ASSESSMENTS

2.18.1 Full vessel and mini audits procedures

Correctly scheduled, effective and thorough auditing is essential in helping to identify areas for material and performance improvement, both of which contribute significantly towards a vessel's safe operation.

While the SMS detailed the full vessel and mini auditing requirements, in practice there was no schedule to support these until September 2012.

As a result, prior to the accident, *Windcat 9* had not been subjected to an internal full vessel audit. Had the vessel been audited, it is possible that the master's lack of appropriate qualifications and navigation-related issues would have been identified and extra training provided. A mini audit could then have checked on the progress made, possibly reducing the likelihood of the accident happening. However, this check would only have been effective if the master had been on duty at the time *Windcat 9* was audited.

Neither the QHSE Plan 2013 nor the 2013 Audit Schedule specifically set out when the mini audits should take place on each vessel. The QHSE Plan simply required a minimum of six mini audits to be carried out each month.

Theoretically, the subject areas for the mini audit were based on the outcomes of the annual full vessel audit and from feedback from site managers and the contracting clients. In practice, the company adopted a policy of leaving the mini audit subject area to the auditor's discretion. This policy lends itself to subject area bias such that the auditor selects the subject areas he/she feels most comfortable with.

While two mini audits were carried out across the Windcat fleet in 2012, there was no evidence that a radio and navigation mini audit had ever been conducted.

2.18.2 Risk assessments

Thorough and complete risk assessments are an integral part of a company's procedures for ensuring it fulfils its health and safety obligations. Only by identifying the risks can appropriate control measures be put in place to minimise risks to personnel and equipment.

TBRA 0020 – Night/dark Operations was the only WWL risk assessment which identified the risk of collision. To reduce the risk, it identified a series of sensible and appropriate control measures **(Annex J)**. Had all of the control measures been adhered to, the likelihood of the accident occurring would have been significantly reduced.

Since the accident, three additional and relevant TBRAs have been developed as follows:

- TBRA 58 - Sailing Without Using Radar
- TBRA 60 - Vessels Operating from Grimsby Fish Dock to Lincs Wind Farm
- TBRA 61 - Vessels Operating from Grimsby Fish Quay Side to Lincs Wind Farm.

The control measures identified in TBRAs 58, 60 and 61 are very similar to those in TBRA 0020, with the additional need for the passage plan to be followed. They also emphasised the need to keep a proper lookout and, for the first time, identified the risks and control measures associated with Target 3.

2.19 INDUSTRY TRAINING, GUIDANCE AND PROMULGATION OF SAFETY LESSONS

2.19.1 Training

Industry training is currently focused on the offshore renewable energy technicians, who complete courses in accordance with RUK's Approved Training Standard - Marine Safety Training syllabus.

A random selection of the 12 technicians on board *Windcat 9* at the time of the accident was interviewed in the course of the investigation. They were very positive about the manner in which the crew dealt with the emergency, and all agreed that their training had prepared them well for the situation. Review of the vessel's CCTV footage showed that they reacted quickly and correctly in donning immersion suits and lifejackets, preparing the liferaft and assisting the crew with pumping operations.

One of the technicians observed that he felt uncomfortable crossing from *Windcat 9* to *Fastnet Tern* at sea. It is understood that "cross-decking" has been recently added to the training syllabus.

2.19.2 Guidance

NWA's draft "Best Practice Guide for Offshore Energy Service Vessel Crews" is the first document directed specifically at improving the skills base of the crews of offshore energy passenger transfer vessels. The document requires further development and should be considered in conjunction with the work that IMCA is undertaking with respect to developing skipper and crew competence frameworks and guidance.

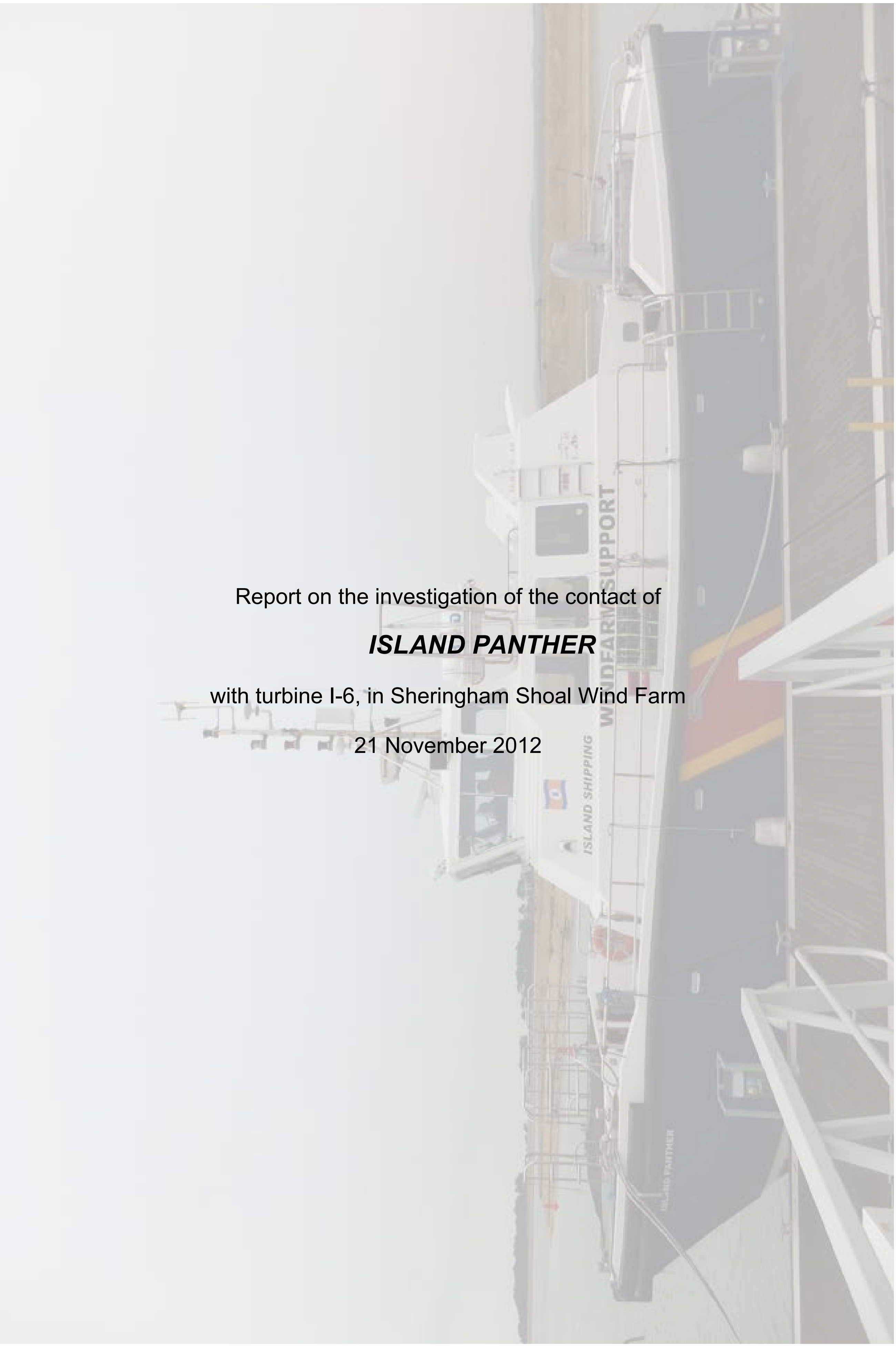
There is little consolidated marine operational guidance available to owners/managers and crews of PTVs. Guidance is particularly important to those new to the industry.

2.19.3 Promulgation of safety lessons

The promulgation of safety lessons is an essential management tool in helping to prevent repetition of accidents and hazardous incidents.

Currently, a number of industry-related organisations have their own methods of bringing safety lessons to the attention of their respective membership. Notwithstanding the potential legal issues, it would be particularly beneficial if these lessons were shared among all of those involved in the offshore renewable energy industry. It is also important that all stakeholders are aware of not only how to access this information but also how they can input their own safety issues and lessons for dissemination.

With respect to this, IMCA and RUK have already established “safety alert” processes and the NWA is considering developing such a system.



Report on the investigation of the contact of

ISLAND PANTHER

with turbine I-6, in Sheringham Shoal Wind Farm

21 November 2012

SYNOPSIS

At 1811 on 21 November 2012, the wind farm passenger transfer vessel *Island Panther* made heavy contact with the transition piece of turbine I-6 in the Sheringham Shoal Wind Farm at a speed of about 12 knots. The impact caused the five persons on board to be forced out of their seats and sustain various injuries. The structure immediately aft of the vessel's bow fender crumpled as a result of the impact but no water ingress occurred.

During the day, *Island Panther* had been operating within the wind farm transferring personnel from the floating hotel, *Regina Baltica*, to various turbines situated in the wind farm. With bad weather approaching, the master collected the personnel from their various locations and had returned them all to *Regina Baltica* by 1536.

At 1750, *Island Panther*'s night master and deckhand joined the vessel from *Regina Baltica* and a handover between the day and night masters commenced. At 1800, with the day master still at the helm, *Island Panther* collected a passenger from *Regina Baltica* before the night master took command.

The night master had to make passage through the wind farm to follow the approved route back to Wells-next-the-Sea. It was dark, the wind was gusting 25-30 knots with driving rain from the west-north-west, and there was 1.5m of swell from the south-east. The south cardinal buoy light on the south side of the wind farm was visible, as were the rows of turbine aviation safety lights. The master steered *Island Panther* towards the south cardinal buoy light, glancing at the chart plotter in front of him, at a reduced speed of 11-12 knots because of the sea conditions.

At 1811, *Island Panther* made heavy head-on contact with the unlit transition piece of a turbine. The impact forced everyone out of their seats. The passenger sustained a head injury but remained conscious and was tended to by one of the crew. The vessel was assessed for damage before slowly heading out of the wind farm. Two other passenger transfer vessels stood by and the vessel was met off Wells fairway buoy by two lifeboats. Having decided it was safer to keep the casualties on board, once there was sufficient tidal height, *Island Panther* entered the harbour and was met by shore emergency services.

The investigation determined that the accident occurred because the master had relied too heavily on visual cues and had made insufficient use of the lookout and navigation equipment available. There was insufficient training, particularly in regard to navigation equipment, and no formal assessment of new masters, allowing the possibility of ingrained poor working practices being passed on. Although the turbine transition piece had been reported as unlit, the system for reporting defects had failed to result in a navigation warning being promulgated. Although, not formal aids to navigation, it was inevitable that the lights would be utilised as such.

Recommendations have been made to the wind farm operator, Scira Offshore Energy Ltd, the vessel owner, Island Shipping Ltd, and other stakeholders involved in the offshore renewable energy industry aimed at improving the safety of wind farm passenger transfer vessel operations.

