Australian Government
Australian Transport Safety Bureau

Collision between the bulk carrier *Furness Melbourne* and the yacht *Riga II*

North of Bowen, Queensland | 26 May 2012

Investigation

ATSB Transport Safety Report
Marine Occurrence Investigation
295-MO-2012-006
Final – 12 December 2013

Cover photo: Australian Transport Safety Bureau

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 4150 (24 hours)
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

Addendum

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Safety summary

What happened

At 2156 on 26 May 2012, the bulk carrier *Furness Melbourne* and the yacht *Riga II* collided about 15 miles north of Bowen, Queensland.

Riga II was dismasted and its hull was damaged but no-one was seriously injured and the yacht was towed into Bowen by a volunteer marine rescue vessel.

Furness Melbourne was not damaged and, after rendering assistance to the yacht, continued its voyage.

What the ATSB found

The investigation found that a proper lookout was not being kept on board either vessel in the time leading up to the collision.

Furness Melbourne's lookout had sighted *Riga II*'s starboard sidelight prior to collision but the officer of the watch made a series of assumptions based on limited information and concluded that the light was from a distant navigation buoy rather than another vessel that presented a risk of collision.

Riga II's watchkeeper did not visually identify *Furness Melbourne*'s navigation lights in time to make an effective appraisal of the situation, did not set the yacht's automatic identification system (AIS) unit on a range scale that would provide adequate warning of approaching vessels and when alerted by the AIS of the approaching ship, misinterpreted that information.

What's been done as a result

In the past 25 years, 60 collisions involving ships and small vessels have been reported to the ATSB and its predecessor, the Marine Incident Investigation Unit. Of these, 39 have been investigated.

The findings from these investigations have invariably included the failure of the watchkeepers on board one or both vessels to keep a proper lookout and the absence of early and appropriate action to avoid a collision.

The safety lessons from these investigations have been included in the published investigation reports. A number of safety bulletins that aim to highlight the risks and educate seafarers with regard to the similar contributing factors have also been published.

These documents and further safety related information can be downloaded at: www.atsb.gov.au/marine.aspx

Safety message

This incident again emphasises the need for those charged with the navigation of vessels of all types and sizes to keep a proper lookout and to take early and appropriate action to avoid a collision in accordance with the international collision regulations.

Contents

The occurrence

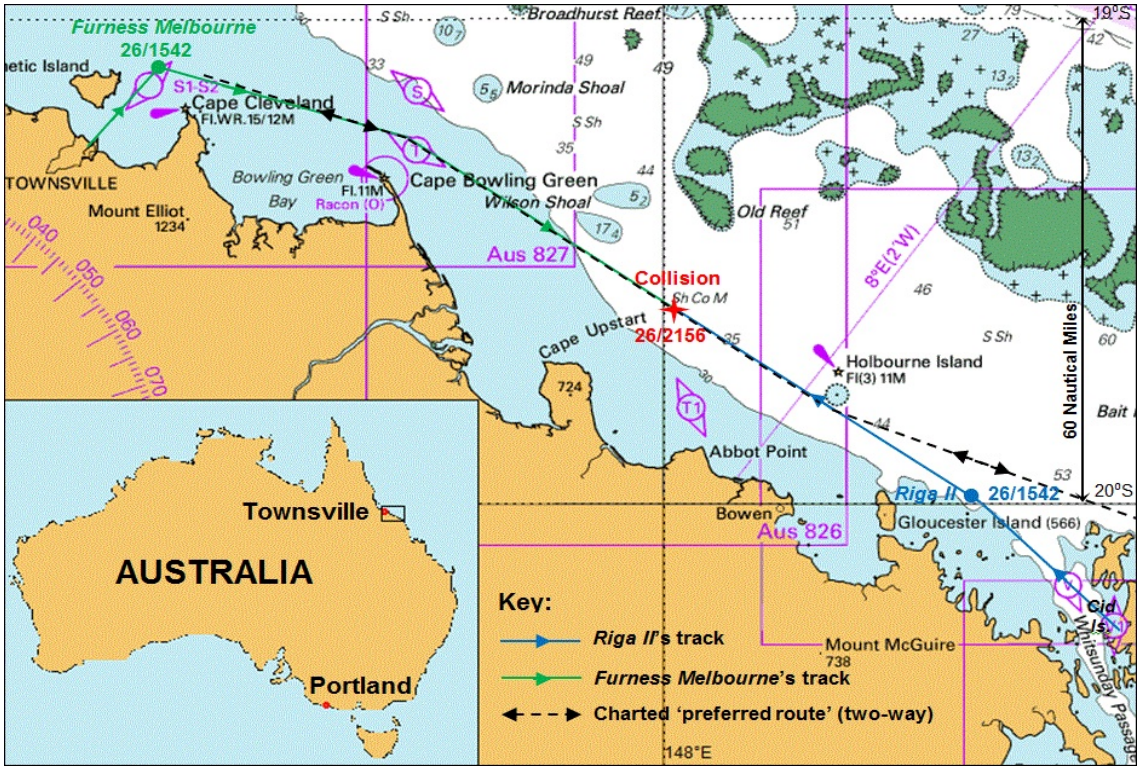
At 1410[1] on 26 May 2012, the 190 m geared bulk carrier *Furness Melbourne* (Figure 1) sailed from Townsville, Queensland, after loading a part cargo of lead slabs and zinc concentrate. The ship was bound for Portland, Victoria, to load mineral sands before departing the Australian coast bound for Europe.

Figure 1: *Furness Melbourne*

Source: ATSB

By 1542, *Furness Melbourne* was well clear of Townsville and its course was altered to 106º (T) and speed increased to 11 knots[2] (Figure 2). The auto-pilot was engaged and the master handed over the conduct (con) of the ship to the officer of the watch. The duty seaman was posted as a lookout.

Figure 2: Section of navigational chart Aus 4620 from Townsville to Whitsunday Islands



Source: Australian Hydrographic Service

[1] All times referred to in this report are local time, Coordinated Universal Time (UTC) + 10 hours.

[2] One knot, or one nautical mile per hour equals 1.852 kilometres per hour.

Meanwhile, the 13.6 m yacht *Riga II* (Figure 3) was en route to Townsville. At 1542, the yacht was about 9 miles[3] east of Gloucester Island (Figure 2) on a course of 303º (T) and making good about 6.5 knots. The skipper and his wife (the yacht's owners), their friend and grandson were on board. They had sailed from Cid Harbour in the Whitsunday Islands earlier that afternoon on the first leg of a cruise to far north Queensland.

