



Australian Government  
Australian Transport Safety Bureau

# Breakdown and subsequent drift towards danger of the bulk carrier *ID Integrity*

Coral Sea | 18 to 23 May 2012



Investigation

**ATSB Transport Safety Report**  
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#### **Addendum**

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# Safety summary

## What happened

In the early hours of 18 May 2012, while transiting the Coral Sea, *ID Integrity's* main engine shut down when its fuel pump reversing mechanism came free and jammed. This caused the camshaft to bend and slip in a drive coupling which resulted in the camshaft being out of timing and therefore the engine could not be restarted.

The ship drifted in a westerly direction towards the Australian coast and the Great Barrier Reef. During the afternoon of 19 May, the ship passed over Shark Reef, located about 60 miles east of the Great Barrier Reef Marine Park, without incident. The following day, the ship was taken in tow when it was about 35 miles to the east of the marine park and towed to Cairns for repairs.

## What the ATSB found

The ATSB found that the engine manufacturer had identified the need for owners and operators to check the fuel pump reversing mechanism for cracks and secureness and provided this advice in service letters. However, on board *ID Integrity*, this advice had not been included in the engine manuals or planned maintenance system. As a result, over time and despite regular inspections, the system deteriorated and cracks developed in the mechanism undetected. This led to the failure of a fuel pump reversing link on 18 May.

The investigation also found that, once notified, the actions of the various stakeholders were appropriate and the response arrangements were effective.

## What's been done as a result

*ID Integrity's* managers have implemented a schedule to inspect all main engines in their fleet and undertake repairs as necessary. Staff from all company ships have been made aware of this incident and it has been included in crew training centre courses.

MAN B&W, the main engine designer, reiterated the need to include all service letter advice in manuals and maintenance systems. They also advised that service letters and updated manuals are always available on request through the website <http://www.mandieselturbo.com> via the Nexus (Customer extranet) link.

The ship's classification society, ClassNK, initiated discussions with MAN B&W to enhance its knowledge of engine design and operation changes. ClassNK also improved the content and extent of information provided to its surveyors.

## Safety message

Service advice from machinery manufacturers needs to be carefully assessed and implemented as necessary as part of a ship's planned maintenance system. Furthermore, all associated documentation should be updated and regularly checked to ensure it remains relevant and reflects the latest available information.

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## The occurrence

On 5 May 2012, the 185.74 m geared bulk carrier *ID Integrity* (Figure 1) departed from Shanghai, China. The ship was in ballast and bound for Townsville, Australia, where it was to load a cargo of sugar.

The ship travelled south through the western Pacific Ocean toward the northern coast of Papua New Guinea. During this time, the crew carried out an exchange of the ship's ballast water<sup>1</sup> in accordance with Australian ballast water management requirements. This process took about 3 days and required the running of two of the ship's three diesel generators.

While running two diesel generators, the ship's engineers found that diesel generator numbers 2 (DG2) and 3 (DG3) could not carry the required load, so they dismantled and cleaned the turbochargers of both engines. The turbochargers were found heavily contaminated with carbon. In the days following this maintenance, DG2 was used to supply all the ship's electrical needs.

**Figure 1: *ID Integrity* as it drifted across Shark Reef**



Source: Australian Maritime Safety Authority

At about 0600<sup>2</sup> on 14 May, when the ship was in the Vitiaz Strait on the northern coast of Papua New Guinea (Figure 2), DG2 shutdown without warning, the ship lost all electrical power (blacked out) and the main engine stopped. The engineers restored electrical power by starting diesel generator number 1 (DG1) and DG3 and the voyage was continued. Upon investigation, the engineers found DG2's turbocharger rotor shaft had broken. Since there was no spare on board, the turbocharger could not be repaired and the generator was not run. The engineers left the remaining two diesel generators running in the belief that running two generators in parallel on low load provided more security of power supply than one generator running alone on higher load.

At 2200 on 15 May, *ID Integrity* passed through Jomard Passage (Figure 2) and entered the Coral Sea. The weather was now from the southeast at force<sup>3</sup> 7 (28 to 33 knot<sup>4</sup> winds with wave heights

<sup>1</sup> Ballast consists of heavy material (commonly sea water) loaded on board a ship to improve its stability and ride conditions.

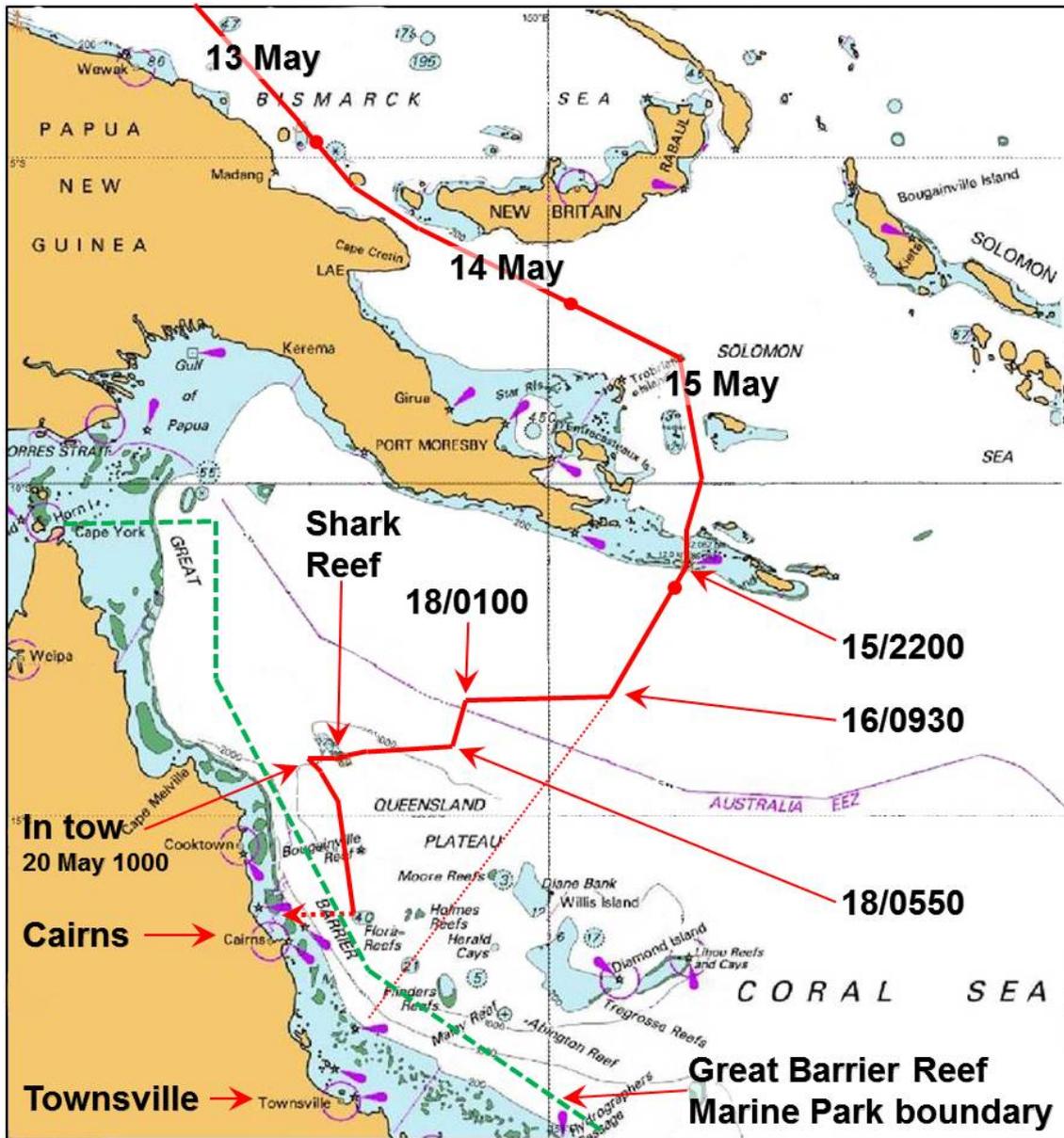
<sup>2</sup> Unless otherwise stated, all times in this report are local time, UTC +10 hours.

