Anatomy of a trial for manslaughter at sea: the P&O ferry the *Pride of Bilbao* and the yacht *Ouzo*

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1. Introduction

It is some eight years since the tragic death at sea of three experienced yachtsmen. It was said that on the night of Sunday 20 August 2006 their yacht the *Ouzo*, which was making her way from Bembridge on the Isle of Wight to Dartmouth,[2] at night and in a moderate sea, was struck or swamped by the 37,000 tonne *Pride of Bilbao* and sunk. The incident was rapid and catastrophic and all three yachtsmen drowned.

No distress flares were sighted. No mayday call was made. It must have been a collision or capsize following close contact with another vessel or object. There were no serious traumatic injuries or damage to outer clothing so that, as one expert in marine medicine concluded, the yacht could not have been involved in a direct impact with a ship at speed.[3] Therefore, the yacht must have capsized or been sunk either by sustaining a glancing blow from a ship or by a wave from the wash of a ship. Sudden capsize with the occupants being washed into the water was a probable explanation for their drowning. The bodies were not found until two days later on 22 and 23 August. The wreck of the yacht has never been found.

If the *Ouzo* was sunk by another, larger vessel it was but one of a number of such accidents in recent years. To give some examples, in July 2006 the yacht *Tuila*, a 28 foot Twister, was lost with all four crew in the North Sea and it was considered that she had been struck by a merchant vessel; on 5 August 2010 the ferry *Scottish Viking* collided with a fishing vessel *Homeland* off St Abb's Head off the east coast of Scotland and a member of the Homeland's crew was lost; and on 11 February 2011 the container ship *MV Boxford* collided with the fishing vessel *Admiral Blake* south of Start Point and the *Admiral Blake* was damaged and two crew thrown overboard, although they were later rescued.

This article describes what was involved in the trial of the officer of the watch Michael Hubble 29 October–31 December 2007 at Winchester Crown Court.

2. The vessels

The *Ouzo* was a 26ft Sailfish, a sloop-rigged sailing boat with a lifting keel built by Maxi Marine of Hamble. Her previous owner wrote that in a Force 4 she would carry her full sails comfortably and

[1] Richard Barraclough was leading counsel for the defence in this case. Any technical or other errors are entirely the author's. Any comments will be gratefully received at richardbarraclough@6pumpcourt.co.uk. My thanks go to Brian Corlett of Burness Corlett Three Quays (IOM) Limited for considering the technical matters.
[2] Approximately 70 nm west of Bembridge.
[3] There was evidence of hypothermia. The yachtsmen were wearing life jackets, albeit in at least one case the crotch strap was not properly fitted.

when beating would manage as much as 30 degrees of wind. She was very stable and had a buoyant hull. He thought that in the improbable event of her being knocked over, there was the possibility of the keel lifting, thus making the boat less stable but that this was highly unlikely. She was equipped with navigation lights on the push and pull pits with an independent light at the mast head and a streaming light. She had an aluminium octahedral radar reflector, which could be hoisted up into the rigging. She had previously sailed in a Force 8.

The *Pride of Bilbao* (renamed *Bilbao* in 2010 and then the *Princess Anastasia*) is a 37,000 tonne RoRo passenger ferry built in 1986 in Finland. She is 177 metres long overall with a beam of 28.4 metres. The bridge is set 20 metres back from the bow and is 32 metres above the waterline. She is ice strengthened Class 1A. It was assumed that she had a pronounced bow wave by reason of her bulbous bow. In fact she did not. She had been constructed for the Swedish Archipelago and thus designed to create as little wash as possible.

3. The prosecution

The accident resulted in the officer of the watch and first mate Michael Hubble being prosecuted for manslaughter and under the Merchant Shipping Act 1995. The allegation was not so much that he had been negligent in the control of the ship prior to the collision or close quarter passing; rather, that he, as the officer in charge had failed to turn her round and ensure that the three men were safe before proceeding.

That sort of allegation, the abandonment of fellow seafarers, is perhaps one of the most distressing complaints that can be made against a seaman. One national newspaper cruelly headlined the prosecution claim by describing how the officer 'left [the yachtsmen] to die'. The jury acquitted Mr Hubble of manslaughter. It was unable to agree on a verdict in respect of a count alleging a breach of section 58 of the Merchant Shipping Act 1995 in that he had

> . . . failed properly to discharge his duties or to perform any other function in relation to the operation of his ship or its machinery or equipment to such an extent as to cause or to be likely to cause the death of or serious injury to [the deceased yachtsmen].

The crown offered no further evidence and a 'Not Guilty' verdict was recorded on that count.

4. Expertise involved in the trial

The trial was a complex one involving experts in virtually every area of marine expertise – master mariners, experts in ship design, in seamanship, hydrodynamics, radar, tides, body drift, SARIS,[4] yacht design, paint analysis, analysis of VR3000 bridge data recording equipment, radar reflectivity, mobile phone ranges, meteorology, environmental medicine, applied physiology, marine survival and ship dynamics. It involved an analysis of the COLREGS,[5] Fleet Regulations, Marine Guidance Notes and the International Convention for the Safety of Life at Sea (SOLAS), as well as the primary legislation.

In addition, there was voice analysis evidence from the recording of what had been said on the bridge at about the time of the presumed collision. Counsel and experts travelled on board the *Pride of Bilbao* before the trial on one of her regular trips to Bilbao. The defence had the assistance of a marine expert,[6] who collated the evidence as it developed during the trial. A Spanish tug was employed in Bilbao to position itself so that visibility from the bridge might be calculated. The resulting evidence proved crucial to the outcome of the trial.

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[4] The Coastguard Search and Rescue Information System http://www.bmtargoss.com/services-and-solutions/incident-and-environment/search-and-rescue-information-system/.

[5] IMO International Regulations for Preventing Collisions at Sea 1972 (COLREGs) http://www.imo.org/About/Conventions/ListOfConventions/Pages/COLREG.aspx.

[6] Captain Stephen Healy of Compass Maritime Limited. He was available to assist 24 hours a day.

5. The facts

The *Ouzo* should have left Bembridge on the east coast of the Isle of Wight in the afternoon of Sunday 20 August 2006 but the crew missed the tide; it was not possible to get out of harbour. By 1730 BST the crew was preparing to launch, intending to leave Bembridge at about 1930 BST. The Bembridge radar showed a target leaving the harbour at about 2030 BST, first clearing Bembridge approach channel and then altering course south south east in the direction of Bembridge Ledge buoy, where it altered course to the south south west and was lost to radar, owing to the shadow created by Foreland Point (Isle of Wight). At 2054 BST the target was in close proximity to an inbound target coming from the north and heading towards Bembridge harbour. The outbound target continued to clear St Helen's Fort,[7] where it changed course towards Bembridge Ledge.