Figure 3: *Riga II*

Source: *Riga II*'s skipper

By 1930, *Riga II* had reached a position nearly 6 miles west of Holbourne Island, very close to the 123·5º - 303·5º charted 'preferred route'[4] (Figure 2). The yacht's auto-pilot was set to make good its planned course of 303º (T) and the wind (15 to 20 knots from the south) was abaft the port beam. The starboard leeway meant that the heading[5] varied between 295º and 300º. The skipper was on watch, keeping a lookout while the others on board either rested or slept. While the yacht's automatic identification system (AIS) unit was switched on, the radar was switched off.

At this time, *Furness Melbourne* was on a 123º (T) course following the 123·5º - 303·5º preferred route in the opposite direction to *Riga II*. At 2000, when the third mate took over the bridge watch from the chief mate, the ship was about 42 miles west-northwest of Holbourne Island. The duty seaman on watch also changed. The weather conditions recorded in the ship's log book noted 'overcast skies, good visibility, fresh southerly breeze and rough seas'.

At 2051, the third mate began playing music on a personal computer. From time to time, he hummed or sang along with the music and, sometimes, chatted with the lookout. The visibility remained good and they could not see any ships or other traffic nearby. The s-band radar, AIS unit and both very high frequency (VHF) radios were switched on.

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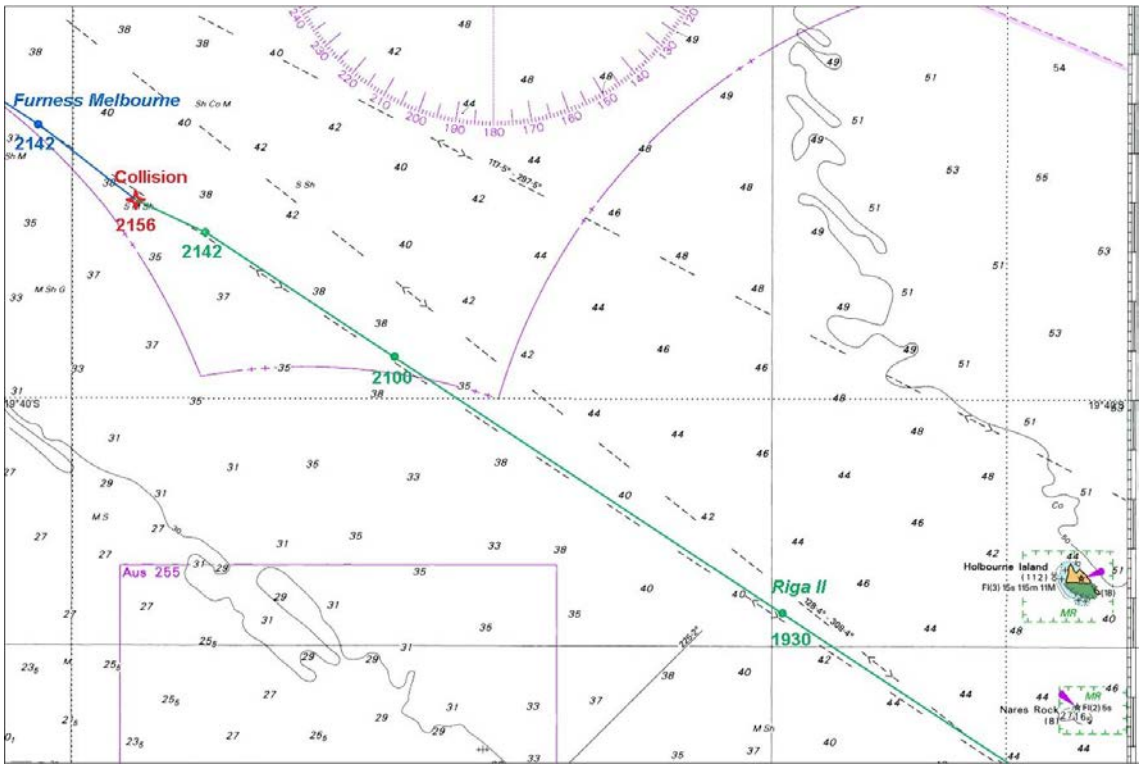
[3] A nautical mile of 1852 m.

[4] The relevant note on the Aus navigational charts states: This is a preferred route and has not been surveyed in accordance with the IMO/IHO standards for recommended tracks, but is the preferred route for vessels having regard to charted depths. The attention of vessels meeting on the preferred routes is drawn to the International Regulations for the Prevention of Collision at Sea (1972), particularly Rules 18 and 28 in regards to vessels constrained by their draught.

[5] All headings referred to in this report are true headings.

Shortly after 2100, the seaman reported a white light fine on *Furness Melbourne*'s port bow. The third mate told the seaman that the light was a distant lighthouse. At this time, Holbourne Island and Nares Rock, both of which were fitted with lights, were a little over 30 miles away (Figure 4).[6]

Figure 4: Section of navigational chart Aus 826 showing area west of Holbourne Island



Source: Australian Hydrographic Service with annotations by the ATSB

At about 2118, the lookout reported that the white light he had seen earlier was flashing. The third mate could see no radar targets in the general direction of the light and told the lookout that it was the distant lighthouse that he had previously mentioned.

At 2142, the seaman reported a green light fine on the port bow. The third mate thought the green light was from the isolated danger beacon on Nares Rock and he told the seaman that the light was a distant 'light buoy'. In fact, the green light was the starboard sidelight of *Riga II*, which was about 4 miles away.

At 2144, the third mate adjusted *Furness Melbourne*'s heading to starboard from 123º to 128º, to pass further away from what he mistakenly believed was Nares Rock. At 2146, he adjusted the heading back to 125º and, 2 minutes later, again to 128º. He then adjusted the heading back to 123º. He sang and hummed along with the music as he had during the past hour.

At about 2149,[7] *Riga II*'s AIS unit 'target alarm' sounded. Alerted, the skipper's wife called the skipper to come inside the cabin and have a look at the AIS display. Together, they noted from the AIS data that the approaching ship was making good a course of 122º (T) at 11.5 knots. They also switched on the yacht's radar.

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6 The lighthouse on Holbourne Island is 115 m high and has a white light that flashes three times every 15 seconds. It has a nominal range of 11 miles. The isolated danger beacon on Nares Rock is a minor light and has a much lower and less bright white light that flashes two times every 5 seconds.

7 This estimated time is derived from an analysis of all the available evidence. This analysis is discussed in the 'Safety Analysis' section of the report.

