



Australian Government

Australian Transport Safety Bureau



ATSB TRANSPORT SAFETY INVESTIGATION REPORT  
Marine Occurrence Investigation No. 245  
Final

Independent investigation into the fire on board  
the Antigua and Barbuda registered general cargo ship

# BBC Islander

at Dampier, Western Australia

14 August 2007



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### Abstract

On 14 August 2007, the Antigua and Barbuda registered general cargo ship *BBC Islander* anchored off Dampier, Western Australia. One of the tasks the crew was to complete while the ship was at anchor was the removal of steel brackets that had been welded to the hatch covers.

In the process of removing the brackets with oxy-acetylene cutting equipment, a hole was inadvertently cut in the aft cargo hold hatch cover. As a result, sparks and molten metal fell into the cargo hold and onto the pallets of cargo stowed below.

At about 1340, smoke was noticed coming from the aft cargo hold. The general alarm was sounded and the master decided to use the ship's fixed fire extinguishing system to flood the cargo hold with carbon dioxide.

The harbour master was notified and he arranged for the ship to be brought alongside the wharf.

By 1312 on 16 August, *BBC Islander* was all fast alongside the wharf and the local fire fighting authorities took control of the response. Initially, they tried flooding the cargo hold with more carbon dioxide. They then attempted to remove the cargo in order to reach the seat of the fire and extinguish it with the use of fire hoses. Eventually, the hold was filled with high expansion foam. However, none of these actions extinguished the fire.

On 18 August, the fire was finally extinguished when an offshore supply vessel's fire monitor was used to flood *BBC Islander's* aft cargo hold with about 700 tonnes of seawater.

The ATSB has issued two recommendations and three safety advisory notices to address the identified safety issues.

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# THE AUSTRALIAN TRANSPORT SAFETY BUREAU

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The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Infrastructure, Transport and Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external bodies.

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 enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, 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 proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.



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## TERMINOLOGY USED IN THIS REPORT

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**Occurrence:** accident or incident.

**Safety factor:** an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, risk controls and organisational influences.

**Contributing safety factor:** a safety factor that, if it had not occurred or existed at the relevant time, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or (c) another contributing safety factor would probably not have occurred or existed..

**Other safety factor:** a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report.

**Other key finding:** any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which ‘saved the day’ or played an important role in reducing the risk associated with an occurrence.

**Safety issue:** a safety factor that (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 operational environment at a specific point in time.

Safety issues can broadly be classified in terms of their level of risk as follows:

- **Critical safety issue:** associated with an intolerable level of risk.
- **Significant safety issue:** associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable.
- **Minor safety issue:** associated with a broadly acceptable level of risk.



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## EXECUTIVE SUMMARY

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At 0654<sup>1</sup> on 14 August 2007, the Antigua and Barbuda registered general cargo ship *BBC Islander* anchored off Dampier, Western Australia. One of the tasks the crew were to complete while the ship was at anchor was the removal of steel brackets, or stoppers, which had been welded to the cargo hold hatch covers. The stoppers had been used to secure a heavy lift unit of cargo that had been discharged in Port Hedland the day before.

In the process of removing the stoppers from the aft cargo hold hatch covers with oxy-acetylene cutting equipment, the ship's fitter inadvertently cut a hole in the hatch cover. As a result, sparks and molten metal fell into the cargo hold and onto the pallets of cargo stowed below.

At about 1340, the fitter noticed smoke coming from the aft cargo hold ventilator. The bridge watchkeeper was notified and the general alarm was sounded.

By 1350, the master had consulted with the ship's senior officers and decided to use the ship's fixed fire extinguishing system to flood the cargo hold with carbon dioxide. However, the fire was not extinguished and, over the next eight hours, the ship's entire supply of carbon dioxide was discharged into the cargo hold.

At 1610, the Dampier harbour master was notified and he organised for more cylinders of carbon dioxide to be delivered to the ship. He also arranged for the ship to be berthed at the Dampier Cargo Wharf.

By 1312 on 16 August, *BBC Islander* was all fast alongside the wharf and the Fire and Emergency Services Authority of Western Australia (FESA) took control of the fire fighting response.

The fire fighters initially tried flooding the cargo hold with more carbon dioxide. They then removed some of the cargo to reach the seat of the fire and extinguish it with the use of fire hoses. Eventually, the cargo hold was filled with high expansion foam. However, none of these actions extinguished the fire.

On 18 August, the fire was finally extinguished when an offshore supply vessel's fire monitor was used to flood *BBC Islander*'s aft cargo hold with about 700 tonnes of seawater.

The report identifies the following safety issues and issues recommendations and safety advisory notices to address them.

- The ship's cargo stowage plan was neither accurate nor complete. Consequently, the ship was in breach of the SOLAS requirements for the carriage of dangerous goods. However, more importantly, the ship's master, its crew and the fire fighters were not armed with documentation that clearly outlined the location, and types, of dangerous goods that would be encountered during the emergency response on board the ship in Dampier.

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<sup>1</sup> All times referred to in this report are local time, Coordinated Universal Time (UTC) + 8 hours.

- The ship's safety management system procedures did not provide sufficient guidance to ensure that the crew appropriately assessed the risks associated with removing the stoppers from the hatch covers. As a result, adequate precautions, in the form of a continuous fire watch inside the cargo hold, were not implemented before they started removing the stoppers.
- The fitter removing the stoppers from the cargo hold hatch covers could not read English and hence could not fully understand the requirements of the ship's safety management system hot work permit.
- The fire fighters had received little training in fire fighting on board ships and had only limited experience in responding to such fires. As a result, the hatch covers were prematurely opened on 16 August to enable them to see the fire and assess the situation. Then, when they closed the hatch covers and flooded the hold with carbon dioxide, insufficient time was allowed for the carbon dioxide to extinguish the fire.
- The application of a blanket of hi-expansion foam over the cargo, during the night of 17 August 2007, was effective in preventing the fire from spreading until the local stocks of foam concentrate were exhausted.

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# 1

## FACTUAL INFORMATION

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### 1.1 *BBC Islander*

*BBC Islander* is an Antigua and Barbuda registered general cargo/container ship (Figure 1). The ship is owned and managed by Briese Schiffahrts, Germany and classed with Germanischer Lloyd (GL). It has two cargo holds and two cargo cranes located forward of the accommodation superstructure.

The ship was built in 1998 by Zhejiang Shipyard, China. It has an overall length of 100.7 m, a beam of 16.4 m, a depth of 8.0 m and a deadweight of 4979 tonnes at its summer draught of 6.236 m.

Propulsive power is provided by a single nine cylinder MAK 9M32 four-stroke diesel engine, delivering 3960 kW. The main engine drives a controllable pitch propeller which gives the ship a service speed of about 16 knots<sup>2</sup>.

**Figure 1:** *BBC Islander*



At the time of the incident, *BBC Islander*'s crew of 14 consisted of a Swedish master, a German chief mate, a Ukrainian chief engineer, Ukrainian and Russian junior officers and Ukrainian and Filipino crew. Due to the number of different nationalities on board the ship, it was usual for all communications be in English.

The master had 46 years of seagoing experience. He held a Swedish master's certificate of competency that was first issued in 1973. He had been sailing as master since 1981 and had considerable experience on board general cargo ships. At the time of the incident, he was completing his first assignment on board *BBC Islander* and had been on board the ship for about two weeks.

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<sup>2</sup> One knot, or one nautical mile per hour equals 1.852 kilometres per hour.

The chief mate started his seagoing career with the German navy in 1984. In 1996, he joined his first merchant ship and, in 1999, gained his master's certificate of competency. He was completing his first assignment on board *BBC Islander* and had been on board the ship for just over a week.

The chief engineer held a first class certificate of competency. He had 20 years of seagoing experience and had been on board *BBC Islander* for about four months.

The ship's fitter was a qualified welder and had four years of seagoing experience. At the time of the incident, he was completing his first assignment on board *BBC Islander*.

