Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Marine Occurrence Investigation No. 228
Final

Independent investigation into the leakage of dangerous goods on board the Liberian registered container ship

Kota Pahlawan

off the coast of Australia

16 June 2006

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Photographs used in the report are courtesy of the Queensland Fire and Rescue Service (Cover and Figure 1), the master of *Kota Pahlawan* (Figures 3 and 4), SNF Australia (Figures 5, 6 and 7) and the Australian Maritime Safety Authority (Figure 8).

Abstract
On 16 June 2006, during *Kota Pahlawan*'s voyage from Singapore to Australia, a foul odour was noted coming from two containers on board the ship. The containers were packed with xanthates, dangerous goods which produce carbon disulphide vapours and can spontaneously combust.

Later that day, the master informed the ship's charterer of the 'incident' and that the odour indicated that the packaging of the xanthates was not 'gas-tight', in accordance with international rules. He also asked for the containers to be discharged at Brisbane, the ship's next port of call.

At 0411 on 18 June, the master reported the incident as a defect to the Australian Maritime Safety Authority (AMSA). At 0720, the ship embarked a coastal pilot and started its transit of the Great Barrier Reef.

At 0907 on 19 June, AMSA issued a defect report and started collecting information about the incident. At 1252, the pilot disembarked from the ship after it had completed its transit of the northern part of the Great Barrier Reef Inner Route.

The ship berthed in Brisbane on 22 June after an 'emergency' was declared in the port. All eight xanthates containers on board the ship were discharged and purged with nitrogen gas to mitigate the risks posed by the foul smelling, highly flammable and toxic carbon disulphide vapours. On 24 June, the master was asked to reload the containers. He agreed on the condition that AMSA provide a written acceptance of the proposal with regard to 'compliance' with international rules.

By 0400 on 25 June, the xanthates containers had been reloaded onto the ship before it sailed from Brisbane. On 6 July, the ship discharged the last of the xanthates containers in Fremantle.

The report identifies several safety issues and the safety actions to address them.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Transport and Regional Services. 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.

TERMINOLOGY USED IN THIS REPORT

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.

EXECUTIVE SUMMARY

On 12 June 2006, *Kota Pahlawan* sailed from Singapore on a regular, scheduled, voyage to Australia. The almost fully loaded container ship was bound for Brisbane, its first Australian port of call, via the Torres Strait and the Great Barrier Reef Inner Route. Amongst the 1519 containers on board, 69 contained 'dangerous goods'[1].

On the morning of 16 June, a foul odour was noted coming from two containers stowed on the ship's deck. Both containers, and six others on board, were packed with solid xanthates[2]. The door seals of the two containers were taped by the crew and the master reported the incident to the ship's manager. The master was advised that any odour from the containers was an 'incident' because the packaging of the xanthates inside was required to be 'hermetically sealed'[3]. To reduce the risk of a fire it was decided to keep the containers' door seals taped, stop adjacent cargo hold ventilation, avoid ignition sources, rig fire hoses and inspect the deck area regularly.

Later that day, the master informed the ship's charterer of the incident stating that the xanthates in the two containers were not packaged in accordance with the requirements of the IMDG Code. He demanded that both containers, which were destined for Fremantle, be discharged in Brisbane. He also advised the charterer that he was required to report the incident to 'Australian authorities' before entering the Torres Strait.

At 0411[4] on Sunday 18 June, the master reported the odour from the xanthates containers as a defect to the Australian Maritime Safety Authority (AMSA). At 0720, a coastal pilot boarded and the master confirmed that he had reported the defect. The pilot was not asked for or given any information by AMSA about the reported defect and nothing suggested to him that it was necessary to change the ship's planned Great Barrier Reef transit. *Kota Pahlawan* transited the Torres Strait and at about 1000, the pilot turned the ship southwards into the Inner Route.

At 0907 on Monday 19 June, AMSA issued a defect report for *Kota Pahlawan*. Later, AMSA advised Maritime Safety Queensland (MSQ) of the risks posed by xanthates if not packaged properly and provided relevant information. At 1252, the pilot disembarked from the ship after it had completed its transit of the critical northern part of the Inner Route. The ship continued its passage and anchored off Brisbane on 21 June.

On the morning of 22 June, a Queensland Fire and Rescue Service (QFRS) team boarded the ship and later confirmed to the Port of Brisbane Corporation (PBC) that the xanthates containers were 'leaking powder' and that the leak was 'substantial and serious'. In the afternoon, the police declared an 'emergency situation' and set up exclusion zones in the port before *Kota Pahlawan* berthed at 1612.

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1 Substances, materials and articles covered by the International Maritime Dangerous Goods (IMDG) Code.

2 Chemicals used in mining and industrial processes, identified as dangerous goods and classed as 'substances liable to spontaneous combustion'. On contact with moisture, xanthates produce vapours of carbon disulphide, which is also identified as dangerous goods and classed as 'flammable liquids' with a subsidiary risk because it is toxic.

3 Defined as a 'vapour-tight closure' in the IMDG Code.

4 All times in the report are local time, Coordinated Universal Time (UTC) + 10 hours.

Under directions from QFRS, all eight xanthates containers on board the ship were discharged. All the containers were found to be producing highly flammable and toxic carbon disulphide vapours and were purged with nitrogen gas to mitigate the risks posed by the vapours.

On 24 June, PBC became concerned that the containers might be abandoned in Brisbane. It noted that QFRS had advised that the purged containers were 'fit for transport' and that *Kota Pahlawan* was still in port and, therefore, could reload the containers.

Kota Pahlawan's master declined to accept the containers, reiterating that the xanthates inside them were not packaged in accordance with the IMDG Code. PBC informed him that the ship's owners, charterers, agent and master would be liable for all costs associated with the incident and that it expected the containers to be reloaded on the basis of the QFRS opinion. PBC also advised the master and the agent that the ship would be detained to confirm that other dangerous goods containers on board the ship complied with the IMDG Code.

The master then agreed to consider reloading the containers if AMSA provided a written acceptance of reloading the containers with regard to 'compliance' with the IMDG Code. Later, AMSA endorsed the QFRS opinion, agreed to accept the original documentation for the containers and specified conditions for carriage to their destinations on board the ship.

By 0400 on 25 June, the xanthates containers had been reloaded onto *Kota Pahlawan* and soon after the ship sailed from Brisbane. A QFRS scientific officer sailed on board the ship to monitor the containers during its voyage.

On 6 July, the last of the xanthates containers were discharged in Fremantle before *Kota Pahlawan* sailed for Singapore.

An AMSA surveyor attended two of the premises where some of the xanthates containers were stored after discharge. After his inspection, he concluded that the source of the odour was a few stray pellets of xanthates outside their hermetically sealed packaging.

The report identifies the following safety issues, reports three safety actions taken and issues three recommendations and four safety advisory notices to address them:

- The odour of carbon disulphide vapours from xanthates shipments, similar to *Kota Pahlawan*'s, was known to be commonplace by Australian importers of xanthates. This indicates that xanthates are frequently not hermetically sealed strictly in accordance with the International Maritime Dangerous Goods Code. This regular violation of the Code's requirements was not reported.
- The odour of carbon disulphide vapours from xanthates containers on board *Kota Pahlawan* indicated that the xanthates were not hermetically sealed strictly in accordance with the International Maritime Dangerous Goods Code and there was an increased risk of a fire or toxic exposure incident.
- The Australian Maritime Safety Authority was not made aware of the dangerous goods leakage on board *Kota Pahlawan* until 18 June 2006, two days after it was first noted by the ship's crew.
- The Australian Maritime Safety Authority did not appropriately assess the risks associated with the leakage of dangerous goods on board *Kota Pahlawan* until

19 June 2006, more than one day after the master had reported it and before the ship started its transit of the Great Barrier Reef Inner Route.

- The actions taken by the Port of Brisbane Corporation on 24 June 2006, in relation to the reloading of the xanthates containers onto *Kota Pahlawan*, were inconsistent with its publicly stated core value of 'safety first' and did not adequately consider the master's legal and safety responsibilities to comply with the requirements of the International Maritime Dangerous Goods Code.
- The packing group assigned to sodium isobutyl xanthate and sodium isopropyl xanthate in the dangerous goods declarations for carriage on board *Kota Pahlawan* was not consistent with the packing group assigned to them in the material data safety sheets provided by the consignees for these consignments.
- The Australian Maritime Safety Authority has advised that xanthates have a recognised capacity to emit the odour of carbon disulphide even when packaged in accordance with the International Maritime Dangerous Goods Code and an odour from xanthates shipments, similar to *Kota Pahlawan*'s, is commonplace according to their Australian importers. This suggests that the information for xanthates and requirements for their carriage, in particular the packaging, provided in the Code should be reviewed.