Shortly afterwards, *Riga II*'s skipper, who had not yet visually sighted *Furness Melbourne*, went back on deck to look for the ship. Within a minute, he saw its green sidelight fine on his starboard bow. He decided to alter course to port and, by about 2151, *Riga II*'s heading had been altered 10º to port. The skipper then altered the yacht's heading a further 10º to port to a heading of about 280º, with the aim of passing well clear of the ship.

Just after 2153, *Furness Melbourne*'s lookout reported that the green light he had been observing seemed very close. *Riga II* was now less than 1 mile ahead of the ship and the two vessels were closing at a combined speed of nearly 18 knots. In response to the seaman's report, the third mate checked the radar and the AIS unit and saw no target in the direction of the green light.

At 2154, the third mate adjusted *Furness Melbourne*'s heading to 128º.

Riga II's AIS unit now indicated that the ship was making good 127º. The skipper's wife passed this information to the skipper, who exclaimed in surprise to his wife about what the ship appeared to be doing. At 2155¼, she called *Furness Melbourne* on VHF channel 16 and identified her vessel as *Riga II*. The yacht was now about 200 m from the ship's bow.

Alerted by the unexpected radio call to his ship, the third mate stopped humming. A few seconds later, he broadcast on VHF channel 16 that the ship's course was being altered to starboard. He then ordered the seaman to engage hand steering.

At 2155¾, the skipper's wife called *Furness Melbourne* again and asked its intentions. At about the same time, the skipper saw the ship bearing down on the yacht and shouted for his wife to brace herself.

The third mate responded to the call from *Riga II*, stating that he was going to starboard and asked for a port to port passing. He could no longer see the yacht's green light when he ordered the rudder hard-to-starboard.

At 2156, *Furness Melbourne*'s heading was about 130º when it collided with *Riga II* in position 19º 35.88'S 148º 01.37'E. The ship's starboard anchor and/or some part of its flared bow contacted the yacht's mast and brought it down and the yacht scraped along the ship's starboard side.

At 2156¼, the skipper's wife called *Furness Melbourne* and reported the collision. A few seconds later, she reported that *Riga II* had been dismasted. The yacht's navigation lights (mounted on the mast) had gone out and the third mate could not see the yacht. He thought that the yacht was on the port side and, at 2157¼, ordered hard over to port to swing the stern of the ship away from it.

At 2157¾, the third mate ordered the rudder amidships and called the master, asking him to come to the bridge. The master hurried from his cabin to the bridge to find the third mate on the bridge wing looking for a boat he thought the ship might have collided with.

At 2159, the master ordered a heading of 122º. He adjusted the radar's gain and clutter settings and identified a small target close by on the starboard quarter. He then sighted a dim light in the direction of the target and thought it could be from a torch.

Meanwhile, *Riga II*'s skipper and his wife were assessing the damage to the yacht. No-one on board was seriously injured. At 2202, the skipper's wife broadcast an urgency message on VHF channel 16 and then called *Furness Melbourne*. The master answered her call, exchanged necessary information and advised that he would assist. He then turned his ship around to render assistance to the yacht.

At 2210, *Furness Melbourne*'s master reported the collision to authorities ashore, advising that the ship was providing assistance to *Riga II*. The authorities began preparing resources ashore to respond.

By 2300, *Furness Melbourne* had arrived near the disabled *Riga II*. The yacht's sails and rigging had fouled its hull and propeller. The master ordered a lifeboat lowered to assist the yacht's crew while he manoeuvred the ship to shelter the yacht from the wind and waves.

At 2353, the volunteer marine rescue (VMR) vessel *Rescue Bowen* departed Bowen to assist *Riga II*. By this time, *Furness Melbourne*'s starboard lifeboat was in the water and approaching the yacht with tools that had been requested to cut the rigging that was fouling the hull.

At 0130 on 27 May, *Rescue Bowen* arrived on the scene and approached *Riga II*. With *Furness Melbourne* providing a lee, the VMR rescue crew began connecting their vessel's tow line to the yacht. By 0206, *Rescue Bowen* had connected the tow line and, shortly afterwards, began towing *Riga II* towards Bowen at a speed of about 6 knots.

Furness Melbourne's crew recovered the lifeboat and, at 0237, after the master had confirmed with authorities that the ship was no longer required to assist, the passage to Portland was resumed.

By 0647, *Riga II* had been safely towed into Bowen and secured in the marina. In addition to losing its mast, sails and rigging, the yacht's hull, handrails and paintwork on the starboard side, were damaged. The internal support of the mast had moved, as had some cabinetwork and internal lighting.

Context

Furness Melbourne

Furness Melbourne was fitted with navigational equipment required for a ship of its size. The two Japan Radio Company (JRC) radars, an s-band JMA-9932-SA and an x-band JMA-9922-XA, had automatic radar plotting aid (ARPA) functions. Other bridge equipment included a JRC JHS-182 automatic identification system (AIS) transceiver and two JRC JHS-32B very high frequency (VHF) radios.

At the time of the collision, *Furness Melbourne* was managed by Fukujin Kisen, Japan. The ship had a crew of 21 Filipinos, all of whom held Philippines-issued qualifications appropriate for their positions on board the ship.

The master had 18 years of seagoing experience, of which the last 3 years had been in command. He had been on board *Furness Melbourne* for about 4 months.

The third mate first went to sea in 2005 as a seaman. In 2009, he gained a certificate as an officer in charge of a navigational watch and, in 2011, first sailed as third mate. He joined *Furness Melbourne*, his second ship as third mate, in Townsville, 10 days before the collision.

The duty seaman had 8 years of experience as a seaman. He had been on board *Furness Melbourne* for about 6 weeks.

Riga II

Riga II was a 13.6 m sloop rigged yacht constructed from aluminium and composite materials. The yacht was fitted with a diesel engine but, at the time of the collision, it was under sail and the engine was not being used.

Riga II was crewed by its owners (the skipper and his wife) and their friend. All three held a Swiss international certificate for operators of pleasure craft (Permit B). Each had more than 25 years of sailing experience in different parts of the world. Over that period, they had sailed together a number of times.

After purchasing *Riga II* in 2007, the skipper and his wife began sailing around the world in the yacht with their friend frequently accompanying them as circumstances permitted. In September 2011, their leisurely paced voyage brought them to Bundaberg, Australia. They returned to Europe for a few months before resuming their voyage in May 2012, after their friend and 11 year old grandson had joined them to sail north along the coast of Queensland.

The yacht's navigational equipment included a SIMRAD CX-44 radar, a NASA MARINE AIS radar receiver and two VHF radios (SIMRAD and ICOM).

