

Departmental investigation  
into the accommodation fire aboard the  
bulk carrier  
**DOCEBAY**  
off the coast of Queensland  
on  
13 May 1996



No 92



**Transport and  
Regional Development**

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**Navigation Act 1912  
Navigation (Marine Casualty) Regulations  
investigation into the into the  
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DOCEBAY  
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Investigation into marine casualties occurring within the Commonwealth's jurisdiction are conducted under the provisions of the Navigation (Marine Casualty) Regulations, made pursuant to sub section 425 (1) (ea) and 425 1 AAA of the Navigation Act 1912. The Regulations provide discretionary powers to the Inspector to investigate incidents as defined by the regulations. Where an investigation is undertaken the Inspector must submit a report to the Secretary of the Department. It is Departmental policy to publish such reports in full as an educational tool.

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Marine Incident Investigation Unit  
Department of Transport and Regional Development  
P O Box 594  
CANBERRA ACT 2601

Phone: 06 274 7324

Fax: 06 274 6699

Email: [MIIU@dot.gov.au](mailto:MIIU@dot.gov.au)

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# Sources of information

The Master and officers, *Docebay*

ABS Sydney

CSIRO

Forensic Services, Australian Federal Police

## **Acknowledgement**

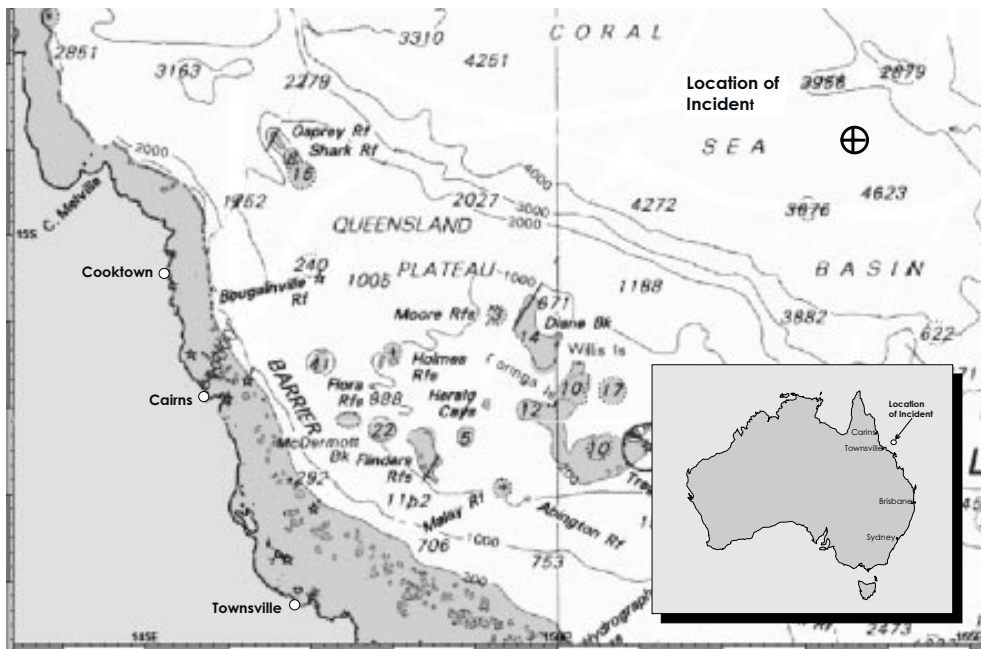
Portion of chart Aus373, reproduced by permission of the Hydrographic Office RAN.

# Summary

On the morning of 13 May 1996, the 152,308 tonne dwt. Liberian flag bulk carrier Docebay was on ballast passage from Japan to Dalrymple Bay in Queensland. At 0400, the ship was at the position 13°47.7' S, 153° 56.8' E, approximately 500 nautical miles north-east of Townsville.

Shortly before 0400, the Second Engineer had left his cabin for his 0400-0800 watch in the engine room. At about 0405, the First Engineer, in the cabin adjacent to that of the Second Engineer, heard the sound of a fire and felt heat through their common bulkhead. He telephoned the engine room and the Second Engineer returned to his cabin, where, upon unlocking and opening the door, he was met by a

## Portion of chart Aus 373 showing location of Incident



blast of heat and black smoke. The ship's fire detection system went into alarm. The fire very quickly gained a hold in the cabin as the ship's crew started to tackle the fire from the Chief Engineer's cabin, at the forward end of the alleyway, and from the external door at the aft end of the alleyway. The ventilation was shut down and boundary cooling was applied to the decks above and below the Second Engineer's cabin.

At 0432 the Master broadcast a Mayday message which was received and acknowledged by the Maritime Rescue Co-ordination Centre in Canberra.

After 1¾ hours the fire was extinguished and the Mayday was cancelled. The fire had gutted the Second Engineer's cabin and caused extensive smoke damage to other areas on the same deck. Nobody had been injured during the incident.