SECTION 3 - FACTUAL INFORMATION

3.1 PARTICULARS OF *ISLAND PANTHER* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Island Panther*
Flag and Port of Registry	United Kingdom- Southampton
MCA's Certifying Authority	The Society of Consulting Marine Engineers and Ship Surveyors
Official Number	917511
Type	Commercial vessel (Catamaran)
Registered owner	Island Shipping Ltd
Manager	Island Shipping Ltd
Construction	GRP
Length overall	16.8m
Gross tonnage	21.72
Minimum safe manning	2
Authorised cargo	Up to 6 tonnes (t) including 12 passengers
VOYAGE PARTICULARS	
Port of departure	Wells-next-the-Sea
Port of arrival	Wells-next-the-Sea
Type of voyage	Coastal
Cargo information	3 passengers + 30 barrels of waste
Manning	2 crew
MARINE CASUALTY INFORMATION	
Date and time	21 November 2012 at 1811
Type of marine casualty or incident	Less serious marine casualty
Location of incident	53º 07.05' N 001º 11.36'E
Place on board	Not applicable
Injuries/fatalities	5 injuries
Damage/environmental impact	Structural damage to the bow above the waterline
Ship operation	On passage
Voyage segment	Mid-water
External environment	Dark, west-north-west wind 25-30 knots, rough sea and rain showers
Persons on board	5

Island Panther

3.2 SHERINGHAM SHOAL WIND FARM

3.2.1 Wind farm background

Sheringham Shoal Wind Farm (SSWF) **(Figure 25)** is situated approximately 10nm north of the Norfolk coast and consists of 88 turbines each capable of generating 3.6MW. Construction of the wind farm started in 2010 and, at the time of the accident, was nearing completion. As turbines were installed and commissioned they were handed over to the wind farm operator, Scira Offshore Energy Ltd (hereafter referred to as Scira).

Scira had a marine control centre based in Wells-next-the-Sea. This centre was responsible for co-ordinating operations and was continuously manned.

3.2.2 Passenger transfer vessels

PTVs were primarily employed to transport wind farm technicians to and from the turbines. They were also used to transport supplies and for other general duties.

During the construction phase, the technicians were based on a floating hotel, *Regina Baltica*, which was normally anchored to the north-east of the wind farm. The ship was fitted with push tubes and a ladder at its stern **(Figure 26)** in a similar manner to that of the turbines themselves, enabling personnel to readily transfer to and from the PTVs. Transfers to and from the turbines generally only took place during the day, although the PTVs were continuously manned with either a night or day crew.

When not at sea due to bad weather ("weather day"), the PTVs were usually based, with some tidal constraint, in Wells-next-the-Sea, which was about 15nm from the wind farm.

3.2.3 Wind farm entry and exit zones, and approved route

The wind farm was temporarily marked during the construction phase with four cardinal buoys and four pillar special mark buoys. Each buoy had a light with a nominal range of 5nm.

The wind farm had a 700m-wide buffer zone around the majority of its perimeter, primarily on the south and west sides **(Figure 27)**. No entry or exit to or from the wind farm was permitted through the buffer zone. If access to the zone was required, the local fishery was to be notified in good time as the zone was open to fishing. There was a south gate in the vicinity of the south cardinal mark through which vessels were permitted to pass. **Figure 28** shows the AIS tracks of vessels operating to, from, and within the wind farm on 21 November 2012. Within the wind farm, the turbines were spaced at least 700m apart, providing channels within which vessels could safely navigate.

An approved passage plan was provided for the PTVs to follow when transiting between the south gate and the entrance to Wells-next-the-Sea. This route had been agreed with local fishermen to ensure wind farm vessel interference with fishing activity was kept to a minimum **(Figure 29)**.