Navigation lights

The International Regulations for the Prevention of Collisions at Sea, 1972, as amended (COLREGS) require all vessels to exhibit specific lights (commonly known as navigation lights) from sunset to sunrise.

The navigation lights of a power-driven vessel underway consist of a masthead light[8] forward, a second masthead light abaft of and higher than the forward one (mandatory for vessels 50 m or

[8] A masthead light is a white light placed over the fore and aft centreline of a vessel and is visible over an arc of the horizon of 225º, and fixed to show it from right ahead to 22.5º abaft the beam on either side of the vessel.

more in length), sidelights[9] and a sternlight.[10] *Furness Melbourne* was exhibiting all of these lights at the time of the collision.

A sailing vessel under way is required to exhibit sidelights and a sternlight. If the vessel is less than 20 m in length, these lights may be combined in a lantern at or near the top of the mast. *Riga II* was fitted with such a combined lantern. At the time of the collision, the yacht was exhibiting the lights in that lantern.

Holbourne Island and Nares Rock lights

In addition to approved navigational charts, nautical publications, such as the Admiralty List of Lights and Fog Signals, are required to be carried on board ships. These publications provide information about lighthouses, beacons and similar traditional aids to navigation. This information includes details of the lights fitted to these aids (for example, light characteristics and range). The publications also include luminous range[11] diagrams and geographical range[12] tables that enable mariners to determine the approximate range at which a light may be sighted.

The lighthouse on Holbourne Island is 115 m high and its light has a nominal range[13] of 11 miles. The light's elevation gives it a significant geographical range, which means that in good visibility it can be sighted at distances of much more than 11 miles. In this instance, it is possible that Holbourne Island light was visible to the watchkeepers on board *Furness Melbourne* at a range of about 32 miles.

Nares Rock is about 8 m high and of limited horizontal extent. The isolated danger has a beacon fitted that has a light of limited intensity. The range and height of the light are not specified in shipboard publications as it is a minor light designed to be observed at close range, not as a long range navigational light. Hence it would usually be sighted at distances of no more than a few miles.

Holbourne Island lies 3 miles north of Nares Rock. Preferred routes for all vessels (in a WNW-ESE direction) are charted a couple of miles north of the island and a similar distance south of the rock. Consequently, the watchkeepers on board vessels using these routes will normally sight Holbourne Island and Nares Rock lights.

Holbourne Island light is a white light that flashes three times every 15 seconds and Nares Rock light is a white light that flashes twice every 5 seconds. While the lights are both white and they are located relatively close to each other, their distinctive characteristics make them readily distinguishable. Furthermore, Holbourne Island light is much brighter than the light at Nares Rock and will invariably be sighted well before the latter, making confusing one with the other extremely unlikely.

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9 Sidelights - a green light on the starboard side of the vessel and a red light on its port side, each visible over an arc of the horizon of 112.5º and fixed to show it from right ahead to 22.5º abaft the beam on its respective side.

10 Sternlight - a white light placed near the vessels stern and visible over an arc of the horizon of 135º and fixed to show it from right aft to 22.5º abaft the beam on either side of the vessel.

11 The luminous range of a light is the maximum distance at which it can be seen, as determined by its intensity and the meteorological visibility.

12 The geographical range of a light is the maximum distance at which it can theoretically be seen, as limited by the curvature of the earth, atmospheric refraction, the elevation of the light and the observer's height of eye.

13 The nominal range of a light is its luminous range when the meteorological visibility is 10 miles.

Safety analysis

First sighting of *Furness Melbourne*

When interviewed, *Riga II*'s skipper and his wife stated that the yacht's AIS unit was set on '8 miles, 4 miles all around' and that *Furness Melbourne* was at a range of 4 miles when the yacht's AIS unit alarmed, warning them of the ship's presence. Since the two vessels had a combined closing speed of nearly 18 knots, they would have closed that distance in about 13 minutes. This evidence suggests that the AIS unit alarmed at about 2143, 13 minutes before the collision. They went on to say that the skipper then returned to the deck of the yacht and, within a minute, identified the ship's starboard (green) sidelight.

However, the above scenario is not consistent with all of the available evidence. Information from *Furness Melbourne*'s voyage data recorder unequivocally shows that at 2143 *Riga II* was about 2 points[14] to port of the ship's heading line. In such a position, the yacht's skipper could not have seen the ship's starboard (green) sidelight as he would have been looking at the ship's port side. The only navigation lights visible to him at that time would have been the ship's port (red) sidelight and its two white masthead lights.

Since the statements and actions of *Riga II*'s skipper support the fact that he identified the ship's starboard (green) sidelight, and reacted accordingly to it, it is more likely that he identified the ship sometime well after 2143, when the starboard (green) sidelight and the starboard side of the ship became visible to him.

Considering the relative headings and the combined speeds of the two vessels, the earliest this is likely to have occurred was when the yacht was almost directly ahead of the ship and at a range of less than 2 miles (about 6 minutes before the collision).

Therefore, it is more likely that *Riga II*'s AIS unit alarm activated about 7 minutes before the collision, at about 2149, when the ship was at a range of about 2 miles.

Lookout

The COLREGS provide guidance to all mariners with regard to the actions that should be taken by those responsible for navigating a vessel. Rule 5 *Look-out* states:

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

Since the COLREGS applied to the watchkeepers on board both *Furness Melbourne* and *Riga II*, they were both responsible for maintaining a proper lookout in order to determine if a risk of collision existed, so that they could take appropriate action to avoid it.

Lookout on board Riga II

In the prevailing conditions, *Furness Melbourne's* mast head light should have been visible to *Riga II*'s skipper at a range of at least 6 miles.[15] At a range of at least 3 miles, he should have also been able to see the ship's sidelight(s). However, while the skipper was keeping a visual lookout during the period of time leading up to the collision, he did not identify *Furness Melbourne* before the yacht's AIS unit alarmed.