1 FACTUAL INFORMATION

1.1 *Kota Pahlawan*

Kota Pahlawan is a Liberian registered container ship (Figure 1) owned by MS Pembroke Senator, Germany, and managed by Reederei F. Laeisz, Germany. The ship was chartered and operated by Pacific International Lines, Singapore.

The ship was built in 1997 by Thyssen Nordseewerke, Germany, and was classed with Germanischer Lloyd (GL). It has an overall length of 198.90 m, a moulded breadth of 29.80 m and a moulded depth of 16.50 m. At its summer draught of 11.55 m, the ship has a deadweight of 33 950 tonnes.

Figure 1: ***Kota Pahlawan***

Kota Pahlawan has three cargo cranes and six cargo holds, all located forward of the accommodation superstructure. The ship has a capacity of 2458 TEU[5], of which 986 can be stowed in the cargo holds and the remainder on deck. Power outlets are provided on deck for 300 refrigerated containers.

Propulsive power is provided by a Mitsubishi 8UEC60LS, two stroke, single acting, diesel engine developing 16 000 kW. The main engine drives a single, controllable pitch propeller which gives the ship a service speed of 19.5 knots[6].

Kota Pahlawan complied with all the relevant SOLAS[7] requirements including those for the carriage of dangerous goods. At the time of the incident, the ship was operating a liner service between Singapore and Australia. On several successive voyages before the incident, it had transited the Torres Strait and the Great Barrier Reef southbound en route to ports on the east coast of Australia.

5 Twenty-foot Equivalent Unit, a standard shipping container. The nominal size of ships in TEU refers to the number of standard containers that it can carry.

6 One knot, or one nautical mile per hour equals 1.852 kilometres per hour.

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

At the time of the incident, the ship had an appropriately qualified crew of 19. The master and chief engineer were both German nationals. The remaining crew included one Russian, seven Filipinos and nine nationals of Tuvalu.

The master started his seagoing career as an apprentice in 1981. He completed training at a nautical college in Germany in 1986 and since then had been employed by Reederei F. Laeisz. He held German qualifications for a master and had sailed at that rank for four years. He had joined *Kota Pahlawan* in Singapore, a few days before the incident, for his fourth assignment on the ship.

1.2 The Great Barrier Reef

The Great Barrier Reef (Figure 2) stretches along the Queensland coast from the seas off Gladstone in the south to the Torres Strait in the north. It is the world's largest coral reef ecosystem with vast areas of reefs and shoals. Fast flowing tidal streams, strong trade winds, heavy rain squalls and occasional cyclones are features of this area. These features make navigation in the area, with its narrow shipping channels, a complex and challenging process.

Measures to protect this environmentally sensitive area have been progressively implemented since the establishment, in 1975, of the Great Barrier Reef Marine Park. The area was declared as a World Heritage Area in 1981 and the International Maritime Organization (IMO) designated it a 'Particularly Sensitive Sea Area' (PSSA) in 1990. This was followed by other initiatives to enhance safety including compulsory pilotage and a mandatory ship reporting system for the area.

1.2.1 Coastal pilotage

The purpose of introducing compulsory pilotage in the Great Barrier Reef was to reduce the risk of a shipping incident in the area and damage to the environment.

In October 1991, Australia introduced compulsory pilotage areas in parts of the PSSA. When inside a compulsory pilotage area, all ships of 70 m or more in length and all loaded oil tankers, chemical tankers and gas carriers, irrespective of size, must use the services of a coastal pilot licensed by the Australian Maritime Safety Authority (AMSA). Outside these areas, ships may also use the services of a coastal pilot and this practice is quite common.

Initially, only the northern part of the Inner Route and the Hydrographers Passage (Figure 2) were compulsory pilotage areas but others were included later. In July 2006, IMO extended the boundary of the PSSA northwards as far as Papua New Guinea to include the entire Torres Strait in recognition of its importance. This resulted in the Torres Strait and the Great North East Channel being included in the compulsory pilotage areas from October 2006.

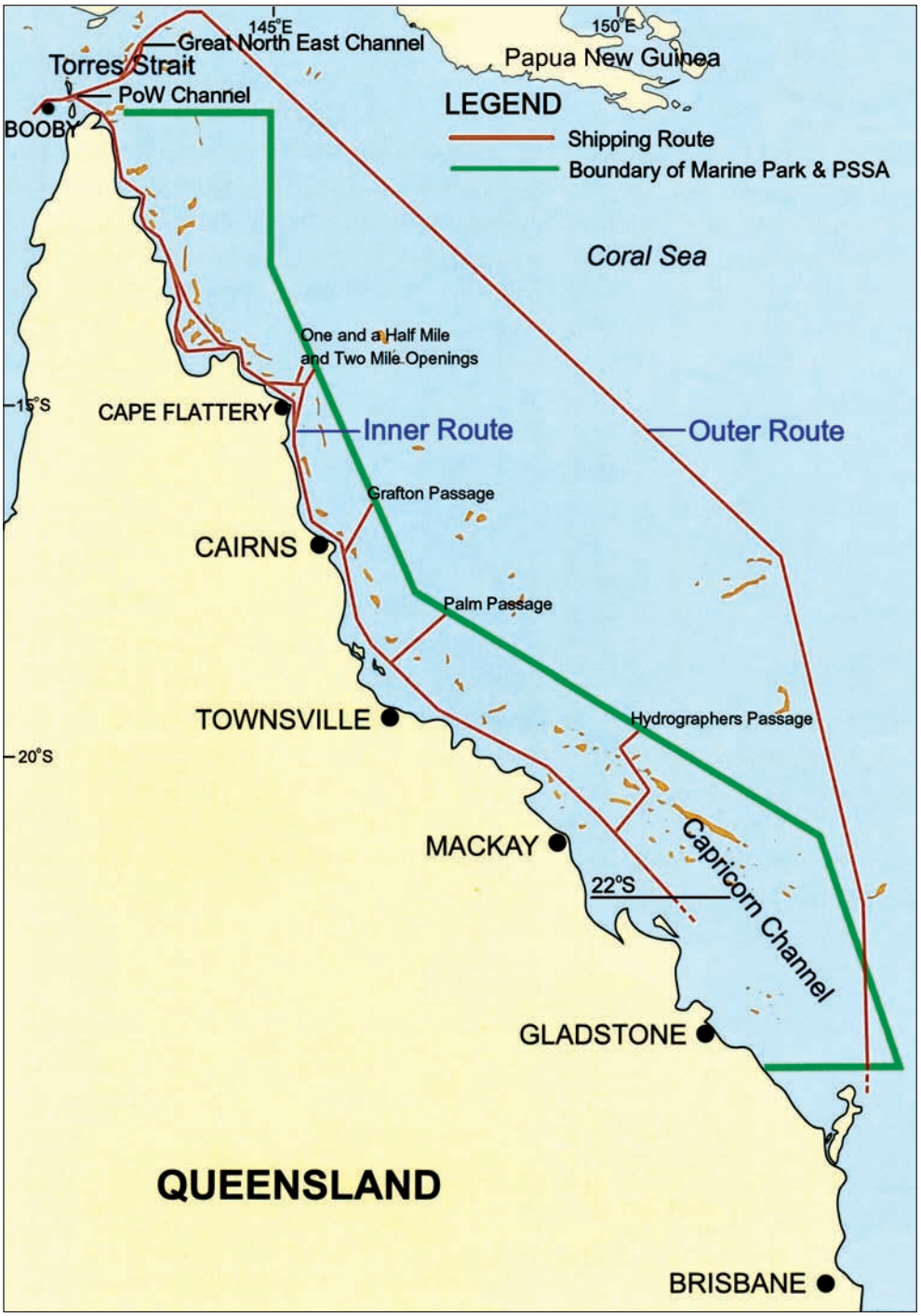
The Inner Route north of Cairns, a distance of about 500 miles[8] from Booby Island at the western entrance to the Torres Strait, lies within a compulsory pilotage area. The route lies entirely inside the PSSA, while the alternative Outer Route lies mostly outside the PSSA. When southbound, ships have limited opportunities to safely exit the Inner Route towards open waters because there are very few openings in the reefs between the Torres Strait and Cape Flattery.