Photo taken at Sheringham Shoal by CHPV and supplied by Scira Offshore Energy

Figure 25: Sheringham Shoal Wind Farm

Photo taken at Sheringham Shoal by CHPV and supplied by Scira Offshore Energy

Figure 26: *Regina Baltica* passenger transfer arrangement

Courtesy of The UK Hydrographic Office

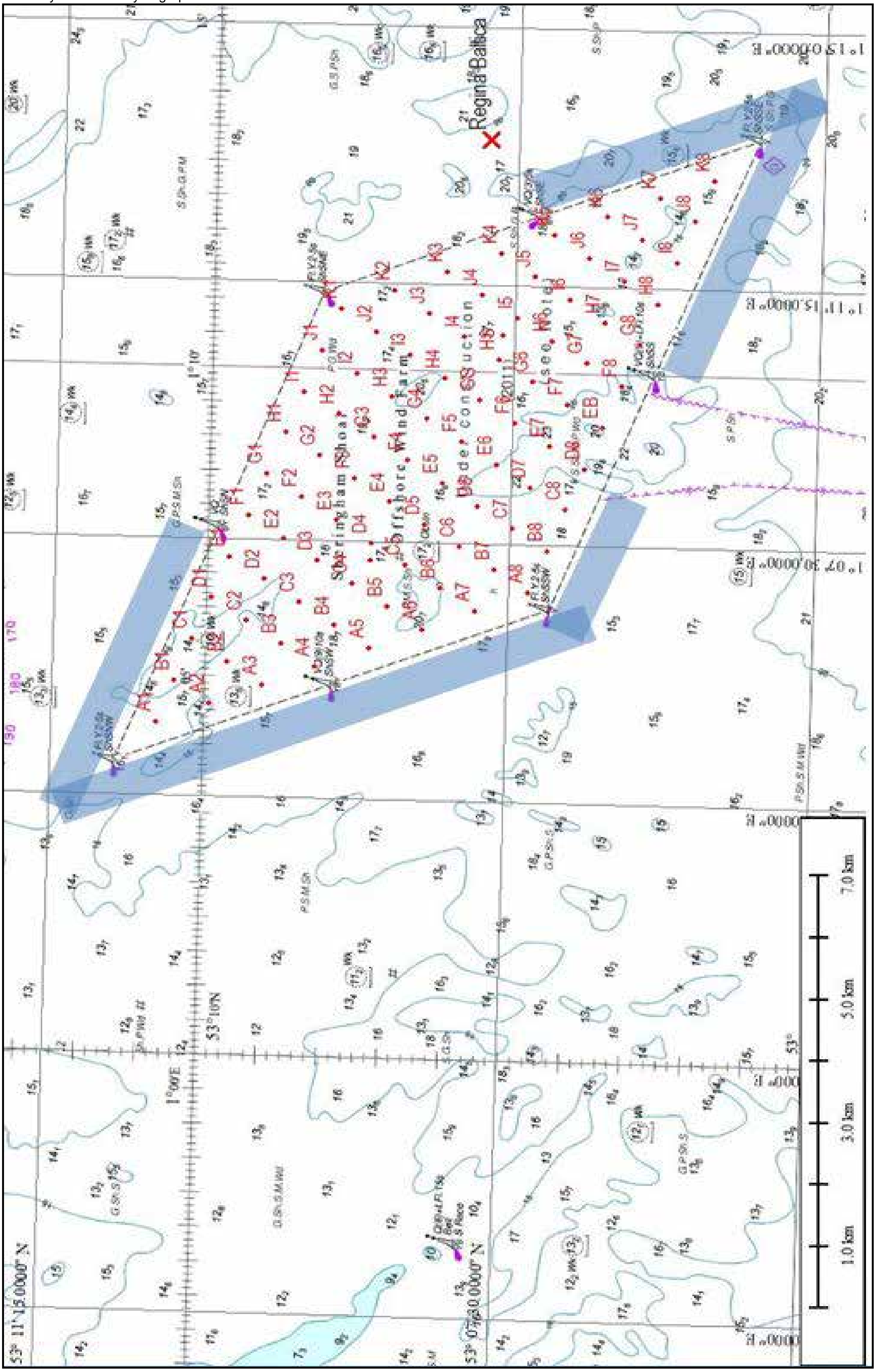


Figure 27: Sheringham Shoal chart with buffer zone

Courtesy of The UK Hydrographic Office

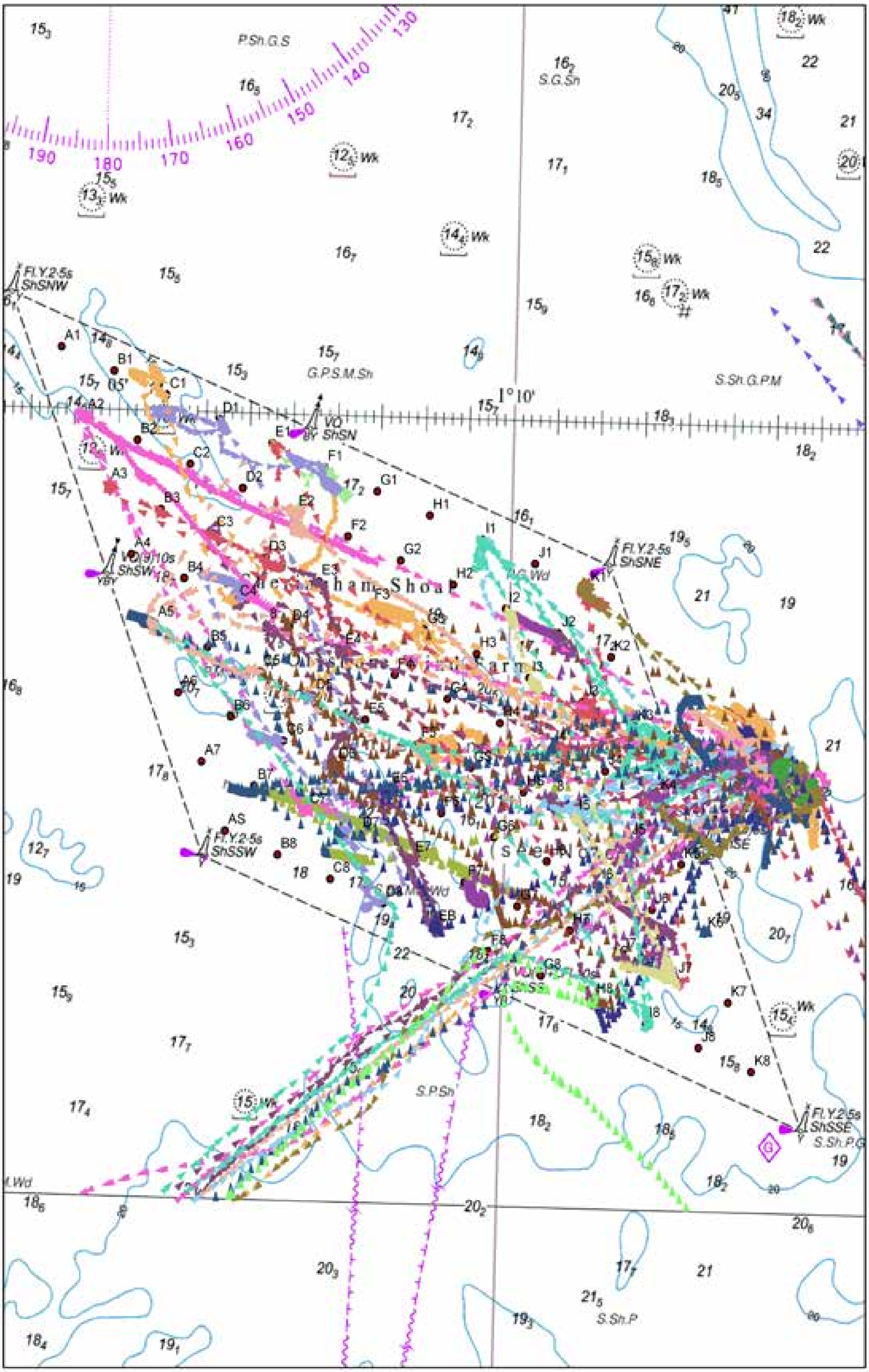


Figure 28: Sheringham Shoal vessel traffic for 21 November 2012

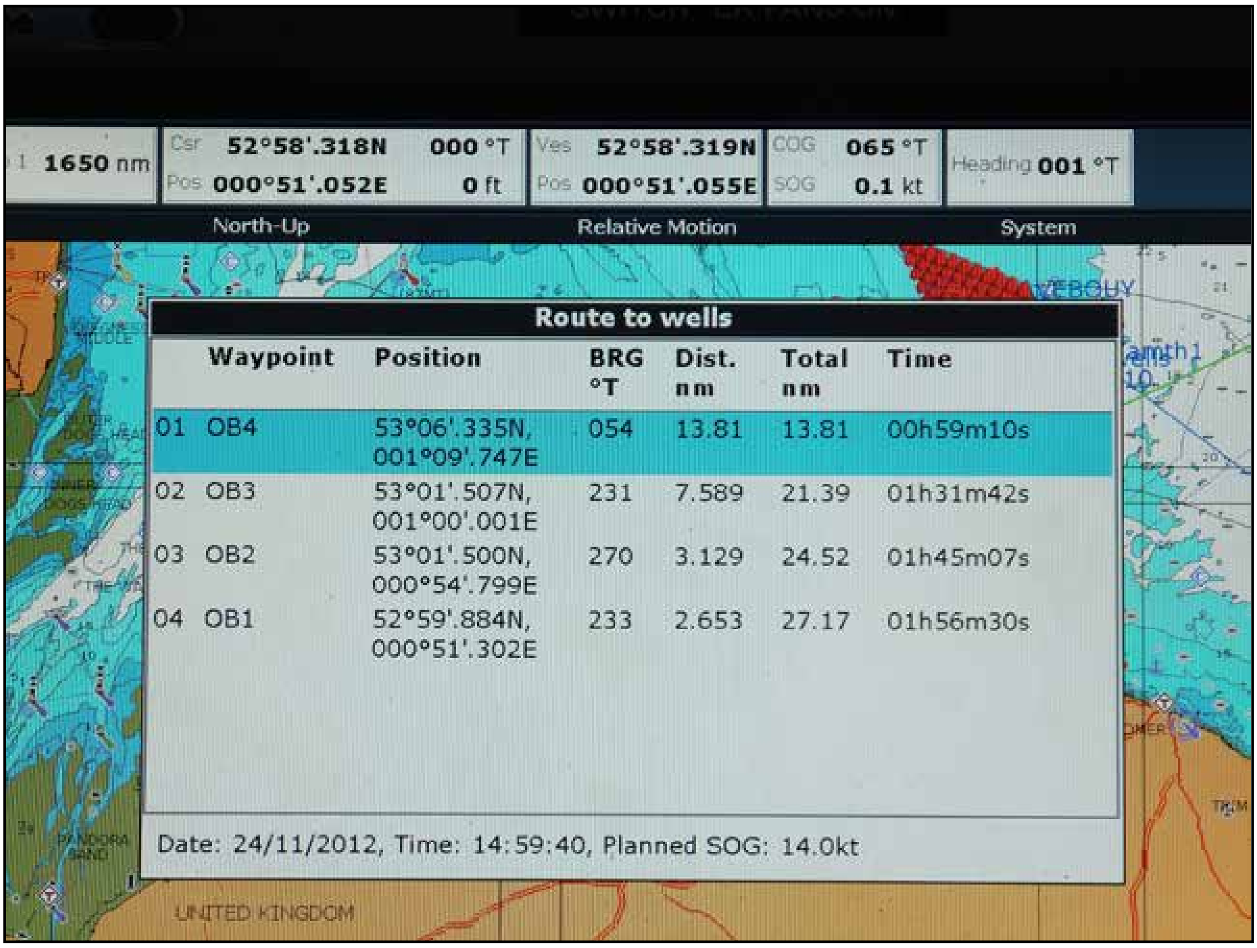


Figure 29: Approved passage plan and waypoints on chart plotter

3.3 NARRATIVE

3.3.1 Events leading up to the contact

At 0040 on 21 November 2012, the night crew, consisting of a master and a deckhand, were on watch when *Island Panther* departed Wells-next-the-Sea with supplies for *Regina Baltica*. At 0200, after unloading the supplies, the crew moored the vessel to turbine K-6 and the engines were shut down. The crew then completed checks on the engines and other administrative tasks for the remainder of their watch. At 0600, the engines were started and the mooring was slipped. The master then steered *Island Panther* towards *Regina Baltica* to enable the night crew to change over with the day crew, who had slept on board *Regina Baltica* as normal. By 0618, the night crew had boarded *Regina Baltica* after handing over to the day crew, and had gone to their cabins to rest.

At 0705, the day crew collected nine technicians from *Regina Baltica*, along with the boarding manifest that detailed which turbines the technicians were scheduled to work on that day. The weather was expected to deteriorate later and so the master was asked to provide the technicians with 45 minutes' warning before collecting them from the turbines to allow the technicians sufficient time to pack up their gear. The master disembarked the technicians at two turbines, B-7 and D-7. During the day, he collected a further wind farm technician from *Regina Baltica* and transported him to various turbines **(Figure 30)**.

Courtesy of The UK Hydrographic Office

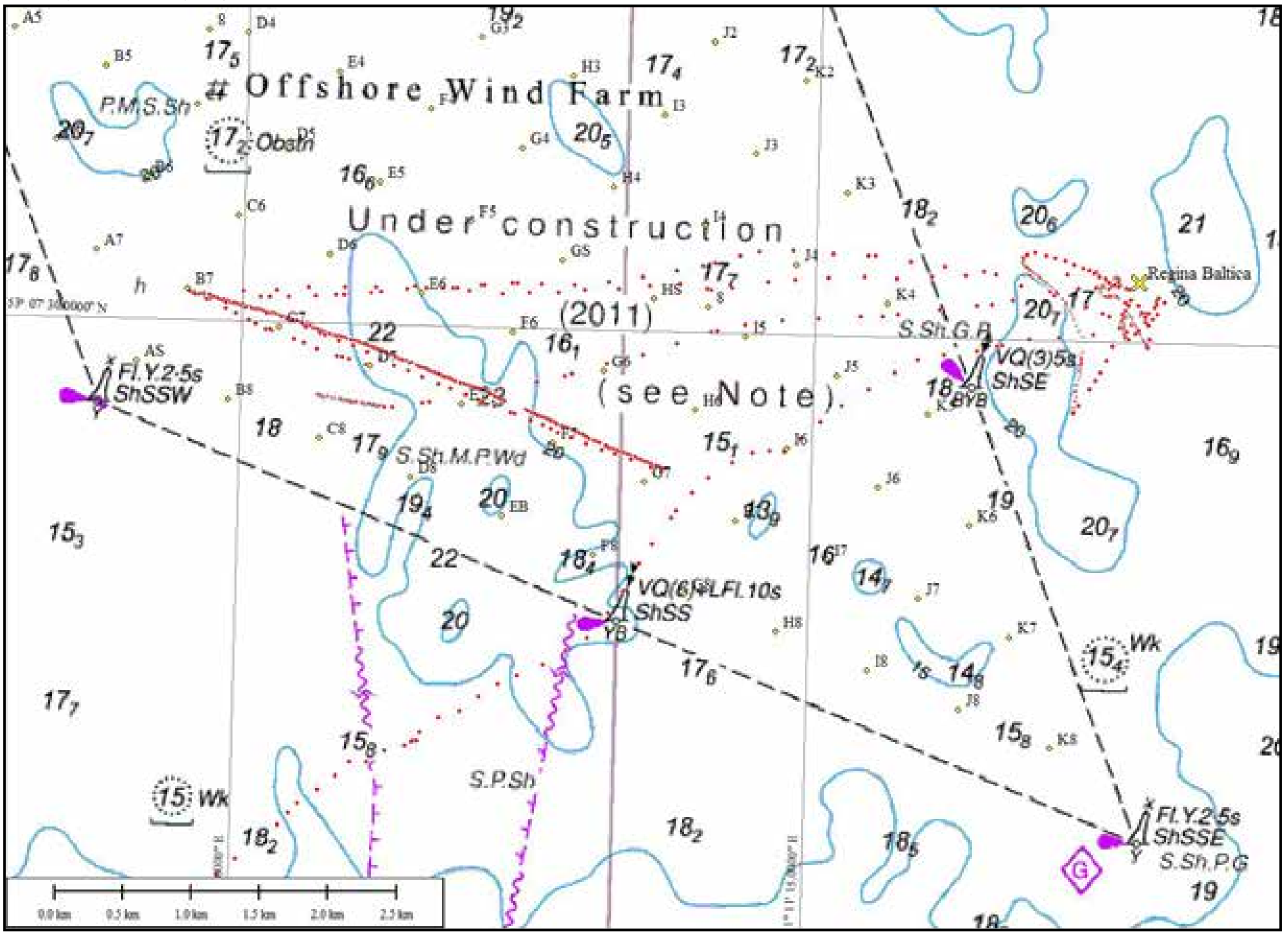


Figure 30: *Island Panther* AIS track (shown by red dots) during 21 November 2012

At 1452, the master began the process of collecting his 10 passengers and by 1536 they had all safely transferred to *Regina Baltica*. While *Island Panther* was transferring the passengers, 30 barrels of waste, weighing 5-10kg each, were loaded onto the foredeck and secured in place. The weather at this time had started to deteriorate, with the wind veering to the west-north-west and increasing in strength.

At approximately 1600, while *Island Panther* was drifting near *Regina Baltica*, the day master called the night master on board *Regina Baltica* and informed him that both crews would probably be returning to Wells-next-the-Sea that evening. Scira marine control shortly afterwards took the decision to cease work in the wind farm and recalled all PTVs to port.

At about 1750, the night crew boarded *Island Panther* from *Regina Baltica*. The day master then moved *Island Panther* away from the boarding area to await the arrival of a passenger. The weather at this point had deteriorated further. *Regina Baltica* was lying to its anchor on a south-westerly heading, making docking with the stern boarding area difficult.

The crew commenced their handover and, at 1800, *Island Panther* was recalled to *Regina Baltica* to collect the passenger. The day master took three attempts to successfully dock because of the sea conditions. Once the passenger had boarded, he moved *Island Panther* away from *Regina Baltica* before handing over to the night master. The day crew then sat down in the passenger compartment, either side of the table, and started to eat the meals that the night crew had brought on board for them.

3.3.2 Contact with turbine

The night master sat in the port seat of the wheelhouse. He set a course to pass to the north of turbine K-5, with the intention of then heading south-west towards the south cardinal mark at the south gate of the wind farm. He set the port chart plotter display to the 1.5nm range scale with ship's head up. It was not his practice to use the radar while inside the wind farm owing to the numerous false returns created by the turbines. However, the radar was switched on so that it would be immediately ready for use once the vessel was outside the wind farm. The night deckhand sat in the starboard seat. He set the starboard chart plotter display to a higher scale, probably 12nm, to view south of the wind farm for inshore traffic transmitting AIS information.

The night master identified the south cardinal buoy light and could see the pattern of the red aviation safety lights of the towers in rows as he had expected. He steered *Island Panther* for the south cardinal buoy light, glancing at the port chart plotter as he did so. He restricted the vessel's speed to 11-12 knots because of the sea conditions.

At 1811, the transition piece of turbine I-6 suddenly appeared out of the darkness dead ahead. The night master attempted to apply astern propulsion, but this did not prevent *Island Panther*'s bow fender from making heavy contact **(Figure 31)** with the turbine, resulting in everyone on board being forced out of their seats.