The skipper could not understand or explain why he did not see *Furness Melbourne* before the yacht's AIS unit alarmed. However, keeping an effective visual lookout from the deck of a yacht can be difficult because of the obstructions to line of sight posed by the sails and rigging, the

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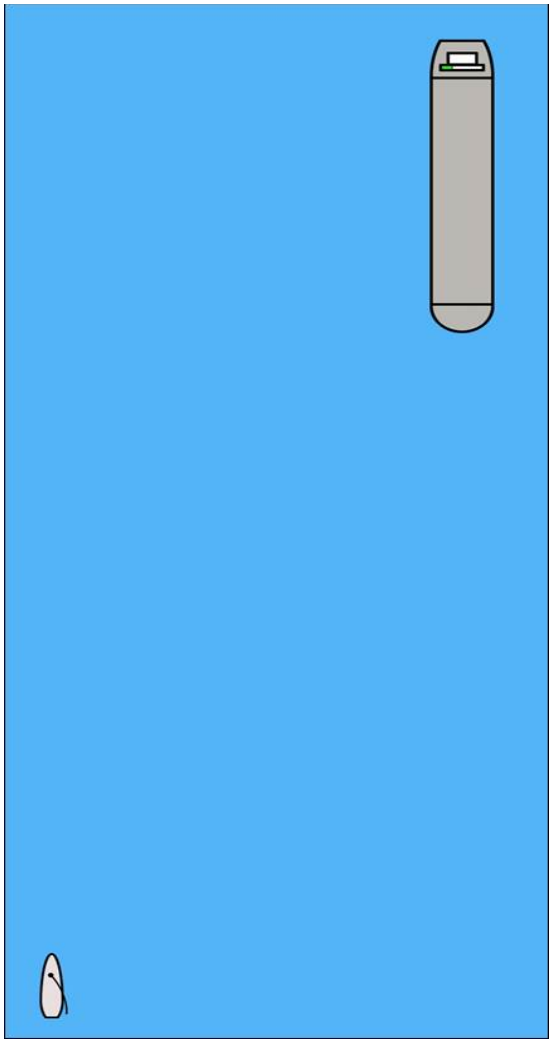
[14] One point of the compass equals 11.25 degrees.

[15] COLREGS Rule 22: Visibility of lights

movement of the yacht and the fact that the watchkeeper's height of eye is only about 2 m above sea level. Furthermore, the wind and spray encountered as a result of the weather conditions could have detracted from the skipper's attentiveness to his navigational task.

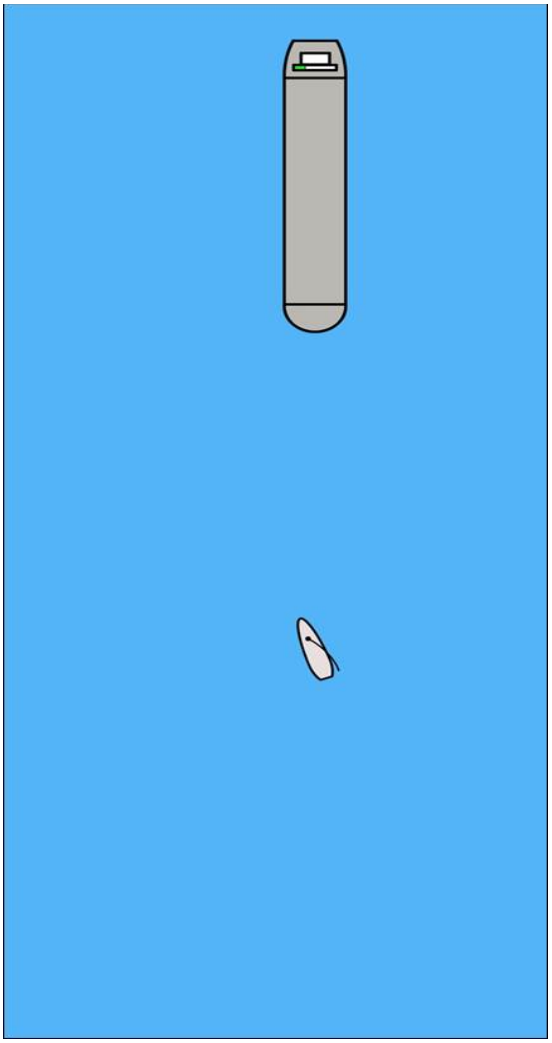
When the skipper identified the ship's starboard (green) sidelight, he concluded that *Furness Melbourne* was to starboard of the yacht and the two vessels were on reciprocal courses (Figure 5). He thought that by altering course to port he was opening up the passing distance between the two vessels. However, the two vessels were not on reciprocal courses, the yacht was crossing the ship's bow (Figure 6). Furthermore, the ship was probably at a range of less than 2 miles, not 4 miles as concluded by the yacht's skipper.