8 A nautical mile of 1852 m.

The coastal pilot

Kota Pahlawan's coastal pilot, at the time of the incident, held an unrestricted licence as a coastal pilot. He had experience piloting all types of ships in the Great Barrier Reef since 1998. Before starting his pilotage career, he had also sailed as a shipmaster. Much of his seagoing experience of over 25 years was on ships transiting the Great Barrier Reef. He had sailed on several different types of ships including container ships.

Figure 2: The Great Barrier Reef



1.2.2 Ship reporting systems

Ship reporting systems have been identified by SOLAS to 'contribute to the safety of life at sea, safety and efficiency of navigation, and protection of the marine environment'. The Great Barrier Reef and Torres Strait Ship Reporting System (REEFREP), mandatory for most ships, was established in 1996.

In 2004, to further enhance safety, the Great Barrier Reef and Torres Strait Vessel Traffic Service (REEFVTS) comprising REEFREP and monitoring and surveillance systems was established. This interactive service monitors ships using radar, the automatic identification system (AIS), the marine satellite communication system and very high frequency radiotelephone (VHF radio) communications.

The publicly stated objectives of REEFVTS, in summary, are to:

- enhance navigational safety in the Torres Strait and the Great Barrier Reef Inner Route
- minimise the risk of a maritime accident and consequential pollution and major damage to the marine environment
- provide an ability to respond more quickly to a safety or pollution incident.

While REEFVTS is jointly operated by AMSA and Maritime Safety Queensland (MSQ), there is a functional split of responsibilities between the two organisations. Responsibility for assessing the risk of a maritime incident, including those involving dangerous goods, in the Great Barrier Reef lies with AMSA. Based on this risk assessment and the type of incident, MSQ can get involved, for example, in incidents of marine pollution or if a port pilotage area under MSQ jurisdiction may be affected.

The Great Barrier Reef area southwards from Papua New Guinea to latitude 22º S (Figure 2) is covered by REEFVTS. The area is part of the search and rescue region covered by the Australian Ship Reporting System (AUSREP) which is operated by AMSA. In addition to the search and rescue function, AUSREP also provides the means to collect relevant information in the event of an incident.

Participation in AUSREP is mandatory for most foreign ships only from arrival at the first Australian port until departure from the final Australian port. However, AMSA strongly encourages their voluntary participation while in the AUSREP area and most ships do participate.

Within AMSA, AUSREP is operated through the Rescue Coordination Centre (RCC) in Canberra. REEFVTS, with its operations centre near Mackay, is electronically linked to RCC to enhance coordination. Therefore, a ship making a REEFREP report does not need to make an AUSREP report while it is in the REEFVTS area.

Both AUSREP and REEFREP require certain information to be reported in the standard IMO format for ship reporting systems. The reporting of dangerous goods and defects is specifically covered by the reporting requirements. Coastal pilots also report, or confirm, information for dangerous goods and defects after boarding a ship as part of their routine report, via VHF radio, to REEFVTS.

1.3 The International Maritime Dangerous Goods (IMDG) Code

The IMDG Code is a uniform international code for the transportation of dangerous goods in packaged form by sea. The mandatory code provides basic principles and detailed recommendations for the carriage of substances, materials and articles it defines and lists as dangerous goods. Each of these dangerous goods is identified by a United Nations (UN) number and a 'proper shipping name'. For each of the dangerous goods listed, the Code provides a description; including the applicable class or division, packing group and provisions, stowage and segregation category, and emergency procedure schedules.

Shippers of dangerous goods on board ships are required to provide the necessary shipping documents. These documents include a declaration that the shipment is packaged and marked in accordance with the IMDG Code, and that the dangerous goods are, in all respects, in proper condition for carriage.

1.3.1 Xanthates

'Xanthates' is the proper shipping name for a group of chemicals which are sodium or potassium salts or esters of xanthic acid. They are used in various industrial processes and in the mining industry. Being similar chemicals, all xanthates are identified by UN number 3342. The IMDG Code classifies them as 'Class 4.2' dangerous goods, defined as 'substances liable to spontaneous combustion'. The Code notes the following properties and observations for xanthates:

> Hygroscopic yellow powder with an unpleasant odour. On contact with moisture, evolves highly flammable vapours such as carbon disulphide (UN 1131 which has a flashpoint of -30°C and a very low ignition temperature of 100°C). When confined, can cause an explosion due to the wide explosive limits of the vapours. Finely divided dust forms explosive mixtures in air. Care should be taken when opening cargo transport units in case carbon disulphide vapours are present.

The IMDG Code requires xanthates to be stowed on a ship's deck and clear of crew living quarters. The Code does not identify specific xanthates by name but defines the criteria to be used to assign one of the two packing groups applicable to different xanthates. The packing group determines the specific packaging requirements for the xanthates that it is intended to cover. The requirements are quite different but both packing groups require hermetically sealed packaging.

Carbon disulphide

The IMDG Code requires the packaging of dangerous goods which evolve flammable or toxic gases or vapours to be hermetically sealed. Decomposing xanthates produce vapours of carbon disulphide which are highly flammable and toxic. Carbon disulphide is identified as dangerous goods and classed as a flammable liquid with a subsidiary toxicity risk.

The Code notes that carbon disulphide vapours are heavier than air and will travel a considerable distance to a source of ignition and will flash back. The vapours may be ignited by contact with an ordinary light bulb or a warm steam pipe and have explosive limits from 1 to 60 per cent by volume. Carbon disulphide has an odour usually described as strong and disagreeable or foul.

1.4 The incident

On the morning of 12 June 2006, *Kota Pahlawan* sailed from Singapore bound for Brisbane, Queensland. The ship was on an even keel with a draught of 11.40 m. It was carrying 1519 containers including 69 packed with dangerous goods.

The master had been provided with the appropriate documentation for all the dangerous goods containers on board the ship. The chief mate had, on departure from Singapore, completed a 'declaration of seaworthiness' which included a statement that all of the dangerous goods on board were stowed in accordance with the IMDG Code.

Amongst the dangerous goods that the ship had loaded in Singapore, were eight containers of xanthates. Seven of them, destined for Fremantle, Western Australia, were stowed on deck; about 40 m forward of the accommodation, on the starboard side, in container bays 33 and 35. The eighth container, destined for Sydney, New South Wales, was stowed further forward on deck, on the port side, in bay 19.

At about midday on 15 June, the master reported *Kota Pahlawan*'s 'Sail Plan' to AUSREP in which the master had elected to voluntarily participate. The weather during the voyage remained good, with light to moderate wind and sea conditions. The ship did not experience any significant rolling or pitching.

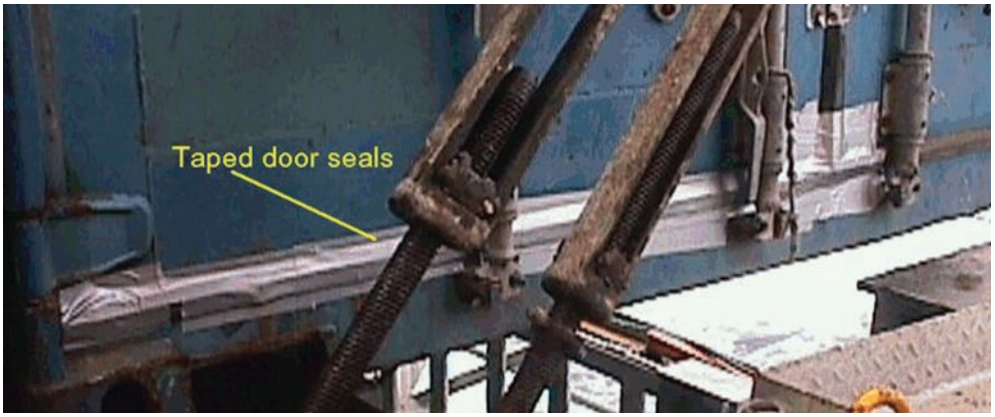
On the morning of 16 June, the boatswain reported a foul odour on deck near bay 33. The chief mate and master inspected the area and found that the odour was coming from the containers stowed in the two lower tiers of the starboard outboard row in bay 35. The weather-tight rubber door seals of both of these containers were rippled and appeared to be in poor condition (Figure 3).

Figure 3: Rippled rubber door seals of a xanthates container

The dangerous goods declaration and manifest showed that these containers, and six others on board, were each packed with 20 boxes of xanthates. The master checked the IMDG Code for information and guidance. He noted the risk of fire or explosion and decided to implement some precautions.