The vessel anchored at Hay Point on 14 May before loading its cargo of 130,000 tonnes of coal for Praia Mole in Brazil.

Before the ship arrived at Hay Point, the cabin was completely cleaned out. This action, unfortunately, removed any evidence which would have assisted in determining the cause and origin of the fire. Nevertheless, the investigation revealed that in other cabins on the vessel there were electrical extensions, made up by crew members, to provide power from the scarce power points to televisions, VCRs and sound systems situated some distance from them.

Although the lack of available evidence prevented any conclusion being reached on the cause of the fire, an extension lead used in the Second Engineer's cabin, the construction of which would not meet Australian Standards, was suspected.

The incident was investigated by the Marine Incident Investigation Unit under the provisions of the Navigation (Marine Casualty) Regulations.

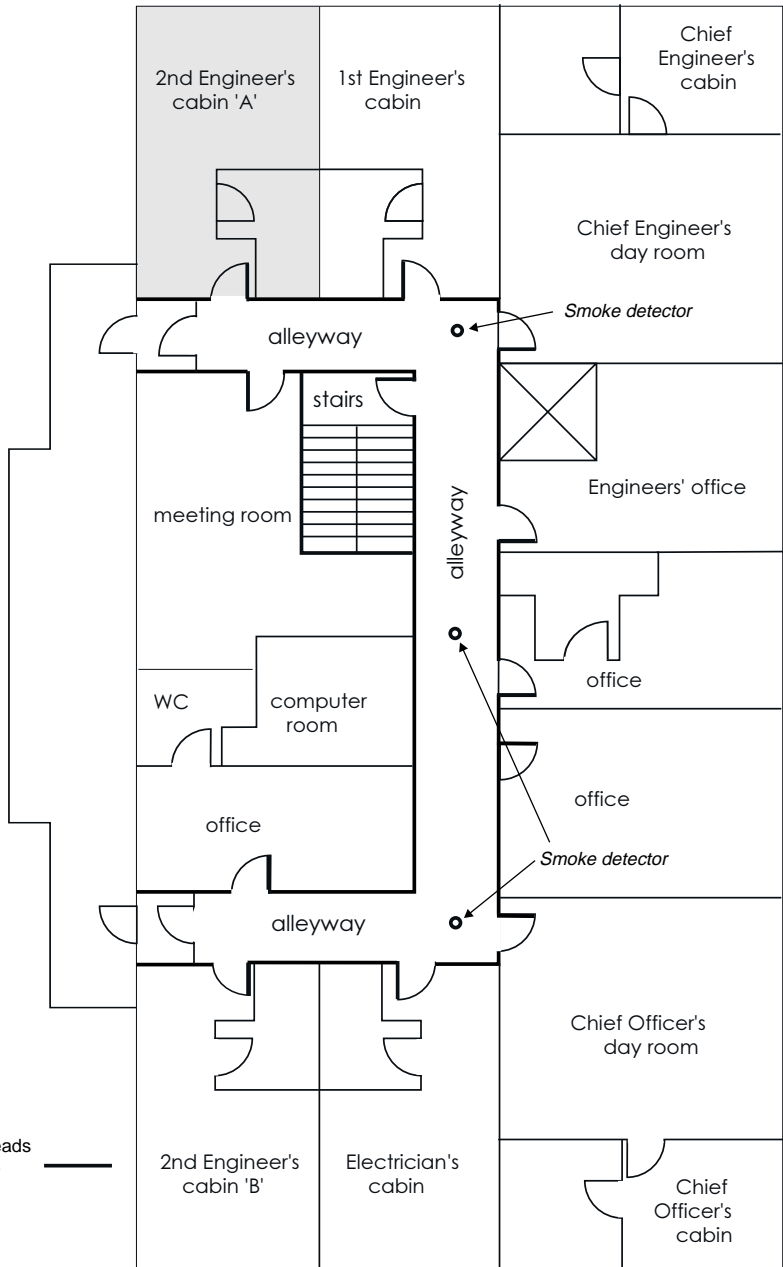
# Docebay

*Docebay* is a Liberian flag bulk carrier of 152,308 tonnes deadweight (79,184 gross tonnes) strengthened for heavy cargoes and having nine holds and nine hatches. It has a length of 276.99 m, a beam of 43.5 m and a moulded depth of 24.01 m. The main engine is a 6 cylinder Hitachi Zosen B&W of 12,578 kW driving a single screw. The vessel is classed with American Bureau of Shipping (ABS) as an ABS + A1 (E) Bulk carrier.

The ship was built in 1986 in Brazil by Verolme Est. Reunidos do Brasil S.A. - Angra dos Reis. It is owned by the Stallworthy Corporation of Wilmington in the USA, is chartered by the Seamar Shipping Corporation of Monrovia, Liberia and is managed by Sea & Port Shipping Management of Nassau, Bahamas. Both Seamar Shipping and Sea & Port Management are owned by Docenave which is itself controlled by the Government of Brazil.