Figure 5: The skipper's mental image



Source: ATSB

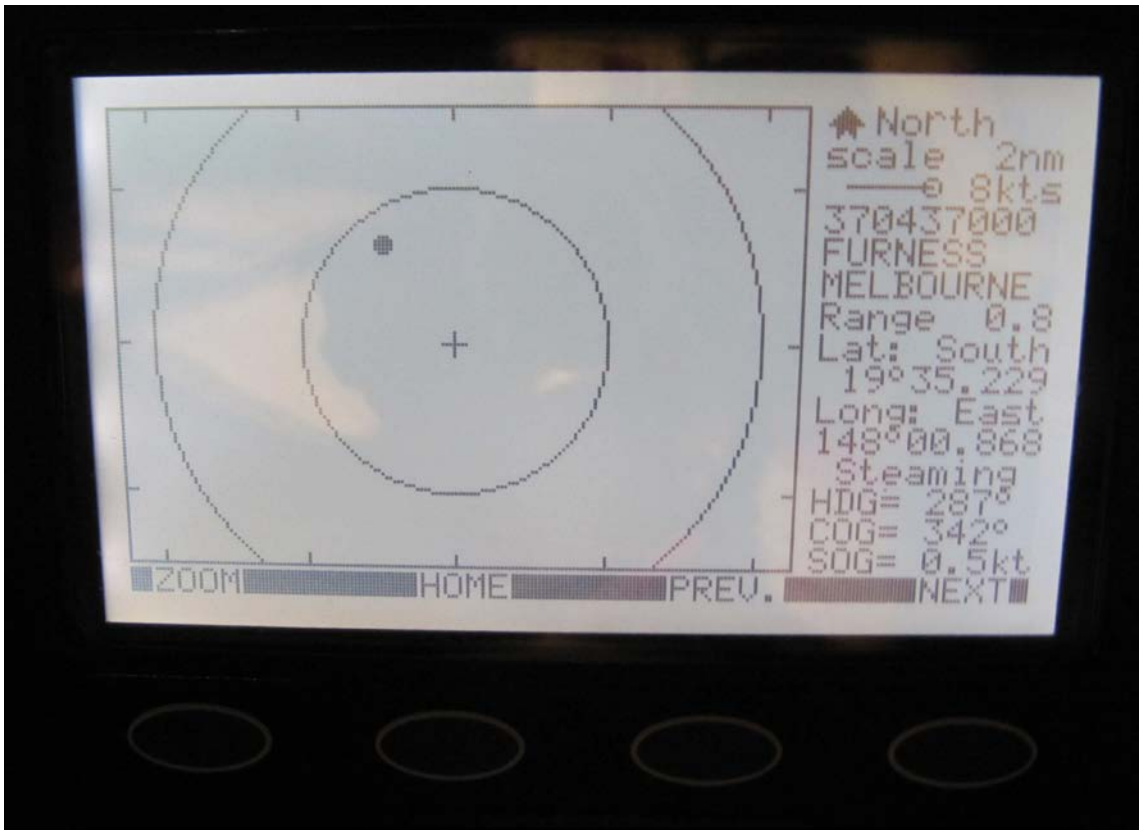
Figure 6: The actual situation



Source: ATSB

As previously discussed, it is likely that the yacht's AIS alarmed when *Furness Melbourne* was identified at a range of about 2 miles. Since the range of the alarm (inner ring on the display in Figure 7) is automatically set at half of the selected range scale (the outer ring on the display), the AIS unit was probably set on the 4 mile range scale. This may be contrary to the information provided by the yacht's skipper and his wife, who stated that it was set on '8 miles, 4 miles all around'. However, their statement does not clearly identify the selected range scale and, when they were asked to clarify what they meant by this statement, they demonstrated that they did not have a clear understanding of the operation of the AIS unit and its controls.

Figure 7: Photograph of *Riga II*'s AIS unit display taken after the collision when the scale had been set to 2 miles



Source: *Riga II*'s skipper

What is certain is that the AIS unit did not provide the skipper with sufficient warning of the presence of other vessels. Had the AIS unit been set on a larger and more appropriate range scale, it would have provided the skipper with more time in which to properly appraise the situation and the risk of collision.

While *Riga II*'s skipper was keeping watch during the period of time leading up to the collision, his actions did not constitute a proper lookout. He did not identify *Furness Melbourne*'s navigation lights at a range that would have enabled him to make an effective appraisal of the situation and the yacht's AIS unit was not set on a range that would provide adequate warning of approaching vessels. When the AIS unit did alert him to the approaching ship, he misinterpreted that information and concluded that it was at a range of 4 miles when it was probably at a range of 2 miles.

Lookout on board Furness Melbourne

Shortly after 2100, the lookout reported to the third mate that he had observed a light. The third mate immediately assumed that the lookout had observed Holbourne Island light. At 2118, the lookout reported that the white light he had observed was flashing. This information further confirmed to the third mate that his assumption, that the light was Holbourne Island light, was correct.

On both occasions, the lookout had identified Holbourne Island light. However, on each occasion, the third mate made an assumption based on limited information. He did not follow a systematic approach to confirm what had been observed. He did not take the light's bearing, check the bearing and range of Holbourne Island on the radar, check the information on the navigational chart or the characteristics of Holbourne Island light.

At 2142, the lookout reported a green light fine on the port bow and was told by the third mate that it was a distant 'light buoy'. At this time, Nares Rock was about 24 miles away. Again, the third mate made an assumption based on minimal information and took no action to confirm what had been seen. The seaman had, in fact, identified the light on the masthead of the approaching *Riga II* which was about 4 miles ahead of the ship.

By 2148, the third mate had adjusted *Furness Melbourne*'s heading by 5º to starboard so that it would pass further away from what he believed was Nares Rock. Despite the fact that the light remained on a constant bearing, indicating that it posed a risk of collision,[16] the third mate continued to believe that it was Nares Rock light.

Just after 2153, the lookout alerted the third mate to the fact that he thought the green light he had been watching to port was now very close. However, it was not until *Riga II*'s VHF radio call at 2155¼ that the third mate realised the light was probably that of the calling yacht. At about the same time, the third mate lost sight of the yacht, probably because it had entered the blind sector created by the ship's cargo cranes (Figures 8 and 9).

The third mate now did not have sufficient time to properly assess the situation and the risk of collision, so he acted instinctively and in accordance with the COLREGS. He engaged hand steering and ordered hard-to-starboard.

Figure 8: View looking from the centre of *Furness Melbourne*'s bridge

Source: ATSB

Figure 9: View forward from the port side of *Furness Melbourne*'s bridge

Source: ATSB

The third mate did not effectively use all available means at his disposal,[17] including the navigational chart and radar, to confirm at the earliest possible opportunity what he believed the lookout had seen. Had he done so, he would have been alerted to the fact that Holbourne Island and Nares Rock lights were white flashing lights.

Furthermore, had the third mate correctly appraised and monitored the situation, he would have determined that the lone green light he was seeing was indicative of a yacht under way and that *Furness Melbourne* was, therefore, the give way vessel.[18] He could have then made a course alteration that would have been readily apparent to the watchkeeper on board *Riga II*, about 14 minutes before the collision and passed well clear of the yacht. However, the third mate did not

16 COLREGS Rule 7: Risk of collision

17 ibid

18 COLREGS Rule 18: Responsibilities between vessels

determine that the green light identified by the lookout was another vessel. Therefore, he took no action to avoid what was a developing collision situation.

It is possible that the third mate had developed an expectation that at some point during the watch he would see both Holbourne Island and Nares Rock lights. Then, when advised by the seaman that he had observed a series of lights, he incorporated these pieces of information into his existing mental model, interpreting the lights as being Holbourne Island and Nares Rock lights.

It is a known phenomenon of human cognitive processing that when people are faced with an ambiguous situation, they will develop a theory to explain that situation and unconsciously seek out information from the environment which is compatible with the beliefs they currently hold. People will rarely attempt to prove themselves wrong and will often disregard or even fail to observe information that would contradict their ideas.[19,20] Despite there being information available which might have alerted the third mate to his erroneous interpretation, he instead interpreted that information in such a way that it confirmed his established ideas. This is commonly referred to as confirmation bias.[21]

There is no evidence that suggests the third mate's performance was adversely affected by fatigue. However, it is possible that he was distracted from his primary task, the safe navigation of the ship, by his conversations with the seaman and the music that he was engaging with through his constant humming and singing. Each person has finite cognitive resources available to attend to and process information or perform tasks at any particular time. In general, if a person is focussing on one particular task, then their performance on other tasks will be degraded.[22] While attending to the music and the conversation with the lookout would not have required high levels of cognitive processing, it may have been sufficient to compromise the third mate's attention to the requirements of his navigational task.

Radar

The third mate checked the radar, looking for a target, when he was advised by the lookout that the lookout had observed a green light fine on the ship's port bow. However, he could not detect a target. Later, after the collision, he checked the radar again when he was trying to determine where the yacht was. Again he could not identify the yacht on the radar.