Wind conditions were breezy or fresh with moderate seas. One maritime expert described the conditions as 'probably not ideal for fair weather summer sailing but not exceptional for the Channel even in August'. An analysis of the wind and weather conditions at trial suggested that it was at the top end of Force 4, probably Force 5. One expert said: 'The conditions would have been relatively uncomfortable for [a boat] of its size with a significant wave height of about two metres; the largest waves could have been nearly four metres crest to trough'.

At about 2300 BST one of the members of the crew of the *Ouzo* had used his mobile to phone home. He described conditions as very calm. The crew was doing three-hour watches. The last known position was thought to be at 2212 BST.

5.1. Radar dumps

The Marine Simulation Department at South Tyneside College analysed the Southampton radar dumps. It had been possible to track the *Ouzo* from 2107 BST leaving Bembridge just east of St Helen's Fort, slowing possibly to hoist sail. A ground speed of 4.7 knots was detected as she made towards the Bembridge Ledge buoy at 2113 BST and then at 2120 BST. She ended up east of the buoy at 2130 BST just as the ferry *Bretagne* passed her at 140 metres at 13 knots. By 2138 BST she was passing east of the West Princess buoy. She is last recorded on radar at 2245 BST, although there are possible images at 0104 and 0110 BST. A speed of 2.5 knots was calculated based on time and distance. The radar evidence suggested that if the *Ouzo* had sailed on an expected heading from the Bembridge Ledge buoy, she would have ground tracked to the west. At 0107 BST she would have been in an estimated position well to north east of the *Pride of Bilbao*'s position.

The *Pride of Bilbao* left the berth at Portsmouth shortly after 2300 BST on Sunday 20 August 2006. At the helm was the senior master, Captain Alastair McFadyen, a man with long experience. The officer of the watch or second mate was Michael Hubble. There were at least two watch keepers as Portsmouth is a busy sea area and, indeed, the radar screen dumps showed just how busy this area of sea was at the time. On the bridge were the captain, the chief officer and the helmsman, with lookouts on the foc'sle.

The helmsman took over as she was driven out of Portsmouth along the Portsmouth approach channel. The ship passed Blockhouse and then Outer Spit buoy. At about midnight in the vicinity of the forts,[8] Mr Hubble took over. Two lookouts arrived, one of whom relieved the helmsman and, just past Nab Tower, the *Pride of Bilbao* approached full power at between 17 and 19 knots.

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[7] St Helen's Fort marks the channel north east of Bembridge, so after clearing the Fort the *Ouzo* would have turned south to go out to sea and round the south coast of the Isle of Wight towards Dartmouth.

[8] Situated in the Solent (the sea between the south coast and the Isle of Wight) the four forts were built to protect the maritime access to Spithead and the entrance to Portsmouth Harbour. Although the eastern part of the Solent is very wide, the majority of it is shallow: sand banks protrude from Portsmouth and the Isle of Wight, resulting in a very narrow deep water channel. The shoals round the forts are covered by only 6–12 feet of water at low tide, and therefore large ships must keep to the buoyed channels for safe passage. The forts were positioned in the 19th century to command these strategic shipping channels.

The 'night orders' were to maintain four engines throughout, keeping at full speed, fins throughout.[9] The captain made it clear in the orders that, in the case of doubt, he must be called. Safety distance between ships was set at two miles ahead and one mile astern. As vessels appeared on the radar the cursor was moved to record speed, direction, course and distance from the ship. The port radar was set at 12 miles, the central radar at five miles. Speed was about 20 knots. Visibility was quite good. The course changed gradually as the ship positioned herself to head towards Spain.

The black box data showed that the steering was set at automatic pilot between 0002 to 0017 BST: at 0002 the ship made an alteration to starboard to bring her to a new course; at 0005 she was steady on a new course of 242 degrees; at 0103 she was slightly to north of her intended track; at 0108 she was turning to starboard and at 0111 she turned 5 degrees to port to start bringing her back onto the intended track. At no point was there any large target on the radar close to the *Pride of Bilbao*. This manoeuvre is described by Mr Hubble and is indicated from the recorded conversation on the bridge (see below section 7.1).

The black box showed that at 0114 automatic clutter control was changed from automatic to manual, showing noise (return from waves) out by approximately one mile.

Radar works on the principle that the ship sends out radio waves which, if they hit an object, are reflected and show up on the radar screen. The bigger the object, the bigger the image. The radar can be adjusted to make it more or less sensitive. This can create problems at sea, as waves give a radar reflection that causes other small objects to be lost in the clutter by the waves shown on the screen. If the clutter is manually suppressed too low there is a risk of losing small objects from the screen completely. The autoclutter selects its own levels, depending on the amount of clutter it detects.

6. Research into evidence

6.1. Noise on board the ship

The trial involved the analysis of every possible noise that might have alerted the watch to a collision. An examination of the entire ship, from engine room to car deck, was undertaken to attempt to establish just how many mysterious noises might be heard from the bowels of the *Pride of Bilbao*. A total of 1153 questionnaires had been sent out to passengers.[10] No reports of noise were received from crew members. Passengers described hearing 'a big thump' and feeling a shuddering at about the time when the collision might have taken place[11] and some passengers were convinced that there had been a collision.

The master mariner Captain Stephen Healy undertook a detailed search of the lower accommodation, car decks and engine room areas specifically to look for potential sources of the types of noise reported. Whether they were noises from waves, noises from the car deck or noises that would have no detectable cause apart from the ship's structure, we shall never know. What was plain is that they could not have been noises of a small yacht colliding sideways on with a ship the size of the *Pride of Bilbao*. Such a noise would have been no more than a relatively light scraping sound, which would not have been heard several decks higher on the opposite side of the ship, as described by some of the passengers.

6.2. Paint scrapings

A paint analysis was essentially negative. The side of the ship was examined for relevant damage. There was none.

[9] The fins of the vessel are its stabilising devices, which lie some four metres below the waterline and three metres laterally from the ship's side.

[10] Of these, 691 replies were received: 636 made no mention of noise; 32 positively stated that they had heard no noise; 23 reported hearing noises.

