



Australian Government
Australian Transport Safety Bureau

Crew member fatality on board the bulk carrier *Nireas*

Gladstone anchorage, Queensland | 20 March 2013



Investigation

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Addendum

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Safety summary

The information contained in this preliminary report is derived from the initial investigation of the occurrence. Readers are cautioned that it is possible that new evidence may become available that alters the circumstances as depicted in the report.

What happened

On 20 March 2013, an engineer on board the bulk carrier *Nireas* was fatally injured after being struck by flying debris when the observation window of a main air receiver drainage pot exploded. At the time of the explosion, the ship was at anchor off Gladstone, Queensland, and the engineer was carrying out the routine task of draining water from the pressurised air receiver.

What the ATSB found so far

Initial analysis of the accident indicates that the observation window glass of the drainage pot exploded when it was exposed to the air receiver pressure. However, all of the factors which contributed to the failure of the glass have not yet been established.

What's been done as a result

All six similar drainage pot observation window glasses on board *Nireas* have been removed pending verification of the drainage arrangement design to the satisfaction of Lloyd's Register, the ship's classification society.

The ATSB has contacted *Nireas*' managers, the ship builder, Lloyd's Register, the flag state (Liberia) and the Australian Maritime Safety Authority. They were all informed of the accident and asked that the owners and operators of any ships fitted with similar systems be advised of this accident and that appropriate safety action should be taken by them to prevent similar accidents on board their ships.

Nireas' managers have advised the ATSB that they have also removed the drainage pot observation window glasses from the only other ship managed by them that is fitted with similar drainage arrangements.

The ship builder has advised the ATSB that it has contacted all owners of ships in which it had fitted this design of drain system informing them of the accident and requesting that all observation glasses be removed and for the pots to remain unobstructed.

Investigation direction

The investigation is ongoing and it will focus on determining why the observation glass failed, whether the drainage pot was fit for purpose and whether there were any underlying issues in relation to the design, construction, testing, or certification of the drainage pot.

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The occurrence

The information contained in this preliminary report is derived from the initial investigation of the occurrence. Readers are cautioned that it is possible that new evidence may become available that alters the circumstances as depicted in the report.

In late November 2012, the crew joined the new 229 m long bulk carrier *Nireas* (Figure 1) while it was at the Jiangsu Jinling Shipyard, Nanjing, China. On 6 December, the ship departed Nanjing on its maiden voyage to Australia where it loaded coal for export to Shanghai, China. On 17 February 2013, after discharging that cargo, the ship sailed to Australia to load another cargo of coal.

Figure 1: *Nireas*



Source: ATSB

On 2 March, *Nireas* anchored off Gladstone, Queensland, to wait for a berth. During the time at anchor, the crew continued with their normal deck and engine room watches and carried out routine maintenance tasks.

On the morning of 20 March, the ship's engineers met for breakfast as normal and the fourth engineer, who had been on duty¹ the previous night, reported to the other engineers that he had had no call outs. The fourth engineer finished his breakfast and a little before 0730² went to the engine room to complete a routine inspection of the machinery prior to handing over duty to the second engineer. At about the same time, the second engineer went to the machinery control room (control room) to complete routine checks and the third engineer went to the engine room to start work.

The fourth engineer started his engine room checks and inspections, which included draining accumulated water (condensate) from the main and auxiliary air receivers.³ He opened each of the two inline drain valves of the forward main air receiver (Figure 2) about one turn and stood by while the water drained. Then, without warning, the observation window glass of the drainage pot exploded.