On the master's orders, the chief mate and the boatswain sealed the doors of both containers with duct tape (Figure 4). After taping the containers, they could smell little or no odour. No precautions to address the toxicity of the carbon disulphide vapours were considered. The other six xanthates containers were also checked. The door seals of these containers appeared normal with no odour in their vicinity.

Figure 4: Taped door seals of the container in Figure 3



Just after mid-day, the master informed the ship's manager in Germany about the situation with the xanthates containers. At the time, *Kota Pahlawan* was about 200 miles north-northwest of Darwin, Australia. Later that afternoon, the manager's dangerous goods safety advisor informed the master that the odour from the xanthates containers was an 'irregular occurrence'.

A telephone discussion between the advisor and the master followed. It was agreed that the odour indicated that the xanthates were not hermetically sealed. They decided to take the following precautions:

- maintain the tape on the door seals
- stop any adjacent cargo hold ventilation fans
- avoid any sources of ignition
- rig fire hoses
- inspect the deck area regularly.

With these measures in place, the crew monitored the situation by inspecting the xanthates containers every two hours. It was decided not to switch off the power to the refrigerated containers on deck at this stage.

In the evening, the master lodged a 'letter of protest' with the ship's charterer. He stated that the odour from the two containers indicated that the packaging of the xanthates was not 'gas-tight' and it was, therefore, an 'incident'. He demanded that the containers be discharged from the ship at Brisbane because they were not fully compliant with the packaging requirements of the IMDG Code. He informed the charterer that he was 'legally required to report this condition to Australian authorities prior to entering the Torres Strait/Barrier Reef'. The ship's manager also sent a message to the charterer reiterating the master's letter of protest.

At 0733 on 17 June, the master gave 24 hours notice of the ship's arrival off Booby Island to the coastal pilotage company and the ship's agent in Brisbane. He also advised that an odour was coming from two 'dangerous cargo' containers loaded with 'UN3342' and stowed on deck, and that he would report this to REEFVTS. Based on this information from the master, neither the pilotage company nor the agent informed any authorities.

The coastal pilot assigned for piloting *Kota Pahlawan* noted the master's message but he had no other information relating to UN3342 dangerous goods. As a precaution, the pilot planned an alternate passage through the Great North East

Channel and the Outer Route. He anticipated that he may receive information or guidance from REEFVTS, with regard to the odour from the dangerous goods containers, which could make using the alternate route necessary.

At 0411 on Sunday 18 June, *Kota Pahlawan*'s master sent the ship's pre-entry position report to REEFVTS. Field 'Q' of the report, used for reporting defects, damage, deficiencies and other limitations, stated:

> Found 2 dangerous cargo containers loaded with UN3342 stowed on deck emitting odour.

The details of the defect were submitted by REEFVTS to RCC through the traffic information management system which then automatically included these details in every subsequent AUSREP position report. REEFVTS also informed the Mackay regional harbour master. The harbour master, aware that AMSA had been notified through RCC, requested REEFVTS to maintain a watch on the ship during its transit of the Inner Route.

At 0720, the coastal pilot boarded *Kota Pahlawan* off Booby Island. Soon after, a report was made to REEFVTS on the ship's VHF radio advising that the ship had embarked a pilot and that 'they had a dangerous cargo leak to report with an odour'. The master then discussed the situation with the pilot, confirmed the defect had been reported and exchanged navigational information. The pilot made his routine report to REEFVTS but he was not asked for or given any information relating to the xanthates containers.

At about 1000, after the ship had transited the Torres Strait, the pilot spoke to REEFVTS again. Once again, nothing suggested to him that there was any need to change the ship's planned transit. He consulted the master and then turned the ship southwards to follow the Great Barrier Reef Inner Route.

During the pilotage passage, the pilot noted that the crew were reporting to the officer of the watch after making their inspections on deck. The situation with the xanthates containers appeared to remain unchanged.

At 0602 on Monday 19 June, the master sent a message to the ship's agent giving the ship's estimated time of arrival off Brisbane. He also provided the numbers and stowage of the taped xanthates containers that he had demanded be discharged and asked the agent to inform 'all concerned parties in Brisbane'.

At 0907, when the ship was 70 miles north of Cairns, RCC issued a 'merchant ship breakdown/defect report' for *Kota Pahlawan*. This report quoted field 'Q' from the ship's pre-entry position report. The report was sent to various areas within AMSA including the maritime operations (MO) and the environment protection response (EPR) business units. RCC also sent the defect report to MSQ including their regional harbour master in Brisbane, the ship's next port of call.

When the ship's agent received the master's message he started informing various parties. He had just completed informing the cargo terminal in Brisbane, when he was contacted by AMSA and the Brisbane regional harbour master in regard to the defect reported by the master.

The Brisbane regional harbour master, on behalf of MSQ, is responsible for the safe movement of ships in the Brisbane pilotage area. Soon after being notified, the harbour master started to assess the risks associated with *Kota Pahlawan* calling at the port. He consulted a number of parties including the Port of Brisbane

Corporation (PBC) and the Queensland Fire and Rescue Service (QFRS) to plan an appropriate response before the ship's arrival.

Later that morning, AMSA informed MSQ of 'the risks associated with xanthates if the substance was not packaged properly' and provided relevant documents and information. AMSA also offered to make their chemical spill expertise available to MSQ, if required.

At 1252, the pilot disembarked as usual when the ship was off Cairns. He was contacted at 1622 by the Brisbane regional harbour master for information about his observations during the pilotage.

Kota Pahlawan continued its passage towards Brisbane through the Inner Route and at 1400 on 20 June; the ship exited the REEFVTS area boundary at 22º S latitude.

At 0954 on 21 June, *Kota Pahlawan* anchored off Brisbane waiting for a berth. At 1240, QFRS informed the Queensland Police Service (police) about the 'incident'. The police decided that a water police escort vessel and an exclusion zone would be necessary for the ship to enter the port. At 1515, the harbour master spoke to the ship's master on the telephone. The master confirmed that the situation with the xanthates containers was unchanged.

At 0848 on 22 June, *Kota Pahlawan* weighed anchor. An hour later, the assistant harbour master and a five person team from QFRS, with scientific testing equipment and breathing apparatus, boarded the ship using the port's pilot boat. They discussed the situation with the master and had the power to all of the refrigerated containers on board the ship isolated. QFRS used a variety of detection equipment to measure the atmosphere inside the two taped xanthates containers. The measurements, according to QFRS, represented vapour concentrations of carbon disulphide found in both the containers. The vapour concentration inside and near the containers was then monitored.

At 1136, a Brisbane port pilot boarded the ship. At 1216, on advice from QFRS, the harbour master gave permission for the ship to enter the port. *Kota Pahlawan* proceeded towards its berth escorted by two police vessels.

By early afternoon, PBC noted that QFRS had confirmed that the containers were 'leaking powder' and that the leak was 'substantial and serious'. At 1430, the police declared an 'emergency situation' and established an exclusion zone in the port covering part of the Brisbane River and the Fisherman Islands container terminal. A tanker truck containing carbon dioxide was ready at the wharf to address the risk of a fire. As the ship approached its berth, QFRS checked and detected carbon disulphide in the xanthates container stowed in bay 19 and started considering the possibility that the entire shipment of xanthates containers may be unstable.

At 1612, *Kota Pahlawan* berthed at Fisherman Islands berth number two. The ship's crew, except for the master and four others, were evacuated from the ship. At about 1720, three of the ship's remaining crew, wearing breathing apparatus, unlashed the containers in bay 35 to allow them to be discharged. By this time, QFRS had decided that all of the xanthates containers were to be discharged so the containers in bays 33 and 19 were also unlashed.

By 2035, the eight xanthates containers were on the wharf and power to the refrigerated containers on board the ship had been restored. At 2145, QFRS declared the ship 'gas-free' and the police allowed the evacuated crew to return. On

the wharf, QFRS inspected the xanthates containers and found that all of them were producing carbon disulphide vapours. QFRS decided to contact the consignees of the containers for advice to mitigate the risks.

At 2330, *Kota Pahlawan* was moved to Fisherman Islands berth number seven for its normal cargo operations.

By midnight, QFRS had decided to introduce nitrogen gas into the containers to reduce the risk of fire and explosion and to stop the decomposition of the xanthates.

At about 0420 on 23 June, QFRS began purging the xanthates containers with nitrogen gas. During the process of inspecting and treating the containers, QFRS noted that the boxes inside the containers appeared to be intact (Figure 5).

Figure 5: Boxes inside a container

Later that morning, a strategic advisory group, comprising several government and commercial stakeholders with a direct interest in the incident, was formed to manage and resolve the situation. Because of its close involvement, QFRS coordinated the group and chaired its meetings. QFRS advised that the xanthates containers were not suitable for transport by sea, road or rail.