<sup>3</sup> The Beaufort scale of wind force, developed in 1805 by Admiral Sir Francis Beaufort, enables sailors to estimate wind speeds through visual observations of sea states.

<sup>4</sup> One knot, or one nautical mile per hour, equals 1.852 kilometres per hour.

of 4 to 5.5 m). The master contacted the Australian Rescue Coordination Centre (RCC)<sup>5</sup> and made an initial Australian Ship Reporting System (AUSREP) report.

Figure 2: Section of navigational chart Aus4060 showing *ID Integrity's* track, 14 to 22 May



Source: Australian Hydrographic Service

At about 0930 on 16 May, in position 13° 16.5' S 150° 46.3' E, both diesel generators unexpectedly stopped when they were unable to carry the electrical load. The ship blacked out, the main engine stopped and the emergency generator automatically started, providing emergency power. Without propulsion, the ship turned beam on to the weather and swell, began to roll heavily and to drift in a westerly direction.

DG3's turbocharger was dismantled and cleaned and the engine put back into operation. DG1's turbocharger was also dismantled, however, the engineers found the bearings had failed. Because there were no spares remaining on board, the turbocharger could not be repaired. In an

<sup>5</sup> The RCC is an operational unit of the Australian Maritime Safety Authority (AMSA).

effort to provide backup electrical power to support DG3, and as DG2’s turbocharger was already dismantled, the engineers decided to run DG2 normally aspirated.<sup>6</sup>

At about 2000 on 16 May, the main engine was started, but it could not be run up to full speed because the number two cylinder air start valve was stuck open. The engine was shut down to repair the air start valve, but the engineers could not repair it in place and were unable to remove it from the engine as it was stuck fast in the cylinder head.

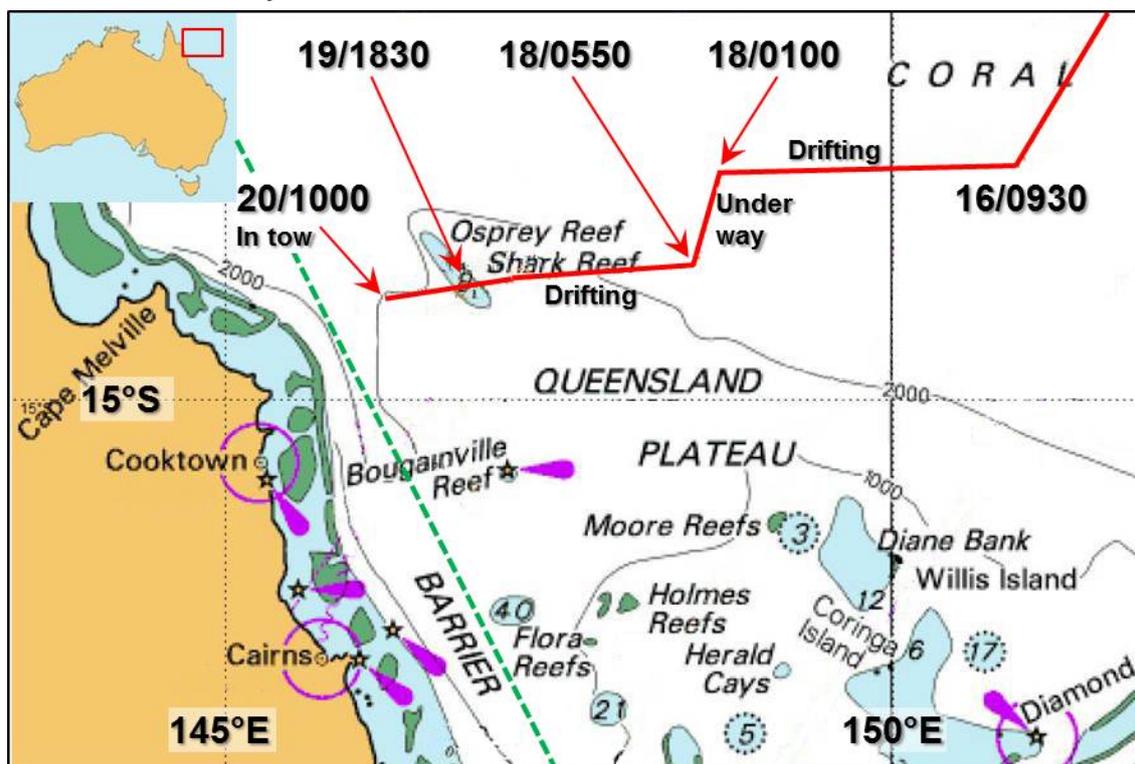
By the morning of 17 May, the air pipe leading to the faulty air start valve had been blanked off. The main engine was started, but this time its number six cylinder was not firing and the engine would not reach full speed. The main engine was shut down again and, after some consultation with the company’s shore-based technical superintendent, the engineers replaced the number six cylinder fuel valves (injectors) and the fuel pump delivery valve.

During this time, the ship continued to drift in a westerly direction, rolling heavily in the rough seas.

At 1218, the master made an AUSREP deviation report.<sup>7</sup> He noted that the ship was stopped due to main engine problems and was drifting in a westerly direction at 3 knots. It was 150 miles<sup>8</sup> from the nearest danger (Willis Islets to the south) and about 310 miles northeast of Cairns, Queensland. The master provided further information to the RCC as the day progressed.

At 0100 on 18 May, in position 13° 22.19' S 148° 56.29' E, the main engine was started and the voyage was resumed (Figure 3). The master reported to the RCC that the ship was making good a speed of 8 knots but had only one fully operational diesel generator.

Figure 3: Section of navigational chart Aus4060 showing *ID Integrity’s* track from 16 to 20 May



Source: Australian Hydrographic Service

<sup>6</sup> Normally, or naturally, aspirated refers to an engine operating without assisted air supply to the cylinders (by turbocharging or super-charging). This reduces the density of air in the cylinders reducing the amount of fuel that can be burnt and therefore reducing the load carrying capacity of the engine.

<sup>7</sup> AUSREP regulations require that should a ship, at any time, be in a position more than 2 hours steaming from the position that would be predicted, a deviation report must be sent.

<sup>8</sup> A nautical mile of 1852 m.

At about 0550, in position 14°00.66' S 148°30.87' E, the main engine stopped again. No alarm sounded and the duty engineer could not identify a fault.

The chief engineer was called and the engine room staff began searching for the cause of the shutdown. In the heavy seas, there had been repeated lubricating oil pressure alarms so attention was initially turned to verifying the integrity of the main engine lubrication system. No problems were found and several unsuccessful attempts were made to restart the main engine.

At 0859, the master reported to the RCC that the ship was drifting, with an expected stoppage time of about 3 hours. The RCC began to monitor *ID Integrity's* progress. The ship was in no immediate danger (about 100 miles to the east of Osprey Reef) and the engineers continued to search for the cause of the main engine stoppage.

At 1815, the master contacted the RCC and reported that the ship was in position 14° 05' S 148° 00' E and that the main engine could not be started. The ship was drifting in a westerly direction at about 3 knots and would be closing on Shark Reef in about 20 hours.

The Australian Maritime Safety Authority (AMSA) activated the Australian National Maritime Emergency Response Arrangements (NEMERA) which included assessing the availability of towing resources. AMSA advised *ID Integrity's* managers, ID Wallem Ship Management, of this action and the company began making arrangements to source other suitable towing vessels to assist.

AMSA kept stakeholders, including Maritime Safety Queensland (MSQ), the Great Barrier Reef Marine Park Authority (GBRMPA), the Great Barrier Reef and Torres Strait Vessel Traffic Service (REEFVTS), insurers and ID Wallem apprised of the situation. AMSA also assessed the ship's drift and tasked the emergency towage vessel *Pacific Responder*<sup>9</sup> to assist. At the time, *Pacific Responder* was in the Torres Strait, about 350 miles to the northwest and was expected to arrive at *ID Integrity's* position late in the afternoon of 20 May.

In the meantime, the ship's managers negotiated a commercial towage agreement and, on 19 May, two tugs were dispatched to assist *ID Integrity*. *PT Kotor*, a 23.5 m tug departed from Mourilyan (south of Cairns) and was expected to rendezvous with *ID Integrity* during the morning of 20 May. The 28.7 m tug *PB Leichhardt* departed from Townsville with an estimated arrival at the ship's position during the evening of 20 May.