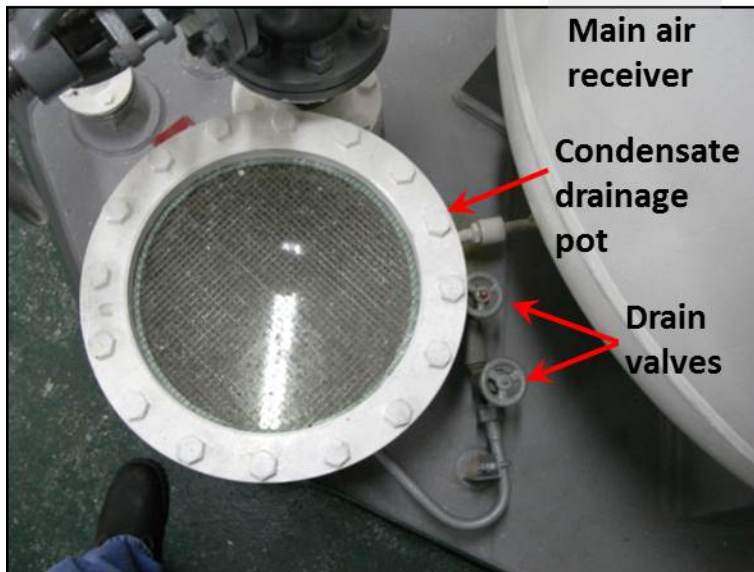
The loud thump of the explosion was heard around the ship. In the engine room the unusual sound drew the attention of both the second and third engineers. On the bridge, the master, chief mate and third mate heard the loud thump, but they thought the noise was a wave slamming against the hull in the rough seas

¹ On ships with an unmanned machinery space, it is normal practice that the engineers follow a rotating roster in which each takes turns at checking and monitoring the ship's machinery and answering alarms and call outs for a 24 hour period.

² All times referred to in this report are local time, Coordinated Universal Time (UTC) + 10 hours.

³ An air receiver is a large steel cylinder that contains compressed air that is supplied from a compressor. The main air receivers on board *Nireas* contain 30 bar compressed air which is used to start the main and auxiliary engines.

Figure 2: Main air receiver condensate drainage pot



Source: ATSB

Shortly afterwards, at 0744, the engine room alarm system sounded and indicated a fire alarm from the engine room lower platform area along with a 440 V electrical system earth fault. The second engineer checked the alarms and then left the control room to investigate. On his way, he met the third engineer who was also on his way to investigate. The two men decided to separate and search either side of the engine room. The third engineer went down the starboard side stairs and the second engineer went down the port side stairs.

As the second engineer approached the bottom of the stairs, he saw the fourth engineer surrounded by debris and slumped over at the base of the forward main air receiver. The atmosphere was misty, there was the distinct smell of oil and moisture laden air and compressed air could be heard freely escaping. The second engineer urgently called the third engineer.

The fourth engineer was unconscious and seriously injured. The second engineer hurried to the control room to telephone the bridge. Meanwhile, the third engineer, after checking for dangers, moved the fourth engineer clear of the air receiver and laid him on the deck. He shut off the two air receiver drain valves, stopping the flow of escaping air.

At about 0752, the second engineer telephoned the bridge and told the master to come quickly to the engine room with the chief engineer. The master and chief mate immediately headed for the engine room. The chief engineer had already heard the noise and the alarms in his cabin and was on his way to the engine room to investigate.

Meanwhile, the third engineer took the first aid kit from the control room to treat the fourth engineer's injuries. The fourth engineer was breathing but unconscious.

When the master, chief mate and chief engineer arrived in the engine room, the second engineer told them that the fourth engineer was badly injured. They went to investigate and as soon as the master saw the injuries, he told the chief mate to attend to them. He then hurried back to the bridge to get urgent medical advice from ashore. On his way to the bridge, he passed the boatswain (bosun) and an able seaman and directed them to muster the crew and proceed to the engine room to assist.

At 0755, the master notified Gladstone Harbour Control of the accident. He asked for medical assistance and requested that the fourth engineer be evacuated from the ship. The master was advised not to move the injured man or administer any drugs but to continue first aid until shore paramedics arrived. Subsequently, the master informed the ship's managers of the accident.

At about 0815, the chief mate noted that the fourth engineer had stopped breathing. He immediately commenced cardio pulmonary resuscitation (CPR) with assistance from the other crew members.

By 0845, a helicopter with paramedics on board was en route to *Nireas*. At 0920, the helicopter landed on board the ship and the paramedics were taken directly to the accident site, where the crew were still giving CPR. The paramedics assessed the situation, and the condition of the fourth engineer, and shortly thereafter confirmed that he had died.

At 1009, the paramedics departed the ship. Arrangements were then made for the fourth engineer's body to be removed from the ship the following day.