As a bulk carrier, *Docebay* is employed mainly in exporting iron ore from Brazil and returning with cargoes of coal as imports to Brazil. It has a crew of 24 consisting of the Master, three deck officers, a radio officer, four engineer officers, an electrician, two fitters, four firemen, a Bosun, five seamen, a cook and a messman. At the time of the fire, the ship was carrying three supernumeraries including crew members' wives.

The Master, officers and crew are all Brazilian nationals.



Layout of Upper Bridge Deck

MV DOCEBAY

## **Accommodation**

The vessel's accommodation, in common with all bulk carriers, is situated aft. The officers are accommodated on two decks below the bridge, known as the Captain's Deck and the Upper Bridge Deck. The engineers are accommodated on the lower of these two, the Upper Bridge Deck. The alleyways on these decks are arranged in a U-shape (see diagram page 9). The Second Engineer's cabin is situated at the after end of the port alleyway and, as such, has two external bulkheads. The other two bulkheads border on the alleyway and the First Engineer's cabin, immediately forward of the Second Engineer's. The crew are accommodated below the Upper Bridge Deck, on the Bridge Deck and the Boat Deck.

## **Fire-fighting arrangements**

Apart from lifeboat muster stations, Docebay has no emergency muster positions. The watch and station bill lists, in detail, the duties of each crew member in case of fire, and a system of rings on the emergency alarm bells indicates to the crew the approximate location of the emergency - one ring for forward, two for midships and three for aft. In case of fire, the crew report directly to the scene of the fire, about which further information is announced on the ship's public address system.

Three breathing apparatus sets are carried on board, two of these being located on the bridge and one in the engine room. There are also three fire-fighting proximity suits carried, one on the bridge, one in the engine room and one in the Bosun's store. The ship is fitted with both 65 mm fire hoses and 38 mm hoses, the 65 mm hoses being stowed on deck and the 38 mm hoses being stowed around the accommodation spaces. There are no 25 mm "first-aid" rubber fire hose reels in the accommodation. Water, CO<sub>2</sub>, dry powder and foam

extinguishers are stowed at various locations around the accommodation spaces and in the engine room.

Docebay has three fire pumps, an electrically-driven dedicated fire pump, an electrically-driven fire and general service pump, both in the engine room, and a diesel-driven emergency fire pump in the forecandle.

The ship is fitted with an automatic fire detection and alarm system located on the bridge. The accommodation decks are fitted with three smoke detectors on each deck, one in the centre and one at each end of the cross-alleyway. There are no sensors in individual cabins.

## **The fire**

On 4 May 1996, Docebay sailed from Kakagowa, Japan, bound for Dalrymple Bay near Mackay, Queensland. The vessel was in ballast, having discharged a cargo of Brazilian iron ore in Japan. On arrival at Dalrymple Bay the ship was to load 130,000 tonnes of coal for Praia Mole in Brazil.

At 0400 on the morning of 13 May, the ship was approximately 500 nautical miles north-east of Townsville at the position 13°47.7' S, 153°56.8' E. The weather was fine with a 20 knot south-easterly wind and Docebay was making 13.7 knots on a course of 197° heading for Dalrymple Bay.

The Second Engineer had awakened at approximately 0330 and, after having a wash and then donning his overalls, he left his cabin at about 0350 to start his engine room watch at 0400. As is customary for most crew members aboard Docebay, he locked his cabin before heading for the engine room. At about the same time, the Chief

Officer arrived on the bridge to commence his 0400-0800 bridge watch.

The First Engineer occupied the cabin immediately forward of that of the Second Engineer on the port side of the Upper Bridge Deck. At some time around 0405, he awoke to the sound of a fire burning, the smell of smoke and sensed heat coming through the bulkhead adjacent to the head of his bunk. Seeing the time, he realised that the Second Engineer would have gone down to the engine room for his watch and, knowing that the cabin would be locked, he telephoned the engine control room. The telephone was answered by the 12-4 watchkeeper who passed the message to the Second Engineer. The First Engineer then telephoned the bridge and advised the Mate of the situation.

The Second Engineer raced up the stairs to the bridge deck, unlocked his cabin and opened the door. He was met by a blast of heat and thick black smoke. After pulling the door closed again, he ran to the Chief Engineer's cabin, at the forward end of the same alleyway, shouting that his cabin was on fire and banging on the Chief Engineer's door.

Soon after the Mate had received the telephone call from the First Engineer, the fire detector at the for'd end of the port side of the alleyway was activated, initiating an alarm on the bridge fire panel. The Mate noted the location of the fire from the bridge fire panel which was indicating a fire on the port side of the Upper Bridge Deck. He telephoned the Master and advised him of the situation before leaving the bridge for the scene of the fire.