*ID Integrity's* engineers, in consultation with ID Wallem's technical superintendent, continued to search for the cause of the main engine stoppage. While inspecting the engine, the engineers were slowly turning the engine using the turning gear<sup>10</sup> when the turning gear drive motor overloaded and tripped out. The chief engineer concluded that there was a physical obstruction in the engine that was causing an increased resistance to turning, so he decided to inspect the rotating components of the engine, starting with the camshaft. Upon removal of the camshaft cover from number six cylinder, he found pieces of the fuel pump cam, fuel pump roller and reversing mechanism (Figure 4). Closer inspection showed damage to the cam and engine block surfaces (Figures 5, 6 and 7).

The engineers cleaned the debris out of the camshaft space and began preparing to lift the number six fuel pump off the cam so they could attempt to run the main engine on the remaining five cylinders.

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<sup>9</sup> *Pacific Responder* is an Anchor Handling Tug Supply (AHTS) vessel modified to fulfil the role of AMSA's dedicated emergency towage vessel (ETV). This is the only ETV of its type in Australia and operates in the particularly sensitive sea areas of the northern Great Barrier Reef and Torres Strait.

<sup>10</sup> A reversible electric motor connected through a worm gear drive to the toothed flywheel of the main engine to allow slow turning of the engine.

Meanwhile, *ID Integrity* continued to drift in a westerly direction towards Shark Reef.

At 1305 on 19 May, the master reported to the RCC that the ship was rolling heavily in 2.5 to 3 m seas and 35 to 40 knot winds from the southeast. It was still drifting in a westerly direction at 3 knots and was about 14 miles from Shark Reef.

As none of the tugs would reach the ship before it was likely to pass over Shark Reef, other contingencies, including the use of the ship's anchors, were considered. It was agreed that the master would de-ballast the ship to reduce its aft draught to 5.0 m, increasing the ship's under keel clearance to the maximum possible. The minimum charted depth for Shark Reef is 8.1 m.

**Figure 4: Pieces removed from camshaft space**



Source: ATSB

**Figure 5: Fuel pump cam and engine block damage**



Source: ID Wallem

**Figure 6: Fuel pump cam damage**



Source: MAN Diesel & Turbo

**Figure 7: Damage to roller guide housing**



Source: MAN Diesel & Turbo

At about 1830, *ID Integrity* drifted across the southern end of Shark Reef in waters about 20 m deep, about 4 miles south of the charted 8.1 m depth. *ID Integrity* was now about 60 miles from the eastern edge of the Great Barrier Reef Marine Park and was expected to close on it in less than 24 hours.

At 0900 on 20 May, *PT Kotor* rendezvoused with *ID Integrity* and in the rough seas it took about an hour to connect a tow line. *ID Integrity's* bow was then turned into the weather allowing it to ride more easily and its drift was arrested. The tug and tow moved in a south-easterly direction.

At 1715, *Pacific Responder* arrived at *ID Integrity's* position and, with darkness approaching, stood-by until the following morning. *PB Leichhardt* arrived later that evening.

During the morning of 21 May, *Pacific Responder* took over the tow and at 0815, with the other tugs as escorts, commenced towing *ID Integrity* toward Cairns.

At 0635 on 23 May, two pilots boarded the ship and guided the tow through the Grafton Passage and towards Cairns. By 1500, the ship was safely anchored off Cairns, and the tugs had been released.

While *ID Integrity* was at anchor, the main engine and generators were repaired. On 27 June, the ship sailed for Port Moresby, Papua New Guinea, where further repairs were carried out.

# Context

## *ID Integrity*

### Crew

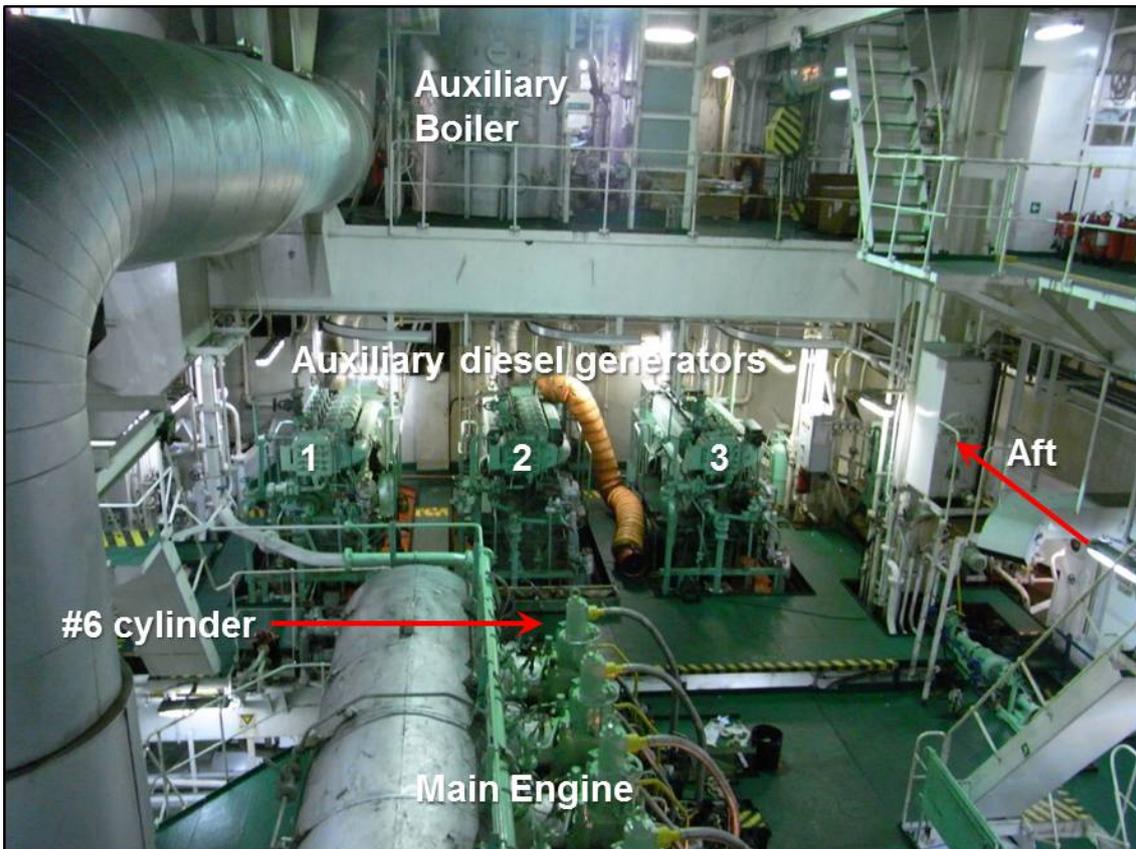
*ID Integrity* had a crew of 23 Indian and Myanmar nationals, all of whom were appropriately qualified for the positions they held on board the ship. Apart from the chief engineer, all the crew had joined the ship 4 months prior to the incident, in February 2012, when ID Wallem Ship Management had changed the ship’s crew from predominantly Chinese crew to predominantly Indian crew.

The master had about 22 years of seagoing experience. He held an Indian master’s certificate of competency and had been sailing as master since 2002. This was his first voyage on *ID Integrity* and his first with ID Wallem Ship Management.

The chief engineer first went to sea in 1978. He obtained his Myanmar chief engineer’s certificate in 1992 and had been sailing as chief engineer since 1996. This was his first ship and contract with ID Wallem Ship Management. He had joined *ID Integrity* 3 months before this incident.

The ship maintained a manned engine room at all times with the engineers, assisted by an oiler, keeping a standard 4 hours on, 8 hours off watch system. The chief engineer was supported by three marine engineers and an electrical engineer plus a trainee/junior engineer.