[11] Some passengers mentioned a noise from the engine area like a skip being dropped by a lorry; a bang, a 'shudder and a loud crashing noise', 'bangs and judders' as if as a result of a collision, a 'crunch like fibre glass being crunched'.

6.3. Distances

One of the issues was the position of the yacht as she approached the *Pride of Bilbao*. A watch keeper on the *Pride of Bilbao* called at 0107 BST: 'showing a red light to 1 point head on, pretty close, a yacht just there, with clearing, no red light'. If a yacht was head on, the captain should have been called. The emergency procedures would have been followed, which would have involved the ship turning round, man overboard procedures being followed, life buoys being released and the coastguard informed.

The autopilot turn radius was set at 1.5 miles, although there is an override facility that can be used to change course quickly. The captain would have used the autopilot emergency override and then, using the tiller, would have put the helm hard a-port with a maximum rudder angle of 38 degrees and a few seconds later, when the vessel was on the starboard shoulder (where the bow starts to curve from the side of the ship), he would have used the same tiller to apply full starboard helm. There was nothing else that could have been done, apart from stabilising the ship once the vessel was clear.

During the interview with the investigators, the officer of the watch Mr Hubble spoke of travelling at a speed of 21 knots, and seeing a small vessel just off the starboard bow at half a cable's length from the bridge. He stated that, as a result, he put the ship 5 degrees to port for 9 seconds and then 10 degrees to starboard for 2.5 seconds, so as to avoid the vessel. (He did not say so at the time but this was taken to be the 'dog leg' incident that occurred at 0107 BST; see below the MAIB hypothesis of the movements of the *Pride of Bilbao* at section 7.1). This, the captain said, would have been an unusual manoeuvre and one which he himself had never undertaken.

In fact, whilst gathering evidence in Bilbao for the trial it was possible to demonstrate that the estimate of the yacht being so close was wrong. The officer on the bridge would not have been able to see a vessel at half a cable's length from the bridge. In Bilbao, by way of demonstration, a Spanish pilot boat was used to position itself as directed from the bridge of the *Pride of Bilbao*. The boat started off on the starboard bow and moved down the ship towards the stern. It clear that, if a person were to leave the chart room and stand as the officer would have been standing and as Mr Hubble described, any light seen must have been more than two cables away. Thus, the passing distance must have been much greater than at first thought.

The P&O Ferries Limited Marine and Safety Manager, a master mariner, provided important evidence. He was able to take the various positions of the crew at the time of the initial sighting of the yacht. He calculated the minimum distances at which a target could be seen from each of the positions and from the bridge windows to the position envisaged and from various points to starboard, calculating the observer's height and the height of the bridge above sea level and the height of the bridge front window sill. Captain Healy noted that anything closer than 393.83 metres would not have been visible to a man of Mr Hubble's height, standing in the agreed position on the bridge. In his view, the two vessels would have been at least 360 metres apart or just under two cables, not half a cable.

At night the bridge is profoundly dark, with dimmed control lights. When the members of the jury visited the ship, their surprise was palpable as the lights went off. It is so dark that when a person returns to the bridge he has to be guided by torchlight to his position. There was much discussion following this incident of the time that it takes for crew members returning to the bridge to accustom their eyes to the 'complete darkness' – as one watch keeper described it – so that they could properly undertake their watch keeping duties. There was also a degree of light pollution on the bridge from the chart room, as pointed out by the Marine Accident Investigation Branch (MAIB).

When those of us involved in the trial travelled with the ship to Bilbao it became clear just how dangerous it is to sail in those waters at night. The *Pride of Bilbao* is huge. A yacht is small. On leaving port those on watch took inordinate care to watch for small vessels, some of which, as they approached, had no lights or obscured lights. The captain's experience was that it was not unusual for sailing boats to be sailing at night without lights and for a yacht to be invisible to both radar and the naked eye.

The MAIB investigation that followed the tragedy hypothesised that the crew of the *Ouzo* was likely to have seen the *Pride of Bilbao*. Visibility was good, the night was dark, the ferry would have been brightly lit and she was approaching from a direction such that she would not have been obscured by the yacht's sails. As the ferry approached it would have appeared to the yachtsmen that she was going to pass well clear of the *Ouzo*. In fact, until 0101 BST it was said that she was steering a course to pass the yacht at a distance of 0.5 nautical miles. However, on reaching the waypoint position at 0101 she began a slow turn to starboard. The yacht's crew members, if they had seen this, might have thought that she was altering course to give way in compliance with Rule 18 of the Collision Regulations. The alteration of course took more than three minutes to undertake by reason of the small alterations. These were the initial changes of course that the officer of the watch Mr Hubble had ordered, in order to avoid heeling. The time taken from when the ferry settled on her new course to the time of collision or close quarters would have been less than four minutes.

From a conversation this author had with one of the experts, from the point of view of the yacht, when the crew first saw the *Pride of Bilbao* she would have been starboard side on and looking as if she was heading away. She then turned to starboard to head to Spain and would have been upon the yacht within minutes.

Captain Healy, who did not give evidence to the court, had the opportunity to make a passage on a sister yacht to the *Ouzo* for the purpose of assessing the helmsman's ability to maintain a proper look out when under sail. He has commented that there could potentially be a restricted arc of visibility from right ahead to approximately two points ahead of the beam (22.5 degrees) on the side on which the sail lay when the sail was deployed. In addition, if the helmsman is seated low in the cockpit there was a minor obstruction astern presented by the horseshoe life buoy and the ensign.

7. The prosecution evidence

The chief examiner of the Royal Yachting Association (RYA) knew the Sailfish 25 well. He sought to plot the likely position of the *Ouzo* at 0107 BST on 21 August, taking into account the last known position. The technical department of the RYA assisted with the hull, rig structure and stability of the vessel and the RYA meteorologist assisted with the marine weather assessment for the yacht. Taking into account wind, tide, sea state, strength and ability of the crew, type of boat, probable sail plan and the probable effect of the land on wind direction, he sought to establish the probable position of the yacht at 0112 BST. The variables were wind direction, tacking angle, amount of leeway and effect of tidal stream. However, it emerged that the evidence adduced by the defence, based on real time simulation, was probably more accurate in determining the position of the yacht.

The Marine and Coastguard Agency (MCA) collated all the geographical information relating to the incident and, in particular, the *Pride of Bilbao's* passage plan showing waypoints and course lines, log book entries and data recorder (VDR). In addition, the Southampton Vessel Traffic System showed what must have been the *Ouzo* leaving Bembridge at 2115 BST on 20 August until she was apparently lost to radar at about 2212 BST (as it was then thought). The MCA also provided information concerning the location of where the bodies were found, SARIS data and mobile telephone information.