Having roused the Chief Engineer, the Second Engineer obtained a fire hose from the deck above. Other crew members quickly responded to the alarm and started to tackle the fire using

extinguishers - four water and four CO<sub>2</sub> extinguishers were used, but this action proved quite ineffective. On his return, the Second Engineer gave them the hose to run out before making his way to the engine room to get the extended fog nozzle which was stowed there.

The Chief Engineer, having been awakened by the Second Engineer, donned his overalls and boots and attempted to make his way into the alleyway from his cabin. On opening his cabin door, he found the smoke and heat in the alleyway so intense that he had to immediately retreat, closing the door again. The forward facing windows in his cabin, unlike those in tankers, can be opened and after opening the window closest to the port side, he climbed out and reached a vertical fixed ladder running down the front of the superstructure, by which he was able to descend to the main deck.

At the aft end of the bridge deck there is an external access to the accommodation air conditioning fan room on the Bridge Deck. The fans had already been manually tripped by one of the engineers, so the Chief Engineer, by putting the recirculating flaps in the “external” air supply position then closing the external doors over the inlet filters, effectively isolated any supply of air to the fire via the air conditioning system. When the fire alarm had sounded, the electric fire pump had been started in the engine room and was pressurising the firemain. The emergency fire pump in the forecastle was also started and left running sea-to-sea, ready to connect to the firemain if needed.

The crew, on deck, prepared hoses and the Chief Engineer climbed back up the ladder, and back into his cabin, taking with him an unpressurised 65 mm hose. When the hose had been charged he again opened his cabin door and began to fight the fire from the forward end of the alleyway. He was soon joined by other crew members, with another hose, which had also been brought up the ladder and through his cabin window.

Another fire-fighting team, under the direction of the Mate was, by this time, approaching the fire from the external access at the aft end of the Upper Bridge Deck. VHF radio communication was established between this team and the bridge. The intensity of the smoke very quickly became such that the fire-fighters were unable to enter the accommodation without breathing apparatus and both officers and crew members used the three breathing apparatus sets in relays.

When the Master had arrived on the bridge he had stopped the vessel's main engine in order to reduce the wind speed around the accommodation but, as the fire-fighting progressed, the smoke continued to intensify. At 0432 he broadcast a Mayday message on Inmarsat A. This message was received by the Maritime Rescue Co-ordination Centre (MRCC) in Canberra and acknowledged at 0454. During the course of the fire, the Master moved between the bridge and the scene of the fire, dividing his attention between communications with the outside world and the fire-fighting operations.

Boundary cooling was applied to the port side of the accommodation from hoses set up on the port bridge wing and in the vicinity of the port lifeboat. In addition, hoses were connected at the port side of the Captain's Deck, to apply boundary cooling around the store and apprentices' cabin above the fire, and at the port side of the Bridge Deck, to cool the deckhead in the motormens' cabins below the fire.

At 0556, Docebay received a message from the MRCC requesting details of the nature and position of the fire and advising that the nearest vessel to Docebay's position was the containership Contship Europe, some 60 nautical miles, or 3.6 hours steaming, away. The measures taken, however, had successfully contained the fire within the area surrounding the Second Engineer's cabin and by 0550 the

fire was out. At 0612, the Master was able to send a message to the MRCC advising that the situation was under control and that no further assistance was required.

It had taken approximately 1¾ hours to put out the fire. After assessing the damage and isolating electrical circuits to the Upper Bridge Deck, the ship again got under way for Dalrymple Bay at 0856, with a 24 hour fire-watch posted. The fire detection and alarm systems had sustained wiring damage during the fire and been rendered inoperable. During the remainder of the passage, the accommodation was dried out and the Second Engineer's cabin was completely stripped of debris and the remains of the furnishings. The debris was stored in plastic bags on the after deck.

Docebay arrived at the northern anchorage off Hay Point on 15 May and anchored at 2247. An Investigator boarded the vessel to interview the crew, to inspect the accommodation and to examine the debris that was left in the plastic bags. After temporary repairs to the requirements of the classification society, in particular the reinstatement of the vessel's fire detection and alarm systems, the vessel berthed, loaded and then continued its voyage to Brazil where permanent repairs to the accommodation were to be undertaken.

# Comment and analysis

## Damage

The Second Engineer's cabin had been gutted by the fire. The Upper Bridge Deck port side alleyway sustained considerable heat damage in the area adjacent to the Second Engineer's cabin, with charring of the laminate panels and melted fittings. Smoke damage on that deck extended around to the starboard side alleyway. The First Engineer's cabin suffered some damage due to heat transfer through the common bulkhead. Most of the other cabins on that deck sustained extensive smoke damage and the conference room, immediately opposite the Second Engineer's cabin, and the Electrician's cabin, both of which had their doors held open by holdbacks, were significantly damaged by the heat. There was no fire damage to any compartment either above or below the Upper Bridge Deck.