**Figure 8: *ID Integrity* engine room layout**



Source: ATSB

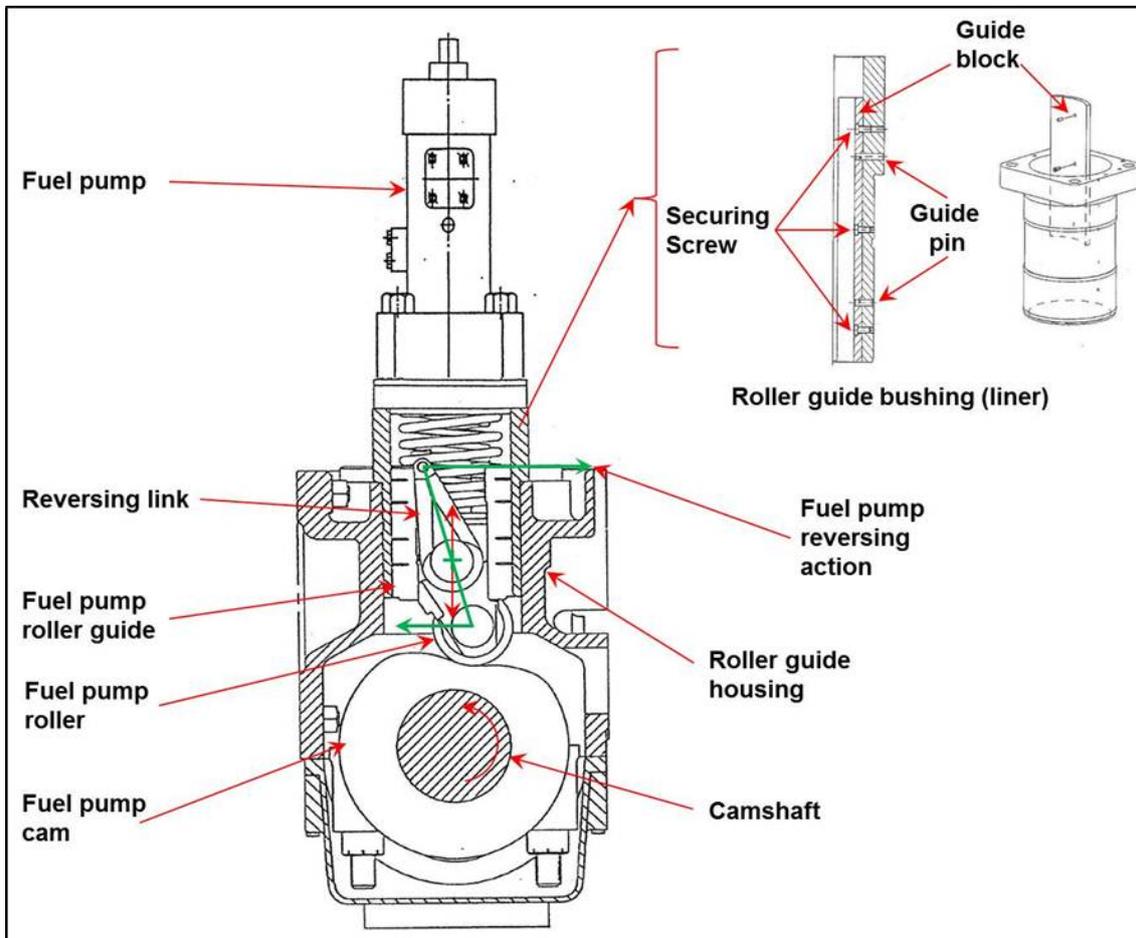
## Main engine

The ship is fitted with a MAN B&W 6S50MC Mk5, six cylinder, two stroke, reversible slow speed diesel engine which delivers 7,465 kW at 122 rpm (Figure 8). The engine was built by Mitsui Engineering and Shipbuilding, Japan, under licence from the engine designer, MAN B&W Diesel and Turbo Copenhagen (MAN B&W), Denmark. The engine drives a single, fixed pitch propeller, giving the ship a service speed of about 14.1 knots. At the time of the incident, the main engine had recorded 86,907 run hours since new and 6,186 run hours since the last major maintenance had been completed on the camshaft and reversing systems. Records showed that the engine's components had been surveyed as per Nippon Kaiji Kyokai (ClassNK)<sup>11</sup> requirements.

The camshaft in the six cylinder MC-type engine is driven from the crankshaft by a chain. It is made up of a number of camshaft segments coupled together, each segment holding the exhaust valve and fuel pump cams required for two main engine cylinders.

Each main engine cylinder has its own fuel pump mounted on the roller guide housing over the camshaft segment corresponding to that cylinder. Rotating motion of the camshaft is converted to vertical reciprocating motion in the fuel pump through the fuel pump roller and guide (Figure 9).

**Figure 9: MAN B&W fuel pump, cam, roller, guide and reversing arrangement**



Source: MAN Diesel & Turbo Australia

The fuel pump roller guide slides in a guide bushing (liner) which is fastened in the roller guide housing. The guide bushing includes a guide block (plate) which prevents the roller guide from turning about the vertical axis of the fuel pump during reversing of the engine.

<sup>11</sup> Nippon Kaiji Kyokai, known as ClassNK, is a ship classification society.

Each cylinder is individually reversed by shifting the roller in the fuel pump drive mechanism. The link connecting the roller guide and roller is provided with a reversing arm, connected to an air cylinder. The link is self-locking in either the ahead or astern position without the aid of external forces. Sensors are fitted to the air cylinder to provide feedback of the roller position to the engine monitoring and control system.

### **Auxiliary machinery**

The ship's electrical power was provided by three Yanmar 6M-200L-SN diesel engines driving direct coupled 440 kW, 60 Hz Taiyo electrical generators at 720 rpm. The engines were designed to run on varying grades of fuel oil up to a viscosity of about 700 cSt.<sup>12</sup> However, they were to use marine diesel oil (a higher grade of fuel of lower viscosity and not requiring heating for use) when starting and for running at less than 30 per cent load.

At the time of the incident, the main engine and diesel generators were operating on 380 cSt intermediate fuel oil (IFO380). The fuel oil viscosity controller was not operational and, as a result, fuel viscosity for all engines was controlled manually based upon the fuel oil inlet temperature to the main engine. An independent analysis of bunker fuel samples taken at the time the fuel was received on board included recommended fuel temperatures for injection viscosities. This analysis had determined that this fuel was 'above average' in quality and sufficient quantity was on board for the voyage to Australia.

### **Main engine breakdown**

When the ship's engineers discovered the broken pieces of fuel cam reversing mechanism under number six fuel pump, it was apparent to them that the damage to the main engine was more extensive than just the fuel pump cam and fuel pump roller reversing and guide assemblies. While the ship was at anchor off Cairns, technical staff from ID Wallem Ship Management and service personnel from MAN B&W attended the ship to conduct an inspection and to carry out repairs.

The initial MAN B&W inspection report found that:

The No. 6 fuel roller guide has failed and caused damage [to] the fuel cam for unit<sup>13</sup> 6 which has caused the camshaft to slip 190 degrees in the after most coupling. The resulting mistiming of all cylinders rendered the engine unable to be started.

The fuel pump guide plate for units 1, 2, 3 and 4 were found loose and the bolts and pins were found broken.

and

The run out between the fuel cam and bearing for unit 6 was measured ... indicating the [cam]shaft was bent.

MAN B&W subsequently stated that the engine failure was not caused by the loose number six fuel pump cam follower roller guide block and that, historically, loose guide blocks had not significantly affected the operation and reversing of engines. This opinion was further supported by the discovery that four of the remaining five guide blocks in *ID Integrity's* engine were also loose but had not affected the running of the engine.

MAN B&W also stated that the reversing mechanism generally, and in particular cylinders 1 and 6, was in poor or non-operational condition and would not have worked as intended. Cracks were found in all reversing links. MAN B&W stated that it is likely that the number six reversing link broke, causing interference and jamming of the fuel cam in the engine frame. This, they suggested, was as a result of operation of the engine with a malfunctioning reversing mechanism which led to overstressing of the reversing link, its failure and resultant jamming of the camshaft.

<sup>12</sup> CentiStoke, or cSt, is a measure of the kinematic viscosity of a liquid.

<sup>13</sup> 'Unit' is a marine engineering term used interchangeably with cylinder

It is possible that, in the early hours of 18 May, after many days of long hours repairing the main and diesel generator engines, in adverse weather, and often in blackout conditions, the ship's engineers did not verify that all main engine fuel pump cam followers were in the correct, locked position for the duration of main engine operation that morning.