From that information an expert was able to position the mobile call made at about 2300 BST by way of arcs showing possible positions at 2300 BST based on a variety of average speeds over the ground. In order to ensure that the radar target must have been the *Ouzo* a similar yacht was taken out and tracked. The position of the *Pride of Bilbao* was established from the VDR.

The Crown thus sought to establish that, at the crucial time, both vessels were in exactly the same area of collision. It was then necessary to seek to establish where the *Ouzo* must have been when seen by witnesses at various positions from the bridge of the *Pride of Bilbao*. That was done by asking the witnesses to point to where the yacht was and then positioning a police boat at that point so that measurements might be taken. Those calculations purported to establish that the yacht must have been some 14 metres from the straight side of the ship.

The nautical surveyor employed by the MCA then calculated the effect the ship might have on a yacht in that position. The general principle is that a high pressure area is found around the bow of a moving vessel, which tends to push away vessels or floating objects entering that area. Travelling down the side of the moving vessel the pressure area then changes into a suction area, which tends to pull other vessels towards the moving vessel. The evidence of this principle was developed, as will be seen below (see section 7.2).

7.1. Conversations on the bridge

Conversations on the bridge of the *Pride of Bilbao* – as recorded by the black box – provided important evidence. At 0107 the lookout reports a red light: 'He's showing a red that one . . . pretty close . . . head on head on . . . pretty close . . . a yacht . . . just right there'. The ferry alters course to port at 0107 BST and Mr Hubble says: 'we are clearing'. At 0107 the ferry alters course to starboard. At 0108 the lookout asks: 'see a light?' At 0108 Mr Hubble says: 'No, no you can't, you can't see it, can you? [or] I can't see it, can you?'. The watch says: 'no' and at 0109 the watch says: 'Ah, there's a light there . . . can't believe he came up that quick, fuck all on radar'. On the assumption that it was indeed the *Ouzo* that had come into close proximity with the ferry, this was to prove to be very important evidence about the judgment of the crew members in deciding that the vessel was safe; they had seen the light as she apparently tacked away from the ship to safety.

The expert master mariner called by the crown considered what the officer of the watch should have done, on the basis that the stern light of the yacht was first seen one to two points to starboard closely followed by the port side light as the *Pride of Bilbao* closed on the yacht. After the yacht passed abaft the beam no light was seen for some time. Then a single red light was seen, assumed to be the yacht's side light. The expert opined that the dog leg manoeuvre carried out by the officer of the watch was, albeit not unreasonable, of little effect but more action should have been taken to confirm that the light seen was from the same vessel that he had taken action to avoid.

It was argued by the defence that, far from being reckless as to the safety of the crew of the yacht, the officer of the watch had established that it was safe before continuing at 0110 BST to alter course to resume track.

At about 0200 BST, when Mr Hubble left the bridge and handed over the watch, he mentioned that the ship had come very close to a yacht that had come down the starboard side and he had swung the *Pride of Bilbao*'s stern round to port. He was relaxed. He evidently believed that nothing untoward had occurred.

7.2. Evidence on bow wave and hydrodynamics

An interesting piece of evidence was a video taken by the police of the bow wave and wash of the *Pride of Bilbao* (see Appendix A); however, it proved to be of little use once the technical aspects of the ship were analysed by the experts called by the defence.

The evidence relating to the hydrodynamic interaction of the two vessels was problematic. It was dealt with as a matter of principle using MGN 199(M) 'Dangers of Interaction'[12] and evidence provided by the MCA Head of Seafarers Training and Certification Branch. The problem with this approach was that the interaction effect depends very much on the depth of water and the types of vessel involved. This was particularly important in relation to the *Pride of Bilbao*, as will become clear.

Burness Corlett Three Quays (IOM) Limited was instructed by the defence to consider the pattern of waves likely to have been generated by the *Pride of Bilbao*, including the way that pattern would have been affected by the wind-driven sea state at the time of the presumed encounter and the

[12] Maritime and Coastguard Agency 'Marine Guidance Note MGN 199(M)' https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/282279/mgn199.pdf.

variation in the size and severity of the waves, with distance off the ship; the stability of the *Ouzo*; the general magnitude of the interaction forces that would have acted on the *Ouzo* had she passed down the side of the *Pride of Bilbao*; whether they would have tended to suck her inwards or push her away and the way in which those forces would have varied with distance off; the likely effect of the wind-driven sea state and the combined sea state, including the waves from the *Pride of Bilbao* on the motions of the *Ouzo* and their variation with distance off; an assessment of the risk of swamping and sinking of the *Ouzo* during and after a passing manoeuvre by the *Pride of Bilbao*, taking into account the *Ouzo*'s flooded stability, and variation in the possible passing separation.

An account of the simulation and the conclusions drawn from the results can be read in Appendix B. In brief, the conclusion of the experts was that, in long-crested waves representative of the conditions at the time of the presumed incident, the effect of the presence of the ship travelling at 21.5 knots on the wind-driven waves would generally be small and that it was unlikely that the *Ouzo* was pulled towards the *Pride of Bilbao* significantly. As regards swamping, the *Ouzo* would not have been particularly affected by the waves generated around the ship, unless she was within 25 metres of the stern.

8. Defence and the *Crescent Beaune*

As the evidence developed and the position of the *Ouzo* at the point of presumed collision was less certain than had been thought, so the defence was able to submit that the *Pride of Bilbao* might not have been the offending vessel; rather, it could have been an oil products tanker of 2865 gross tonnes, the *Crescent Beaune*, whose master was later to admit that he had stood his watch down at the presumed time of the collision.

During the investigative process in September 2006, the master had told police that the crew consisted of himself, a chief mate and three able seamen, a chief engineer a second engineer and a cook. The *Crescent Beaune* left Dover at 1500 BST on 20 August on its way to Portland. There was a four-hour rota and the captain took it in turns with the chief mate and second mate to control the ship. He stated that: 'The three able seamen also take it in four hour turns to act as look out'. The ship does not have a black box recorder. She does have two Sperry Radar Systems and an ECD15 electronic chart system. He identified the lookout for the period 0100 and 0400 BST. In fact, he had stood his lookouts down and was later to tell the court that he was not able to say whether the *Crescent Beaune* had been in collision with the *Ouzo*.

It was suggested that the superstructure of the *Crescent Beaune* was such that it might have caught the upper rigging of the yacht.