While *Nireas* remained at anchor, investigations were carried out by the ATSB, Lloyds Register (the ship's classification society) and the ship's Protection and Indemnity (P&I) representative. On 22 March, the attending Lloyds Register surveyor issued the master with a condition of class, which in part stated that:

Observation glass of forward main air receiver condensate drainage pot shattered during drainage operation. The observation glasses are fitted to air receivers and air compressors throughout the engine room. The design of the drainage arrangements is to be verified. Meantime, the observation glasses have been removed from all of the pots.

On 25 March, *Nireas* berthed in Gladstone to load its cargo of coal and, on 26 March, the ship departed bound for Singapore.

Context

Nireas's Crew

Nireas had a crew of 18 Ukrainian nationals, all of whom were appropriately qualified for the positions they held on board the ship.

The fourth engineer first went to sea as an oiler in 2007. In 2008, he completed a Ukrainian third class engineer certificate of competency. Since that time, he had sailed as a fourth engineer.

Compressed air system condensate drain system

The compressed air system on board *Nireas* consisted of a high pressure system (controlled to about 30 bar)⁴ for main and auxiliary engine starting requirements and low pressure systems for control and machinery air (7 bar) and general service outlets (4 bar). The low pressure systems were supplied from the high pressure system through pressure control valves.

Two main air compressors and an emergency air compressor supplied 30 bar air, while a working air compressor supplied 7 bar air for deck requirements. The air was stored in two 30 bar main air receivers, a 30 bar auxiliary air receiver and two 7 bar control and working air receivers.

The compressed air system was fitted with a drain line arrangement in which individual machinery drains were fed into a closed drain line. This system included condensate and unloader⁵ drains for three air compressors, condensate drains from the five air receivers and manual drains from the main engine starting air system. Individual drain lines came together into a single drain pipe which exhausted into the after engine room bilge.

Each of the compressor and air receiver drain lines fed into a drainage pot (Figure 3) which then drained into the bilge well via the common line. The line increased in size as more drains emptied into it. Flow from the drainage pots to the bilge was clear and no valves were fitted in the lines.

Main air start receiver drainage pots

The main air receiver drainage pots appeared to the naked eye to be strongly built (Figures 3 and 4) and were constructed from 18 mm thick steel cylinders. The cylinders had an outside diameter of 427 mm, were 600 mm deep and were fitted with a 32 mm thick top flange that had an outside diameter of 565 mm. The flange had 16 holes drilled through it to suit 25 mm bolts.

The observation window consisted of a 467 mm diameter piece of 18 mm thick glass which was covered with a 1 mm diameter wire mesh.

The 15 mm diameter⁶ drain line from the air receiver entered the side of the pot and exhausted toward the bottom. Central in the bottom of the pot was a welded-in 15 mm diameter outlet line which fed into the common drain line and finally to the aft engine room bilge.

⁴ 1 bar equals 100 kPa or approximately one atmosphere.

⁵ Unloading of air compressors involves draining the air pressure in the lines from all stages of compression. This relieves the pressure in the cylinders of the air compressor and reduces starting loads.

⁶ Pipe diameters are nominal internal diameters. The actual internal diameter of a pipe depends upon the pipe standard and schedule (weight) being used.