In theory, with *Furness Melbourne*'s radar properly adjusted, *Riga II* could have been visible on the ship's radar display at a range of up to 6 miles.[23] However, the echo displayed was still dependent upon the size, shape, aspect and composition of the yacht and the weather conditions at the time.[24] Furthermore, these types of echoes are often lost or seen intermittently when sea clutter interferes with their detection, especially towards the centre of the radar screen.

When the master came to the bridge after the collision, one of his first actions was to adjust the radar gain and clutter controls. The yacht's target was then easily identified on the radar display.

Had the third mate correctly adjusted the controls on the ship's radar, he may have determined that the green light the lookout had identified was a vessel. As a result, he would have been in a better position to make a full appraisal of the situation, the risk of collision and to take early and appropriate action.

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19 Kahneman, D. 2011, *Thinking Fast and Slow,* Farrar, Straus & Giroux, New York.

20 Reason, J. & Hobbs, A. 2003, *Managing Maintenance Error,* Ashgate, Aldershot.

21 Reason & Hobbs, 2003.

22 Kahneman, 2011.

23 Supplement to the Nautical Institute, Seaways, January 1994 – Radar detectability and collision risk.

24 ATSB Safety Bulletin 5 – Fishermen and Safety Awareness at Sea

Detectability

It is important that, for their own safety and peace of mind, operators of small vessels abide by the adage of 'see and be seen'. They should keep an effective lookout at all times and ensure they understand the operation and limitations of all their navigational equipment. They should also ensure that their vessels are easily detected by watchkeepers on board other vessels.

Automatic identification system (AIS)

AIS is a VHF radio broadcasting system that transfers packets of data. The system enables AIS equipped vessels and shore-based AIS stations to send and/or receive identification information that can be displayed on an electronic chart, computer display, compatible radar or standalone unit.

The Class A AIS system was developed for use by commercial shipping. It is a SOLAS[25] requirement for a Class A AIS unit to be fitted to vessels of 300 grt[26] and upwards engaged on international voyages, cargo ships of 500 grt and upwards not engaged in international voyages and all passenger ships (more than 12 passengers), irrespective of size. Operators began equipping ships with Class A AIS units in 2002.

More recently, the Class B AIS system has been developed for non-SOLAS commercial and recreational vessels. Class B units are less expensive than Class A units and provide limited functionality. While all Class A AIS units are transceivers (they transmit and receive data), a Class B AIS unit can be either a 'transceiver' or 'receiver'.

While there was no requirement for small recreational vessels to be equipped with AIS, *Riga II* was fitted with a NASA MARINE AIS radar receiver. While the unit's name included the term 'radar', it was not a radar. The unit displayed and monitored target information but, as a receiver unit only, did not transmit a signal that could be detected by other AIS units. Since it transmitted no 'own ship' information for use by other ships' navigators, there was no available AIS information on board *Furness Melbourne* that identified the yacht.

It is important for operators of vessels fitted with Class B AIS units to have a clear understanding of the operation and limitations of their unit. Furthermore, if the unit is only a 'receiver', they should also understand that it does not provide an output signal and hence, watchkeepers on board other vessels are not provided with any AIS initiated information or warning.

Radar reflectors

Riga II was not fitted with a radar reflector because the yacht's skipper believed that its aluminium hull provided a good radar target. However, in this instance it did not because the yacht was head-on to the approaching ship (a narrow target) and would have been only intermittently 'visible' to *Furness Melbourne*'s radar in the prevailing sea conditions.[27] *Riga II* probably would not have been an easily identifiable target on the screen of *Furness Melbourne*'s poorly adjusted radar.

The echo displayed on a ship's radar screen is dependent upon the size, shape, composition and aspect of the target vessel and the prevailing sea conditions. Small vessels constructed of materials which are poor radar reflectors, like fibreglass or timber, operating in seas with wave heights higher than the vessel's freeboard can be very difficult to detect. It is important for small vessel owners and operators to be aware of radar's limitations, particularly when they are operating in areas frequented by trading vessels, and to consider improving their vessel's radar detectability to minimise collision risk.

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[25] The International Convention for the Safety of Life at Sea, 1974, as amended.

[26] Gross registered tonnage.

[27] The ATSB has published a safety bulletin titled *Fisherman and Safety Awareness at Sea* that outlines the limitations of radar in more detail. This bulletin can be found at; www.atsb.gov.au/media/36729/Fisherman_safety.pdf

A radar reflector can significantly improve a small vessel's detectability, particularly when fitted high on the vessel and preferably in the standing rigging or on the mast of a yacht. A reflector may be a simple and inexpensive passive reflector that improves a vessel's radar reflection, or an active reflector (radar transponder) that transmits a pulse when activated by an incoming radar signal.

If *Riga II* had been fitted with a radar reflector or transponder, the target displayed on *Furness Melbourne*'s radar would have been enhanced and hence more easily identifiable as a vessel which presented a potential collision risk.

Previous incidents

In the past 25 years, 60 collisions involving ships and small vessels have been reported to the ATSB and its predecessor, the Marine Incident Investigation Unit. Of these, 39 have been investigated.

The safety lessons from these occurrence reports and investigations have invariably included the failure of the watchkeepers on board one or both vessels to keep a proper lookout and the absence of early and appropriate action to avoid the collision.

The safety lessons from these investigations have been included in the published investigation reports. A number of safety bulletins that aim to highlight the risks and educate seafarers with regard to the similar contributing factors have also been published.

Three of the more detailed investigation reports that analyse similar contributing factors are:

- Investigation number 240 - Collision between the bulk carrier *Silky Ocean* and the fishing vessel *Peter Crombie* off the South Australian coast, 23 April 2007.
- Investigation number 249 - Collision between the fishing vessel *Allena* and the container ship *Northern Fortune* off Bowen, Queensland, on 21 January 2008.
- Investigation number 268 - Collision between the bulk carrier *Silver Yang* and the yacht *Ella's Pink Lady* off Point Lookout, Queensland, on 9 September 2009

These documents and further safety related information can be downloaded at: www.atsb.gov.au/marine.aspx

Findings

At 2156 on 26 May 2012, the bulk carrier *Furness Melbourne* and the yacht *Riga II* collided 15 miles north of Bowen, Queensland. *Riga II* was dismasted and its hull was damaged but no-one on board was seriously injured and the yacht was towed into Bowen by a volunteer marine rescue vessel. *Furness Melbourne* was not damaged and, after rendering assistance to the yacht, continued its voyage.