It is plain from the Southampton VTS that at 0103 BST she was 2.5 nautical miles astern of the *Pride of Bilbao*. The chart display system of the *Crescent Beaune* was viewed for the period 0110 to 0200 BST. In order for radar targets to be displayed on the system, the officer of the watch must manually select the target as he wishes. The radar disclosed nothing significant. There was no unusual course alteration.

If the 0104 and 0110 BST radar returns from the Southampton radar dumps (see section 5.1) are of the *Ouzo*, then she is close to the *Crescent Beaune* and the same position is close to where the simulator placed the yachtsmen at 0107.

8.1. Simulation trials for body drift compared with SARIS

In this case, the real time simulation was more accurate in tracking the probable drift of the bodies than SARIS (Search and Rescue Information System), which has been in use since 1998 and is a sophisticated maritime search planning tool. The simulator performed a reverse exercise from the primary purpose of SARIS. The prosecution concluded on the evidence from using SARIS that the bodies and the *Pride of Bilbao* could be considered to have been in very close proximity to one another when the bodies went into the water.

The Marine Simulation Department of South Tyneside College undertook real time simulation trials using the Kongsberg Ship Bridge Simulator to ascertain whether there was any correlation between the position of the *Pride of Bilbao* and the *Ouzo* at 0107 BST on 21 August. The real time simulation was shown to be more accurate than SARIS and the conclusion of the exercise was that the bodies were much further east than the position of the presumed incident with the *Pride of Bilbao* at 0107.

The experts concluded that: 'there was no real correlation between the position of the *Pride of Bilbao* and the probable position of the *Ouzo* at 0107 on 21 August 2006' and continued: 'it is possible that another vessel may have collided with the *Ouzo* or had a close quarter situation'. (See Appendix C for details of the simulation trials.)

When, on the return trip, the officers of the *Pride of Bilbao* heard of the accident on the VHF emergency channel and all ships were told to look for debris, the thought in some minds was that the yacht had been run down by a container ship. That thought proved to be prophetic if one strand of the defence was correct and the *Crescent Beaune* did collide or may have collided with the *Ouzo*.

8.2. Flooding potential of the *Ouzo*

The experts considered the flooding potential of the *Ouzo*. From the measurements taken, and considering the probable sea conditions and sales hoisted, the volume of water taken on board would have had to have been great and sudden for the yacht to have capsized. (See Appendix D for details.)

8.3. Actions of other officers

The defence needed to show if possible what other officers might have done in similar circumstances and a number of mariners were called to give evidence.

8.4. Mobile phone evidence

The final piece in the jigsaw was to check the mobile phone evidence. The range and areas covered by the various cells engaged by the mobile phones used by the crew of the *Ouzo* were examined in order to see if it was possible to determine positions at the time of the call.

Each of the mobile operators provides coverage to the country from cell towers, all of which have a unique ID. Each cell tower can provide coverage with a radius of many kilometres, although factors such as buildings and geographic conditions contribute to the actual area of coverage. Beyond the shore there is nothing to interrupt a signal. The area of coverage proved to be significant; connection to certain cells could have occurred 'almost anywhere in a vast area to the south of the Isle of Wight'. The evidence of mobile calls was important because it was possible to fit this together with other radar evidence to demonstrate that, when a call was made at 2300 BST before the *Ouzo* had passed Shanklin, it may be that she was not making particularly good progress at that time.

9. The law

To find the defendant guilty of manslaughter the jury had to be satisfied that it was the *Pride of Bilbao* that had come into close proximity with the *Ouzo* and caused her to sink; in other words, that it was not the *Crescent Beaune* or some other vessel. If it was the *Pride of Bilbao*, the members of the jury had to be certain that the man accused, Mr Hubble, first owed a duty of care to the crew of the *Ouzo*. Next, the jury had to satisfy itself that there was a breach of that duty of care and that Mr Hubble caused – in the sense of being a significant or substantial or more than minimal cause of – their deaths. To be in breach of that duty of care it had to be proved that Mr Hubble's actions were grossly negligent, bearing in mind the risk of death. Gross negligence is more than simple negligence; it is such negligence as to warrant condemnation. It carries a degree of turpitude. In other words, it must be shown that, when judged on an objective basis, the defendant demonstrated such a departure from the proper standard of care incumbent upon him that he should be adjudged to have acted in a criminal manner. It must be demonstrated that there was a failure to avert a serious risk, going beyond mere inadvertence, in respect of an obvious and important matter, and one which the defendant had a duty to address.

A conviction for manslaughter does not depend on the defendant's state of mind, although as in *Misra*[13] and *Attorney General's Reference (No 2) of 1999*,[14] evidence of state of mind can be relevant to the circumstances for a jury to consider as to the grossness and criminality of the alleged conduct; hence the reference to what was said by the officer after the yacht (whether the *Ouzo* or not) had passed and appeared to be tacking away. Contributory negligence does not provide a defence.[15]

The Merchant Shipping Act 1995 deals with the duties following collision and imposes duties upon the master of each ship involved in a collision to assist the other ship. Section 92(1) provides that:

> . . . [I]t shall be the duty of the master of each ship if and so far as he can do so without damage to his own ship, crew and passengers to render to the other ship, its master, crew and passengers (if any) such assistance as may be practicable, and may be necessary to save them from any danger caused by the collision, and to stay by the other ship until he has ascertained that it has no need of further assistance.

It matters not whose fault the collision might be. The duty is clear.

10. Cause of the sinking and conclusions of the jury

So what was the cause of this particular disaster? Was it the *Pride of Bilbao*? Or perhaps the *Crescent Beaune*? But what then of the weather? Whilst the *Ouzo* was capable of sailing a moderate sea and the crew was competent, the sea conditions at night were not as comfortable as might have been desired. The Met Office evidence, based in part on ship observations for the area, calculated a maximum wave height to be as high as twice the significant wave height or 3.5 metres. A computer simulation put maximum wave height at nearly four metres crest to trough.

The jury was either not satisfied that the *Ouzo* was sunk by the *Pride of Bilbao* or, if she had been, that the officer of the watch was negligent in not taking measures to ensure that the yacht was safe or that, if the officer of the watch was negligent, such negligence was so grave as to justify condemnation sufficient to make him guilty of manslaughter.

The fact that the jury was unable to agree a verdict on the section 58 count suggests that some at least accepted that it was the *Pride of Bilbao* that had either collided with the *Ouzo* or had come into close quarters with her and the officer should have reacted accordingly. Alternatively, there may have been any number of permutations in the minds of individual jurors. It is impossible to know.