### 1.1.1 Cargo hold fire detection and extinguishing systems

*BBC Islander's* cargo holds are fitted with a smoke detection system that uses a fan to continually draw a sample of air from each cargo hold. The air sample is fed to the fire detection unit via each cargo hold's fixed fire extinguishing system carbon dioxide (CO<sub>2</sub>) distribution line. A three way valve allows connection of the distribution lines to either the smoke detection unit or the fire extinguishing system. When smoke is detected in an air sample, the detection system activates an alarm that is located on the ship's bridge.

The smoke detection system, the three way valves and the fire extinguishing system are all located in the ship's forecandle.

The ship's fixed fire extinguishing system consists of 45 cylinders of CO<sub>2</sub>, each containing 45 kg of the gas. The cylinders are connected to a common distribution manifold that can supply CO<sub>2</sub> to the engine room or the cargo holds.

In February 2006, *BBC Islander's* fire detection and extinguishing systems were surveyed by GL while the ship was in dry-dock. The survey found that the systems were operational and that each CO<sub>2</sub> cylinder contained 45 kg of the gas.

## 1.2 The incident

On 1 August 2007, the master joined *BBC Islander* while the ship's cargo was being discharged in Port Kelang, Malaysia. At the completion of the cargo discharge, the ship sailed for Batu Ampur, Indonesia.

During *BBC Islander's* stay in Batu Ampur, pallets stacked with shrink wrapped bags of dry drilling mud, drums of dangerous goods UN1813<sup>3</sup> and UN2735<sup>4</sup> and other equipment bound for the Australian offshore oil industry was loaded into the ship's two cargo holds.

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3 UN1813 is listed in the International Maritime Dangerous Goods (IMDG) Code as potassium hydroxide, solid. White pellets, flakes, lumps or solid blocks, deliquescent. Reacts with ammonium salts, evolving ammonia gas. In the presence of moisture, corrosive to aluminium, zinc and tin. Causes burns to skin, eyes and mucous membranes. Reacts violently with acids.

4 UN2735 is listed in the IMDG Code as Amines or Polyamines. Colourless to yellowish liquids or solutions with a pungent odour. Miscible or soluble in water. When involved in a fire, evolve toxic gases. Corrosive to most metals, especially to copper and its alloys. Reacts violently with acids. Causes burns to skin, eyes and mucous membranes.

On 5 August, *BBC Islander* sailed for Singapore. During its stay in Singapore, more general cargo was loaded into the ship's holds and onto the hatch covers. On 6 August, the ship sailed for Tanjung Uncang, Indonesia.

While *BBC Islander* was in Tanjung Uncang, a large piece of machinery was loaded from a barge onto the ship's cargo hold hatch covers. The master decided that the best way to secure the single 68 tonne piece of machinery to the ship's deck was to weld 16 stoppers (Figure 2) to the hatch covers, around each of the unit's four legs, to prevent it from moving and then lash it to the deck.

On 7 August, the ship sailed for Port Hedland, Western Australia, where the heavy lift unit of machinery was to be discharged.

At 1230 on 13 August, *BBC Islander* berthed in Port Hedland. The heavy lift unit was the only cargo to be discharged and when this was completed, the crew readied the ship for departure. By 1900, the ship had cleared the port, bound for Dampier.

**Figure 2: Stoppers welded to the hatch covers.**



*BBC Islander* arrived at the Dampier anchorage early in the morning of 14 August and, at 0654, the ship's port anchor was let go. The weather was fine with a partly cloudy sky and winds of between 11 and 16 knots. The weather was forecast to remain unchanged over the next few days.

At 0740, the boatswain came to the bridge for his morning work meeting with the chief mate. Amongst other things, they discussed the need to remove the stoppers from the hatch covers. The task was assigned to the ship's fitter, who was to cut the stoppers off the deck using oxy-acetylene cutting equipment and then grind off any remaining material so the hatch covers were smooth.

The chief mate filled out the hot work permit for the work on the hatch covers and, just before 0800, the fitter came to the bridge and signed it. The fitter left the bridge and then went to set up his oxy-acetylene equipment. At about 0830, he started cutting the stoppers off the forward cargo hold hatch covers.

The chief mate had not assigned any of the crew members to carry out a fire watch inside the cargo hold but had decided that he would check inside the holds every half hour. The cargo inside the holds was loaded in such a way that it was about three metres clear of the underside of the hatch covers. Therefore, he considered it would not be subjected to any undue heat as a result of the cutting and grinding associated with the removal of the stoppers.

By 1000, when the fitter stopped work for a coffee break, he had removed all eight stoppers from the forward hold hatch covers. He returned to work at 1030 and started cutting the stoppers off the port side of the aft hold's hatch covers. When he stopped for lunch he had removed three more stoppers.

At 1300, the chief mate checked inside the number two cargo hold before going to his cabin for a rest. He did not see anything that indicated that there was a problem inside the hold.

At about the same time, the fitter returned to work and removed the remaining stoppers from the port side of the aft hold's hatch covers. He then moved his equipment to the starboard side of the hatch covers and began cleaning the oxy-acetylene cutting nozzle in preparation for cutting off the next stopper. At about 1340, he noticed smoke coming from the aft cargo hold's ventilator. He brought the smoke to the attention of a seaman who was working nearby and the seaman used his hand held radio to call the second mate on the bridge.

The second mate told the seaman to close all of the cargo hold's vents and to start rigging fire hoses. The second mate then activated the ship's general alarm and telephoned the master to report the suspected fire. He then telephoned the engine room and asked for the fire pump to be started. At about this time, the cargo hold fire detection system alarm sounded.

When the master and the chief mate arrived on the bridge, they could see smoke escaping from between the aft cargo hold hatch covers and the hatch coaming. The master decided to leave the chief mate on the bridge and to go down to the main deck with the second mate for a closer look. By the time the master had arrived on the main deck, the crew had rigged four fire hoses. He instructed them to rig more hoses and told the second mate to get the chief mate.

Shortly afterwards, the chief mate and the chief engineer joined the master on the main deck and the three men discussed how they would attempt to fight the fire. They decided to use the fire hoses to boundary cool the cargo hold and the hatch covers and to use the ship's fixed fire extinguishing system to flood the hold with CO<sub>2</sub>.

At 1350, the chief engineer, the second mate and a seaman went to the forecandle to operate the fire extinguishing system. They swung the aft cargo hold three way valve to the extinguishing position and then manually discharged 19 cylinders of CO<sub>2</sub>, as per the procedure. The chief engineer noticed some frost building up on the engine room distribution valve. He surmised that some CO<sub>2</sub> was flowing past the valve because it was not completely closed, so he forced it closed. He also noticed that the height that the frost had built up to on the sides of the cylinders, as they discharged their contents, varied from cylinder to cylinder. This indicated, to him, that not all of the cylinders were full.

The master telephoned the ship's manager in Germany and advised him of the fire. The manager was asked to obtain some advice with regard to the dangerous goods being carried on board the ship. The master agreed to keep the manager informed of the situation on board the ship.

The crew continued to monitor the situation and, at 1420, five more cylinders of CO<sub>2</sub> were discharged, as per the ship's procedure. By 1530, there was still smoke escaping from the hold so the master decided to discharge 16 more cylinders of CO<sub>2</sub>.

At 1610, the master reported the fire and his actions thus far, to Dampier port communications. Port communications then informed the harbour master, the Australian Maritime Safety Authority (AMSA) and made an emergency '000' telephone call to the Fire and Emergency Services Authority of Western Australia (FESA).

At 1620, the Dampier harbour master spoke with the master and they discussed the situation on board the ship. The master raised his concerns that he was running low on CO<sub>2</sub> and asked the harbour master to see if he could source any cylinders of CO<sub>2</sub> that could be brought out to the ship.

At 1853, the harbour master again contacted the *BBC Islander's* master for an update of the situation. He was told that the crew were constantly monitoring the situation and that since 1530 there had been no sign of smoke. The master also stated that the hatch covers were not hot and that the crew were no longer cooling them with fire hoses. He also confirmed that there were 446 pallets of drilling mud stowed in the aft cargo hold, half at the forward end and half at the aft end, and that dangerous goods UN1813 and UN2735 were stowed on top of the pallets of mud at the aft end of the hold. There were also gas cylinders containing helium and oxygen stowed in the forward part of the hold.