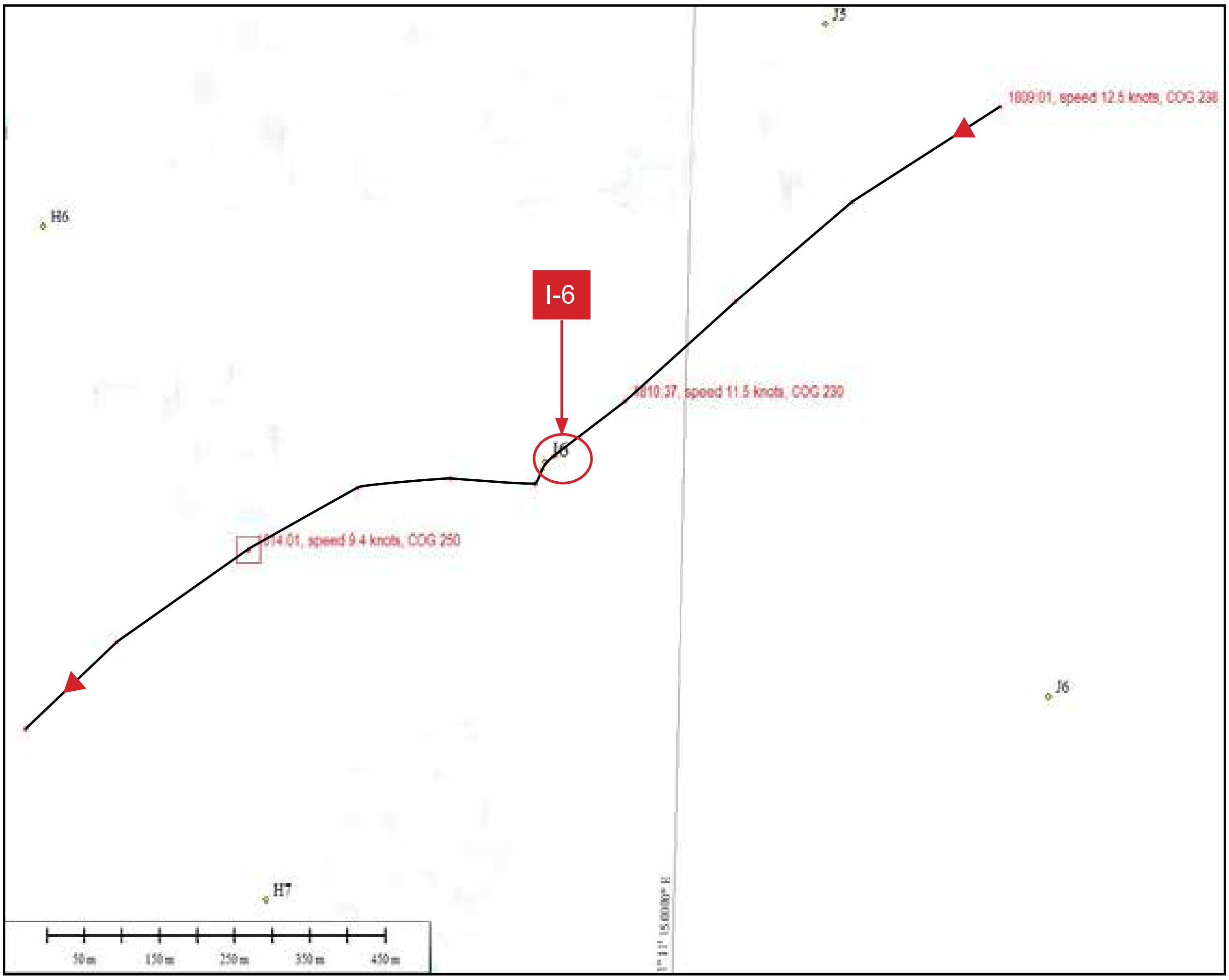


Figure 31: *Island Panther* AIS track approaching turbine I-6

3.3.3 Emergency response

The night master asked if everyone was okay. The day deckhand's first response was "Was that I-6?" The worst apparent injury was sustained by the passenger, who had hit his head but remained conscious. One of the crew immediately tended to his injuries.

The day master came up to the wheelhouse as the night deckhand went below to tend to a cut on his hand, and asked the night master if he still had power, to which the night master confirmed he had. There were no alarms activated on the bilge alarm panel and no indications of bilge pumps running **(Figure 32)**. *Island Panther* drifted clear of the tower.

Figure 32: Bilge alarm panel

After putting on a lifejacket and switching on the deck lights, the day master went on deck to check the forepeak spaces, where there was no sign of flooding. The engine compartments were also checked as well as the accommodation, galley and tank spaces; all were found dry.

On returning to the wheelhouse, the day master was informed by the night master that he had lost directional control of the two waterjets, but he was still able to steer by differentiating the thrust between the two propulsors. By 1812, the night master had started manoeuvring *Island Panther* slowly out of the wind farm.

Once it had been established that the vessel was seaworthy, the crews of *Island Tiger* and *Vanguard* were called by mobile phone and requested to provide assistance, being the closest assets to *Island Panther* at the time. At 1824, once *Island Panther* was clear of the wind farm, the day master, who was managing communications, called the marine control centre to report what had happened and request an ambulance to meet the vessel at Wells-next-the-Sea. The marine co-ordinator advised him to call the coastguard if he had not done so already.

Attempts were made to contact Yarmouth Coastguard but the VHF radio signal was weak so communications were established between *Island Panther* and Yarmouth Coastguard by mobile phone at 1840. By this time *Island Tiger* and *Vanguard* were on scene and the three vessels headed south-west towards the Wells fairway buoy.

A medi-link call was organised by the coastguard. It was decided that the passenger's head injury needed to be examined in hospital within the next 6 hours, so transfer by rescue helicopter was not required in the worsening weather conditions.

Due to the tidal conditions, *Island Panther* was unable to enter Wells-next-the-Sea harbour until 2100-2130 when it was predicted there would be sufficient water for it to pass over the sand bar. It was decided to launch Wells inshore lifeboat (ILB) to assess if the passenger could be brought ashore more quickly. At 1934, the ILB met *Island Panther* at the Wells fairway buoy and a first-aid-trained lifeboatman transferred to the PTV. Around this time, Cromer all weather lifeboat (ALB) was launched with a doctor on board. The sea conditions off Wells were deemed too rough to transfer injured personnel, and the decision was made to keep the passenger on board *Island Panther* for the duration of the voyage into Wells-next-the-Sea.

While at the fairway buoy, the night master completed a full system check and established that he had inadvertently hit a switch during the impact, that had disengaged the joystick steering. He reset the switch and consequently regained full directional control of the two waterjets.

At 2020, Cromer ALB arrived on scene and the doctor transferred to *Island Panther*. Wells ILB returned to base, leaving one of its crew on board *Island Panther*. The doctor assessed that the injured passenger required an ambulance and that the crew also needed to be further assessed in hospital.

At 2045, *Island Panther,* following another wind farm vessel, entered the Wells harbour channel and, by 2100, was moored alongside. The vessel was met by a paramedic, who examined everyone on board. All were taken to hospital; the passenger by ambulance and the crew by taxi. All were discharged during the early hours of 22 November.

3.3.4 Injuries and vessel damage

The passenger sustained the worst injury because his head had hit the forward bulkhead as he was forced out of his seat. He suffered concussion and a broken arm. The night deckhand had smashed a display screen when he had been forced forward. He had consequently cut his hand on the broken glass and he was also badly bruised. The night master's jaw had made contact with the bridge console and, consequently, he had damaged his teeth and mouth. The day master and deckhand suffered back and chest injuries.

The major damage to the vessel occurred to the bow area immediately aft of the bow fender, which had absorbed some of the impact **(Figures 33** to **35)**. The damage to the starboard hull was worse than that to the port hull, indicating the contact was to the starboard side of the centreline. The forward deck had lifted because the deck/hull joint had been split as the fender housing took the impact.

Figure 33: Damage to bow

Figure 34: Damage within starboard outboard void

Figure 35: Damage within starboard inboard void

Inside the vessel, the independent joystick controls for the waterjets were damaged when the night master hit the console. In the passenger compartment, the table was torn from its mountings as the day crew were forced out of their seats.

3.4 ENVIRONMENTAL CONDITIONS

The wind during the day was generally 10 knots from the south-east and there was less than 1m of swell.

By the time *Island Panther* departed *Regina Baltica* for Wells-next-the-Sea, it was dark and the wind was gusting 25-30 knots from the west-north-west, with driving rain. There was a swell of 1-1.5m from the south-east and a tidal stream of 1-1.5 knots also from the south-east. Visibility was moderate to poor. Low water at Wells-next-the-Sea was at 1800, the next high water being due at 0025. It was mid-way between spring and neap tides.

3.5 REGULATIONS AND GUIDANCE

See Section 1.7, most of which is equally applicable to *Island Panther*.

3.6 CREW

3.6.1 Night master

The night master, who was 47 years old, had served with the Royal Marines for 27 years and had experience with a wide range of commercial and military vessels, propelled by waterjet and double/single screws. He had worked in various posts related to the marine and security sector since leaving the armed forces, including working as a master on wind farm PTVs. He held an RYA Yachtmaster Offshore Certificate of Competency (CoC) for power-driven craft, which was commercially-endorsed by the MCA for yachts up to 200gt and vessels subject to the SCV Code. He also held a commercially-endorsed RYA Advanced Powerboat certificate.

The night master joined Island Shipping Ltd, and was appointed to *Island Panther* in July 2012. He then underwent an induction and assessment period during 13-19 July 2012, under the supervision of two experienced masters. Having completed this initial stage of training, he then served as night master for 24 days before being approved to operate as a day master. At the time of the accident, he was working 1 month on duty followed by 1 month on leave, and had joined *Island Panther* on 15 November 2012 as night master.

3.6.2 Night deckhand

The night deckhand, who was 28 years old, had originally embarked on training to become an able seaman. However, after spending 5 months at sea, he came ashore and started work with Island Shipping Ltd in June 2012. He held a personal sea survival certificate and an ENG1 medical certificate. The night deckhand was also a qualified coastal dinghy instructor and had worked on the Norfolk coast. He was operating a rota of 1 month on duty followed by 1 month on leave, and had joined *Island Panther* on this rotation at the same time as the night master.

3.6.3 Day master

The day master, who was 29 years old, had worked on small boats before undertaking a nautical studies course that included 2 years at sea. He had not obtained a qualification from this course as he chose not to sit the final exams. He sailed round the world for 3 years before working as crew on large yachts and flotilla holidays in the Mediterranean, during which time he gained some experience of waterjet propulsion.

He held an RYA Yachtmaster Offshore CoC for power-driven craft and sailing vessels, which was commercially-endorsed by the MCA for yachts up to 200gt and for use on vessels subject to the SCV Code. His qualification also complied with STCW 95 regulations VI/1 sections VI/1-4.

The day master joined Island Shipping Ltd in June 2011 and underwent a 10-day induction and assessment period on *Island Panther* with two experienced masters. At the time of the accident, he was working a rota of 4 weeks on duty, about 2 weeks of which were as night master, followed by 2 weeks on leave.

3.6.4 Day deckhand

The day deckhand, who was 39 years old, had worked at sea for 22 years, initially on fishing vessels, then offshore supply and standby vessels, and various tugs and workboats. He held an Able Seaman's Certificate and an Advanced Powerboat Certificate of Competence, which was commercially endorsed.