The defence had to approach the case using the 'ABC' principles of detective work, namely 'accept nothing, believe nothing and challenge everything' in order to seek to get to the truth. The result was uncertainty about what did happen, as the defence was able to show that it may not have been the *Pride of Bilbao* that had come into close proximity with the *Ouzo*, but rather a tanker whose master had stood his watch down.

For a seafarer to be accused of failing to act so as to save another in distress is a dreadful condemnation. It was plain, the defence submitted, that on the evidence the officer of the watch and the crew of the *Pride of Bilbao* had acted properly when they saw a yacht (whether the *Ouzo* or some other yacht) pass the ship. They watched for her as she emerged from the stern. They observed her lights and that she was tacking and that, therefore she was safe.

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13 *R v Misra and Srivastava* [2005] 1 Cr App R 21.

14 [2000] EWCA Crim 91 http://www.bailii.org/ew/cases/EWCA/Crim/2000/91.html.

15 See *R v Adomaku* [1995] 1 AC 171; *Khan v Khan* [1998] Crim LR 830; *Attorney General's Reference (No 2) of 1999* [2000] 2 Cr App R 207 (CA); *R v DPP ex parte Jones* [2000] Crim LR 858; *R v Brown (Uriah)* [2005] UKPC 18; *R v Yaqoob* (2005) 9 *Archbold News* 2; S Gault et al *Marsden Collisions at Sea* (13th edn Sweet & Maxwell London 2003).

11. The aftermath

A number of issues arose from the investigation into the accident. The MAIB report concluded that after a period of time the lenses of combined plastic masthead units are prone to crazing as the plastic becomes diffuse owing to heating from the lamp, thereby reducing luminosity. Good practice dictated that bridge watch keepers should, at night, arrive on the bridge 10 minutes prior to the start of their watch to allow time for their eyesight to adapt to the darkness. That timing was insufficient. Potential problems with photochromic lenses were highlighted.[16] Moderate sea conditions with the west south westerly wind might impact on radar visibility.

On this basis, recommendations were made to the MCA in relation to bridge lookouts wearing photochromic lenses; to the MCA and RYA in relation to the ineffectiveness of radar reflectors and the inability of ships' radars to detect small yachts in moderate sea conditions; to the British Marine Federation in relation to the mounting of reflectors; to the BMF and BSI in relation to the fitting of life jackets and, in particular, crotch straps; and to the International Chamber of Shipping in relation to adjustment times for watch keepers at night and blackout procedures.[17]

In particular, an MAIB flyer to the leisure industry noted that navigation lights are prone to crazing; lamp bulbs can be inadvertently replaced with bulbs of a lower rating; filaments may be damaged; if a yacht heels more than 5 degrees the horizontal intensity of her navigation lights may be decreased; a yacht's crew should not hesitate to do everything in their power to attract attention, for example by shining a torch on the sails; best radar reflectors should be fitted; crotch straps should be fitted and worn; and an EPIRB and/or life raft with hydrostatic release unit should be available.

In 2003 in the English Channel, in thick fog conditions, the yacht *Wahkuna* was in collision with a container ship P&O *Nedlloyd Vespucci*. There was a problem with interpretation of the radar and the yacht sank. The crew members abandoned the yacht onto the life raft and were saved. Thus, the need to have a life raft on deck is highlighted.

Many yachts have AIS Class B receivers as an adjunct to radar. However, the COLREGS do not require this and it is suggested that there is no substitute for visual and radar information. The AIS sends and receives heading, position, rate of turn and identification data over two VHF channels. A class A type transceiver, which knows its own vessel's data, calculates the closest point of approach and time remaining. The Class B AIS transceivers broadcast with lower power than the class A transponders and do not send position updates as frequently (see *Real World AIS October 2014 Power and Motoryacht*). It is said that plotters and radars may filter out signals from the Class B AIS transponders carried by yachts and that the yacht's crew should always assume that they have not been detected by the larger vessel.

It is recommended that a yacht must avoid close quarter situations with larger vessels. Such a situation is said to be within one mile but the yacht's skipper should work on the basis of two miles, which is said to be the distance from which the side lights on an MV can be seen. At this stage the skipper should alter course so as not to present himself as the 'stand on' vessel.[18]

The impact of this matter has been felt as far afield as Australia where, following the collision between the fishing vessel *Allena* and the 30,685 tonne *MV Northern Fortune*, an Antigua and Barbuda registered container ship, on 21 January 2008 it was determined in the ATSB Transport

[16] See the detailed studies carried out by the Institute of Opthalmology, UCL and contained in the reports 'Spectral and temporal characterisation of photochromic lenses' and 'Report on the potential reduction in visual acuity resulting from photochromic glasses' included in the MAIB Marine Accident Report into the investigation of the loss of the sailing yacht *Ouzo* and her three crew members south of the Isle of Wight during the night 20/21 August 2006' Report No 7/2007 Annex 2 and 3).

[17] The P&O Fleet Directive now notes that it '. . . may take up to 30 minutes for night vision to fully recover from exposure to bright light . . . and . . . at least 10 minutes should be allowed for an individual's eyesight to adjust for night vision . . . Lookout duties are not to be handed over to another individual without 10 minutes being allowed for the oncoming lookout's eyesight to adjust to night vision'.

[18] See *Fairway* Newsletter of the Small Craft Group and the Marine Traffic & Navigation Group (Autumn 2012).

Safety Investigation Report that the lookout on both vessels was ineffective, the *Allena* was not fitted with an AIS and the *Northern Fortune*'s third mate did not stop to render assistance to the *Allena* because he said that he believed that it was only a close quarters passing.

The MAIB report in relation to lenses continues to be referred to in the recommendation of certain glasses. The Australian Maritime Authority has issued a safety notice that photochromic lenses should not be worn for lookout duties at night.

12. Conclusion

Whether it was right to prosecute Mr Hubble will be a matter for ongoing debate.[19] As stated by Paul Gelder in the preface to his book entitled *Total Loss*:[20] 'We may never know what really happened in the case of the *Ouzo* but the loss of Rupert Saunders, James Meaby and Jason Downer all in their mid-thirties was a tragedy which threw a spotlight on a host of valuable lessons which may help save lives in the future'.

As for the *Pride of Bilbao*, she has returned home and now sails between Stockholm and St Petersburg, stopping in Tallinn. She will no longer collect marine data for Southampton University; nor will she carry whale watchers as she sails across the Bay of Biscay.