At 1957, the harbour master contacted the master and passed on a message from FESA that he should continue cooling the hatch covers with water and not consider ventilating the hold until the ship's stocks of CO<sub>2</sub> had been replenished.

At 2135, smoke was again observed coming from the hold so the master decided to discharge the ship's remaining cylinders of CO<sub>2</sub>. By 2200, the amount of smoke escaping from the hold had started to reduce.

The harbour master, in consultation with *BBC Islander's* local agent, had arranged for the supply of 25 cylinders of CO<sub>2</sub>. The cylinders were loaded on board the offshore survey vessel *Marhab* and by 0700 on 15 August they had been delivered to *BBC Islander* and connected to the ship's CO<sub>2</sub> distribution rail.

At 0815, the crew again saw smoke escaping from the hold and, at 0830, the master decided to discharge all 25 cylinders of CO<sub>2</sub>. There was still smoke escaping from the cargo hold so the master instructed the crew to place wet rags around the hatch covers in an attempt to better seal them. By 1045, there appeared to be no smoke escaping from the hold.

At 1130, the harbour master, two AMSA surveyors and three FESA fire fighters boarded *BBC Islander*. They discussed with the master the available options for extinguishing the fire. After the discussions were completed they returned to shore.

At 1600, the harbour master advised the master that he was arranging for the ship to berth at the Dampier Cargo Wharf at about noon the next day. This would allow time to clear the berth of all other vessels and would coincide with the arrival of a bulk container of CO<sub>2</sub> that was being delivered from Perth.

A further 31 cylinders of CO<sub>2</sub> were sourced and by 1715 they had been delivered to the ship and connected to the CO<sub>2</sub> distribution rail.

At 0900 on 16 August, smoke was again seen escaping from the hold and another 10 cylinders of CO<sub>2</sub> were discharged. The amount of smoke escaping appeared to reduce and the ship's crew continued to monitor the situation while they prepared the ship for the transit to the wharf.

At 1139, a harbour pilot boarded *BBC Islander* and by 1312 the ship was all fast alongside the wharf. The harbour master, AMSA surveyors and FESA fire fighters boarded the ship to discuss the emergency response. While it was acknowledged that the port authority was the hazard management agency and FESA was an assisting combat agency, it was agreed that FESA would take charge of the response and that all other parties would assist as required.

The master informed the fire fighters that his company had advised him that the use of water or foam should be restricted due to the dangerous goods that were stowed in the hold.

By 1440, a bulk container carrying 15 tonnes of CO<sub>2</sub> was positioned adjacent to the ship on the wharf. At about the same time, a shore crane was used to unload the cargo that had been stowed on the hatch covers.

At 1500, fire fighters wearing breathing apparatus (BA) entered the ship's aft cargo hold. They used thermal imaging devices to determine that the fire was still active but had been suppressed. The temperature in the hold was about 36°C.

By 1635, another 15 cylinders of CO<sub>2</sub> had been delivered to the ship and connected to the CO<sub>2</sub> distribution rail.

**Figure 3: The aft cargo hold after the smoke had cleared.**



At about 1620, the aft cargo hold hatch covers were opened and, after the smoke had cleared, the area where the fire was seated could be identified (Figure 3). However, the introduction of air into the cargo hold caused the fire to reignite. Some flames were detected and they were extinguished using a small amount of water.

The hatch covers were closed and, at 1730, the fire fighters started pumping CO<sub>2</sub> from the bulk container into the ship's aft cargo hold. Throughout the CO<sub>2</sub> operations, the fire fighters continued to monitor the temperature inside the aft cargo hold.

At about 0750 on 17 August, the fire fighters stopped pumping CO<sub>2</sub> into the hold. By this time, all of the bulk container's 15 tonnes of the gas had been used.

At 1100, the hatch covers were opened and a crane was used to clear the cargo in the centre of the hold and a forklift was lowered into the hold. Fire fighters wearing BA sets were also lowered into the hold, via a basket connected to the crane. They started removing pallets of cargo in an attempt to access the seat of the fire and extinguish it using fire hoses (Figure 4). The fire fighters only used small amounts of water because they were attempting to minimise damage and there were still concerns about the water reacting with the cargo.

**Figure 4: Fire fighters attempting to access the seat of the fire**



At about 1630, operations were stopped and the fire fighters were removed from the hold. The forward stack of cargo had become unstable and the forklift was slipping and sliding on the wet tank top. Furthermore, the introduction of air, when the pallets of cargo were moved to access the seat of the fire, had caused the fire to spread. A blanket of foam was spread over the fire affected area of cargo and the hatch covers were partly closed.

At 1800, the hold was filled with high expansion foam in an attempt to suppress the fire until a cargo grab, that was to be sourced from Perth, was on site. The intention was to connect the grab to a crane and remove the smouldering cargo from the hold and place it on the wharf. Once the cargo was on the wharf, water could then be used to extinguish the fire.

The fire fighters monitored the situation throughout the night and continued to top up the high expansion foam as necessary. However, by the morning of 18 August, their stocks of high expansion foam concentrate were exhausted. As a result, the blanket of hi-expansion foam broke down and the fire started to spread rapidly. Eventually, the drums of dangerous goods stowed at the forward end of the aft cargo hold started exploding. The hatch covers were then closed in an attempt to contain the explosions and to restrict the supply of oxygen to the fire.

The fire fighters received advice from the State Hazard Emergency Advisory Team (HEAT) that there would not be a violent reaction if the cargo was doused with large volumes of water. They decided to extinguish the fire by flooding it with water. The chief mate was asked to calculate the amount of water that could be pumped into the hold without compromising the ship's stability. He determined that it would be acceptable to fill the hold with water to a maximum level of 2.5 m.

At 1410, the hatch covers were opened and the offshore supply vessel *Far Sword* came alongside *BBC Islander*. A jet of water from *Far Sword*'s fire monitor was then directed over the cargo in *BBC Islander*'s aft cargo hold (Figure 5). In about 12 minutes, approximately 700 tonnes of water was pumped into the hold (Figure 6).

**Figure 5:** *Far Sword's* fire monitor being used to extinguish the fire



Following the flooding of the hold, the fire fighters applied water and foam to the remaining hot spots. They remained on standby, continued to monitor the situation during the night and re-applied foam and water to the hot spots.

**Figure 6: The hold flooded with liquid to a depth of about two metres.**



The water in the hold had mixed with the cargo and, on the morning of 19 August, a sample was taken to determine the level of contamination. The contaminated water had a pH<sup>5</sup> reading of 11 and was, therefore, corrosive and had to be removed from the ship and disposed of appropriately.

The fire fighters continued to monitor the situation and maintained a blanket of foam over the cargo. Meanwhile, the chief mate transferred some of the contaminated water from the cargo hold to the ship's ballast tanks in an attempt to improve the ship's stability.

At 1200, the transfer of contaminated water from *BBC Islander*'s aft cargo hold to road tankers began. About 355 000 litres of waste was removed, transported 260 kilometres to Port Hedland and incinerated.

The fire fighters continued to monitor the ship while the cargo in the forward hold and the bulker bags stowed at the after end of the aft hold were discharged from the ship. A grab, connected to a crane, was then used to remove the remaining hot spots of cargo and dump them in the water within the hold. The fire fighters also hosed down the grab and cargo during this process (Figure 7).

On 23 August, AMSA carried out a port state control inspection on board *BBC Islander*. The ship was detained due to a number of safety related deficiencies but was allowed to leave the Dampier Cargo Wharf and proceed to the anchorage.

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<sup>5</sup> The pH scale is a measure of the acidity or alkalinity of a solution and ranges from 0 to 14. Pure water has a pH of seven and is considered to be neutral. A solution with a pH of less than seven is considered to be acidic, the lower the reading the more acidic it is. A solution with a pH of more than seven is considered to be alkaline, the higher the reading the more alkaline it is.