Other than the fire detection and alarm systems, which suffered fire damage to the wiring, it appears that damage was confined to the upper bridge deck. The alarm systems were rendered inoperable until repaired at Dalrymple Bay. The Pilot who brought the ship into the anchorage at Hay Point reported that all navigational equipment was working correctly during the pilotage.

## The source

A diagram showing the layout of the Second Engineer's cabin before the fire is shown on page 20. Unfortunately, by the time Docebay arrived at the anchorage at Hay Point, the cabin had been completely stripped of all debris, damaged furnishings and personal belongings. When the investigating officer boarded, the deck and bulkheads were



**Heat and smoke damage in alleyway outside  
2nd Engineer's cabin**



**View from 1st Engineer's cabin of bulkhead between 2nd and 1st Engineers'  
cabins showing effect of heat transfer**

completely bare and no evidence remained by which the cause of the fire could be positively ascertained. In spite of examining the scorch and burn marks on these areas and the ashes and remnants of the cabin contents in garbage bags on deck, it was not possible to establish, with any degree of certainty, either the cause of the fire or the position of its source.

The speed at which the fire became established is worthy of note. The Second Engineer, a non-smoker, had left his cabin at approximately 0350. By 0405 the fire could be heard in the First Engineer's cabin and the heat felt through the bulkhead. When the Second Engineer left his cabin, the strip light over his bunk and the strip light over his desk were left switched on. The refrigerator was on, but all other electrical equipment in his cabin, the television, VCR and sound system were reportedly switched off. The electric fan was not in use and was stowed in the wardrobe. Neither he, nor any of the other personnel on board were able to offer any evidence which could provide a pointer to what might have started the fire.

## **Combustible materials**

For a fire to occur, there are three pre-requisites - combustible material to fuel the fire, a supply of oxygen, usually in the form of air, and a source of ignition.

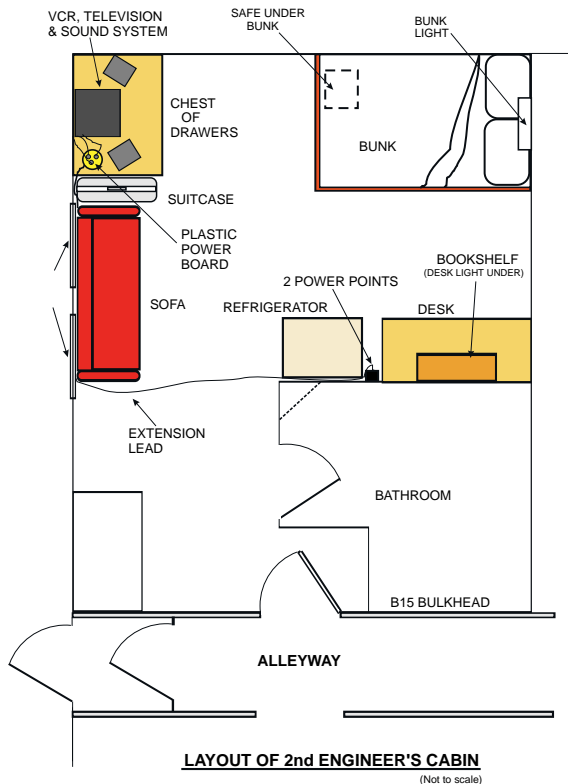
The cabins are somewhat austere furnished. (See photos page 19). There is no carpet or matting on the decks, which have a covering of vinyl tiles. The desks, chests of drawers and wardrobes are constructed of laminate-covered chipboard and the sofas and chairs are upholstered in vinyl-covered polyurethane foam. There are a pair of short curtains over the two windows which appeared to be of cotton/polyester material. The bunk mattresses are of polyurethane



**2 views of typical cabin furnishings**



**Extension lead and power board as used in 2nd Engineers' cabin**



foam. Other combustible materials in the cabins would be personal items, such as clothing, books and papers.

Some cabins, as did the Second Engineer's, have a small refrigerator, purchased by the individual crew-member. In the case of the Second Engineer's cabin, there were also, on top of the chest of drawers, a television set, a VCR and a "mini" sound system. The structural components of these latter items were of plastic, although the VCR had a metal frame and cover. In addition, a few other items were

stowed under the desk, such as cardboard boxes and a large, folded, rug. The boxes were the original containers for the television set and the VCR, while the rug, which had been bought ashore and remnants of which were found, was of wool and although charred, did not appear to have burned. There was a suitcase, containing overalls, stowed between the sofa and the side of the chest of drawers. The suitcase was of polypropylene, or similar plastic, with an aluminium frame.

The temperature rise in a small space, such as a ship's cabin, due to even a small fire can be rapid. In the first 7 or 8 minutes the ceiling temperature can reach approximately 500°C. At a temperature of just



**Burned area of vinyl deck tiles adjacent to 2nd Engineers bunk**



**Fire damage to cabin windows and bulkheads**

over 600°C “flash over” occurs and all exposed combustible materials in the space may be expected to ignite. At the end of this initial period of fire spread, however, the available oxygen in the space may be nearly exhausted and the rate of increase in burning slows. At that stage, the admission of more air by, for example, opening the cabin door will allow the fire to expand extremely quickly; almost explosively if unburned combustible gases have built up within the space.