Of the four consignees of the xanthates containers, only Orica Australia (Orica), consignee for one container, was represented in the strategic advisory group. The ship's agent contacted the other three, Coogee Chemicals (Coogee), Redox and SNF Australia, consignees for one or more of the containers. Each of the four was informed that their consignments were being terminated in Brisbane and that they would have to take charge of the containers after QFRS had treated them. Orica indicated that it was prepared to take charge of its consignment of one container.

The purging of the containers continued and the police maintained the exclusion zones. At 2250, QFRS advised that the xanthates containers no longer constituted a danger and the police revoked the 'emergency situation'.

At about 0930 on 24 June, the ship's agent, on advice from QFRS, started informing the consignees that the xanthates had been stabilised. Coogee advised that it was investigating the possibility of transporting its consignment of two containers to Western Australia. Orica advised that it could take charge of its consignment of one container but none of the others.

At 1200, the strategic advisory group met again and several options, either addressing the xanthates and their packaging or transporting them from the port, were considered. QFRS advised that, since the xanthates had been stabilised, they were safe for further transport by sea. The advisory group noted that *Kota Pahlawan* was still in port but due to sail at about 1500. The ship's agent was asked to check, with the master, the possibility of reloading the containers onto the ship.

At about 1315, PBC contacted the Brisbane regional harbour master to ask for *Kota Pahlawan* to be detained. The harbour master advised that MSQ, in the circumstances, had no reason to detain the ship. While PBC was considering using its own powers to detain the ship, there had been delays in the ship's cargo operations and its departure was rescheduled for that evening.

The ship's agent discussed the reloading of the xanthates containers with the master. The master consulted the ship's manager and reiterated that there should be 'nil' odour if the xanthates were packaged properly. However, at 1500, he attended the next meeting of the strategic advisory group.

At 1600, QFRS presented four containers, one from each supplier, to the master and others from the strategic advisory group. A marine surveyor arranged by the charterer also attended but no one was permitted closer than about three metres from the containers. This only allowed them to view that the boxes inside the containers appeared to be intact. QFRS also advised the master that it would provide a scientific officer to sail on the ship to monitor the containers if they were reloaded.

The xanthates containers were purged with nitrogen gas again and resealed. At 1700, QFRS declared them to be 'fit for transport' and provided the master with a 'statement of opinion' document.

At 1712, *Kota Pahlawan* completed its normal cargo operations but the master had not yet agreed to reload the xanthates containers.

At 1730, the strategic advisory group met again and QFRS briefed the master in detail and presented its record of emission levels from the containers. QFRS also spoke with the ship's dangerous goods safety advisor in Germany to address the 'nil' odour issue. QFRS advised that, based on anecdotal evidence and information from the consignees, this was impossible because xanthates shipments invariably had some odour. However, QFRS agreed that an explanation for the continued detection of carbon disulphide vapours, even after purging, indicated that the xanthates were not, in fact, hermetically sealed.

The master then stated that the xanthates would not be reloaded because their packaging did not meet the 'hermetically sealed' requirement in the IMDG Code. A representative from Queensland Transport advised that if the cargo did not comply with the IMDG Code, it would also not comply with the Australian Dangerous Goods Code and that this would exclude its transport by road.

At 1920, PBC met separately with the master and the ship's agent and issued a 'notice of intent to claim' which stated PBCs intention to hold the master and the ship's owner, charterer and agent liable for all ongoing and future costs associated with the incident. The notice also stated that, because the xanthates containers had been declared 'fit for transport' by QFRS, PBC expected them to be reloaded but that it would 'respect that the master's decision is the final authority'.

The master and the agent were also informed by PBC that it would detain the ship to check all the other dangerous goods containers on board. PBC advised that because eight containers had been found, according to the master, not to comply with the IMDG Code, it had reason to suspect that others on board may also not comply. The master then consulted the ship's manager and agreed to consider reloading the xanthates containers if AMSA provided its written acceptance of this with regard to 'compliance' with the IMDG Code.

At 2255, AMSA endorsed the QFRS 'statement of opinion' stating that it would continue to accept the original dangerous goods declarations for the xanthates containers and specified certain conditions for their carriage to their destinations. The master then agreed to accept the containers for reloading. He also accepted the offer for a QFRS scientific officer to sail on the ship to monitor them.

By 0400 on 25 June, the xanthates containers had been reloaded onto the ship. Soon after, *Kota Pahlawan* sailed from Brisbane.

The ship continued its scheduled voyage to Sydney, where it unloaded one of the xanthates containers. An AMSA surveyor attended the ship and had discussions with the master who was asked to contact AMSA if the carbon disulphide vapour concentrations in the containers increased significantly.

At the next port, Bell Bay, the master contacted AMSA a number of times by telephone on 30 June when the vapour concentrations increased and confirmed that AMSA still endorsed the carriage of the containers. The next day an AMSA surveyor attended and the master confirmed the same with him before the ship sailed for Fremantle.

The ship arrived in Fremantle on 5 July and an AMSA surveyor attended the ship. In the early hours of 6 July, the seven remaining xanthates containers on board the ship were discharged. Later that morning, after making a final check for carbon disulphide vapours, the scientific officer disembarked from the ship. After completing its cargo operations, *Kota Pahlawan* sailed for Singapore.

The AMSA surveyor from Fremantle attended the premises of Redox and Coogee, on 7 and 10 July respectively, to inspect the xanthates containers. From his inspections, and a discussion with a Coogee representative, he concluded that some pellets of xanthates outside their hermetically sealed packaging were the probable source of the odour from *Kota Pahlawan*'s xanthates shipment.

After the incident, *Kota Pahlawan*'s charterer decided to stop carrying xanthates shipments from China to Australia but to continue to carry them to all other destinations. The decision, the charterer stated, was made for purely economic reasons due to the costs incurred as a result of the incident.

2 ANALYSIS

2.1 Evidence

On 24 June, an investigator from the Australian Transport Safety Bureau (ATSB) attended *Kota Pahlawan* whilst it was berthed in Brisbane. The ship's master, chief mate and boatswain were interviewed and relevant documents and records were obtained. The evidence included copies of the master's statement of facts, dangerous goods declarations and manifests, ship's statutory certificates, log books, procedures, various documents and correspondence relevant to the incident.

On 3 July, relevant information was obtained from the coastal pilot during a telephone interview. During the course of the investigation further evidence was sourced from Maritime Safety Queensland (MSQ), the Australian Maritime Safety Authority (AMSA), the Queensland Police Service, the Queensland Fire and Rescue Service (QFRS), the Port of Brisbane Corporation (PBC), the ship's agent, the charterer and the shippers, receivers and consignees of the xanthates containers.

2.2 The leakage

The foul odour from the xanthates containers on board *Kota Pahlawan*, first noted on 16 June 2006, led the master to conclude that that the packaging of the xanthates inside them was not hermetically sealed. He based this upon relevant information in the International Maritime Dangerous Goods (IMDG) Code and advice from the dangerous goods safety advisor of the ship's manager.

Information in the IMDG Code about xanthates, with particular relevance to an odour, includes the following:

- Hygroscopic yellow powder with an unpleasant odour.
- Finely divided dust forms explosive mixtures in air.
- On contact with moisture, evolves highly flammable vapours such as carbon disulphide.

The odour from the containers was evidence that some quantity of the xanthates or their dust or the foul smelling carbon disulphide vapours they can produce were escaping from the containers. The master took the precautions which he considered necessary to address the risks posed by the dangerous goods escaping from the containers and demanded that they be discharged at the next port.

The master had no equipment with which to measure the amount of dangerous goods escaping from the containers but he reported the odour from xanthates containers as a defect to REEFVTS. In the subsequent report by VHF radio to REEFVTS the defect was reported as a 'dangerous cargo leak'. Based on information about xanthates and their own testing and measurements after boarding the ship off Brisbane, QFRS confirmed that the containers were 'leaking powder' and the leak was 'substantial and serious'.

Therefore, not all of the xanthates were contained in hermetically sealed packaging and dangerous goods were escaping or leaking from the containers. The dangerous goods were suspended in air or in a gaseous state and the odour confirmed their presence outside the xanthates containers and it was reported as a defect to AMSA.