**Figure 7: Removing the hot spots of cargo**



On 1 September, after the AMSA detention order was lifted, *BBC Islander* sailed for Henderson, Western Australia, where a further 117 200 litres of liquid waste and 439 800 kg of solid waste were discharged from the ship.

## 2.1 Evidence

Between 15 and 19 August 2007, two investigators from the Australian Transport Safety Bureau (ATSB) attended *BBC Islander* in Dampier. The master and directly involved crew members were interviewed and they provided accounts of the incident. Photographs of the ship and copies of relevant documents were obtained, including log books, reports, manuals, procedures and statutory certificates.

The investigators also held discussions with the Dampier harbour master, the Australian Maritime Safety Authority (AMSA) and the Fire and Emergency Services Authority of Western Australia (FESA).

During the course of the investigation further information was obtained from the Dampier harbour master, AMSA, FESA and Transpacific Industries Group.

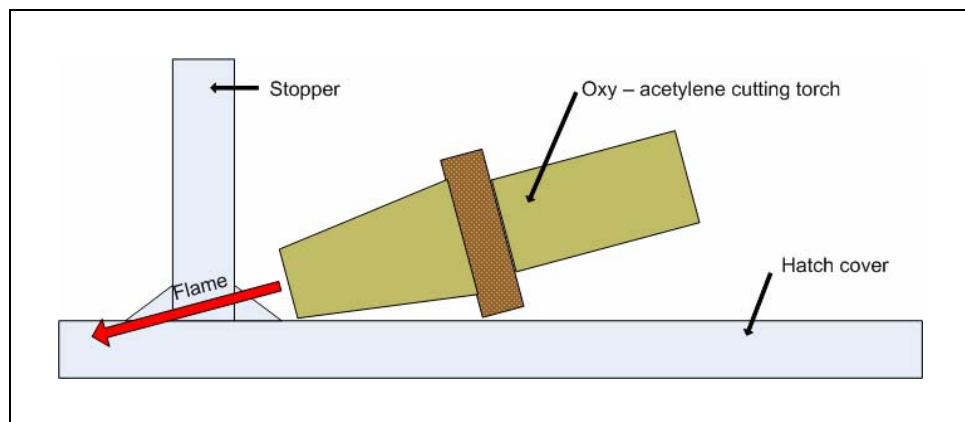
## 2.2 The fire

During the process of cutting the last stopper off the port side of the aft cargo hold hatch covers, the fitter inadvertently cut a small hole in the hatch cover with the oxy-acetylene cutting equipment. As a result, the cargo stowed in the aft cargo hold, beneath the hole, was ignited by a shower of sparks and molten metal.

### 2.2.1 Removing the stoppers

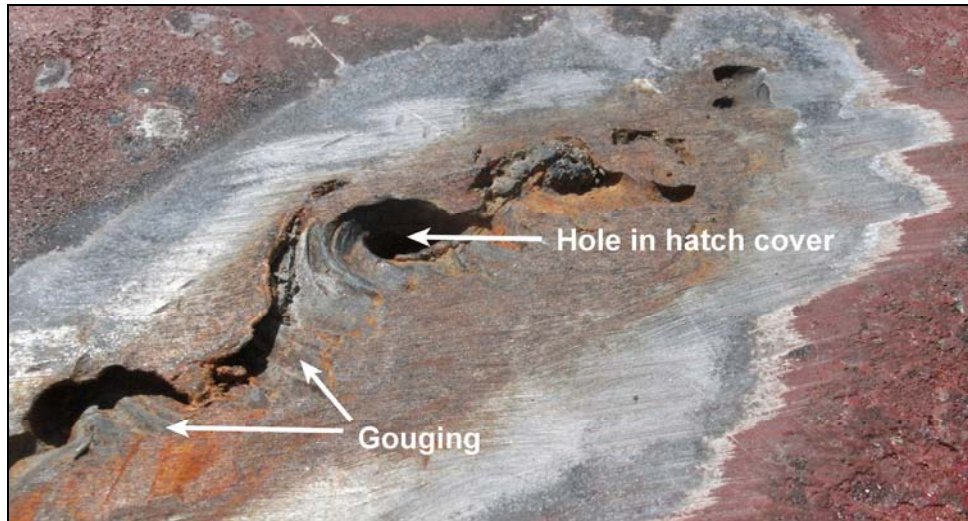
The stoppers were made from sections of mild steel I-beam and were about 15 mm thick so the fitter tried to cut them off as close as possible to the hatch covers to ensure that the amount of material that was left to grind off was minimised. However, the design of the oxy-acetylene cutting torch (Figure 8) led to him directing the oxy-acetylene flame downwards, at an angle towards the hatch covers. This resulted in areas of the hatch cover material being gouged by the flame (Figure 9).

**Figure 8: Schematic diagram of the oxy-acetylene cutting torch**



At about 1310, when the fitter removed the last stopper from the port side of the aft cargo hold hatch covers, he inadvertently cut a hole through the hatch cover. As a result, sparks and molten metal were blown into the cargo hold and onto the cargo stowed below.

**Figure 9: The gouging of the hatch cover**



The cargo stowed directly below the hole consisted of polyester bags of dry drilling mud that had been loaded onto wooden pallets and then shrink wrapped in plastic (Figure 10). Dunnage, mostly loose wooden pallets, had been placed between the stacks of cargo in order to stop any cargo movement in a seaway. It is likely that the sparks and molten metal fell down between the stacks of cargo and that the plastic shrink wrap started to melt. Soon afterwards the wooden pallets and dunnage probably ignited.

**Figure 10: Pallets of dry drilling mud**




## 2.2.2 The work permit system

BBC Islander's safety management system included procedures for hot work and a hot work permit system. It was a requirement of this system for a hot work permit to be completed and signed by the individual carrying out the work and the chief mate (referred to on the form as the chief officer) before the work was started.

On 14 August 2007, a hot work permit had been signed by the fitter and the chief mate. However, the fitter could not read English. While the chief mate discussed the task with the fitter, he did not fully understand the permit's requirements. The fitter then signed the permit, as he was instructed, and carried out the task he was given, as he understood it.

Figure 11: Hot work permit



### Hot Work Permit

This permit is valid	From : <u>09</u> hours <u>00</u>	To : <u>17</u> hours <u>00</u>	Date: <u>14.08.</u> Date: <u>14.08.</u>
Location of work	: <u>Top of Hatchcover No 1+2</u>		
Description of work	: <u>Take of Lashings from Deck</u>		
Crew carrying out the work	: <u>Fitter</u>		
Responsible Officer in charge	: <u>Chief Mate</u>		

1. Has the work area been checked with a combustible gas indicator for hydrocarbon vapours?	<input type="checkbox"/> yes	<input checked="" type="checkbox"/> no	<input type="checkbox"/> n/a
2. Has the equipment or pipeline been purged?	<input type="checkbox"/> yes	<input type="checkbox"/> no	<input checked="" type="checkbox"/> n/a
3. Has the equipment or pipeline been blanked?	<input type="checkbox"/> yes	<input type="checkbox"/> no	<input checked="" type="checkbox"/> n/a
4. Is the equipment or pipeline free of liquid?	<input type="checkbox"/> yes	<input checked="" type="checkbox"/> no	<input type="checkbox"/> n/a
5. Is the surrounding area safe?	<input type="checkbox"/> yes	<input checked="" type="checkbox"/> no	<input type="checkbox"/> n/a
6. Is additional fire protection available?	<input checked="" type="checkbox"/> yes	<input type="checkbox"/> no	<input type="checkbox"/> n/a
7. Is the equipment isolated electrically?	<input checked="" type="checkbox"/> yes	<input type="checkbox"/> no	<input type="checkbox"/> n/a
8. Special conditions/ precautions:	<u>NO</u>		

<u><i>Rausch</i></u> Chief Officer	<u><i>Stemp</i></u> Person of work
---------------------------------------	---------------------------------------

The work has been completed and all persons under my supervision, materials and equipment have been withdrawn.

<u><i>Rausch</i></u> Chief Officer	<u>08:00 14.08.2007</u> Time and date
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**GUIDANCE NOTES FOR HOT WORK**

This permit relates to any work involving temperature conditions which are likely to be of sufficient intensity to cause ignition of combustible gases, vapours or liquids in or adjacent to the area involved.