In 2011, the day deckhand began working in the wind farm sector as a deckhand. In July/August 2012 he started work with Island Shipping Ltd, initially on *Island Tiger*. He held a personal sea survival certificate and an ENG1 medical certificate. He was operating a rota of 1 month on duty followed by 1 month on leave, and had joined *Island Panther* on this rotation on 12 November 2012.

3.7 VESSEL BACKGROUND

3.7.1 Vessel and safety equipment

Island Panther was built in March 2011 by Safehaven Marine as a 16m wind farm support catamaran, for Island Shipping Ltd **(Annex M)**. The vessel was powered by waterjets and had a top speed of over 20 knots.

Island Panther had been certified by The Society of Consulting Marine Engineers and Ship Surveyors in April 2011 under the SCV Code. The vessel was certified as a Category 2 vessel, able to operate up to 60nm from a safe haven carrying up to 6t of cargo including 12 passengers.

Each of the vessel's hulls was divided into four watertight compartments, each with its own automatic electric bilge pump and bilge alarm, indicators for which were on a panel in the wheelhouse **(Figure 32)**. In addition, the aft three spaces in each hull had a separate bilge suction connected to a bilge manifold that allowed any of these compartments to be pumped out by hand or by using a pump driven by the port main engine. The engine-driven bilge pump could also be used as a fire pump.

The vessel was fitted with a 16-man liferaft and a Jason's Cradle for the recovery of personnel from the water. Fourteen lifejackets were carried for abandoning ship and the vessel was equipped with a Jotron 406MHz float-free emergency position indicating radio beacon (EPIRB).

3.7.2 Vessel propulsion controls

A Scania D16 V8 diesel engine in each of *Island Panther*'s hulls drove an Ultra Dynamics UJ451 waterjet. Propulsion was achieved by initially setting the engine revolutions with the throttle. Thrust forward or aft was then achieved by operating the waterjet bucket levers. Steering was carried out by using the joystick on the port seat arm rest **(Figure 36)**.

The vessel also had alternative/revisionary modes for controlling the waterjets. The joystick could be configured to operate thrust and direction; separate mini joysticks could be employed to move each waterjet and bucket independently; or the vessel could simply be steered by altering the thrust provided by each waterjet using the bucket levers.

3.7.3 Navigation equipment and charts

Island Panther was fitted with a modern ergonomically-designed wheelhouse enabling the master to operate most equipment from his port seat **(Figure 36)**. The wheelhouse was fitted with three Raymarine C-Series windscreen multifunction displays. The system took inputs from the echo sounder, radar, satellite compass, AIS, GPS and radar. The screens could then be used to display different outputs as required by the operator. The normal arrangement employed had the port screen assigned as a chart plotter, overlaying positional and AIS information on Navionics charts, the centre screen set as the radar, and the starboard screen used as a chart plotter for the deckhand. The radar was fitted with a mini automatic radar plotting aid to assist in target tracking and collision avoidance.

Figure 36: *Island Panther* helm position

3.8 NAVIGATION PRACTICE

3.8.1 Primary means of navigation

Paper charts were declared to be the primary means of navigation on board *Island Panther*.

3.8.2 International Convention for the Safety of Life at Sea requirements

See Section 1.13.2.

3.8.3 MCA guidance

See Section 1.13.3, most of which is equally applicable to *Island Panther*.

3.8.4 Charts

Island Panther carried paper charts, in this case the Admiralty Leisure Chart Folio SC 5614, Issue 3, which was published on 27 August 2010. There were no apparent chart corrections on SC 5614-7, the applicable chart for the passage from SSWF to Wells-next-the-Sea. At the time of the accident, Folio SC 5614 had been reissued twice, Issue 5 having been published by the UKHO on 14 June 2012.

The electronic Navionics charts in use with the Raymarine chart plotter were supplied with a chart data end user licence agreement. It stated:

> *"The chart data is merely an aid to navigation designed to facilitate the use of authorised government charts, not to replace them."*

This was because Navionics charts utilised a combination of government, private and other data. The Raymarine C-series chart plotter, therefore, did not meet the requirements of the SFIA specification nor was it required to do so while paper charts were declared as the primary means of navigation.

3.8.5 Passage planning and monitoring

Island Panther did not have a dedicated chart table, although the table in the passenger area could be used to lay out a chart. There was also a shelf at the rear of the wheelhouse on which charts could be stored and readily accessed from the two wheelhouse seats **(Figure 37)**.

An approved passage plan from Wells-next-the-Sea to the wind farm was provided by Scira and was contained in Sheringham Shoal Captain's Handbook **(Annex N)**. The plan had been transposed onto the paper chart on board *Island Panther* **(Figure 38)** and input to the chart plotter in the form of four waypoints OB1-OB4 that formed the route. The crew also had manually added all 88 turbines in the wind farm to the chart plotter, highlighting them with a buoy symbol **(Figure 39)**. The turbine positions were taken from the Captain's Handbook.

While transiting from Wells-next-the-Sea to the wind farm, the chart plotter was used to monitor the passage. The radar and AIS information on the chart plotter was used to monitor traffic and assist with collision avoidance. Once within the wind farm, navigation was primarily conducted by eye, with occasional reference to the chart plotter. Radar was not routinely employed within the wind farm owing to the numerous false echoes caused by the turbines and also to prevent exposing technicians on the turbines to radiation hazard.

Figure 37: Chart stowage area

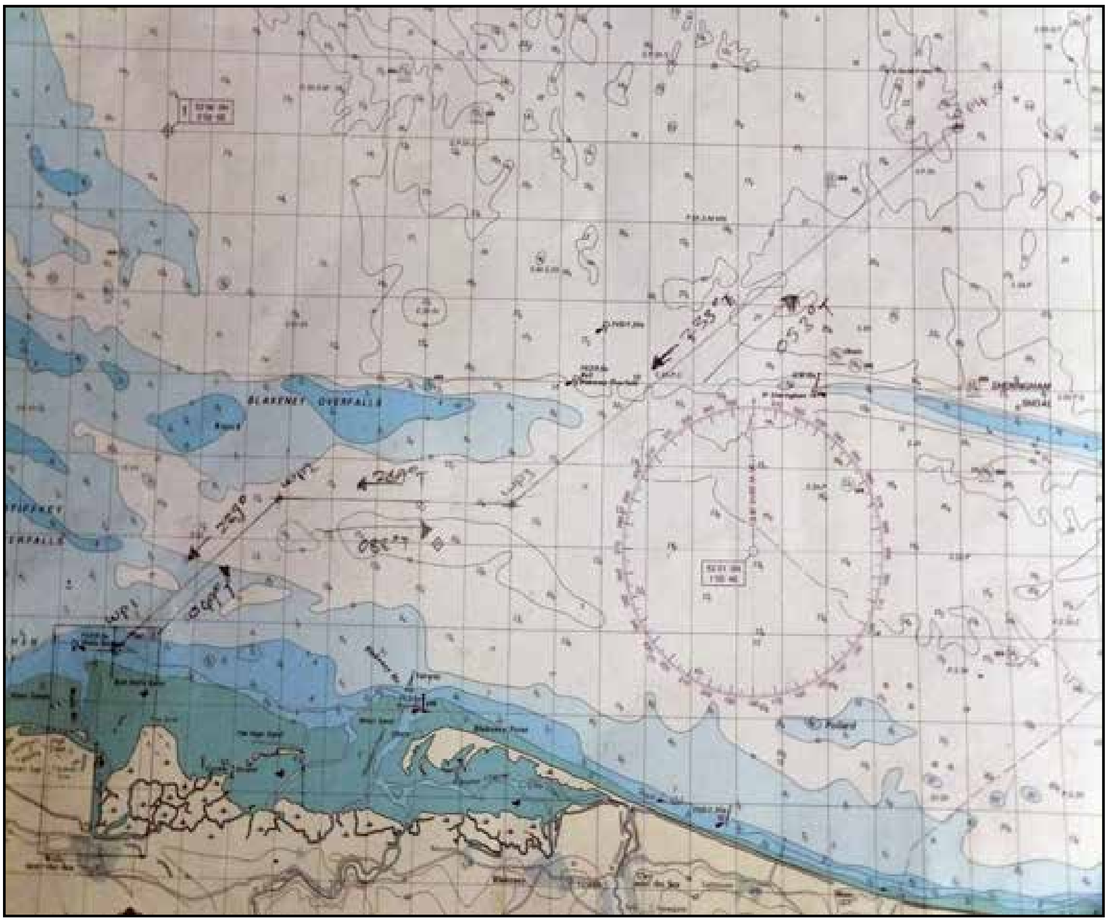


Figure 38: Chart with passage plan, in use on board *Island Panther*

Figure 39: Turbine positions displayed on *Island Panther*'s chart plotter

*Island Panther'*s crew did not plot positions on the paper chart as the chart plotter provided them with an instantaneous GPS position. The chart plotter system had the functionality of many similar systems, including an ability to show the vessel's heading and course over the ground vectors, and cross-track error. At the time of the accident, the night master was not employing these functions.

3.9 ISLAND SHIPPING LTD

3.9.1 Background

Island Shipping Ltd is a family business, based in Ireland, and was formed in 2004. The company, together with its sister company, Island Maritime Ltd, provides a variety of services to the marine sector in Ireland, UK and elsewhere in Europe. At the time of the accident, the company operated five vessels employed in the wind farm industry: two PTVs, a 21m tug, and a 22m multicat. The company also operated a 12m survey/dive/crew boat around the coast of Ireland.

3.9.2 Master recruitment, induction and assessment

Island Shipping Ltd had experienced some difficulty recruiting suitable masters for its PTVs owing to many applicants not having operated with waterjet propulsion. The company tended to focus on ex-military and RNLI personnel as, generally, Merchant Navy masters were found not to have the necessary boat-handling skills and aptitude for basic vessel maintenance required for operating PTVs.

Once a master had been selected after interview, he/she was required to undergo an induction and assessment process. Scira also carried out its own site safety induction process before the trainee master stepped onto the vessel. Once on the vessel, the trainee master spent an initial 1-week period observing and training with an experienced master, who then assessed the trainee master's ability and reported back to the company if further training was required. If not, the trainee master was signed off and began operating as a night master, when the workload was generally lighter, before gaining further experience and then being approved for day duty.

3.9.3 Safety management

Island Shipping Ltd operated an SMS that included the company safety policy, job descriptions, maintenance and operation procedures, emergency preparedness, training requirements as well as forms and checklists to assist with the safe running of the vessel. The drills and maintenance activities were usually completed during the night when the operational workload was lighter.

3.10 SHERINGHAM SHOAL WIND FARM OPERATIONS

3.10.1 Statoil/Statkraft and Rheidol control

Statoil is a Norwegian international energy company, which has extensive experience from 40 years of oil and gas production on the Norwegian continental shelf. Statkraft is a state-owned Norwegian company, whose core business is renewable energy, and is Norway's largest power producer. They have been involved in numerous renewable energy projects in Europe and around the world.

Statoil and Statkraft funded the construction of SSWF, contracting Siemens Windpower to install and commission the wind turbines. The wind farm is owned equally by Statoil and Statkraft through the joint venture company Scira.

Control of the SSWF turbines is carried out from Rheidol, North Wales. From there the turbines are activated, shut down, and monitored, and any defects are reported to Scira.

3.10.2 Scira safety management

Scira was responsible for the operation and maintenance of the wind farm turbines. The company had an overarching Health, Safety and the Environment (HSE) plan and further documents and procedures were then provided for the various operational activities.