However, several safeguards were built into the engine room monitoring and control systems to minimise the likelihood of this occurring. The main engine monitoring system included an alarm (audible and visual) for any fuel cam abnormality—that is, if any of the six fuel pump roller guides were not in the correct position corresponding to the direction of rotation of the engine this alarm activated. Further, the main engine control console (and the engine side control station) included indicator lamps for fuel cam position—ahead or astern—which illuminated only when all of the fuel cams were in the same position. In addition to these safeguards, the position of each fuel pump was physically indicated on the back of the fuel pump by the position of the reversing cylinder shaft. These indicators should have been checked as part of routine engine room checks soon after starting of the main engine. Operating parameters recorded during the period of main engine operation on the morning of 18 May showed the main engine to be operating satisfactorily with no clear indication of any abnormality.

After considering the evidence available, the ATSB concluded that cracks had developed in several reversing links and guide rollers over the life of the ship, possibly due to repeated events in which the engine had been operated with fuel pump roller guides in the wrong position.

It is also possible that the lack of firing in number six unit on the morning of 17 May may have been attributable to the later identified fuel pump cam follower failure. However, the actions taken by the ship's crew, replacing the fuel valves and the fuel pump delivery valve, appeared to rectify the non-firing issue at the time and were probably reasonable in the circumstances.

## Diesel generator breakdowns

All three diesel generator turbochargers were overhauled in September/October 2011 and records indicate that they had operated trouble free for the previous 12 months.

In January 2012, DG2's turbocharger rotor failed. In February 2012, when the new crew joined *ID Integrity* they were still awaiting spare parts for the turbocharger. On 14 March 2012, the turbocharger and engine were rebuilt and put back into service.

In the following 2 months (to 14 May), both DG2 and DG3's turbochargers were stripped and cleaned twice each. Then, on 14 May, DG2's turbocharger failed due to a broken rotor shaft and, on 16 May, DG1 and DG3 shutdown due to fouled turbochargers.

During this time, the engineers concentrated their efforts on rectifying the symptom, the fouled turbochargers, rather than identifying and rectifying the actual cause of the turbocharger fouling.

The fuel analysis indicated that the fuel in use at the time was of above average quality and hence should not have been a contributing factor to the fouling. However, the diesel generators were regularly operated for extended periods of time at less than 30 per cent load while using heavy fuel oil, contrary to the manufacturer's instructions.

It is likely that, as a result of prolonged periods of operation at reduced load, the cylinder bores and piston ring faces had become glazed. This probably led to poor sealing of piston rings to cylinder liner resulting in carry-over of lubricating oil into the exhaust system (Figure 10). Furthermore, operating the engines on heavy fuel at low loads probably resulted in poor combustion and carry-over of unburnt fuel. It is also possible that oil entered the exhaust system through leaking valve guide seals in the cylinder head. Together, these conditions probably led to the fouling of the turbochargers.

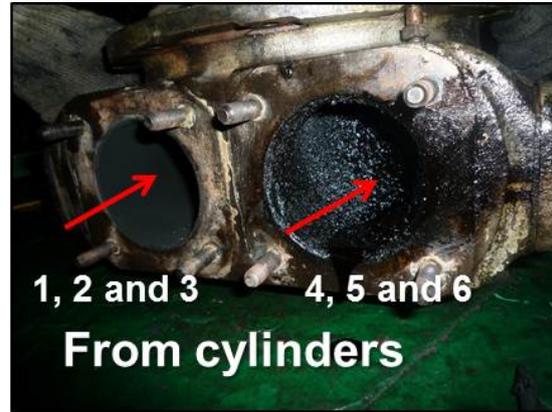
**Figure 10: Number 3 diesel generator turbocharger, May 2012**

a) Fouled turbocharger nozzle ring



Source: ID Wallem

b) Turbocharger exhaust inlet pipes



Source: ID Wallem

## The Great Barrier Reef and Marine Park

The Great Barrier Reef (GBR) is the world's largest coral reef ecosystem with vast areas of reefs, shoals and numerous islands (Figure 11). It extends over 1,400 miles almost parallel to the Queensland coast and is up to 35 miles wide, between 8 and 80 miles offshore and contains over 2,900 reefs and 900 islands. The GBR and islands in the area form a natural breakwater at varying distances from the coastline. A number of openings or passages exist through the reefs and between islands.

The World Heritage listed GBR has long been recognised as an environmentally sensitive area. Since the establishment of the Great Barrier Reef Marine Park in 1975 measures to protect the area have been progressively implemented. The focus of all existing protective measures is centred on preventing environmental damage, particularly due to a shipping incident.

The Great Barrier Reef Marine Park encompasses most of the world heritage area and covers about 344,000 km<sup>2</sup> along the Queensland coast. It is managed by the Great Barrier Reef Marine Park Authority (GBRMPA) whose objective is to protect the park by controlling human activity and by maintaining the natural functions of the ecosystem. The park extends from the low water mark of the northern tip of Cape York, south to latitude 24°30' S about 40 miles south of Gladstone .

## Shark Reef

Shark Reef is part of the Osprey group of reefs (Osprey, Shark and Vema Reefs) located about 100 miles north-east of Cape Flattery and about 60 miles from the outer limit of the boundary of the GBR marine park. The reefs form an important ecological, research and dive location in the Coral Sea.

The Australia Pilot<sup>14</sup> describes Shark Reef as:

Shark Reef, with a least known depth of 8.1 m over it, lies at the NW end of a bank, 8 miles SE of Rapid Horn [Osprey Reef]. The reef is a narrow ridge of coral, 1 mile in length, and is not easily seen from any distance. The bank has general depths less than 20 m over it and is steep-to.

Osprey Reef:

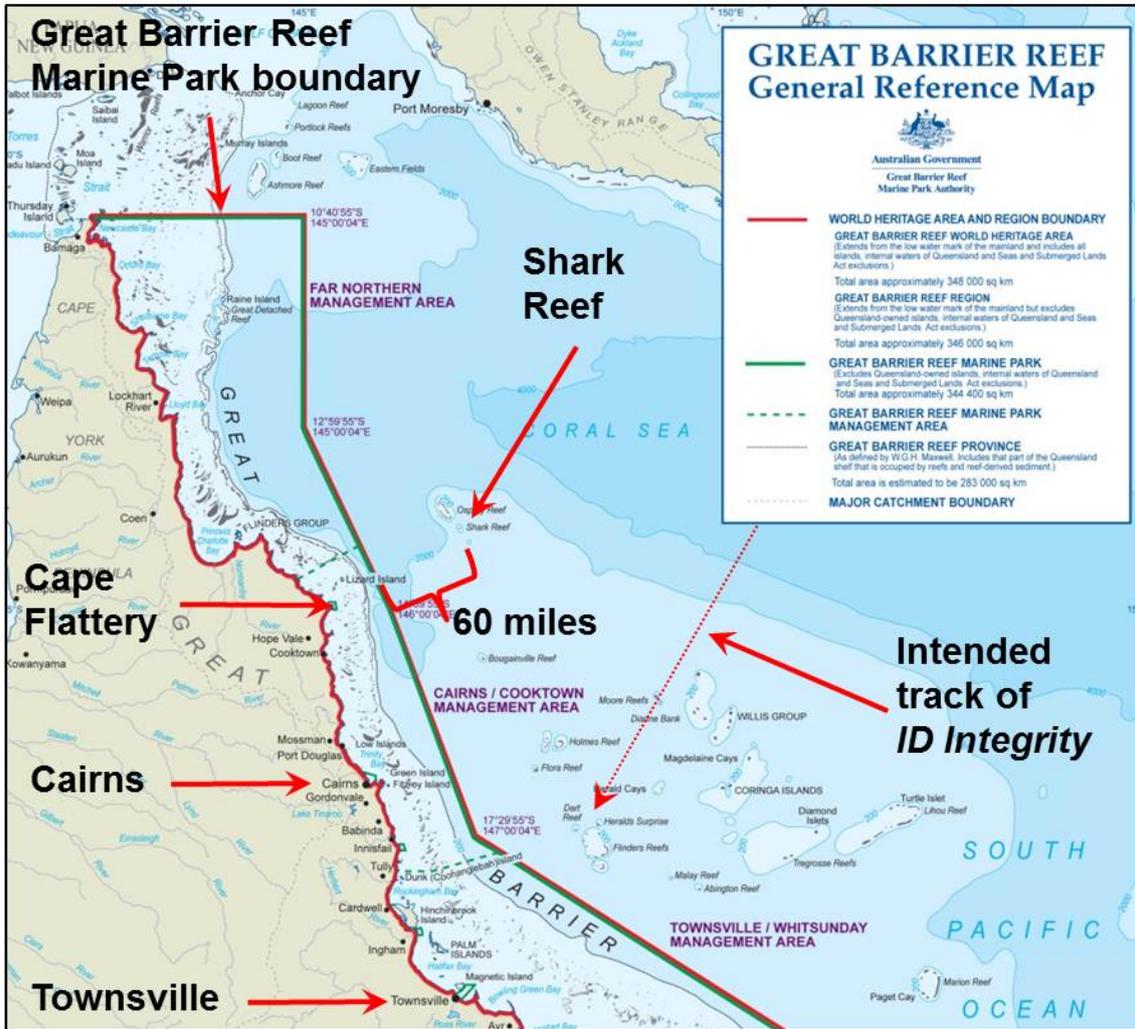
... extends... 15 miles NNW, and encloses a lagoon which has an entrance near the middle of the W side... In strong SE winds seas break heavily on the SE side of the reef...