- Starting/ finishing time must not exceed the Authorised Signatories/ Responsible Officer's working hours.
- Specific location of work to be given.
- Description of work to include type of equipment to be used.

Revision: 0

Furthermore, the chief mate incorrectly signed off the work as being completed at 0800. This section of the permit should not have been filled out until after the work was completed.

The hot work permit was a very simple document (Figure 11) that asked seven quite generic questions, like 'Is the surrounding area safe?'. While the permit had a place for any special precautions to be included, on this occasion, none were considered to be necessary.

It is not unusual for a fire to start in a space adjacent to where hot work is being carried out. Therefore, it is a common precaution to keep a watch in the adjacent spaces during the hot work, thus ensuring that, if a fire starts, the alarm can be raised and the fire extinguished quickly.

However, on this occasion, the ship's hot work permit system was not specific enough to ensure that the crew monitored the cargo hold while the stoppers were being removed. Furthermore, the safety management system did not include any guidance or instructions that would have ensured that the chief mate adequately assessed the risks involved in carrying out the task before the fitter started work.

The chief mate thought that the only consideration inside the holds during the removal of the stoppers was the transfer of heat through the hatch covers. He had inspected the cargo holds on a number of occasions while the fitter was removing the stoppers and had seen nothing more than blistered paint. However, he had not considered the possibility that a hole might be cut in the hatch cover and that this may result in a fire in the cargo hold.

The ship's safety management system procedures did not ensure that the crew appropriately assessed the risks associated with removing the stoppers from the hatch covers. As a result, adequate precautions, in the form of a continuous fire watch inside the cargo hold, were not implemented before they started removing the stoppers.

## **2.3 Fire fighting response at the anchorage**

The response of the crew on board *BBC Islander* to the fire in the aft cargo hold was prompt and decisive. The alarm was raised quickly and within ten minutes the master had consulted with the ship's senior officers and decided to use the fixed fire extinguishing system to flood the cargo hold with CO<sub>2</sub>.

The fire was deep seated in the cargo. The plastic wrapping around the pallets was melting and the timber pallets and dunnage had ignited. However, the cargo hold hatch covers could not be opened to reach the fire because of the cargo loaded on top of them. Considering this, the type of fire and the resources available on board *BBC Islander* with which to fight the fire, the master's decisions, to flood the hold with CO<sub>2</sub> and boundary cool it, were reasonable.

Carbon dioxide is heavier than air and it extinguishes a fire by displacing the air and, therefore, starving the fire of oxygen. Because CO<sub>2</sub> has little cooling effect, the area where the fire is seated needs to remain sealed and flooded with CO<sub>2</sub> until the heat that was generated by the fire has dissipated. If the space is opened too soon, the introduction of air can allow the fire to reignite.

It was a SOLAS<sup>6</sup> requirement for the ship to carry enough CO<sub>2</sub> to fill each empty cargo hold with a concentration of 30 per cent of the gas. The aft cargo hold had a volume of 3165 m<sup>3</sup> and calculations contained in the ship's fixed fire extinguishing system instruction manual showed that 1696 kg of CO<sub>2</sub> was required to provide a 30 per cent concentration in the empty hold. The manual also contained instructions for the system's operation. In the case of a fire in the aft cargo hold, 19 cylinders of CO<sub>2</sub> had to be manually discharged, followed by four more cylinders half an hour later (1035 kg in total). The instructions stated that this quantity of CO<sub>2</sub> would be sufficient to extinguish a fire in a loaded cargo hold.

At 1350 on 14 August, the ship's crew discharged 19 cylinders of CO<sub>2</sub> followed by five more, half an hour later. Over the next seven hours, the remaining 21 cylinders were discharged as the crew observed smoke coming from the cargo hold.

By 0700 on 15 August, 25 more cylinders of CO<sub>2</sub> (640 kg) had been supplied to the ship and connected to the fixed fire extinguishing system discharge manifold. At 0830, all 25 cylinders were discharged into the hold. By this time, even considering the chief engineer's thoughts that not all of the original cylinders were full and that a small amount of gas had been discharged into the engine room, there should have been enough CO<sub>2</sub> in the hold to extinguish the fire.

**Figure 12: Hatch with missing dogs**



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

When the AMSA surveyors carried out the port state inspection on board *BBC Islander* after the fire, they discovered that the dogs securing the small access hatch between the aft cargo hold and the port side longitudinal void space were missing (Figure 12). The hatch was about 700 mm x 700 mm in size and positioned half way along the hold, about two metres below the hatch cover. The hatch was closed but not sealing correctly. Consequently, on each occasion that CO<sub>2</sub> was discharged into the hold, a small amount of the gas may have escaped through the poorly sealed hatch. Therefore, the effectiveness of the CO<sub>2</sub> in extinguishing the fire may have been diminished.

Smoke was first noticed coming from the ship's aft cargo hold at 1340 and the crew's response was initiated immediately. The master then telephoned the ship's manager, in Germany, and reported the fire. However, the fire was not reported to the local port authority until 1610, two and a half hours later. In this instance, the delay in reporting the fire to the port authority did not have an adverse impact on either the fire fighting on board the ship or the port authority's response to the fire. However, it is important that shipboard emergencies are promptly reported to the local authorities. This enables the authorities to appropriately plan their response to the emergency situation.

## **2.4 Fire fighting response alongside the wharf**

At 1312 on 16 August, *BBC Islander* berthed at the Dampier Cargo Wharf and, shortly afterwards, the FESA fire fighters assumed control of the emergency response. The master provided the fire fighters with a cargo plan that he believed to be inaccurate. He also advised them that his company had recommended that they limit the use of water and foam.

While the 84 FESA fire fighters who took part in the fire fighting response on board *BBC Islander* had been trained in the various tasks required to extinguish a fire similar to that encountered on board the ship, they had received little training in shipboard fire fighting and had only limited experience in responding to such fires. Furthermore, only 23 of them were full time, salaried, fire fighters. The remaining 61 fire fighters were volunteers.

Over the next two days the fire fighters tried, unsuccessfully, to extinguish the fire while following the master's advice and limiting the use of water. However, the fire was not extinguished until the afternoon of 18 August when the ship's aft cargo hold was flooded with about 700 tonnes of water.

### **2.4.1 The cargo stowage plan**

When *BBC Islander* sailed from Singapore, the ship's cargo stowage plan was neither accurate nor complete. Consequently, the ship was in breach of the SOLAS requirements for the carriage of dangerous goods. However, more importantly, the ship's master, its crew and the fire fighters were not armed with documentation that would clearly outline the location, and types, of dangerous goods that would be encountered during the emergency response on board the ship in Dampier. With reference to cargo stowage plans, SOLAS states:



*BBC Islander* was carrying a manifest that listed all of the cargo that was being carried on board the ship, including the dangerous goods. However, the manifest did not meet the SOLAS definition of a 'special list or manifest' because it did not list the location of each of the dangerous goods being carried on board the ship.

The ship was also carrying a cargo stowage plan (Figure 13) that had been prepared by the ship's crew before sailing from Singapore. The stowage plan also failed to meet the SOLAS requirements because it was incomplete and inaccurate. It did not show the location, or classification, of any of the dangerous goods being carried on board the ship.

The fire fighters used their own observations to gain some understanding of the cargo stowage and they regularly sought advice from FESA's scientific officer and the State Hazard Emergency Advisory Team (HEAT) but they remained uncertain as to what was stowed beneath the outer layers of cargo.

However, armed with their own observations and the cargo information available on board the ship, there was sufficient information to allow the fire fighters, in consultation with the ship's crew, to compile an accurate and complete cargo stowage plan.