The marine control centre, headed by the marine manager, was central to marine activities and performed several roles including:

- Co-ordinating movement of vessels to and from the wind farm
- Communicating with working vessels and the floating hotel *Regina Baltica*
- Monitoring weather conditions and planning
- Monitoring personnel movements to/from and inside the wind farm
- Following operations as detailed in the emergency response plan
- Liaising with UKHO regarding NTM
- Liaising with Wells-next-the-Sea harbourmaster

- Responsibility for marine inductions and verification of personnel qualifications

- Responsibility for conducting suitability surveys of vessels new to site.

Each day, Siemens, Scira and Rhiedol representatives held a planning meeting to determine work priorities for the next 3 days. This then enabled the Siemens contractors on board *Regina Baltica* to plan the activities for the next day.

Skippers' Meetings were intended to be held once a month to enable new procedures to be communicated and to allow discussion of any PTV crew concerns. The meetings were ideally to be organised on "weather days", when no activity was possible on the wind farm. Prior to the accident, the last meeting had been held in April 2012.

A key document for the crews of PTVs was Sheringham Shoal Captain's Handbook **(Annex N)**. This document provided operational information for masters to transit to, and operate in, the wind farm. It included information on the positions of turbines, navigation lighting, approved passage plans, reporting, personnel transfer and emergency response procedures and general health, safety and environment requirements.

3.11 TURBINE I-6

3.11.1 General

Each turbine consists of several key components **(Figure 40)**. Access to and from the turbine is gained via a ladder with push tubes situated on either side, against which a PTV's bow is positioned. Each turbine has two ladders and associated push tubes situated on the transition piece. The PTV master chooses the best ladder to use depending on the tidal stream and sea conditions. Each ladder has fall-arrest gear to which the turbine technicians attach themselves before climbing the ladder. Masters were encouraged to report defects, such as faulty fall-arrest gear, to enable repairs to be scheduled.

3.11.2 UK Requirements for lighting of turbines

MGN 372 (M+F), Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs, includes the requirements for marking a wind farm **(Annex O)**. During construction, cardinal marks are to be used around the wind farm. Once a wind farm is complete, corner structures or other significant peripheral structures are to be marked with synchronised lights showing "special mark" characteristics: flashing yellow, with a range of not less than 5nm. Intermediate structures should also be marked if the wind farm stretches over 2nm.

MGN 372 (M+F) also details how individual turbines should be marked:

> *"Individual turbines will be marked with a unique alphanumeric identifier which should be clearly visible at a range of not less than 150 metres. At night, the identifier will be lit discretely, (e.g. with down lighters), enabling it to be seen at the same range."*

The MGN also refers to the possible radar interference effects that may be caused by a wind farm and emphasises the need for safe speed and the use of information sources such as VHF radio, AIS and vessel traffic services (VTS). However, it includes a cautionary note that not all vessels may be equipped with AIS.

Figure 40: Wind turbine

3.11.3 Lighting of turbine I-6

Each turbine was fitted with a red aviation safety light on the nacelle and identification illumination on the turbine transition piece. The control centre at Rhiedol automatically received a warning if an aviation safety light was defective. This was not the case for an identification illumination light and operators in the wind farm were relied upon to report any defects.

It has been suggested that reports about defective identification lighting on turbine I-6 had been made to the marine control centre several weeks before the accident. There was also evidence that a PTV master reported the unlit I-6 turbine on 18 November 2012, but Scira's control log had no entry to this effect. Although the wind farm 72-hour work schedule listed the defective identification illumination on turbine I-6, the entries were dated and timed after the accident. It is understood that turbine I-6's transition piece was the only one that was unlit in the wind farm on the evening of the accident.

3.12 ORGANISATIONS INVOLVED WITH OFFSHORE RENEWABLE ENERGY PASSENGER TRANSFER VESSELS

See Section 1.19.

3.13 INDUSTRY GUIDANCE

See Sections 1.20.2 and 1.20.3.

3.14 INDUSTRY TRAINING

See Section 1.21.

3.15 SIMILAR ACCIDENTS

See Section 1.22.

SECTION 4 - ANALYSIS

4.1 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.

4.2 FATIGUE

Having slept during the day and having only just started work prior to the accident, there is no evidence that the night master and deckhand were suffering from fatigue. Therefore, fatigue is not considered to be a contributing factor to this accident.

4.3 ACCIDENT OVERVIEW

The contact occurred because the night master's monitoring of *Island Panther*'s passage through the wind farm was ineffective and he lost situational awareness. There was an over-reliance on visual cues and, in the darkness and poor weather conditions, he did not see the unlit turbine transition piece in enough time to take effective evasive action.

4.4 NAVIGATION PRACTICES

4.4.1 Passage monitoring

Good navigation practice requires a master to monitor his/her vessel's passage using all appropriate means at his/her disposal as recommended in MGN 315 (M). These include visual cues, paper charts, chart plotters, radars, and AIS information. Over-reliance on just one means of monitoring places a vessel at a greater risk of contact or grounding. MAIB investigations commonly highlight an officer of the watch having relied too heavily on navigation equipment and not 'looking out of the window'. In this case, insufficient use was made of the navigation equipment available.

When navigating at night or in poor visibility the reliability of visual cues must be considered. Navigation buoys and other vessels may be unlit and debris in the water may be difficult to see. The night master had reduced speed to take account of the sea conditions and visibility but, even at 12 knots, this did not allow him enough time to take effective evasive action when the unlit turbine transition piece became visible. Other methods of monitoring must be employed in parallel.

Under normal circumstances, radar would be an ideal aid to enable objects ahead to be located. Unfortunately, as discussed in MGN 372 (M+F), trials have demonstrated that, at close range, a wind farm may produce multiple reflected and side lobe echoes that can mask real targets. Employing radar within a wind farm is not reliable; therefore, the decision by the night master not to employ the radar while transiting the wind farm was understandable.

The SCV Code implies that paper charts are intended to be used as the primary means of navigation. From this, it could be inferred that a vessel's position should be plotted on a paper chart having obtained a fix from visual bearings, radar or GPS. Although *Island Panther*'s declared primary means of navigation was paper charts, in practice the chart plotter was used to monitor the vessel's progress. It is impractical to expect the master of a catamaran travelling in excess of 20 knots to leave the conning position to consult a paper chart, full-sized or otherwise, to determine the vessel's position. It is, however, reasonable to use paper charts for passage planning purposes and then use the chart plotter for passage monitoring provided that an ability to navigate safely is not compromised.

The only viable option for the master was to use the chart plotter, in combination with visual cues. Although the chart plotter was operating on an appropriate scale, the night master was not employing the system to monitor *Island Panther*'s position. Given that the red aviation safety lights of the turbines were functioning, and his familiarity with navigating in the wind farm at night, the night master was confident in his ability to maintain situational awareness by eye alone.

The deckhand was sitting in the starboard wheelhouse seat and was acting as lookout at the time of the accident. As well as looking ahead, he was able to view his own chart plotter display. However, as was the normal practice for this master, the deckhand's chart plotter was set at a higher range scale to enable him to focus outside the wind farm rather than within it.

While planning ahead was a sensible precaution, it removed the deckhand's ability to identify that *Island Panther* was tracking towards turbine I-6. The consequence of employing the lookout in this way was that neither the master nor the lookout was monitoring the close-in picture on the chart plotter. At night, and in the weather conditions prevailing at the time of the accident, relying on visual cues alone was unlikely to be sufficient to safely transit the wind farm, especially as one obstruction near the vessel's track was unlit. Had more consideration been given to the tasks that needed doing, either the master or the lookout might have been responsible for checking the chart plotter and radar (should the picture be suitable) for hazards and obstructions that could impede *Island Panther*'s passage.

4.4.2 Passage planning

The only formal passage plan on board was that required to transit to and from the wind farm. Within the wind farm, passage planning was rudimentary and relied heavily on navigation by eye, with some consultation of the chart plotter. During daylight hours in good visibility, navigation by eye alone may, in certain circumstances, be sufficient. During the hours of darkness and in restricted visibility, the creation of, and immediate reference to, a properly charted passage plan are important safeguards against a vessel grounding or coming into contact with a fixed object where the cross-track error function can readily indicate that the vessel is deviating from the planned track.

4.4.3 Primary means of navigation

The declared primary means of navigation for *Island Panther* was paper charts as required under the SCV Code. However, it was impractical to navigate *Island Panther* solely employing paper charts, particularly when the vessel was travelling at high speed.

The SCV Code allows an electronic chart plotting system to replace paper charts as long as it complies with the requirements of MGN 319 (M+F) and the corresponding SFIA standard. If Island Shipping Ltd had installed a chart plotter system that was declared as meeting the SFIA standard, paper charts could have legitimately not been used and carried only as a back-up if no electronic back-up system was fitted.

Although published in MGN 319 (M+F), the ability to employ an electronic chart system instead of paper charts does not appear to have been widely recognised, especially given that very few equipment manufacturers have issued declarations that their equipment complies with the SFIA standard. A key element to this may be that only electronic charts, authorised or issued by or on behalf of a Government, are acceptable for use in such systems to satisfy statutory carriage requirements, which may often result in greater cost.

Given the general design and operational requirements of PTVs throughout the growing offshore renewable energy sector, an electronic chart plotter is effectively the only practical primary means of navigation in terms of passage monitoring. However, without knowledge of which specific types of chart plotter meet chart carriage requirements, the extent to which safe navigation is currently being compromised is uncertain and uncontrolled.

4.4.4 Paper chart corrections

Although not contributing to the accident, little effort appears to have been made to correct the paper charts on board *Island Panther*. In order that passage plans are comprehensive and safe, even if executed using electronic systems, it is fundamental that paper charts are kept up-to-date.

4.5 CREW QUALIFICATIONS, TRAINING AND GUIDANCE

4.5.1 Industry requirement

The offshore renewable energy sector has grown rapidly and will continue to grow for the foreseeable future as the demand for clean energy increases. Greater numbers of wind turbines will, in turn, increase the number of passenger transfers and, as wind farms are developed further offshore, potentially increase the length of transit passages from shore.

A key element of a PTV master's functions is boat-handling; manoeuvring close in to turbines and wind farm support vessels in sometimes testing conditions. Often, master recruitment and training is focused on this particular skill to the detriment of other skills which are assumed to be covered by the basic qualification.

4.5.2 Adequacy of qualification

The night master held an RYA Yachtmaster Offshore CoC, which qualified him to command *Island Panther*. The RYA Yachtmaster Offshore qualification prerequisite sea-time is 50 days, including 5 days as master and 2 overnight passages not necessarily as master. The shore-based syllabus, if attended in preparation for the practical examination, requires a minimum of 3 hours to cover GPS and chart plotters to a basic level. A qualification in the operation of radar is not compulsory and, indeed, the SCV Code states in Annex 3:

"2.11 Radar Training

In any vessel that carries radar, the Master and any member of the crew who is liable to use the radar are strongly recommended to undertake appropriate training in its use."

Given the operations of PTVs, which operate at relatively high speed compared to more conventional workboats necessitating the use of chart plotters and radar as a matter of course, the importance of providing additional PTV-specific training is clear. PTV managers cannot simply assume the qualification requirements of the SCV Code are sufficient. They should take the necessary steps to ensure PTV crews are qualified and experienced in the operation of key equipment, such as radar and chart plotters, particularly with respect to the specific equipment fitted to their vessels.