Appendix A

Evidence from the video taken by the police of the bow wave and wash of the *Pride of Bilbao.*

The prosecution expert said that the relative speed of the two vessels was in the region of 15–16 knots, the *Pride of Bilbao* travelling at 20 knots, the *Ouzo* at 4–5 knots.

The literature deals with interaction of ships in close proximity at low speed, eg tugs and tankers. There was no public information covering this case. Thus, the expert performed a series of model tests in the Austin Lamont towing tank at the University of Southampton. He used models which in his view replicated as far as possible the two vessels. The expert's findings included the following:

- The yacht model rode over the waves with rather violent motion.
- The bow wave was four metres above sea level.
- The bow Kelvin wave system was evidently a deep sea formation.
- The stern Kelvin wave system was two metres crest to trough of the wave with a steep wave.
- If the yacht was 20 metres from the side of the ship at the bridge, 25m aft of the bulbous bow then, as the yacht moved aft, it would have been affected by the bow wave system, an area of high amplitude wave motion and relatively short wave length.
- If the yacht survived the wave wash then, as the stern system was encountered with the yacht having violent motions caused by the bow waves, she would have had to ride over a stern wave system of steep waves. At the bow she may have taken on board large amounts of water thus affecting stability and may have been swamped by the stern waves.

That was the expert's theory. The expert acknowledged, however, the problems inherent in his experiments. The question of scale of the *Pride of Bilbao* to the *Ouzo* meant that the scaled model of the *Ouzo* used in the tank was very small (even though the relative sizes of the two models were not correct) and matters such as surface tension might impact on the experiment; the model ship the expert used to replicate the *Pride of Bilbao* did not have the bulbous bow of the ship, which would have a different wave system. It was not possible to take into account weather driven waves, which would have a serious effect on the ship wave wash, depending on the size of the sea state.

[19] The Boulton Lecture 2010 entitled 'Criminalisation or Fair Treatment of Seafarers' delivered by Captain Richards A Coates FNI Company of Master Mariners of Australia makes interesting reading.
[20] P Gelder *Total Loss* (3rd edn Bloomsbury Publishing London 2013).

These difficulties emerged following consideration by the defence of the Crown's expert's report, which used the Pierson Moskowitz sea spectrum (Bretschneider 1 parameter spectrum)–used for open ocean situations – as opposed to the spectrum JONSWAP, which would be used in the English Channel. Having considered the predominant wave direction at the time, the Crown's expert was forced to concede that this wave spectrum was the correct choice. All he could then say was that his experiments were indicative of what might have happened in very close quarters.

Appendix B

Defence hydrodynamics evidence

The experts used a hydrodynamics software called BASIN (Boundary Element Analysis for Sea Keeping Investigation), which investigates wave train and interaction forces and motions of ships in waves, essentially the analysis of hydrodynamic problems with particular emphasis on the prediction of ship motion and loads, together with naval architecture software HYDAS, which is used to investigate intact and flooded stability of ships.

The experts were able to use hull definitions for the *Pride of Bilbao* and photographs of sister vessels of the *Ouzo*. A naval architect was able to inspect another sister vessel and take measurements of her hull, deck and cockpit. They used all relevant environmental data, data from the ship and a stability analysis for the *Pride of Bilbao*, which had already been carried out using software called NAPA. The hull definition from NAPA was imported into a graphical processing package called RHINO, which was used to produce the hull definition for hydrodynamic simulations in BASIN.

The distances were set at 25, 50 and 75 metres. The simulation showed that the stern wave system of the *Pride of Bilbao* was much stronger than the bow wave and that the bow wave diminished relatively quickly with distance off, so that by 50 metres the bow wave is small and the trough wave astern of it has reduced by well over 50%. The ship may produce what looks like a larger rolling bow wave, although this may not be solid water. It is not a solid rolling wave as might be produced by a relatively bluff bowed vessel such as a large tanker or bulk carrier. It is produced by a relatively small amount of water running up the bow plating and then being pushed forward and away from it, as it slows vertically.

Thus, the police video of the *Pride of Bilbao* en route was misleading to this extent. The apparently solid looking rolling wave shown in the video is spray forced up and away from the bulbous bow, which was not fully submerged and the broken water and spray immediately round the bow did not extend out to the full breadth of the hull. What was seen in the video was the top of the bulb rather than the water surface.

The video did, however, show that there was no strong radiating wave pattern from the bow. Nor was there a strong radiating wave pattern from the stern. The crest on the port and starboard quarters was not breaking and there was no white water other than from the turbulent flow close to the side of the ship and the wake immediately behind the transom. In a view from the starboard aft quarter there was a standing wave more or less parallel to the ship. It was difficult to determine its magnitude. It may result from the turbulent and swirling flow produced by the propellers.

Interestingly, the frame of reference from the police launch is moving at a similar speed to the ship. The water appears to be rushing past the ship at great speed, whereas the ship is moving past the water. This is likely to affect the perception of the viewer. Indeed, the still photographs taken from the video, without explanation, would have been sufficient to persuade a jury that being anywhere near the ship would have been fraught with disaster.

The wave-making resistance of the ship increases rapidly with increasing speed. Essentially, the influence of the ship on wave-making extends out for a relatively short distance. Even at 25 metres off, the contours of the ship have little effect on the shape of the wave. By 50 metres the effect has almost disappeared.

The conclusion of the experts was that in long-crested waves representative of the conditions at the time of the presumed incident, the effect of the presence of the ship travelling at 21.5 knots on the wind-driven waves would generally be small, particularly around the bow; there would have been little effect beyond 25 metres off the side. At the stern there could have been significant reinforcement of the stern waves out to about 25 metres off but this would have diminished rapidly between 25 and 50 metres. At 50 and 75 metres off there would be very little effect either at the bow or the stern. Thus, at the bow, to encounter anything different from the current modified wind-driven sea state, the *Ouzo* would have had to have been 12.5 metres or less off. Amidships, the ship would have very little effect on the height or steepness of the wind-driven waves. If the yacht had passed 25 metres or less off the stern the waves could have been significantly worse than the wind driven waves. The area is turbulent because of the accelerated flow into it from the sides and under the stern, the immersed transom and the turbulence of the propellers. The effect of the ship rapidly diminishes beyond 25 metres so that by 50 metres the sea state would be very little changed.