#### **2.4.2 The use of carbon dioxide (CO<sub>2</sub>)**

The first action taken by the FESA fire fighters was to position a bulk container of CO<sub>2</sub> on the wharf. They then inspected the cargo hold, measuring temperatures within it and making an assessment of the fire scene. At this stage, the fire had been suppressed and there was probably sufficient CO<sub>2</sub> in the aft cargo hold to extinguish the fire. However, the fire fighters then chose to open the hatch covers so that they could see the fire and make a further appraisal of it. With regard to this action, the widely recognised shipboard fire fighting reference book, Rushbrook's *Fire Aboard*<sup>7</sup>, states:

The author would counsel everyone – professional fire brigades included – to take their time and not, as so often is the case, rush to take off the hatches in order to see what is happening. Far better to add supplies of gas for topping-up purposes, for a day or two if necessary, until arrangements have been made to handle the damaged cargo.

The fire fighters were informed by the ship's crew that all of the cargo hold's hatches and ventilators were closed. However, the small access hatch between the hold and the port side longitudinal void space was not sealing correctly. The fire fighters did not check the cargo hold and adjoining spaces themselves to confirm that all its openings were closed and correctly sealed before they started to pump the bulk CO<sub>2</sub> into the cargo hold.

The fire fighters then waited for only 17 ½ hours before they opened the hatch covers again. The temperatures at the seat of the fire had not changed and the introduction of air, predictably, caused the fire to once again reignite.

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<sup>7</sup> Rushbrook's *Fire Aboard*, Third edition 1998, Brown, Son & Ferguson Ltd Glasgow.

According to the ship's instruction manual 1035 kg of CO<sub>2</sub> would provide a sufficient concentration of the gas to extinguish a fire in the loaded cargo hold. However, over the next 15 hours the fire fighters pumped the entire contents of the bulk CO<sub>2</sub> container, 15 000 kg, into the hold. Some of the gas may have escaped through the poorly sealing void space access hatch. However, the cargo hold had been pressurised and, on the morning of 17 August, the gas could be heard escaping under pressure through the hatch seals.

There was no need to pressurise the cargo hold with CO<sub>2</sub> for the gas to be effective in extinguishing a fire. It is generally considered that to extinguish most fires sufficient CO<sub>2</sub> must be discharged into the space to ensure that the oxygen content in the space is reduced from the normal 21 per cent to no more than 15 per cent<sup>8</sup>. The CO<sub>2</sub> only needed to displace the air and keep it displaced until the seat of the fire had cooled sufficiently to allow the re-introduction of air without causing the fire to reignite.

Had all of the cargo hold vents and hatches been sealed correctly and the cargo hold remained flooded with CO<sub>2</sub> for a sufficient period of time, it is likely that the fire would have been extinguished.

#### ***Previous incidents where CO<sub>2</sub> was used to extinguish cargo hold fires***

On 26 October 1998, the general cargo ship *Southgate* was in Grande-Anse, Quebec, Canada. At about 1400, a fire broke out in the ship's number five cargo hold while packs of medium density fibre board were being loaded into it. The crew attempted to fight the fire but eventually the hatch covers were closed and the hold was flooded with CO<sub>2</sub>.

At 0800 on 27 October, the crew inspected the hold and the fire appeared to be extinguished. The hatch covers were opened and the fire reignited. The fire could not be controlled with fire hoses and foam so the hatch covers were closed and the hold was again flooded with CO<sub>2</sub>.

On 3 November, seven days later, the hatch covers were opened and the fire was declared extinguished.

On 4 January 2006, the general cargo ship *Skalva* was in Gaspé, Canada and electric arc-welding was being carried out in the ship's cargo hold. At about 1330, a fire broke out in a stack of timber cargo. Because the fire was deep seated, the master decided to close the hatch covers and then flood the hold with CO<sub>2</sub>.

The fire fighters were aware of what had happened on board *Southgate* so it was not until 12 January, almost eight days later, that they considered it was safe to open the hatch covers. For the previous four days the cargo hold temperatures had been about 0°C, consistent with the ambient temperature. The hatch covers were opened and it was confirmed that the fire had been extinguished.

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<sup>8</sup> Rushbrook's Fire Aboard, Third edition 1998, Brown, Son & Ferguson Ltd Glasgow.

### 2.4.3 Accessing the seat of the fire

Discharging or moving the cargo to reach the seat of a fire and using sufficient water to extinguish it is generally considered to be an appropriate course of action in response to a Class A<sup>9</sup> fire.

However, the attempt to access the seat of the fire on board *BBC Islander* and extinguish it may have been destined to fail, primarily because the fire fighters had complied with the master's request to limit their use of water. Without using sufficient amounts of water it was unlikely that the fire fighters were going to be able to extinguish the deep seated fire.

The fire fighters may have experienced difficulty even if they had been free to use large amounts of water to extinguish the fire. It was the water lying on the cargo hold tank top that led to the difficulty they experienced controlling the forklift while they were attempting to access the seat of the fire. Furthermore, as the fire developed and the fire fighters applied water in an attempt to extinguish it, the stack of cargo became unstable. Eventually, this attempt to access the seat of the fire and extinguish it was abandoned because it was deemed unsafe to allow the fire fighters to continue working in the hold.

With reference to accessing the seat of a cargo hold fire, the author of Rushbrook's *Fire Aboard* (he) states:

Admitting, and admiring, as he does the trained fire fighters ingrained urge to get to grips with the seat of a fire with the least possible delay, he believes none the less that there is much to be said for 'playing the waiting game' with any normal fire in a hold.....

If 95 per cent of a cargo can be saved by a certain line of attack and (i.e. flooding the hold with carbon dioxide) one which involves also minimal risk of structural damage to the vessel itself, what matters if the final extinction of the fire may take 48 hours or so?

Is the fire fighters eager urge to take instant and aggressive counter-offensive action against fire always wisely indulged?

The author believes that, in the case of most 'normal' fires in a ship's hold, it is not.

The fire fighters may have been better placed if they had left the CO<sub>2</sub> in the hold for an adequate period of time, allowing it to extinguish the fire. They could have monitored the fire and topped up the CO<sub>2</sub> without opening the hatch covers. In the intervening time they could have prepared for entering the hold and appropriately considered all of the available options for discharging the cargo. Furthermore, they could have used the intervening time to source further advice with regard to the effect that water would have on the cargo and in particular the dangerous goods.

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<sup>9</sup> A fire involving ordinary combustible or fibrous material such as wood, paper, fabric, coal, leather, sugar, rubber and some plastics.

#### **2.4.4 High expansion foam**

High expansion foam can be an effective fire extinguishing agent in enclosed spaces. It has a cooling effect and it smothers the fire, preventing the air and the flammable vapours from combining but the potential for a fire to continue to smoulder can be a limitation to its use<sup>10</sup>.

At 1800 on 17 August, the cargo hold was filled with high expansion foam in an attempt to control the fire until a cargo grab was on site. The intention was to connect the grab to a crane and remove the smouldering cargo from the hold and place it on the wharf. Once the cargo was on the wharf, water could then be used to extinguish the fire.

The fire fighters had made calculations relating to the quantity of foam concentrate that was required to maintain a blanket of hi-expansion foam in the cargo hold until the scheduled arrival of the cargo grab. They then ordered supplementary supplies of foam concentrate from Perth. However, the truck transporting the concentrate to Dampier was involved in an accident and the delivery was delayed.

The blanket of hi-expansion foam was effective in controlling the spread of fire but it is unlikely that it penetrated the spaces between the stacks of cargo to reach the seat of the fire. Then, when the stocks of foam concentrate had been exhausted, the foam blanket broke down and the fire began to spread rapidly. As the fire spread, the amount of heat it was generating increased. It was probably the heat that caused the liquid dangerous goods in the drums to expand, eventually causing the drums to explode under pressure.

By the morning of 18 August, the drums of chemicals were exploding and the fire appeared to be out of control. The fire fighters had to take action to quickly bring it back under control.

#### **2.4.5 Flooding the cargo hold with water**

The flooding of *BBC Islander's* aft cargo hold with about 700 tonnes of water seems, at first consideration, to be an extreme action. However, it was an action that successfully extinguished the fire.

The decision to flood the cargo hold was not one that was taken lightly. The fire fighters consulted with the ship's master and balanced their need to extinguish a fire that they could no longer access against the ship's stability limitations.