The speed with which the fire spread into the alleyway and with which it regained a hold after the Second Engineer opened the cabin door suggests that this occurred. Although he reportedly closed the door to his cabin, it appears unlikely that the door latched, as within moments of his having closed it, the heat and smoke had filled the alleyway, activating the smoke detector at the forward end.

After the fire, it was found that both the laminated glass cabin windows had been shattered by the heat. It is uncertain at what stage of the fire this occurred, but if this had occurred in the early stages, the supply of outside air admitted to the cabin would also help to explain the speed with which the fire gained a hold.

Experiments conducted by the CSIRO on behalf of the Marine Incident Investigation Unit during the investigation of a previous fire aboard a different ship, showed that vinyl-covered polyurethane foam, although the vinyl covering is not easily ignited, burns quite readily and fiercely once it has started. This is accelerated by any cuts or tears in the vinyl at which points the foam is easily ignited and via which the fire is more easily spread. The burning foam liquefies, causing flaming drops to fall to the deck - a mechanism by which the fire can be propagated.

In the case of the CSIRO experiment, the test was conducted on a 1 m x 750 mm vertical panel comprising 13 mm plywood over which

was fixed 25 mm of polyurethane foam covered with vinyl-coated fabric. A small source of ignition was applied to the bottom of the panel.

Within three minutes of ignition, 50% of the foam and vinyl fabric was burning fiercely and the fire test room, of similar dimensions to the cabin in question, was smoke-logged. Within five minutes, all the foam and vinyl had been completely consumed and the plywood panel was burning.

The thickness of the polyurethane foam used in the experiment was considerably less than that on the sofa in the Second Engineer's cabin aboard Docebay. The polyurethane foam was the most combustible component, so it could be expected that the sofa would have burned more quickly and more fiercely than the test piece.

Ignition and combustion of the sofa, in particular, in the Second Engineer's cabin is likely to have raised the temperature in the cabin, in a relatively short period of time, to that at which "flash over" could occur.

## **Sources of ignition**

It may be considered that the start of the fire and the Second Engineer's getting up in the morning and leaving his cabin, must have been related events. However, in addition to the loss of his items of electrical equipment, all of which were fairly new, and all his clothes, the Second Engineer also lost a substantial quantity of cash in US dollars which had been paid to him as salary. Each cabin is provided with a safe under the bunk but the cash had been hidden around the cabin as this safe could not be used. The previous occupant of the cabin had locked it and had not returned the key before leaving the vessel. Some of the notes which had been hidden were recovered from the debris.

It is probable therefore that he would not have deliberately left his cabin with a fire having started and, in the absence of any evidence which would point to the contrary. The two events must be considered a coincidence.

The removal of all the contents in the cabin precluded any evidence being available to the investigation to indicate the exact source of ignition and it is thus possible only to examine possibilities.

The Second Engineer is a confirmed non-smoker. There was no portable electric, or other type of heater in the cabin and, with a laundry equipped with clothes dryers available for the use of the crew, no need to dry clothing over light fittings. No main power supplies were run in the vicinity of the cabin and neither were there any steam pipes passing through or along any adjacent bulkheads. In the absence of any indication of other possible source of ignition, the alternative is regarded as electrical.

Other cabins on board the vessel, seen by the investigating officer, contained a variety of very “home made” electrical extensions, to lead power from the single position in each cabin (next to the desk) where power was available, to other positions around the cabin where there may be electrical equipment purchased by the occupant, such as TVs and sound systems. In some cases, the manner in which the wiring connections had been made and the manner in which the wiring was secured, posed definite hazards both in terms of electric shock and as a potential source of ignition. It became apparent to the investigator that there was, at the time, no policy in place aboard the vessel for vetting these installations. It is understood that since the fire, checks are being made on any electrical wiring rigged and used within the cabins.

According to the evidence provided, all electrical equipment in the Second Engineer’s cabin, with the exception of the refrigerator and

two lights, was switched off. It should be noted, however, that the ship's electrical system is 110 volts, 60 cycle, and the power points are of the U.S. standard, ie. 2-pin, non-earthed and unswitched. Being unswitched means that the equipment cannot be isolated at the power point, and at all times it is live up to the switch on the individual appliance, unless the plug on the electrical lead is physically removed from the socket. There is also the likelihood, that the television set, even if switched "off" at the set, remained in the "standby" condition, ie. with the internal power supply and certain electronic circuits, live.