As regards interaction, the results of the investigation showed that except for very small transverse separations the interaction forces and movements between ships were generally relatively small. This means that a long exposure to them would have been required to have a significant influence on their headings or separations. At a distance off of 25 metres the repulsion and attraction forces at the bow and along the side would not be expected to be particularly large. Furthermore, the forces would not have been acting for a lengthy period of time. Even at an initial separation of 25 metres it is unlikely that the *Ouzo* was pulled towards the *Pride of Bilbao* significantly.

It seems that the interaction of the two vessels would have been different to that between the dredger *Bowbelle* and the disco boat *Marchioness*, where in the MAIB report it was stated that:

> . . . when a relatively large ship is overtaking a smaller one the latter will tend to sheer across the bow of the former. Where the two vessels are very close the effect can be so great that the smaller vessel loses all control. It is highly likely that this effect was a cause probably the major cause of the *Marchioness* sheering across the bow of the *Bowbelle*.

The more pronounced effect arises because with the two vessels travelling in the same direction the forces from the large, overtaking vessel acting on the smaller, slower vessel would be applied for a relatively long time, thereby allowing a substantial response for the latter. The RYA in 'Top tips: Rules of the road'[21] published in 2009 and updated in 2013 described the interaction of the *Ouzo* and the *Pride of Bilbao* as 'much less subtle'.

As regards swamping, according to the experts, at about 0100 BST the sea state would have been relatively severe for a yacht of the size of the *Ouzo*. The biggest waves would have been in the range of three or four metres high, crest to trough and there would have been a significant number of breaking waves as the current from the ebb tide flowed against the wind-driven waves. Around the bow of the *Pride of Bilbao* the wind-driven waves would not have been modified significantly by the passage of the ship. If the *Ouzo* had been passed by the *Pride of Bilbao*, the response of the *Ouzo* would not have been significantly different to her response in the same sea state in the absence of the larger ship, unless she had been very close to the side or even inside the line of the side. The breaking bow wave of the ship does not appear to extend out beyond the beam of the ship around the bow in still water. Amidships, the effect of the ship on the sea state is limited, although it is more significant around the stern.

If the *Ouzo* had passed 25 metres or less off the stern of the ship the waves could have been significantly worse than the wind-driven waves. The effect of the ship diminishes rapidly beyond 25 metres so that by 50 metres off the waves experienced would have been very little changed from the current modified wind-driven sea state. Thus, if the *Ouzo* had been passed by the *Pride of Bilbao* with an

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[21] http://www.rya.org.uk/newsevents/enewsletters/Sportsboatsandribs/september/Pages/toptips.aspx.

initial separation of 25 metres or more, the *Ouzo* would not have been particularly affected by the waves generated around the ship because their effect would have been relatively small compared with the current modified wind-driven sea state at the time. Inside 25 metres off the stern the effect of the ship on the waves would have been more significant and this could have caused problems for a small craft like the *Ouzo*, with a risk of her being knocked down by a large steep breaking wave.

The effect of the ship on the sea state rapidly diminishes with distance off so that, except for the area around the stern, the waves experienced by the yacht could almost be considered as unmodified by the ship.

Appendix C

The SARIS operator took historical wind information, leeway speed value, wind driven current with fix and drift error. For both bodies the calculated back track positions were well within the error radius. The simulator uses dynamic raw data, including tidal values, surface driven currents and hourly changing wind values.

The Marine Simulation Centre included a six bridge ship simulation suite with integrated VTS, two Kongsberg Maritime Simulation Systems and Polaris Full Mission Bridge simulator. The real environment included modelling software, which creates a mathematical model of any floating object and needs inputs for hydrostatics and hydrodynamics to enable movement.

The mathematical model of the bodies in the state found and with exact replication of the state of the life jackets was produced. Wind information was taken from Coastguard recorded information, in this case the MRCC Solent meteorological observation log, taking into account the fact that wind encountered at MRCC Solent is affected by the mainland and the island itself and can be significantly different to that experienced out in the open sea to the south of the Isle of Wight. Information on tidal flow was taken from British Admiralty charted information found on charts and tidal stream atlases. Waves were taken from Coastguard information.

The team considered the Portsmouth tidal information but recognised tidal information from the Hydrographic Office was crucial, the bodies being under the influence of Tidal Diamond F. All systems were completed in real time with results recorded on the Polaris playback system. The exercise was able to assist in relation to the question of whether the bodies went into the water at the same time.

The simulation was performed by a master mariner and expert in nautical studies. Advice was given by a survival expert, who could speak of movement of bodies in water and life jackets. The simulator was programmed with a body in a life jacket as an 'ownership'.

The bodies were assigned individually to a ship bridge, environmental factors were set and the exercise left in real time to drift the ownership body. Environmental factors were varied as time progressed. The Polaris playbacks recorded hourly positions real time for the period 1829 BST on 23 August to 0107 BST on 21 August.

Appendix D

Flooding potential

The height of the sill formed by the bottom edge of the cabin access companionway opening was 0.245 metres below the deck and the bottom of the opening in the cockpit coaming in way of the tiller and about 0.78 metres above the design waterline. There are three washboards and it is likely that, in light of the conditions, at least one or two would have been in place. With one washboard in place the height of the companionway sill from the cockpit would be increased by 0.29 metres. A second washboard raises it by a further 0.3 metres.

It is difficult to see how substantial amounts of water could get down into the cabin. If the cockpit was filled by a wave, only part of its contents above the level of the companionway sill would get down into the cabin. The volume above the sill and below the opening in the transom coaming is about 0.8 cubic metres. If this much water flowed into the cabin it would not immediately threaten the stability of the yacht or prevent measures being taken to stop further ingress, to seek assistance or prepare a life raft.

With three tonnes of water in the hull the level would only be a little way above the cabin side, although it would be moving from side to side above the deck.

Even with no washboards, the passage of several tonnes of water into the cockpit seems unlikely, unless there was already a substantial amount of water in the hull so that the freeboard aft had been reduced and the cockpit was being almost continually refilled by the waves. Until there is about 4.5 tonnes of water in the hull the vessel would remain stable and upright, albeit with significantly reduced margins of stability. If the sails had been left up and were allowed to fill, for example if the sheets were cleated off, then the yacht would have heeled to a large angle but would not have capsized. She would probably have rounded into the wind emptying the sails so that she could come slowly upright again. If the amount of water had exceeded 4.5 tonnes, the freeboard aft would have started to come down quite rapidly as the hull sank lower into the water and the bow trim came off. By the time there were 6 tonnes in the hull the yacht would have had a significant stern trim and the freeboard from the water level in the cockpit to the companionway sill would have been only a few centimetres, with rapid flooding expected at that stage.