The master informed the fire fighters that they could fill the cargo hold with water to a maximum depth of about 2.5 m, without compromising the ship's stability. Furthermore, the fire fighters received advice from HEAT, contrary to the master's advice, that the cargo would not react adversely if doused with large quantities of water.

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<sup>10</sup> Foams: Theory, Measurements, and Applications Robert K. Prud'homme, Saad A. Khan, 1996.

The key aims of a fire fighting operation should be to minimise loss of life, injury and destruction of property. While flooding the cargo hold with water successfully extinguished the fire and no one was injured, much of the cargo stowed in the ship's aft cargo hold was destroyed (Figure 6). Furthermore, the costs associated with returning the ship to service proved to be substantial.

In all 439 800 kilograms of solid waste and 472 000 litres of liquid waste was removed from the ship's cargo hold following the fire fighting response. The ship's cargo hold, ballast tanks, pipes and pumps also had to be cleaned and de-contaminated before the ship could return to service. It was not until seven weeks after the fire started that the ship was back in service.

### 3.1 Context

On 14 August 2007, *BBC Islander*'s crew inadvertently started a fire in the ship's aft cargo hold while they were using oxy-acetylene cutting equipment to remove steel brackets from the cargo hold's hatch covers.

At about 1340, smoke was noticed coming from the aft cargo hold and the general alarm was sounded. The master decided to use the ship's fixed fire extinguishing system to flood the cargo hold with carbon dioxide.

By 1312 on 16 August, *BBC Islander* had berthed in Dampier and the local fire fighting authorities had taken control of the response. Over the next two days a number of unsuccessful attempts were made to extinguish the fire.

On 18 August, the fire was finally extinguished when an offshore supply vessel's fire monitor was used to flood *BBC Islander*'s aft cargo hold with about 700 tonnes of seawater.

From the evidence available, the following findings are made with respect to the fire that occurred on board *BBC Islander* at Dampier on 14 August 2007 and should not be read as apportioning blame or liability to any particular organisation or individual.

### 3.2 Contributing safety factors

- The ship's cargo stowage plan was neither accurate nor complete. Consequently, the ship was in breach of the SOLAS requirements for the carriage of dangerous goods. However, more importantly, the ship's master, its crew and the fire fighters were not armed with documentation that clearly outlined the location, and types, of dangerous goods that would be encountered during the emergency response on board the ship in Dampier. [*Safety Issue*]
- The ship's safety management system procedures did not provide sufficient guidance to ensure that the crew appropriately assessed the risks associated with removing the stoppers from the hatch covers. As a result, adequate precautions, in the form of a continuous fire watch inside the cargo hold, were not implemented before they started removing the stoppers. [*Safety Issue*]
- The fitter removing the stoppers from the cargo hold hatch covers could not read English and hence could not fully understand the requirements of the ship's safety management system hot work permit. [*Safety Issue*]
- A hole was inadvertently cut in one of the aft cargo hold hatch covers while a stopper was being removed by the fitter. It is likely that molten metal fell into the hold and ignited the cargo below.
- The access hatch between the ship's aft cargo hold and the port side longitudinal void space was not sealing correctly because its securing dogs were missing. As a result, some of the carbon dioxide may have escaped from the hold, thus reducing its effectiveness in extinguishing the fire in the cargo hold.

- The fire fighters had received little training in fire fighting on board ships and had only limited experience in responding to such fires. As a result, the hatch covers were prematurely opened on 16 August to enable them to see the fire and assess the situation. Then, when they closed the hatch covers and flooded the hold with carbon dioxide, insufficient time was allowed for the carbon dioxide to extinguish the fire. *[Safety Issue]*
- In the afternoon of 17 August, while the fire fighters were actively trying to extinguish the fire with hoses, it became dangerous for them to work within the cargo hold because the stack of cargo at the forward end of the hold became unstable.
- The application of a blanket of hi-expansion foam over the cargo, during the night of 17 August 2007, was effective in preventing the fire from spreading until the local stocks of foam concentrate were exhausted. *[Safety Issue]*
- In the afternoon of 18 August, the fire was successfully extinguished when the cargo hold was flooded with about 700 tonnes of water. However, this action resulted in the destruction of much of the cargo in the aft cargo hold and substantial cleanup costs.

### **3.3 Other safety factors**

- The fire on board *BBC Islander* was not reported to the local port authority until 1610, two and a half hours after it was discovered. In this instance, the delay in reporting the fire to the port authority did not have an adverse impact on either the fire fighting on board the ship or the port authority's response to the fire. However, it is important that shipboard emergencies are promptly reported to the local authorities. This enables the authorities to appropriately plan their response to the emergency situation.

**4.1 ATSB recommendations****MR20080001**

The ship's safety management system procedures did not provide sufficient guidance to ensure that the crew appropriately assessed the risks associated with removing the stoppers from the hatch covers. As a result, adequate precautions, in the form of a continuous fire watch inside the cargo hold, were not implemented before they started removing the stoppers.

The Australian Transport Safety Bureau advises that Briese Schiffahrts should consider the safety implications of this safety issue and to take action where it is considered appropriate.

**MR20080002**

The fire fighters had received little training in fire fighting on board ships and had only limited experience in responding to such fires. As a result, the hatch covers were prematurely opened on 16 August to enable them to see the fire and assess the situation. Then, when they closed the hatch covers and flooded the hold with carbon dioxide, insufficient time was allowed for the carbon dioxide to extinguish the fire.

The Australian Transport Safety Bureau advises that the Fire and Emergency Services Authority of Western Australia should consider the safety implications of this safety issue and to take action where it is considered appropriate.

**4.2 ATSB safety advisory notices****MS20080003**

The ship's cargo stowage plan was neither accurate nor complete. Consequently, the ship was in breach of the SOLAS requirements for the carriage of dangerous goods. However, more importantly, the ship's master, its crew and the fire fighters were not armed with documentation that clearly outlined the location, and types, of dangerous goods that would be encountered during the emergency response on board the ship in Dampier.

The Australian Transport Safety Bureau advises that ship owners, operators and masters should consider the safety implications of this safety issue and to take action where it is considered appropriate.

**MS20080004**

The fitter removing the stoppers from the cargo hold hatch covers could not read English and hence could not fully understand the requirements of the ship's safety management system hot work permit.