4.5.3 Higher qualifications

There has been recognition by some in the offshore renewable industry that a higher qualification requirement is necessary. However, what level is appropriate is not straightforward. Increasingly, owners and managers are insisting upon masters holding the qualification required under the Large Commercial Yacht Code (LY2) for masters of yachts of up to 200gt. However, the base level qualification remains the RYA Yachtmaster Offshore CoC. A key additional requirement of the LY2 qualification is that a candidate must pass an MCA oral examination. While this may ensure a slightly higher standard, it still remains questionable whether a master will be adequately equipped to operate a PTV within the offshore renewable energy industry unless further specific training is undertaken.

4.5.4 Relevant industry training and guidance

Existing training for PTVs has been predominantly focused on the passengers, i.e. those personnel transiting and transferring to offshore renewable energy structures. Emphasis on this area is understandable given, for example, many turbine technicians will have no maritime background and may be only accustomed to working ashore. There is little relevant industry training available for the masters and crews of PTVs.

One training provider offers an introductory half-day course which includes lectures and a practical exercise in manoeuvring a PTV to dock with a turbine transition piece. While beneficial to those new to the industry, further training is required to ensure masters are suitably qualified to act as a PTV master.

RUK has developed guidance for various aspects of the offshore renewable energy industry, primarily aimed at developers and of limited relevance to the needs of PTV operators and crew. As discussed in Section 2.19.2, NWA's draft "Best Practice Guide for Offshore Energy Service Vessel Crews" is the first document directed specifically at improving the skills base of the crews of offshore energy passenger transfer vessels. The document requires further development and should be considered in conjunction with the work that IMCA is undertaking with respect to developing skipper and crew competence frameworks and guidance.

There is little consolidated marine operational guidance available to owners/managers and crews of PTVs. Guidance is particularly important to those new to the industry.

4.5.5 Promulgation of safety lessons

See Section 2.19.3.

4.6 *ISLAND PANTHER* SAFETY MANAGEMENT

4.6.1 General

Under the SCV Code, there is no obligation on an owner or manager to operate an SMS. However, following industry best practice, Island Shipping Ltd had developed an SMS for its company vessels, broadly aligned with the ISM Code. While providing a good basis, including some useful guidance and checklists, the accident has highlighted areas for improvement.

4.6.2 Induction and training

In common with other wind farm PTV operators, a new master's induction and assessment was completed by a company master already familiar with the vessel. The SMS included a vessel introduction and familiarisation form, but this did not include navigation practices, and no formal documented criteria were provided against which to assess and approve a new master's ability.

Conducting onboard training under the supervision of an experienced master is a wholly appropriate method for ensuring a new master becomes familiar with the vessel. However, with no written scope of what is needed, there is the potential for the quality of the training to vary widely depending on the individual masters involved, and there is a risk that ingrained poor working practices may be passed on to the new recruits.

Although training and familiarisation is best carried out by understudying an experienced master, a new master's assessment and approval should, therefore, ideally be conducted by a suitably qualified independent assessor.

The importance of the chart plotter for PTV navigation would suggest this is one area of training requiring specific attention to ensure the equipment is used effectively.

4.6.3 Navigation practices

Company instructions and guidance on navigation practice were not included in the SMS. It would have been useful to include instructions on the required role of the deckhand to ensure the master was assisted effectively, for example when acting as a lookout.

This accident has demonstrated the importance of passage planning and monitoring. It is important that the expectations of the management company for conducting navigation are included in the SMS. Ideally, instructions should be provided to remind masters of how and when to use different navigation methods, including the use of the chart plotter, given the sea area, weather conditions and visibility.

4.6.4 Emergency response by crew

The response by the crew following the contact with the turbine was well organised and methodical. However, the delay of 30 minutes before contacting the coastguard was not ideal. Part of the problem can be attributed to some VHF radio communication difficulties. Ultimately, this delay did not result in any further adverse consequences as the vessel was able to make its own way back to port. Nevertheless, it is imperative that the coastguard is informed as early as possible following an incident, as required in the Sheringham Shoal Captain's Handbook, to enable emergency response decisions to be made as soon as possible.

The SMS included a section on emergency preparedness and required regular drills. However, instructions and guidance in the event of a collision or contact were not specifically included. An emergency checklist would have been helpful for the crew to follow in the actual emergency, and might have provided a useful reminder to contact the coastguard.

4.7 WIND FARM MANAGEMENT

4.7.1 Turbine lighting

MGN 372 (M+F) **(Annex O)** details the lighting requirements for UK wind turbines, and includes the need for illumination of the turbine identification number. This is, among other things, to ensure that in an emergency, a vessel's master can positively state which turbine the vessel is at or near.

While acknowledging the identification lights are not formal aids to navigation, it is inevitable they will be utilised as visual cues. Simply stating the lights should not be used for navigation does not mean they will not be employed in this manner and does not remove the obligation to ensure they remain lit. Defects with the identification lights are not automatically highlighted in the same way as the formal aids to navigation and turbine aviation safety lights. Instead, reliance is placed on wind farm support vessels reporting lighting failures, in the same manner as other defects.

To date, the MAIB has received few reports of vessels colliding with wind turbine towers at night, though in this instance the damage to the vessel and injuries to those on board were significant. More evidence will be required, however, before a case can be made to improve the lighting on individual turbines as an aid to surface navigation.

4.7.2 Navigation warnings and defect reporting

Scira marine control was able to receive defect reports so that it could feed them into the daily work schedule meetings. However, the system of recording these defects was not sufficiently robust as, it is understood, 3 days prior to the accident the status of turbine I-6 had been reported by a PTV master and this had not been recorded.

The unlit identification light on turbine I-6 appears to have been common knowledge for some time. Skippers' Meetings, which were intended to be called monthly, had not taken place since April 2012. These might have provided a means for alerting Scira management to the problems with reporting unlit turbines. Such meetings are an excellent forum in which to raise safety and other concerns, but they will only serve this function if the meetings take place regularly.

In addition to recording the defect for rectification purposes, Scira marine control should have issued a navigation warning, in line with the marine control's handbook, to the vessels operating in the wind farm. This would have alerted *Island Panther'*s crew to the fact that the transition piece of turbine I-6 was unlit. While vessels should always navigate with caution, a navigation warning provides a further control measure in preventing accidents.

Besides wind farm vessels, navigation warnings should also be disseminated to other maritime users, as the wind farm is not a restricted area once it has been commissioned. All those who might stray into a wind farm need to be able to obtain warnings, so close liaison with the coastguard is essential throughout the wind farm's working life.

4.7.3 Risk assessments of small craft operations within the wind farm

A study of the risks involved with constructing the SSWF was completed prior to building, and this fed into the health, safety and environment plan and various procedures and manuals. The Captain's Handbook was one such document. However, the risks of operating numerous small craft within a wind farm might have been underestimated.

The measures imposed to provide a buffer zone between construction activity and local marine traffic created a single pinch-point on the south side of the farm. Positioning the floating hotel on the north-east side of the wind farm necessitated numerous passages through the wind farm by the PTVs, thereby increasing the risk of collisions and contacts with towers. There were good reasons for the floating hotel being located where it was but, if considered early enough in the planning stage, better solutions might have been identified.

With the arrangement that transpired, it would have been possible to have put further safety measures in place to minimise the risks of operating within the wind farm particularly during restricted visibility and hours of darkness. Conventions for lanes of traffic and official routing through the farm could have reduced the risk of collisions and enabled easier passage monitoring. Speed restrictions would have been beneficial above certain sea states and in reduced visibility. This accident serves as a means of raising awareness of the possible consequences of vessels making contact with turbines and should ultimately inform risk assessments conducted for wind farms in the future.

SECTION 5 – CONCLUSIONS

5.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENTS THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

Passage monitoring and the use of the lookout

1. Both masters lost their situational awareness because the passage was not being properly monitored. [2.2], [2.3.2], [4.3]

2. *Windcat 9*'s master was distracted from monitoring the vessel's passage by his demonstrating the chart plotter's range controls to the trainee master. The master's attention should have been focused on monitoring the vessel's position rather than conducting training. [2.2], [2.6.1], [2.6.5]

3. *Windcat 9*'s master did not routinely monitor the vessel's passage by radar and was not expecting to encounter anything at close range. [2.6.1]

4. Had *Windcat 9*'s master chosen to use visual cues to determine *Windcat 9*'s position before deciding to alter course to port at 1709, he might have recognised that the vessel was already significantly west of the planned reciprocal track, and have decided to take alternative action. [2.6.2]

5. Had *Windcat 9*'s master intermittently used a higher radar range scale, he might have detected radar echoes from Target 3 and DZ1 buoy at a distance of more than 1.5nm, which would have provided for earlier recognition that the vessel had deviated significantly from the planned reciprocal track. [2.6.3]

6. *Windcat 9*'s lookout did not receive any instructions from the master. If he had, especially while the master was instructing the trainee master, the vessel's incorrect position in relation to the flashing light of DZ1 buoy might have been identified and early corrective action taken. [2.6.4]

7. *Island Panther*'s master placed too much reliance on visual cues and insufficient use was made of the navigation equipment available. Had more consideration been given to the tasks that needed doing, either the master or the lookout might have been responsible for checking the chart plotter and radar for hazards and obstructions that could impede *Island Panther*'s passage. [4.4.1]

Training and assessment of masters

1. The high transit speed of wind farm passenger transfer vessels places new demands on masters who have migrated from the fishing industry. [2.12]

2. WWL's Master's Training Programme Checklist did not have sufficient documented criteria on the scope of training against the subject headings. Consequently, this was left to the judgment of the training master. [2.14.2]

3. No formal assessment of masters had taken place between April and November 2012 due to the absence of a Senior Assessor. Consequently, the master of *Windcat 9* had never been formally assessed to determine his suitability for his role. The risks of allowing poor practices to set in had not been properly recognised. [2.15.2]

4. Checks conducted by WCS failed to identify that the master had not applied for a CEC and so lacked the appropriate qualifications for his role. [2.16]

5. *Windcat 9* had never been subjected to a full vessel or radio and navigation mini audit, so the master's potential additional navigation training requirements had not been identified. [2.18.1]

6. Island Shipping Ltd's vessel introduction and familiarisation form did not include navigation practices, and no formal documented criteria were provided against which to assess and approve a new master's ability. [4.6.2]

7. Since Island Shipping Ltd had no independent and suitably qualified assessor appointed and no training and assessment criteria provided in respect of a new master, there was the potential for the quality of training and assessment to vary widely and a risk that ingrained poor working practices may be passed on. [4.6.2]

Passage Planning

1. Waypoint 4 had been moved to the west with the modified route passing through Target 3's guard zone. This went unnoticed by *Windcat 9*'s master and placed the vessel in close proximity to Target 3. [2.3.2]. [2.4.1]

2. The route entered into *Windcat 9*'s chart plotter on 27 May 2012 had not been locked to prevent inadvertent movement of waypoints, as recommended in the operating manual. [2.4.2], [2.5.1]

3. *Windcat 9*'s master was unfamiliar with many of the features of the GB60 chart plotter. Had the Target 3 guard zone alarm been set, he would have been alerted to the imminent contact and could have taken corrective action. [2.5.1], [2.5.2]

4. WWL had no company requirement to periodically check plotter routes against the paper chart, that routes were locked, and that guard zone alarms were set. [2.7]