The two lights left switched on when the Second Engineer left his cabin were that over the bunk and the light over the desk. These were both fluorescent lights with plastic diffusers. There had been no previous problems reported with any of the electrical circuits on that deck and no evidence to indicate that these two lights may have contributed to the fire in any way. The circuit-breaker in the distribution board for that deck was found to be in the "off" position after the fire. However, with the burning of the insulation and the complete destruction of the wiring in the Second Engineer's cabin, it is almost inevitable that this circuit breaker would have tripped due to a short-circuit during the fire.

## **Extension leads**

As indicated in the diagram on page 20, there was an extension lead from one of the two power points adjacent to the desk, leading behind the refrigerator, across the deck, behind the sofa to the television, VCR and sound system on the top of the chest of drawers. This extension lead was purchased ashore in Brazil by the Second Engineer. A similar extension lead, used by another crew member, was examined during the investigation and is shown in the photograph on page 19.

The extension lead consisted of 5 metres of two-core “figure of eight” flex on a reel, with three two-pin sockets in the centre of the reel. The extension lead was not earthed and also had the standard U.S. type, 2-pin plug on the free end. The cross sectional area of the conductors was approximately  $0.75^2$  mm. There was no outer sheath to the cable which has only a single layer of PVC insulation on the two cores.

The reel itself, or power board, is constructed of a polystyrene, non-impact-resistant plastic (see the photograph on page 20 where a piece can be seen broken out of the side of the reel). This type of plastic readily burns. The end of the cable, in the sample viewed during the investigation, was not properly secured before the point where it joined onto the terminals on the back of the sockets. The reel is designed in a form similar to a fishing reel, where one half can be held (in the left hand, for example) and the other half rotated using small handles (with the right hand) to wind the cable into the reel.

This type of cable, having no earth, no outer sheath and conductors of cross sectional area less than  $1 \text{ mm}^2$ , would not meet the Australian standards for an extension lead. The current-carrying capacity of such a cable would be in the order of 7.5 amps. The average current drawn, however, by a television set and VCR similar to those in the Second Engineer’s cabin, when operating normally, would be approximately 2 amps at 110 volts, so it is considered unlikely that an overload of the cable was a factor.

The plug on the extension lead was fitted to one of the two power points next to the desk. The other power point was occupied by the power lead to the refrigerator. From the power point, the lead passed behind the refrigerator, where there was a gap of about 75 mm, across the deck, where it was quite unprotected, behind the sofa and onto the

chest of drawers. The three sockets in the reel were occupied by plugs from the television, VCR and sound system.

For the fire to have gained a hold quickly, it must have started in a position where there was a concentration of combustible material. The most likely place appears to be in the corner of the cabin where the chest of drawers was situated. At this position, the television, VCR, sound system, suitcase, curtains and sofa were in close proximity to each other and to the reel of the extension lead containing the three power sockets. The latter was also situated on top of the chest of drawers adjacent to the curtains.

It is conceivable that an electrical fault, such as a short circuit or earth, in this part of the cabin, be it in the extension lead or any of the electrical appliances, could have provided a source of ignition. The two most likely sources are:

- a) the plastic power board on the extension lead (judging by the construction of the similar extension lead examined during the investigation), and
- b) the television set, if left in the “stand by” condition.

It is acknowledged that the television set in the Second Engineer’s cabin was not purchased in Australia, however, requirements relating to the construction of television sets for sale in Australia are currently being upgraded due to the number of house fires which have been initiated by faults in domestic television sets. The new regulations will cover such things as the flammability of the plastic casings, the standard of insulation on internal wiring, and the spacing of tracks on printed circuit boards. Faults causing a current flow measured only in milliamps have been observed during tests, to be capable of initiating fires.

The plastics from which most television sets, VCRs and sound systems are currently constructed will burn fiercely once ignited.

## **Arson**

Because of the speed with which the fire became established, and the presence of an unexplained circular pattern of charring on the vinyl deck tiles adjacent to the bunk, the available evidence, photographs and samples of the vinyl tiles were submitted to the Forensic Services Section of the Australian Federal Police for examination.

The results of the analysis of the vinyl tile samples were inconclusive due to a number of factors including the elapsed time between the fire and the analysis of the samples and the fact that vinyl itself contains many hydrocarbons typically found in fire accelerants. In addition, the tiles were subjected to intense heat during the incident and then covered with sea water for an extended period following the fire-fighting operations.

A possible explanation of the circular charring on the tiles may be that the foam in the mattress on the bunk, which melts and flows when heated, was melted by the heat and flowed onto the deck during a period when a lack of oxygen prevented its complete combustion in the early stages of the fire. The bunks have no “lee board” fitted.\*

## **Ventilation**

The ventilation fans were promptly stopped at the beginning of the fire. Stopping the fans also automatically stops the air conditioning compressors in the machinery spaces. By closing the doors over the inlet filters in the fan room and putting the flaps in the “external air position” the Chief Engineer effectively isolated the air supply to the

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\* A board fitted to the side of the bunk to prevent the occupant being thrown out of bed in rough weather.

fire. The return air duct for that deck is situated in the alleyway outside, and a few metres forward of, the Second Engineer's cabin. The flap behind the grille is fitted with a fusible link and, upon examination, it was found that the link had melted in the heat of the fire and the flap had automatically closed.