<sup>14</sup> Admiralty Sailing Directions, Australia Pilot Volume III (NP15), eleventh edition, 2009, p82

Vema Reef:

... with a least known depth of 11.5 m over it, lies on a separate bank 7 miles farther SE [of Shark Reef].

Figure 11: The Great Barrier Reef and the area of the incident



Source: Great Barrier Reef Marine Park Authority

## Australian response arrangements

Australia maintains a number of plans and services aimed at providing emergency assistance and search and rescue (SAR) capabilities for ships visiting Australia or transiting Australian waters. The Australian Maritime Safety Authority (AMSA) is the national safety agency responsible for maritime safety, protection of the marine environment and aviation and marine search and rescue.

Australia has accepted search and rescue responsibility for a large region surrounding Australia, into the Indian Ocean and south to the coast of Antarctica. AMSA delivers this SAR service by maintaining the Rescue Coordination Centre (RCC) which coordinates both maritime and aviation search and rescue.

AMSA, through the RCC, also operates the Australian Ship Reporting System (AUSREP)<sup>15</sup> which, as a source of ship position data, provides a positive SAR watch for all participants in the system. If a ship within the system fails to fulfil the daily (24 hour) reporting requirements, the RCC will

<sup>15</sup> See [http://www.amsa.gov.au/Shipping\\_Safety/AUSREP/](http://www.amsa.gov.au/Shipping_Safety/AUSREP/) for information regarding AUSREP.

initiate communication checks to establish the reason for the failure and to check if the ship and crew are safe. If the checks are unsuccessful, a search will be initiated using air and available nearby shipping.

Once aware of an incident or emergency the response of the RCC will vary depending upon the circumstances. In the case of a disabled ship off the coast of Australia, while the prime concern is ensuring the safety of the ship and crew, other efforts are directed toward protecting the environment and coastline from damage and pollution. The potential consequences of such an incident require a rapid and effective response. To this end, Australia has established the National Maritime Emergency Response Arrangements (NEMERA)<sup>16</sup> with an integrated national approach involving an emergency towage capability in strategic locations around the Australian coastline.

Under the NEMERA, a number of emergency towage vessels (ETVs) are located in strategic Australian coastal regions. These ETVs provide an emergency towage capability to deal with a significant, or potentially significant, threat to Australia's marine environment. In the Torres Strait and Great Barrier Reef area north of Cairns, a dedicated ETV (*Pacific Responder*) provides emergency towage and first response capability.

### ***Response to the drifting ID Integrity***

At 1218 on 17 May, *ID Integrity's* master reported the ship was stopped due to main engine problems and was drifting in a westerly direction. The RCC monitored the situation until the master reported that the ship was underway. At that stage, the almost 40 hour stoppage<sup>17</sup> presented no danger to the ship or the environment as it had occurred in the Coral Sea, well to the east and north of any islands, reefs or the mainland of Australia.

Subsequently, at 0859 on 18 May, the master reported that *ID Integrity* was again stopped and drifting. At 1815, he reported that the crew were still unable to start the main engine. The ship was now further to the south and west of the earlier incident and much closer to areas of significance and danger.

The master had identified the ship's drift rate and direction and that the likely nearest point of danger (Shark Reef) was about 20 hours away. In response, AMSA activated the NEMERA and tasked *Pacific Responder*. Discussions with the master, the ship's managers and insurers also led to the ship's managers engaging two tugs to assist the ship. Other stakeholders were briefed and ships in the area alerted.

At 1830 on 19 May, *ID Integrity*, with an under keel clearance of about 15 m, drifted across Shark Reef without incident. At 1000 the following day, in position 14° 14.71' S 146° 16.84' E, about 35 miles from the outer edge of the GBR marine park, the ship was taken in tow.

On 17 May, the master's actions when responding to the unfolding situation were appropriate. Then, on 18 May, after the ship lost propulsion, he again alerted the RCC to the breakdown and subsequently that the ship was without its main engine, was drifting and would need assistance.

There were about 12 hours from the time the main engine stopped to the master informing the RCC that the ship was disabled. However, this time was necessary to determine the extent of the breakdown and to establish that the ship was in fact disabled, could not continue under its own power and was in need of assistance. Given the recent history of machinery breakdowns and the proximity to Shark Reef, notification of authorities at the earliest opportunity was required to give them sufficient time to activate towage and other response measures. As it was, the earliest tug to arrive at *ID Integrity*, *PT Kotor*, arrived more than 15 hours after the ship crossed Shark Reef. Even taking into account the time needed to determine the status of the main engine, there was insufficient time for tug assistance to arrive at *ID Integrity's* position before it crossed Shark Reef.

<sup>16</sup> For more information refer to [http://www.amsa.gov.au/Marine\\_Environment\\_Protection/](http://www.amsa.gov.au/Marine_Environment_Protection/)

<sup>17</sup> Duration calculated using ship recording not reporting times.

The subsequent actions of the various parties were measured and appropriate and the emergency response arrangements were effective. While Shark Reef is isolated and tugs arrived to assist *ID Integrity* after the ship had passed over the reef, they arrived well before the ship could drift into the Great Barrier Reef Marine Park.

# Safety analysis

## Main engine maintenance

The operation and maintenance of *ID Integrity's* MAN B&W MC-type main engine was supported by a suite of manuals and drawings covering the operation, maintenance and spare parts requirements of the engine. Engine owners and operators were also provided with worldwide sales, spare parts, technical service and customer support networks.

### **Service letters**

As part of a program of continual improvement, and to supplement the engine manuals and documents supplied with an engine, the engine designer (MAN B&W), in consultation with the engine manufacturer (in this case Mitsui Engineering and Shipbuilding), from time to time as necessary, release service letters. These letters provide up-to-date information and guidance based on accumulated service experience and describe issues which have become apparent regarding the design, maintenance or operation of the type of engine to which the letter applies. The letters may also include the revision of instructions and overhaul intervals and may supersede originally supplied documents and/or instructions.

Such letters are distributed to all known owners and operators of MC-type engines. MAN B&W expects that any revised documents and instructions are included in the on board engine manuals and maintenance systems. In addition, any such revisions are coded differently to those originally supplied and copies are provided with the service letter or component to which they relate. The original on board manuals also included the advice that new service letters could be of great importance and recommended that they be filed in the appropriate section of the manuals.

MAN B&W also advise that service letters are available on the internet through the website [www.mandieselturbo.com](http://www.mandieselturbo.com) via the Nexus (Customer extranet) link. Further, they advised that updated and revised instruction books are available on request.

### **Maintenance guidance**

The advice provided in the original main engine operating manual was inspection of the fuel pump and camshaft arrangements, including the reversing mechanism, every 8,000 operating hours with overhaul of the mechanism as necessary. The maintenance manual procedure for this overhaul included directions for the disassembly and overhaul of the roller guide and for checking the roller guide plate clearances.