2.3 Previous incidents

In Australia, several incidents involving fires or toxic exposure due to xanthates have been reported in the mining and transport industries. In May 1995, an Australian Government report[9] identified defective packaging as a major risk during the transport and storage of xanthates. One of the report's conclusions stated:

> …, transporting the chemical in large packages, such as bulker bags[10], increases the risk of autoignition and flammability.

In October 1995, a fire started in Port Botany, Sydney, after a foul smelling container, part of a xanthates shipment from China, was opened. Defective packaging of the xanthates in bulker bags was later identified as the probable cause of the fire which had been extinguished by the Fire Brigade. The director of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS), at the time, warned that a spate of recent incidents, including the Port Botany fire, highlighted the need for packaging arrangements, especially bulker bags, to be urgently investigated.

The risks posed by xanthates have been widely documented by several authorities for many years. In 1986, AMSA had provided relevant guidance relating to xanthates in a marine notice which was withdrawn in 1998 after their inclusion in the IMDG Code. The Code's stowage, segregation and packaging requirements for xanthates are aimed at addressing the risks posed by them.

2.4 Packaging of xanthates

The packaging requirements for xanthates in the IMDG Code address the risks posed by carbon disulphide vapours by requiring that the packaging is a 'vapour-tight closure' or hermetically sealed. Xanthates are commonly packaged in a steel drum or, as in this case, in a wooden IBC[11] (intermediate bulk container).

2.4.1 *Kota Pahlawan*'s xanthates shipment

Kota Pahlawan's xanthates shipment of eight containers comprised four different types of xanthates. Of the five containers of sodium ethyl xanthate in the shipment, one was consigned to Coogee and the remaining four to Redox. One container each of sodium isobutyl xanthate, sodium isopropyl xanthate and potassium amyl xanthate were consigned to Coogee, Orica and SNF Australia respectively.

All the xanthates containers were packed with 20 IBCs. The markings on the IBCs, '11D' or '11F', indicated that they were constructed of plywood or reconstituted wood respectively. Each wooden IBC, depending on the consignee's product order, contained between 800 and 900 kg of xanthates.

The wooden body of each IBC protected an inner liner containing the xanthates. The liner consisted of a woven polypropylene outer bag (Figure 6), commonly referred to in the industry as a bulker bag. The bulker bag contained a single or double lined polyethylene inner bag filled with xanthates pellets. The inner bag was twisted, tied off and heat sealed with the aim of hermetically sealing it (Figure 7).

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9 National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Full Public Report, Sodium Ethyl Xanthate, Priority Existing Chemical No. 5, AGPS, Canberra, 1995.

10 A bag generally made from woven material to contain loose substances in bulk.

11 A wooden IBC, according to the IMDG Code, consists of a wooden body together with an inner liner. An IBC is rigid or flexible portable packaging up to 3 cubic metres as defined in the Code.

Figure 6: The outer bag of a liner inside a wooden IBC

Figure 7: Heat sealed inner bags containing xanthates

The consignees had ordered the xanthates from their usual suppliers in China. Of the four different suppliers, one of them was, in this case, supplying sodium ethyl xanthate to both Coogee and Redox. Each of the suppliers had arranged for packing the xanthates they were supplying and as shippers, they had also provided the documentation required by the IMDG Code.

In late May 2006, the xanthates containers were carried from China to Singapore by two other ships chartered by *Kota Pahlawan*'s charterer to await transhipment to Australia. In June 2006, the containers were loaded onto *Kota Pahlawan* in Singapore. When containers are transhipped, in the same condition as when first shipped, the normal procedure is for each subsequent carrier to provide the dangerous goods declaration on the basis of the original documentation. The charterer provided these documents to *Kota Pahlawan*'s master with computer generated signatures on behalf of the shipper.

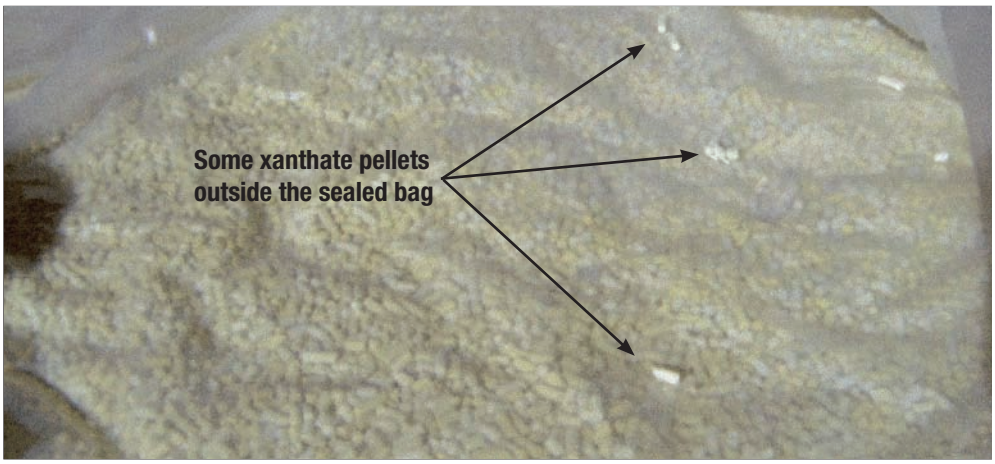
The xanthates containers were opened by QFRS in Brisbane to purge them. The IBCs inside them appeared to be intact and were not moved, opened or otherwise disturbed during the purging process. QFRS had found that the carbon disulphide vapour concentrations a few hours after purging varied from 300 to nearly 2000 ppm (parts per million). QFRS was aware, from anecdotal evidence from Orica, that there had been past instances of concentrations up to 10 000 ppm when opening containers.

During *Kota Pahlawan*'s voyage from Brisbane to Fremantle, QFRS found the carbon disulphide vapour concentration inside the xanthates containers to be generally between 500 and 1500 ppm although one container consigned to Redox recorded concentrations close to 4000 ppm. The lower flammable limit of carbon disulphide vapours, according to QFRS, was stated to be 14 000 ppm. However, the information in the IMDG Code would indicate a figure of 10 000 ppm.

With the sampling method used, a tube inserted at the bottom of the container doors, it is impossible to state with certainty if the readings obtained by QFRS during the voyage represented a uniform concentration of carbon disulphide vapours inside the container. While the vapours are more than twice as dense as the nitrogen gas which was used to purge the containers, almost the entire space inside the containers was occupied by the IBCs, making pockets of varying vapour concentrations likely. It is also possible that the concentration inside any of the IBCs containing decomposing xanthates could have been higher.

After the discharge of the containers in Fremantle, the AMSA surveyor and a surveyor arranged by the charterer viewed the removal of IBCs from one of the containers at the premises of Redox. The surveyors saw the IBCs were intact but none of them were unpacked because Redox did not have a permit to unpack the product on the site. At Coogee's premises, they inspected an unopened IBC from an identical previous xanthates shipment and found that there were some xanthates pellets outside the inner bag (Figure 8). The surveyors concluded that these had overflowed during the filling process and that such stray pellets were probably the source of the odour from the containers in *Kota Pahlawan*'s shipment.

Figure 8: Xanthates pellets outside the sealed inner bag



2.4.2 Procedures and practices of the consignees

All four of the consignees expected their suppliers and shippers to pack and ship the xanthates in accordance with the requirements of the IMDG Code. The consignees, in some cases, also supply these imported xanthates to their customers in Australia and arrange suitable carriers for transport.

All the containers in the shipment, according to the dangerous goods declarations, contained xanthates assigned packing group III and were packed in wooden IBCs. Each consignee provided the ATSB with a material safety data sheet (MSDS) for their consignments of xanthates. The MSDS for the consignments of sodium

isobutyl xanthate and sodium isopropyl xanthate showed that these were assigned packing group II for which wooden IBCs are not authorised under the IMDG Code.

There are many different MSDS available in Australia and overseas for each of the five types of xanthates, four of which *Kota Pahlawan* carried, that are commonly used. The packing group assigned to a particular xanthate in the different MSDS available for the substance can be packing group II or III. The IMDG Code does not identify specific xanthates under either packing group but it defines the criteria and tests to be used to assign packing groups for this class of dangerous goods.

All of the consignees confirmed that the odour from their consignments of xanthates carried by *Kota Pahlawan* was expected because an odour from similarly packaged past consignments was usual. None of them considered or reported an odour from xanthates containers as an abnormal condition. They also confirmed that it was usual to have some concentration of carbon disulphide inside the containers, but none had defined a permissible or acceptable concentration of it.