It is significant that throughout the fire, neither the Master, the Mate, the Chief Engineer, the First Engineer nor the Second Engineer, saw any flames from the time the Second Engineer opened his cabin door, to the time the fire was extinguished. This would indicate that, for much of the time at least, the fire did not have a plentiful supply of air. It is acknowledged however, that the smoke was so thick during most of the firefighting operations that it was difficult for those involved to see anything at all.

## **Fire-fighting**

In accordance with the company's instructions, fire drills are carried out on board Docebay on a weekly basis when the ship is at sea, usually on Saturdays. In addition, instructional videos on various aspects of fire fighting are shown to the crew twice a week, on Tuesday and Thursday evenings. The fire drills involve practical instruction in the use of equipment and exercises in tackling fires at various locations throughout the ship. It is apparent that the emphasis on fire-fighting training, in the managing company's policy, paid off as the fire was tackled quickly and was effectively contained within the area of the Second Engineer's cabin.

It is probable, however, that the fire would have been even better contained if the Second Engineer, upon arriving at his cabin from the engine-room and knowing that there was a fire inside, had unlocked the door but not opened it until the correct fire-fighting measures were in place ie. fire hoses providing a water curtain and a jet whereupon,

to start with, the door could have been slightly and carefully opened. The rapid admission of air not only posed a hazard to the Second Engineer but also allowed a great amount of heat and smoke to escape into the alleyway shortly afterwards.

The fire pump was promptly started upon the fire alarm being sounded, however during the firefighting operations, a number of the vessel's fire hoses were damaged, several of these being split when hydrant valves were opened too quickly. It was necessary to replace 11 hoses while the vessel was at Dalrymple Bay.

The nature of the fire demanded that breathing apparatus sets were used throughout the incident. Although it appears that these were used effectively and no problems were noted with their use, there is no system in use on board Docebay for controlling their use, such as a BA control board on which is recorded the name of the wearer, the time of his entry and exit and the air pressure in the BA set.

The vessel does not carry a charging compressor and used bottles have to be sent ashore for recharging.

Significantly, only two other compartments on the upper bridge deck were damaged by heat (as opposed to by smoke), the Conference Room and the Electrician's cabin. This damage occurred because both spaces had their doors secured in the open position by holdbacks.

# Conclusions

These conclusions identify the different factors which contributed to the circumstances and causes of the incident and should not be read as apportioning blame or liability to any particular organisation or individual.

The removal of the contents of the cabin, before the investigation started, prevented any definite conclusion being reached regarding either the point of origin or the cause of the fire.

With the lack of available evidence to indicate otherwise, the timing of the start of the fire and the Second Engineer's arising in the morning and leaving his cabin must be regarded as purely coincidental.

The fire took hold quickly and for this to have happened there must have been a supply of combustible materials near the source of the fire.

It is concluded that:

1. The port after corner of the Second Engineer's cabin appears to have had the most significant concentration of combustible materials together with the television, VCR, and sound system all connected to a power board on an extension lead at this point. On balance of probability it is likely that the fire started in this area.
2. The extension lead used would not meet Australian Standards, being unearthed, having below minimum size conductors, having no sheath and the power board being poorly made of flammable, non-impact-resistant plastic. In addition, the power

points in the vessel, of American two-pin type, are not switched and therefore appliances cannot be totally isolated from the supply without withdrawing the plugs. This left the extension and power board live at all times.

3. Although it cannot be stated conclusively, the most likely source of ignition would have been either a fault in the television set while in the “stand by” condition or a short circuit in the power board of the extension lead.
4. There was no policy in place on the ship for checking temporary wiring in cabins, installed by members of the crew, to ensure that it was electrically safe. It is understood that, since the fire, this is being addressed.
5. On the evidence available it is unlikely that arson was the cause of the fire.
6. The response of the ship’s crew to the fire was quick and, on the whole, effective. The fire was well contained by the fire-fighting operations although it would have been better contained had the cabin door been kept closed at the beginning of the incident, until fire hoses had been rigged in place and a water curtain was available.

# Details of ship

<b>Name</b>	Docebay
<b>Flag</b>	Liberian
<b>Ship type</b>	Bulk carrier
<b>Year of build</b>	1986
<b>Place of build</b>	Brazil (Verolme Est. Reunidos do Brasil S.A.- Angra dos Reis)
<b>Tonnes dwt</b>	152,308
<b>Gross tonnes</b>	79,184
<b>Lenght overall</b>	276.99 m
<b>Breadth, extreme</b>	43.5 m
<b>Depth</b>	24.01 m
<b>Engine</b>	6 cylinder Hitachi Zosen B&W
<b>Engine power</b>	12,578 kW
<b>Crew</b>	24 (Brazilian nationals)