In 1988, MAN B&W issued a service letter discussing operator experience with the reversing mechanisms of MC/MCE engines.<sup>18</sup> This service bulletin made mention of operating difficulties and possible mechanical damage which may result from operating the engine with the fuel pump cam in the incorrect position.

In March 1997, MAN B&W issued another service letter concerning the reversing link for fuel pump roller guides fitted to MC type engines.<sup>19</sup> This service letter primarily dealt with cracks which had been detected in some reversing links (mainly in K90MC series engines) and recommended the reversing links be inspected at the first opportunity. As with the earlier service letter, this document warned that should the reversing link not shift to its correct position after changing the direction of engine rotation, increased stresses could result in the area in which the cracks had been found. If this condition was repeated, MAN B&W recommended a full manoeuvring system condition check.

<sup>18</sup> SL88-243/UM, September 1988, S/K/L-MC/MCE Service Experience with the Pneumatically Activated Reversible Roller Guide System. This service letter remains current and available from MAN B&W.

<sup>19</sup> Service letter SL97-345/UM, March 1997, MC Engines, Reversing Link for Fuel Pump Roller Guide.

A modified design of reversing link, which was not as prone to cracking, was also made available to the owners and operators of all MC-type engines.

The 1997 service letter also made mention of checking for loose fuel pump guide block mounting screws. This was in response to a number of occurrences where the guide block had come free and dropped down to land on the camshaft. In those instances, the reversing of the engine was not significantly affected and the guide block remained in place running on the camshaft leading to insignificant wear marks. This was mentioned in the service bulletin to alert operators of this unwanted situation and to minimise the risk of this occurring as prolonged operation in this condition could stress the reversing linkage system and roller guide resulting in damage.

In 2009, MAN B&W issued a service letter which included guidance on overhaul intervals and expected service life for components of MC type engines.<sup>20</sup> This service letter recommended that fuel pump and exhaust valve roller guides should be checked in situ at 1,500 hour intervals and checks of the reversing and regulating gear were to occur at intervals between 3,000 and 4,000 hours. The service letter advised that the components had an expected service life equal to that of the engine.

In summary, since the implementation of the individual fuel pump cam follower reversing system, a number of service letters had detailed operational experience and possible troubles with this arrangement. In 1997, in addition to checking for cracks in reversing links, MAN B&W identified the need for the operators of MC type engines to check the security of fuel pump guide blocks and their mounting screws/pins. It was presumed that owners and operators of engines would include such checks in their shipboard manuals and planned maintenance systems as part of the response to service letter updates from the engine company.

However, the service letter advice had not been included in *ID Integrity's* document systems with the result that the checks were not carried out and cracks developed undetected in the reversing mechanism and guide rollers. These faults led to the eventual failure of the reversing mechanism on number six cylinder, jamming and slipping of the camshaft and the disabling of the main engine.

## On board maintenance

ID Wallem Ship Management maintained a computerised planned maintenance system on board *ID Integrity* and the crew used this system to record and monitor machinery maintenance and to satisfy ClassNK continuous machinery survey requirements. The planned maintenance system was also supported by computer files (spreadsheets and documents) listing maintenance tasks, beside which, the due and completed dates or running hours were entered and calculated.

At the time of the incident, the ship's maintenance computer had suffered a computer virus attack. As a result, the investigators were unable to access the computerised planned maintenance system records. However, the hard copy records and files were available for inspection although these were somewhat incomplete. For example, engine room logbook entries were brief, and records of machinery running hours were not consistent with the hours recorded in the planned maintenance jobs lists, nor with the information contained in the engine room reports sent regularly to management ashore.

The planned maintenance system files contained both mechanical and electrical maintenance tasks to be completed on the engine reversing mechanism and monitoring and control systems. These tasks included general inspections of the system (every 2,000 operating hours), overhaul of the fuel pump pneumatic reversing equipment and associated control gear (every 10,000 operating hours) as well as regular alarm and function tests of all monitoring and control equipment including manoeuvring tests prior to each departure and arrival. In addition, routine

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<sup>20</sup> Service letter SL09-509/SBJ, April 2009. Guiding overhaul intervals, Updated tables.

8,000 hour inspections of the camshaft also included inspections of the cams, followers and reversing mechanisms.

The records available suggested that the tasks listed in these files were being completed as prescribed. However, the associated job sheets provided no description of what to do or look for when ‘inspecting’, or carrying out the tasks. Furthermore, the job completion records did not describe the work carried out. From the on board records available to the investigators it was not possible to determine to what extent the roller guides or the fuel pump reversing mechanisms had been inspected at the intervals cited. Further, it was not possible to determine if, or when, the reversing links had been crack tested or renewed.

Furthermore, the schedule contained in the on board files, was not in accordance with the advice contained in the 2009 MAN B&W service letter which altered the schedule to include inspections of the reversing and regulating gear every 3,000 to 4,000 run hours and of the guide rollers every 1,500 hours.

Regular, thorough, inspections of this equipment would have revealed the deterioration of the reversing system and the loose roller guide blocks and prompted suitable maintenance to be conducted before the events of 18 May 2012.

The ship’s main engine maintenance records were generally poor and it was evident that not all of the manufacturer’s maintenance requirements, particularly those provided through service letters, had been incorporated into the ship’s planned maintenance system.

In submission, ID Wallem stated that they had taken action to correct the issues raised by this incident. Closer interaction between ship and shore management, especially with respect to maintenance issues, would be implemented and all company ships would be scheduled for main engine inspections as soon as practical, or during dry dockings, and repairs completed as necessary. Shipboard computer use and virus protection measures were also to be upgraded to preserve the integrity of the information kept on board. Staff from all company ships were going to be advised of this incident and its implications and crew training centres were to include this incident in courses.

## Class requirements

According to the International Association of Classification Societies (IACS):<sup>21</sup>

The objective of ship classification is to verify the structural strength and integrity of essential parts of the ship’s hull and its appendages, and the reliability and function of the propulsion and steering systems, power generation and those other features and auxiliary systems which have been built into the ship in order to maintain essential services on board. Classification Societies aim to achieve this objective through the development and application of their own Rules and by verifying compliance with international and/or national statutory regulations on behalf of flag Administrations.

*ID Integrity’s* machinery was inspected by ClassNK in accordance with a 5 yearly continuous machinery survey regime. Consequently, all machinery survey items, including the main engine and its camshaft arrangement, were inspected once every 5 years. On 23 May 2012, when the ATSB investigators attended *ID Integrity* at anchor off Cairns, the survey records showed that there were no outstanding machinery survey items and that the ‘camshaft driving gear of M/E (main engine)’ had been inspected by class in January 2010.

Inspection revealed that there were no survey records which indicated that the main engine fuel pump reversing arrangements or cam follower guide plates had been inspected by ClassNK to ensure that updated manufacturer requirements regarding inspection and testing had been

<sup>21</sup> International Association of Classification Societies 2011, *Classification Societies – What, Why and How?* IACS, viewed 4 June 2013, <<http://www.iacs.org.uk>>

complied with. Furthermore, the classification society inspections that had been carried out had not ensured that the main engine was maintained in accordance with the manufacturer's most up-to-date recommendations.

It is reasonable to expect that an organisation whose role it is to provide independent verification that the ship continues to maintain reliability and function of its machinery would be aware of, and conversant with, any alterations and updates provided by the machinery or engine manufacturer. That is, ClassNK should have had in place a system which ensured that MAN B&W service letters were known to its surveyors and the ships and operators to whom ClassNK provides its services. This system should have also verified that class surveyors had ensured that ships fitted with engines to which the service letters were relevant had implemented the advice contained in them.

In submission, ClassNK stated that they were in discussion with MAN B&W about the cam shaft follower and reversing mechanism design and service information as they had been unaware of the service letters and associated issues. ClassNK also advised that damage information arising from survey inspections, or machinery maker notices, is analysed and recorded in the company's survey database. This information is brought to the attention of, and made available to, class surveyors through a monthly damage list issued to all class surveyors. This information is also available to surveyors through company internal document systems.