Coogee attributed the odour in their consignment to the carbon disulphide produced by a few 'grams' of xanthates dust or pellets between the inner and outer bags which was common. Coogee had found that a xanthates container would register none or very low concentrations of carbon disulphide at the door seals but concentrations of 500 to 1500 ppm inside the containers were common. In any case, the shipping containers are designed to be weather-tight and their rubber door seals are not designed to make them vapour-tight.

SNF Australia advised that a small section at the end of the seal of one inner bag in their consignment was not intact and that their supplier was informed. Redox and Orica, the consignees of the containers from which the odour was first noted, advised that their consignments were intact with no evidence of any cargo outside the packaging but had no explanation for the odour other than to confirm that it was usual.

However, Redox used the same supplier as Coogee, the consignee that had confirmed noting stray xanthates pellets or dust outside the sealed bags regularly. Redox was also the consignee for four of the containers, two of which registered the highest vapour concentrations. Orica's consignment of one container also registered higher concentrations than most other containers.

Carbon disulphide vapours have an 'odour threshold'[12] of 0.02 ppm and at 0.1 ppm can be detected by most persons. Therefore, the toxic vapours can be smelled at very low concentrations well below their national exposure standard of 10 ppm TWA[13].

The procedures followed by each of the consignees for unpacking containers were similar and required the containers to be ventilated, preventing sources of ignition and not unpacking in wet weather. For example, Coogee required checking for carbon disulphide at the doors of the container before and after opening them. If the carbon disulphide concentration exceeded its TWA or any other abnormality was noted, the doors were left open for ventilation until the concentration of the vapours was diluted by air and below the TWA before unpacking the container.

The odour of carbon disulphide and its vapour concentrations detected by QFRS indicated that some quantity of xanthates outside the hermetic sealing of one or

12 The lowest concentration of a chemical in air that is detectable by smell.

13 Time weighted average, the average airborne concentration over an eight hour working day, for a five day working week over an entire working life.

more of the 20 IBCs in each of the eight containers was their most likely source. Therefore, the xanthates carried by *Kota Pahlawan* were not hermetically sealed strictly in accordance with the IMDG Code.

The decision by the ship's charterer, after the incident, to discontinue the carriage of xanthates to Australia does not offer a solution to prevent future incidents.

2.4.3 Information in the IMDG Code

Ships' crews are not required to carry equipment to check carbon disulphide vapour concentrations and are not expected to open and inspect xanthates containers. Therefore, *Kota Pahlawan*'s master had to rely on the dangerous goods declaration which stated that the contents of the containers were in proper condition for carriage unless there was some physical evidence or reason, with regard to the information provided in the IMDG Code, which indicated otherwise.

The foul odour from the xanthates containers led the master to conclude, reasonably, that the packaging of the xanthates was not hermetically sealed. This incident and the history of an odour from similarly packaged xanthates being commonplace suggest that xanthates are frequently not hermetically sealed strictly in accordance with the IMDG Code.

In submission, AMSA advised that xanthates have a recognised capacity to emit the odour of carbon disulphide even when packaged in accordance with the IMDG Code.

However, the IMDG Code does not describe a capacity for xanthates to emit an odour when packaged in accordance with its provisions. Furthermore, the Code notes the risks from vapours of carbon disulphide not their low odour threshold. In any case, by definition, hermetically sealed xanthates should not emit any odour. The entire quantity of xanthates, therefore, should be contained inside the hermetic seal of its packaging.

An odour from xanthates shipments being commonplace and not being noted as abnormal or reported does not make it acceptable or recognised practice. However, it does suggest a need to review the information for xanthates and requirements for their carriage, in particular the packaging, provided in the IMDG Code.

2.5 Great Barrier Reef transit

Because of the environmentally sensitive nature of the area, a Great Barrier Reef transit by a ship involves a greater degree of risk than an ocean passage. The risk was higher again for *Kota Pahlawan*'s transit because of the leakage of dangerous goods which increased the potential for a fire on board the ship.

2.5.1 Dangerous goods risk

A fire on a ship at sea can result in its loss, the loss of life and damage to the environment. Dangerous goods on board a ship increase the chance, and the impact, of any consequences. The issue has been highlighted by at least nine major explosions and fires, since 1998, involving dangerous goods carried on board container ships around the world.

On 21 March 2006, an explosion and fire on board the container ship *Hyundai Fortune* in the Indian Ocean resulted in the crew abandoning the ship which was

virtually destroyed. Several theories and scenarios exist but it is suspected that dangerous goods, calcium hypochlorite, may have caused the initial explosions.

On 11 November 2002, the container ship *Hanjin Pennsylvania*, suffered a similar fate in the Indian Ocean with the loss of two lives. The cause was undeclared dangerous goods, in this case magnesium.

In both these past incidents, the ships were also carrying containers of other dangerous goods, including fireworks, to which the fire spread, making the consequences in each case more severe.

A dangerous goods fire on board *Kota Pahlawan* during its transit may have been difficult to control. The ship carried six other classes of dangerous goods including flammable gases, toxic substances and marine pollutants. The northern part of the Inner Route not only has narrow shipping channels but is remote from ports with the resources that may be required in the case of a fire or a pollution incident. Therefore, the likelihood and consequences of a fire during the ship's transit of the Great Barrier Reef should have been recognised and carefully managed.

2.5.2 Risk management

There are a number of mechanisms, put in place by AMSA, to manage the risk from incidents in the Australian search and rescue area. AUSREP and REEFREP provide the means for obtaining timely information on which to base a risk assessment. In the Great Barrier Reef, the monitoring and surveillance function of REEFVTS is complemented by compulsory coastal pilotage and together they can be effective risk management tools.

Reporting of the leakage

For AMSA to be able to manage the risk of a fire, or other incident, the risk must be identified and assessed. For this process to take place, relevant and timely information has to be reported to authorities. It is equally important for the reported information to be processed properly, including communicating it appropriately to areas which are responsible for assessing the risk.

The procedures in *Kota Pahlawan*'s safety management system (SMS) detailed reporting requirements for hazardous occurrences, such as dangerous goods incidents, as well as the requirements of ship reporting systems adopted by IMO. The master could have made a report about the dangerous goods incident to AMSA as soon as possible on 16 June. This could have been done either by sending a message to RCC or through an AUSREP dangerous goods report or defect report.

However, the master advised that the 2006 edition of the AUSREP manual, which contained dedicated reporting formats for incidents, was only received on board when the coastal pilot boarded. The previous edition, the master advised, did not contain these formats and he had, therefore, decided to pass the information by sending a message to the coastal pilot company and reporting the 'incident' to REEFVTS.

On 18 June, when the master noted the defect in his REEFREP pre-entry report, REEFVTS notified AMSA by submitting the report to RCC. The Mackay regional harbour master, when advised of the situation by REEFVTS, noted the information and aware that AMSA had been notified, did not make a risk assessment of his own. While MSQ is the lead agency for pollution in the Great Barrier Reef and has

an interest in all ships, particularly those with defects, transiting the area, AMSA is responsible for making a risk assessment for the transit. Consequently, the harbour master only asked REEFVTS to maintain a watch on the ship during its transit.

Within AMSA, procedures required RCC to forward the defect report to the maritime operations (MO) and the environment protection response (EPR) business units. However, this was not done immediately and consequently these units did not make a risk assessment before the ship's transit of the Inner Route.

In submission AMSA stated:

> The RCC made an assessment of the single line in the REEFVTS pre-entry report as being advisory of a potential situation with the containers that may be relevant when the ship arrived at its first port of call.

For an appropriate risk assessment to be made, the risks posed, in the first place have to be identified. The master had reported not just 'an odour', but that it was from 'dangerous cargo' containers. An appropriate response to the master's report should have resulted in RCC forwarding the report to units within AMSA that have the resources to identify and assess the risks in such cases.

The decision taken by RCC, on 18 June, to not forward the master's report until the next day resulted in an appropriate risk assessment not being made before the ship started its transit of the Inner Route.

Risk assessment

By the time the relevant business units within AMSA received the defect report from RCC on 19 June, the ship had nearly completed its transit of the critical northern part of the Inner Route. Consequently, the persons responsible for making an appropriate risk assessment started collecting the information to do so more than a day after the master had reported the defect.

In submission AMSA advised that its risk assessment determined that:

> The odour of carbon disulphide indicated a risk of some leakage of xanthates within the two containers, but AMSA assessed this as being unlikely given the recognised capacity of xanthates to emit this odour even when packaged in accordance with the IMDG Code. While the consequences of this risk were the build up of carbon disulphide to a concentration that was flammable, AMSA assessed this as being highly unlikely given the low level of odour reported and the actions taken by the ship's master to mitigate the risk.