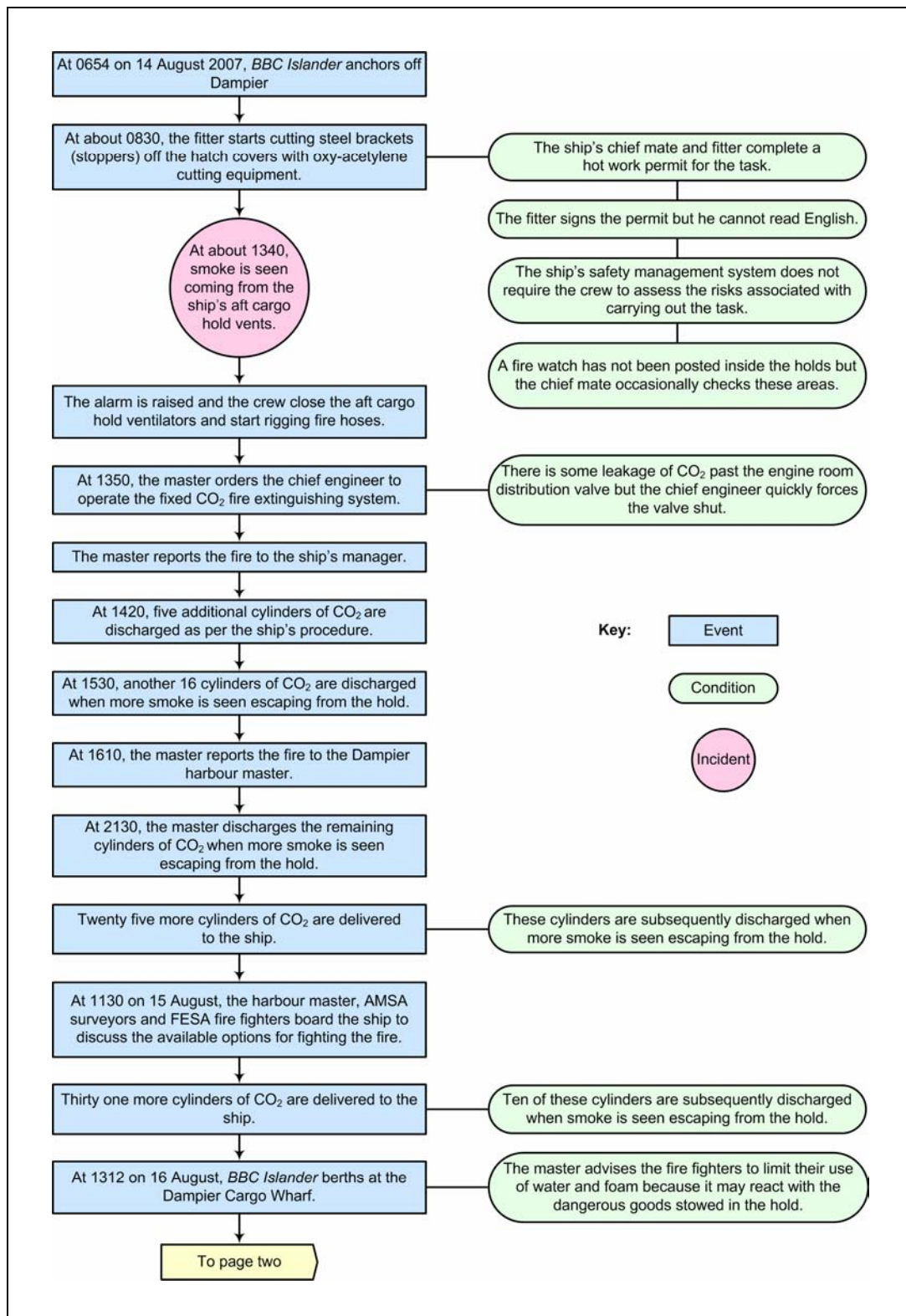
The Australian Transport Safety Bureau advises that ship owners, operators and masters should consider the safety implications of this safety issue and to take action where it is considered appropriate.

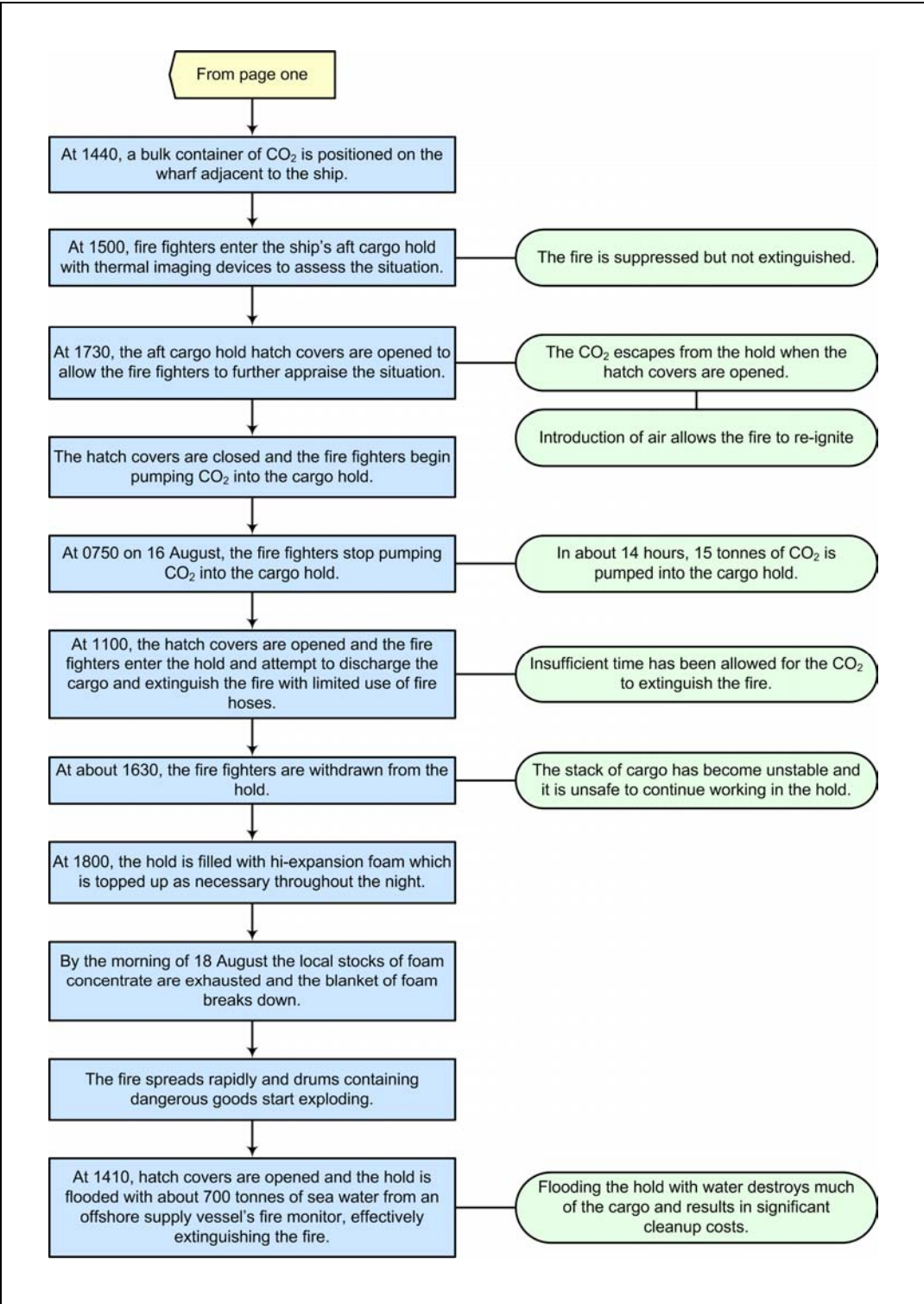
**MS20080005**

The application of a blanket of hi-expansion foam over the cargo, during the night of 17 August 2007, was effective in preventing the fire from spreading until the local stocks of foam concentrate were exhausted.

The Australian Transport Safety Bureau advises that the Fire and Emergency Services Authority of Western Australia should consider the safety implications of this safety issue and to take action where it is considered appropriate.

# APPENDIX A : EVENTS AND CONDITIONS CHART





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## APPENDIX B : SHIP INFORMATION

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### ***BBC Islander***

IMO Number	9183491
Call sign	V2AU9
Flag	Antigua & Barbuda
Port of Registry	St Johns
Classification society	Germanischer Lloyd (GL)
Ship Type	General cargo
Builder	Zhejiang Shipyard
Year built	1998
Owners	Briese Schifffahrts
Ship managers	Briese Schifffahrts
Gross tonnage	3862
Net tonnage	1901
Deadweight (summer)	4979 tonnes
Summer draught	6.236 m
Length overall	100.7 m
Length between perpendiculars	93.5 m
Moulded breadth	16.4 m
Moulded depth	8.0 m
Engine	MAK 9M32
Total power	3960 kW
Crew	14



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## APPENDIX C : SOURCES AND SUBMISSIONS

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### Sources of information

*BBC Islander's* master and crew

Dampier Port Authority

Fire and Emergency Services of Western Australia

Australian Maritime Safety Authority

Transpacific Industries Group

### References

Foams: Theory, Measurements, and Applications Robert K. Prud'homme, Saad A. Khan, 1996

Rushbrook's Fire Aboard, Third edition 1998, Brown, Son & Ferguson Ltd

### Submissions

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

The final draft of this report was sent to the Australian Maritime Safety Authority, the Fire and Emergency Services of Western Australia, the Dampier Port Authority, the Antigua and Barbuda Department of Marine Services and Merchant Shipping and *BBC Islander's* master and ship manager. All submissions have been included and/or the text of the report was amended where appropriate.



Independent investigation into the fire on board the Antigua and Barbuda  
registered general cargo ship *BBC Islander* at Dampier, Western Australia,  
14 August 2007