From the evidence available, the following findings are made with respect to the collision. They should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance. A safety issue is an event or condition that increases safety risk and (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

Contributing factors

- While *Furness Melbourne*'s lookout sighted *Riga II*'s starboard sidelight, the officer of the watch was not keeping a proper lookout. He made a series of assumptions based on limited information instead of following a systematic approach to confirm what had been observed. As a result, he did not conclude early enough that the lookout had identified *Riga II* and that the yacht posed a risk of collision.
- *Riga II*'s watchkeeper was not keeping a proper lookout. He did not visually identify *Furness Melbourne*'s navigation lights in time to make an effective appraisal of the situation, did not set the yacht's AIS unit on a range scale that provided adequate warning of approaching vessels and, when alerted by the AIS of the approaching ship, misinterpreted that information.

Other factors that increase risk

- **In the past 25 years the ATSB and its predecessor have investigated 39 collisions between trading ships and smaller vessels on the Australian coast. These investigations have all concluded that there was a failure of the watchkeepers on board one or both vessels to keep a proper lookout and that there was an absence of early and appropriate action to avoid the collision. [Safety issue]**

Other findings

- *Riga II* was not equipped with a radar reflector or an AIS transceiver unit, either of which would have made it more readily detectable by the watchkeepers on board *Furness Melbourne*.

Safety issues and actions

The safety issues identified during this investigation are listed in the Findings and Safety issues and actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisations. In addressing those issues, the ATSB prefers to encourage relevant organisations to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the directly involved parties were provided with a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

Failure to keep a proper lookout

Number:	MO-2012-006-SI-01
Issue owner:	Fukujin Kisen and all other operators
Operation affected:	*Marine - Shipboard operations*

Safety issue description:

In the past 25 years the ATSB and its predecessor have investigated 39 collisions between trading ships and smaller vessels on the Australian coast. These investigations have all concluded that there was a failure of the watchkeepers on board one or both vessels to keep a proper lookout and that there was an absence of early and appropriate action to avoid the collision.

Proactive safety action taken by: Fukujin Kisen

Following this incident, Fukujin Kisen issued a safety instruction to all ships in its fleet highlighting the need for watchkeepers to keep a proper lookout. They have also advised that, as a result of the ATSB investigation, they will issue a further safety instruction prohibiting activities such as playing music during a navigational watch.

Action number: MO-2012-006-NSA-016

ATSB comment in response:

The ATSB is satisfied that the combination of actions taken and proposed by Fukujin Kisen should adequately address this safety issue.

Current status of the safety issue:

Issue status: Adequately addressed

ATSB safety advisory notice to: All persons charged with navigating a vessel at sea

Action number: MO-2012-006-SAN-015

The Australian Transport Safety Bureau advises all persons charged with navigating vessels at sea to always maintain a proper lookout so as to identify other vessels early enough to make a full appraisal of the situation and to take appropriate, early and effective action to avoid a collision.

General details

Occurrence details

Date and time:	26 May 2012 – 2150 (UTC +10)	
Occurrence category:	Serious incident	
Primary occurrence type:	Collision	
Location:	15 miles north of Bowen, Queensland	
	Latitude: 19° 35.20' S	Longitude: 148° 0.80' E

Furness Melbourne

Name	*Furness Melbourne*
IMO number	9403061
Call sign	3ESV3
Flag	Panama
Classification society	American Bureau of Shipping (ABS).
Ship type	Geared bulk carrier
Builder	Tsuneishi Heavy Industries, Philippines
Year built	2008
Owner(s)	Drake Line, Panama
Manager	Fukujin Kisen, Japan
Gross tonnage	32,387
Deadweight (summer)	58,729 tonnes
Summer draught	12.83 m
Length overall	190.0 m
Moulded breadth	32.2 m
Moulded depth	18.0 m
Main engine(s)	MAN B&W 6S50MC-C
Total power	8,400 kW
Speed	14.5 knots
Damage:	Nil

Riga II

Name	*Riga II*
Flag	Switzerland
Ship type	Sailing vessel
Builder	Allures, France
Year built	2007
Owner(s)	Private
Draught	3.0 m
Length overall	13.6 m
Moulded breadth	4.25 m
Sail area	95 m^2
Main engine(s)	Volvo D2-55
Total power	41 kW
Damage:	Significant

Sources and submissions

Sources of information

On 29 May 2012, investigators from the Australian Transport Safety Bureau (ATSB) attended *Riga II* while the yacht was berthed in Bowen, Queensland. The skipper and both adult crew members were interviewed. Photographs of the yacht and copies of relevant documents and records were also obtained. The investigators also interviewed officers from Bowen Volunteer Marine Rescue.

Later that day, the investigators attended the offices of the Great Barrier Reef Vessel Traffic Service (REEFVTS) in Townsville, Queensland. The REEFVTS manager was interviewed and copies of relevant documents were obtained.

On 2 and 3 June, the investigators attended *Furness Melbourne* while the ship was at anchor off Portland, Victoria. The master and directly involved crew members were interviewed. Photographs of the ship and copies of relevant documents and records, including data from the ship's voyage data recorder (VDR), were obtained.

References

The International Regulations for the Prevention of Collisions at Sea, 1972, as amended (COLREGs), the International Maritime Organization

The International Convention for the Safety of Life at Sea, 1974, as amended, the International Maritime Organization.

Kahneman, D 2011, *Thinking Fast and Slow,* Farrar, Straus & Giroux, New York.

Reason, J & Hobbs, A 2003, *Managing Maintenance Error,* Ashgate, Aldershot.

ATSB Safety Bulletin 1, *Ships and fishing vessels*

ATSB Safety Bulletin 2, *Ships and fishing vessels, an open letter to all masters and bridge watchkeepers*

ATSB Safety Bulletin 5, *Fisherman and Safety Awareness at Sea*

Nautical Institute, Seaways, January 1994. *Radar detectability and collision risk*

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to *Riga II*'s owners, *Furness Melbourne*'s master and third mate, Fukujin Kisen, Wallmans Lawyers, the Australian Maritime Safety Authority (AMSA) and Maritime Safety Queensland (MSQ).

Submissions were received from *Riga II*'s owners, *Furness Melbourne*'s master, Fukujin Kisen, Wallmans Lawyers, AMSA and MSQ. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

24 Hours 1800 020 616
Web www.atsb.gov.au
Twitter @ATSBinfo
Email atsbinfo@atsb.gov.au

Investigation

ATSB Transport Safety Report
Marine Occurrence Investigation

Collision between the bulk carrier *Furness Melbourne* and the yacht *Riga II,* North of Bowen, Queenslanld, 26 May 2012

295-MO-2012-006
Final – 12 December 2013