Figure 3: Air receiver condensate drainage pots

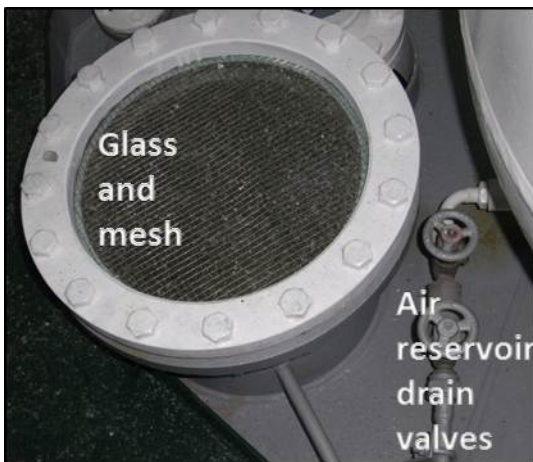


Source: ATSB

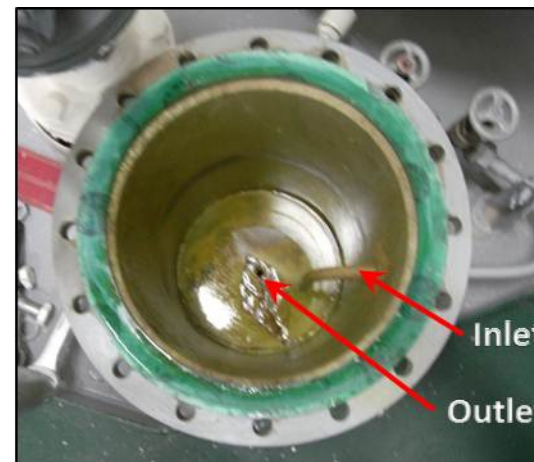


Source: Brian White and Associates

Figure 4: Main air receiver drainage pot arrangement



Source: ATSB



Source: ATSB

The accident

Initial analysis indicates that the drainage pot was exposed to full air receiver pressure (about 30 bar) and that the inspection window glass failed under the pressure.

Investigation activities

Safety actions taken so far

On 27 March, the ATSB advised Laskaridis Shipping (the ship's managers), Jiangsu Jinling Shipyard (the ship builder), the Liberian Ship Registry (the flag State), Lloyds Register and the Australian Maritime Safety Authority of the accident. All parties were made aware of what the ATSB investigation had initially found. They were all urged to identify ships fitted with similar drainage pots and to advise operators of those ships to take appropriate safety action to prevent similar accidents from occurring.

In response, Laskaridis Shipping confirmed that the inspection glasses had been removed from the remaining observation pots on board *Nireas*, and that the glasses from similar pots fitted on board another of the company's ships had also been removed. The company also stated that they had commenced their own investigation, were in contact with the shipyard and classification society and that a safety circular highlighting the accident will be distributed to their entire fleet.

Jiangsu Jinling Shipyard advised that they have carried out a preliminary analysis and investigation. The company has also notified owners of ships built with similar air receiver

condensate drain systems and requested that they remove the observation window glasses from all drainage pots.

In addition, the North of England Protection and Indemnity (P&I) association has informed the ATSB that the association was advising its members to check the air receiver drainage systems on board their ships. The association also stated that they ‘...would be looking to further distribute your [the ATSB] findings on our website ... and push the message to highlight this risk.’

Safety investigation direction

The investigation is ongoing and will focus on determining why the observation glass failed, whether the drainage pot was fit for purpose and whether there were any underlying issues in relation to the design, construction, testing, or certification of the drainage pot.

General details

Occurrence details

Date and time:	20 March 2013 – 0744 EST	
Occurrence category:	Accident	
Primary occurrence type:	Fatality	
Location:	At anchor off Gladstone, Queensland	
	Latitude: 23° 50.60' S	Longitude: 151° 36.00' E

Ship details

Ship name	Nireas
IMO number	9611905
Call sign	D5BC8
Flag	Liberia
Classification society	Lloyd's Register
Ship type	Bulk carrier
Builder	Jiangsu Jinling Shipyard, Nanjing, China
Year built	2012
Owners:	Ocean Strength Navigation
Operators:	Laskaridis Shipping, Athens, Greece
Manager	Laskaridis Shipping, Athens, Greece
Gross tonnage	44,128
Deadweight (summer)	82,067.1 t
Summer draught	12.20 m
Length overall	229.02 m
Moulded breadth	20.05 m
Moulded depth	20.05 m
Main engine	Hyundai MAN-B&W 6S60MC-C7
Total power	13,560 kW
Speed	14.1 knots

Sources and submissions

Sources of information

On 20 March 2013, investigators from the Australian Transport Safety Bureau (ATSB) attended *Nireas* while the ship was at anchor off Gladstone, 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 thus far, further information was provided by Laskaridis Shipping, Jiangsu Jinling Shipyard, the North of England P&I Association, Brian White & Associates, the Queensland Police Service and Lloyd's Register.

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.

Investigation

ATSB Transport Safety Report

Marine Occurrence Investigation

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Gladstone anchorage, Queensland on 20 March 2013

299-MO-2013-005

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