5. Company instructions and guidance on navigation practices were not included in Island Shipping Ltd's SMS. [4.6.3]

Wind turbine illumination

1. The transition piece of turbine I-6 was unlit. [4.3]

2. While acknowledging the identification lights are not formal aids to navigation, it is inevitable they will be utilised as visual cues for navigation. [4.7.1]

3. Scira's defect reporting system was not robust, which allowed the identification illumination of the transition piece of turbine I-6 to remain unlit. [4.7.2]

5.2 OTHER SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE *WINDCAT 9* ACCIDENT[15]

1. The GB60 chart plotter was not designed to prompt the user to save routes, with the risk that routes and/or waypoints could be inadvertently moved. [2.4.1], [2.5.1]

5.3 SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENTS THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

Chart corrections

1. The management of paper charts, including the use of latest charts and correction procedures, was poorly attended to on both vessels. This led to the use of out-of-date charts and, in the case of *Windcat 9*, obscuration of symbology. [2.9.1], [4.4.4]

2. The UKHO's method of identifying Target 3 in the DNAWR with small-sized font and on the VTS Harbour limit dotted magenta line makes Target 3 difficult to identify and potentially puts at risk mariners who are unfamiliar with the area. [2.9.2]

Industry guidance and promulgation of safety issues

1. There is little consolidated marine operational guidance available to owners/managers and crews of PTVs. Guidance is particularly important to those new to the industry. [2.19.2], [4.5.4]

2. The promulgation of safety lessons tends to be organisation-specific. There is widespread benefit in sharing safety issues and lessons learned throughout the offshore renewable energy sector. [2.19.3], [4.5.5]

3. The accident involving *Island Panther* serves as a means of raising awareness of the possible consequences of vessels making contact with turbines and should ultimately inform risk assessments conducted for wind farms in the future. [4.7.3]

Company procedures

1. WWL's SMS instructions relating to the nomination and duties of lookouts are confusing. [2.6.4]

2. There was no evidence of any WWL documented professional standards required for an assessor. There were also no specific terms of reference laying out the assessor's role, required competencies or responsibilities. [2.15.1]

3. The quality of the assessment-related WWL documentation was poor and lacked sufficient detail and explanation for it to be an effective management tool. [2.15.3]

4. An emergency checklist would have been helpful for *Island Panther*'s crew to follow in the actual emergency and might have provided a useful reminder to contact the coastguard. [4.6.4]

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[15] These safety issues identify lessons to be learned. They do not merit a safety recommendation based on this investigation alone. However, they may be used for analysing trends in marine accidents or in support of a future safety recommendation.

5.4 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENTS

Use of chart plotters

1. Although paper charts were the primary means of navigation, in practice the chart plotter was used to monitor both vessels' positions when underway. A procedure to specify the chart plotter as the primary means of navigation is contained within MGN 319 (M+F). However this information does not appear to be widely understood by the industry and neither of the chart plotters in these accidents met the necessary requirements. [2.8], [4.4.3]

2. Without knowledge of which specific types of chart plotter meet chart carriage requirements, the extent to which safe navigation is currently being compromised is uncertain and uncontrolled. [2.8], [4.4.3]

3. A newly qualified Yachtmaster Offshore may only have had 50 days' sea-time experience and only 5 days as a master. In addition, a master who has completed the shore-based Yachtmaster Offshore course may only have had a minimum of only 3 hours training in GPS and chart plotter techniques. Owners should consider this in their training and assessment procedures. [2.12.3], [4.5.2]

Other

1. The operating patterns and manning levels of PTVs has the potential to make the crew susceptible to the effects of fatigue. [2.11]

2. There was a delay of 30 minutes before the coastguard was contacted. It is imperative that the coastguard is informed as early as possible following an incident, as required by the Sheringham Shoal Captain's Handbook, to enable emergency response decisions to be made as soon as possible. [4.6.4]

SECTION 6 – ACTIONS TAKEN

Windcat Workboats Ltd has:

- Conducted an internal investigation into the circumstances of the accident.

- Promulgated Safety Alert SA 31 on 17 December 2012 – Simrad GB Routestorage **(Annex P)**. The alert instructed masters on the methods of locking and unlocking routes on the GB60 chart plotter.

- Contracted an independent audit of the management and procedures for recruiting, checking certification and training of vessel masters and crews. The recommendations of the associated report have been agreed by WWL and an implementation plan is being produced.

- Replaced all Simrad GB60 chart plotters with Simrad NSO chart plotters.

- Produced three additional, vessel-operation related, Task-Based Risk Assessments:

  - TBRA 58 - Sailing Without Using Radar

  - TBRA 60 - Vessels Operating from Grimsby Fish Dock to Lincs Wind Farm

  - TBRA 61 - Vessels Operating from Grimsby Fish Quay Side to Lincs Wind Farm.

Windcat Crewing Services BV has confirmed that all masters of Windcat Workboats Limited vessels hold the appropriate qualifications.

Centrica Renewable Energy Division Ltd has:

- Conducted a joint investigation with Siemens Energy Sector Renewable Energy Division into the circumstances of the accident.

- Established a Vessel Safety Group comprising vessel operators, developers, and operation and maintenance company representatives. Its purpose is to share best practice, identify and address safety concerns and develop a stakeholders' communications process.

- Imposed a 0.5nm alarmed exclusion zone around Target 3 which is set to alert CREL's marine control room staff in the event of a vessel passing through the zone.

Siemens Energy Sector Renewable Energy Division has:

- Conducted a joint investigation with Centrica Renewable Energy Division Limited into the circumstances of the accident.

- Established a review of its marine co-ordination and emergency procedures and those of other organisations who provide the service to SESRED.

- Reviewed its vessel selection procedures to include confirmation with vessel owners/managers that crew training, certification and experience checks procedures are in place.

The UK Hydrographic Office has:

- Issued a chart correction under NTM 1560/13 dated 11 April 2013 which improves the prominence of Target 3 on Admiralty charts 104,170 and 1190.

- Decided to increase the font size associated with the legend of Target 3 in future editions of the above charts.

Associated British Ports Humber Estuary Services has issued NTM – H30-2013 – River Humber Wind Farm Transfer Vessels, on 15 March 2013, advising mariners of its publication – “Recommended Route for Wind Farm Transfer Vessels”.

Defence Training Estates has replaced the damaged Target 3 on 19 April 2013.

Statoil has conducted an internal investigation which has resulted in various recommendations to improve operations of small vessels within wind farms.

Scira Offshore Energy Ltd has, as a result of its own investigation and that of Statoil, decided the following course of actions:

<u>Immediate Actions</u>

- Send out an alert message verbally and write to all PTV owners and crew members working in SSWF: “Please recognise that the illuminating lights on the turbines have not been designed for, and therefore, must not be used for navigational purposes”.

- Review the Sheringham Shoal Captain’s Handbook with particular regard to:

    - Advising that sign illumination lighting is not a navigational light.

    - Warning all PTVs on other activities on the wind farm, e.g fishing, by distributing a local Notice to Mariners, and verbally communicating over the VHF Radio.

    - Liaising more closely with fishermen to ensure that both parties are aware of each other’s activities within the wind farm.

- Pre-plan as much information as possible to deliver to masters during meetings, with a set monthly agenda.

Medium-term actions

- Establish bad weather procedures and advise the masters accordingly considering minimum distances to towers during low visibility transits.
- Ensure (through marine inductions) that the navigational assistance function (deckhand) is clearly understood as defined in the International Regulations for Preventing Collisions at Sea.
- Continue to work proactively with vessel owners and produce a meeting plan to present at Skippers' Meetings.
- Advise vessel owners that ongoing navigational aids refresher training must be carried out.
- Evaluate all masters and crew working on SSWF for knowledge on their typical plotter systems.
- Agree with owners a training plan for ongoing refresher training and emergency response exercises in between training courses.

Long-term actions

- Review the competency requirements for Scira marine roles, compile a competency matrix and consider the competency required to audit vessels and crew and to follow up with crew assessment in the field.
- Review and suggest improvements for passage planning with consideration to paper charts and the challenges in using systems on a fast moving PTV.

Island Shipping Ltd has:

- Carried out individual competency assessments of masters, and identified further training requirements for crews operating tugs, multicats, wind farm service vessels and other workboats.
- Decided to develop a company training programme. The course modules will include:

    1. Navigation and watchkeeping
    2. Stability and loading
    3. Towing, anchor-handling and lifting operations
    4. Safety management

  Island Shipping Ltd has appointed a Training Master, whose responsibility is the ongoing assessment and training of masters and crews. It has also delivered its first training course on 'Stability', which has received MCA approval. The next training module, entitled ‘Safety Management’, has been completed and is ready to be delivered. Futher courses are under development. Island Shipping Ltd has received ‘Approved Course Provider’ status from the MCA and is working with the NWA, IMCA and industry in developing a competence framework for wind farm PTV crews.

International Marine Contractors Association has chaired an inaugural meeting on 21 February 2013 with offshore renewable energy stakeholders to develop industry best practice guides, master and crew competency frameworks and agreement on the method of promulgating industry safety lessons.

RenewableUK has:

- Held a meeting in July 2013 with industry stakeholders and agreed a provisional scope of action covering development of:

    - Workboat Best Practice Guide

    - Marine Operations: Developer/Principal Contractor Good Practice.

SECTION 7 – RECOMMENDATIONS

Windcat Workboats Ltd is recommended to:

2013/234 With respect to operational navigational procedures, review and as necessary amend its Safety Management System and task-based risk assessments to provide guidance and instruction on:

- The use and management of electronic navigation systems for passage planning and monitoring.
- The role and crew in support of the master and the conduct of lookout duties while on passage.
- The conduct of passages at night and in restricted visibility.

2013/235 Review its crew training, qualification and assessment procedures, together with their associated documentation, to ensure that:

- Crews are correctly qualified and appropriately trained for their duties.
- Appropriate records are maintained of all training and assessments undertaken.
- Robust processes exist to periodically check an individual's competence.

2013/236 Take action to ensure its internal audits are undertaken in accordance with the company's Safety Management System and, specifically, that the audits are appropriately targeted and have robust assessment mechanisms.

Scira Offshore Energy Ltd is recommended to:

2013/237 Review and amend its procedures to ensure:

- A robust defect reporting system is established in combination with a means to issue navigational warnings when appropriate.
- Liaison with the UK Coastguard to facilitate dissemination of navigation warnings to the marine community as a whole.

Island Shipping Ltd is recommended to:

2013/238 Amend its Safety Management System to include:

- Instructions on passage planning and monitoring, including the use of electronic chart plotters in combination with paper charts.
- The role of the crew as lookout to support the master effectively on passage.
- Emergency procedure checklist(s) to assist the crew immediately after an accident.
- A familiarisation/ training schedule for new masters to follow during the induction period.
- A system for updating and renewing paper charts.

2013/239 Ensure masters are trained in the use of the electronic chart plotters fitted to its vessels and are able to employ them effectively for passage planning and monitoring.

National Workboat Association and **International Marine Contractors Association** are recommended to consult and collaborate with other industry stakeholders to:

2013/240 Review, develop and expand the National Workboat Association's Best Practice Guide for Offshore Energy Service Crews. In addition, develop a complementary document providing operational best practice guidance, specifically directed towards owners and managers of offshore renewable energy passenger transfer vessels.

2013/241 Formulate a consolidated system to receive and promulgate safety issues and lessons to the offshore renewable energy sector.

Marine Accident Investigation Branch
November 2013

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

Marine Accident Report

INVESTORS IN PEOPLE