ClassNK also advised that class surveyors check and confirm the general condition of the equipment and components during surveys and complete additional inspections as required if a defect is found.

## Findings

In the early hours of 18 May 2012, the geared bulk carrier *ID Integrity* lost propulsive power while in the Coral Sea. The ship drifted in a westerly direction towards the Australian coast and the Great Barrier Reef. During the afternoon of 19 May, the ship passed over Shark Reef without incident. The following day the ship was taken in tow when it was about 35 miles to the east of the Great Barrier Reef Marine Park.

From the evidence available, the following findings are made with respect to the loss of propulsion and drift towards danger of *ID Integrity* and 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

- Over time, cracks had developed in the reversing link of the number six cylinder fuel pump. On 18 May 2012, the reversing link failed and the resulting debris jammed the fuel pump drive mechanism. As a consequence, a camshaft coupling slipped and the main engine could not be restarted.
- While the maintenance records on the ship suggested that the reversing mechanism and roller guides had been regularly inspected, there was no evidence to indicate what was checked, whether the reversing links had been crack tested or replaced, or if the cam follower guide block retaining screws and pins were ever inspected, retensioned or replaced.
- **The ship's planned maintenance system did not include all of the main engine manufacturer's maintenance requirements. Furthermore, the maintenance records did not include sufficient detail to confirm that the main engine was maintained in accordance with the manufacturer's requirements. [Safety issue]**
- **ClassNK did not have in place a system which ensured that updated service advice from the engine manufacturer was being implemented on board ships with engines which its surveyors were routinely and regularly surveying. [Safety issue]**

### Other factors that increase risk

- In conducting repeated decarbonizing of the diesel generator turbochargers, the ship's engineers had focussed on the symptoms rather than the causes of the turbocharger fouling. Over time, this approach had resulted in a reduction in the reliability of the machinery.

### Other findings

- Once notified, the actions of the Australian Maritime Safety Authority's Rescue Coordination Centre and the ship's managers were appropriate and the emergency response arrangements were effective.

## 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 organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) 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.

### On board planned maintenance system

Number:	MO-2012-005-SI-01
Issue owner:	ID Wallem Ship Management
Operation type:	Ship management
Who it affects:	Shipboard maintenance management

#### **Safety issue description:**

The ship's planned maintenance system did not include all of the main engine manufacturer's maintenance requirements. Furthermore, the maintenance records did not include sufficient detail to confirm that the main engine was maintained in accordance with the manufacturer's requirements.

#### **Proactive safety action taken by: ID Wallem Ship Management**

ID Wallem Ship Management advised they had taken steps to inspect the roller guides in all main engines in their fleet as soon as practical or during dry dockings and carry out repairs as required. All Ship's staff would be briefed and crew training centres include information regarding this incident. In addition, closer contact between on board and shore management would be instigated along with tighter restrictions on the use of shipboard computers and maintenance systems to limit the loss of information due to computer virus attacks.

Action number: MO-2012-005-NSA-01

ATSB comment in response:

The ATSB is satisfied that the action taken by ID Wallem Ship Management adequately addresses this safety issue.

### Class requirements

Number:	MO-2012-005-SI-02
Issue owner:	ClassNK (Nippon Kaiji Kyokai)
Operation type:	Classification society ship surveying
Who it affects:	Ship and machinery inspection and survey, shipboard maintenance management

***Safety issue description:***

ClassNK did not have in place a system which ensured that updated service advice from the engine manufacturer was being implemented on board ships with engines which its surveyors were routinely and regularly surveying.

***Proactive safety action taken by: ClassNK***

ClassNK advised that they were in discussion with MAN B&W about obtaining engine design and service information and that all relevant departments would share any design change information.

ClassNK also advised that survey reports are checked by head office and damage information arising from inspections, or from notices received from the equipment manufacturer, is analysed and recorded in the company survey database. This information is brought to the attention of, and made available to, class surveyors through a monthly damage list which is issued to all class surveyors. This information is also available to surveyors through company internal document systems.

Action number: MO-2012-005-NSA-02

ATSB comment/action in response:

The ATSB is satisfied that the action taken by ClassNK adequately addresses this safety issue.

# General details

## Occurrence details

Date and time:	18 to 23 May 2012	
Occurrence category:	Incident	
Primary occurrence type:	Loss of propulsion and drift into danger	
Type of operation:	Commercial cargo	
Location:	The Coral Sea	
	Longitude: 14° 00.66' S	Latitude: 148° 30.87' E

## Ship details

Name	<i>ID Integrity</i>
IMO number	9132923
Call sign	VRZA6
Flag	Hong Kong, China
Classification society	Nippon Kaiji Kyokai (ClassNK)
Ship type	Geared bulk carrier
Builder	Tsuneishi shipbuilding, Japan
Year built	1996
Owner(s)	K/S Danskib 41, Hong Kong
Operator	ID Wallem Ship Management, Hong Kong
Manager	ID Wallem Ship Management, Hong Kong
Gross tonnage	26,070
Deadweight (summer)	45,653 t
Summer draught	11.620 m
Length overall	185.74 m
Moulded breadth	30.40 m
Moulded depth	16.50 m
Main engine(s)	Mitsui MAN-B&W 6S50MC (Mk5)
Total power	7,465 kW
Speed	14.10 kts

# Sources and submissions

## Sources of information

On 23 May 2012, investigators from the Australian Transport Safety Bureau (ATSB) attended *ID Integrity* while the ship was at anchor off Cairns, Queensland. The master and directly involved crew members were interviewed and each provided their account of the accident. Photographs of the ship and copies of relevant documents were obtained, including log books, statutory certificates, reports, manuals and procedures.

During the course of the investigation further information was provided by ID Wallem ship management, the Australian Maritime Safety Authority (AMSA), Maritime Safety Queensland (MSQ), The Great Barrier Reef and Torres Strait Vessel Traffic Service (REEFVTS), MAN Diesel & Turbo Australia, Survey Association Ltd, Bixley Marine, Brian White & Associates and Nippon Kaiji Kyokai (ClassNK).

## References

AMSA n.d., *National Maritime Emergency Response Arrangements*, the Australian Maritime Safety Authority, viewed 1 September 2012.

[www.amsa.gov.au/Marine\\_Environment\\_Protection/National\\_Maritime\\_Emergency\\_Response\\_Arrangements/](http://www.amsa.gov.au/Marine_Environment_Protection/National_Maritime_Emergency_Response_Arrangements/)

AMSA 2012, *AUSREP Ship reporting instructions for the Australian area*, the Australian Maritime Safety Authority, viewed 1 September 2012. [www.amsa.gov.au/Publications/AUSREP\\_Book.pdf](http://www.amsa.gov.au/Publications/AUSREP_Book.pdf)

Department of Agriculture, Fisheries and Forestry n.d., *Australian Ballast Water Management Requirements*, Department of Agriculture, Fisheries and Forestry, Canberra.

Department of Agriculture, Fisheries and Forestry website:

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The United Kingdom Hydrographic Office 2009, *Admiralty Sailing Directions, Australian Pilot Volume III* (NP15), eleventh edition, the United Kingdom Hydrographic Office, Somerset, England.

MAN B&W website: [www.manbw.com](http://www.manbw.com)

International Association of Classification Societies website: [www.iasc.org.uk](http://www.iasc.org.uk)

## 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 *ID Integrity's* master, chief mate and chief, second, third and fourth engineers, ID Wallem ship management, ClassNK, MAN Diesel & Turbo, the Marine Department of the Hong Kong SAR, the Australian Maritime Safety Authority (AMSA) and Maritime Safety Queensland (MSQ).

Submissions were received from ID Wallem ship management, *ID Integrity's* chief mate, ClassNK, MAN Diesel and Turbo, the Australian Maritime Safety Authority (AMSA) and Maritime Safety Queensland (MSQ). The submissions were reviewed and where considered appropriate, the text of the draft report was amended accordingly.

# Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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 safety factors related to the transport safety matter being investigated. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

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

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### Investigation

#### **ATSB Transport Safety Report**

Marine Occurrence Investigation

Breakdown and subsequent drift towards danger of the bulk carrier *ID Integrity*, Coral Sea, 18 to 23 May 2012

294-MO-2012-005

Final – 22 August 2013