The risk assessment by AMSA on 19 June should and could have been made the previous day when the defect involving dangerous goods was reported. Actions taken by the master and other information only became known after a risk assessment was started. The likelihood and impact of any adverse consequences due to the reported defect should have been considered before the ship started its transit of the Great Barrier Reef.

Before boarding *Kota Pahlawan*, the pilot had considered the options of using the Outer Route or, if necessary, delaying the transit. He anticipated that his own observations and information from the master but, more importantly, information and guidance from AMSA through REEFVTS would determine the decision taken. Had a risk assessment been made by the relevant units within AMSA, it may have

resulted in some action, including communication with the pilot to consider the available options, some of which the pilot had already planned for.

In submission AMSA stated:

> The implication in the draft report is that AMSA should have been in contact with the pilot to offer him some sort of unspecified advice about the potential risk from the two odorous containers, which AMSA assessed as presenting a minimal risk in any case.
>
> AMSA is aware that all coastal pilots are master mariners who are highly experienced in assessing the various risk safety factors aboard ships that they are piloting as an everyday part their job.

The assessment by AMSA of there being a minimal risk was not made until 19 June. The evaluation by RCC that the reported defect was 'an advisory of a potential situation' that may be relevant when the ship arrived at its next port did not constitute a risk assessment for the ship's transit of the Great Barrier Reef.

Notwithstanding his experience and ability to assess risks, the pilot expected that, in the absence of a defect which he could positively identify as affecting navigational safety, AMSA would provide him with the necessary guidance and advice. It was not the pilot's duty or responsibility to assess the risk at a strategic level and independently make decisions about the ship's transit of the Great Barrier Reef. Therefore, when he contacted REEFVTS before committing the ship to the Inner Route and did not receive any information relating to the xanthates containers, he concluded that there was no need to adjust the planned transit of the Inner Route.

An appropriate risk assessment by AMSA should and could have been started soon after the master's report to REEFVTS. If this had been done both the pilot and the master could have been used by AMSA in the process. Furthermore, the delay in making an appropriate risk assessment meant that the response to an incident would not have been as rapid or well prepared as it could have been.

The systems, procedures and the means of communication aimed at ensuring a timely and appropriate risk assessment was made by AMSA were ineffective in this case. This resulted in the relevant units within AMSA not considering, beforehand, the potential risk associated with *Kota Pahlawan*'s transit of the Great Barrier Reef.

2.6 The response in Brisbane

The emergency response in Brisbane from 22 June was managed by the police and QFRS, which described it as a 'Hazmat[14] Major Incident', but several other organisations were involved and significant safety issues became evident.

By 24 June, the strategic advisory group noted that not all of the consignees would take charge of the containers in Brisbane, not their destination, even though QFRS had treated and advised that they were safe for transport. Apart from Orica, which had indicated a preparedness to take charge of one container and communications with Coogee about its consignment of two containers, a firm solution had not been found for all of the containers.

The options to transport the containers by road or arrange their disposal were complicated. Rail transport was excluded because xanthates are not permitted on

14 Hazmat refers to hazardous materials.

railways. After midday, the group had concluded that transport by sea was a realistic alternative, particularly as *Kota Pahlawan* was still in Brisbane, and QFRS had advised that the containers were safe for further transport by sea.

2.6.1 Action by the Port of Brisbane Corporation (PBC)

The Port of Brisbane Corporation is a Queensland Government owned corporation that is responsible for the operation and management of the port of Brisbane. Concerned that the xanthates containers might be abandoned in the port, PBC decided to take action to have the containers reloaded onto *Kota Pahlawan*.

However, the master, when contacted by the agent after midday on 24 June, maintained that the xanthates containers did not comply with the IMDG Code. He was not convinced by the argument that QFRS had declared the containers safe for further transport by sea and did not agree to reload them.

The actions of PBC on 24 June to have the containers reloaded, in summary, were:

- At 1315, unsuccessfully asking the harbour master to detain the ship.
- Subsequently, considering detaining the ship under its powers.
- At 1920, just after the master repeated his refusal to reload the containers, issuing him with its notice of intent to claim which also advised that PBC would respect the master's decision as final.
- Not respecting the master's decision by informing him that it would detain the ship to inspect all other dangerous goods on board.

These actions, on the part of PBC, suggest a lack of understanding of the master's responsibility to comply with the IMDG Code or a reasonable concern for any consequences once the cargo was removed from its area of responsibility. While PBCs notice of intent to claim stated its legal rights and referred to the QFRS 'statement of opinion', the actions PBC took and their timing indicate attempts to pressure the master to reload the containers. In any case, the document from QFRS was not a replacement for or equivalent to the documents required under the IMDG Code.

The mission statement of PBC commits it to behaving, at all times, in a manner consistent with its values. The first of these values is publicly stated by PBC to be 'safety first – safety will be our priority in everything we do'. It has also committed to working cooperatively to ensure a safe and secure port environment. The actions taken by PBC to pressure the master did not demonstrate these values. In essence, PBC intimidated the master and placed him in a situation where he was left with little choice but to disregard his obligations under the IMDG Code.

In submission PBC stated:

> In circumstances where inspection of the cargo by QFRS and marine surveyors did not discover any breach of the packaging, and where QFRS endorsed in writing the continued transportation of the containers it cannot follow that PBC did not act appropriately and without due regard for safety. Further, PBC's position was reinforced by the endorsement of the QFRS letter by AMSA.

The marine surveyor's report, completed about two weeks after the ship had sailed, showed that he was not permitted closer than about three metres to the containers. The report described the events rather than reach any conclusions to explain the cause of the odour or to confirm that all of the xanthates were effectively hermetically sealed. Most of the information was obtained from QFRS, who had agreed that an explanation for the continued detection of carbon disulphide after purging the containers was that the xanthates were not, in fact, hermetically sealed.

The requirements of the IMDG Code are aimed at limiting the risks of carrying dangerous goods by sea to an acceptable level. Clearly defined requirements make compliance possible and are not subject to negotiation. Instead of dealing any further with PBC, a commercial entity, *Kota Pahalwan*'s master requested, appropriately, that AMSA, the maritime regulator provide a written acceptance of reloading the containers with regard to compliance with the IMDG Code.

2.6.2 Reloading and carriage of the containers

The master and the ship's manager required a 'declaration referring to compliance with the IMDG Code signed by a competent authority such as AMSA'. When AMSA endorsed the QFRS statement of opinion, the master agreed to reload the xanthates containers. Therefore, from the master's point of view, reloading and carrying the containers was also an issue of compliance with the IMDG Code.

In submission AMSA stated:

> The draft report canvasses AMSA's involvement in the eventual decision to reload the containers aboard the ship, which is characterised as a "compliance issue" and that AMSA "confirmed" (the containers) compliance with the IMDG Code. This is not factually correct as AMSA, like all the other agencies involved with the response, had not had the opportunity to check the packaging of the xanthates and form an opinion as to whether it complied with the IMDG Code.
>
> The facts are that AMSA agreed to accept that the original documentation for the containers complied with the IMDG Code requirements and therefore the containers were allowed to continue their voyage to Sydney and Fremantle, as specified on the original documentation.

The decision, AMSA advised, to accept the original documentation took into account a number of factors including its original assessment of the risk and the actions, opinion and involvement of QFRS.

During the voyage from Brisbane, the master contacted AMSA when the carbon disulphide vapour concentration in any container rose significantly. The master had decided to report a concentration reaching 3000 ppm and decided on a limit of 4000 ppm for the continued carriage of the containers. During his telephone calls to AMSA, the master also asked if the 'fit for transport' and 'compliance with the IMDG Code' were still confirmed. On each occasion, he concluded that AMSA had not 'revoked' its earlier decision regarding the carriage of the containers.

Therefore, the xanthates containers were carried to their destinations under arrangements which the master considered were in compliance with the IMDG Code on the basis of the involvement of AMSA and its endorsement of the QFRS 'statement of opinion'.

3 FINDINGS

3.1 Context

During *Kota Pahlawan*'s voyage from Singapore to Brisbane, an odour from xanthates containers, indicating a leakage of dangerous goods, was noted on 16 June 2006. The incident was reported to the Australian Maritime Safety Authority on 18 June. The ship then transited the Great Barrier Reef and berthed in Brisbane on 22 June after an emergency was declared in the port. All eight of the xanthates containers on board the ship were discharged. All of the containers were found to be producing the highly flammable and toxic carbon disulphide vapours. The containers were purged with nitrogen gas and reloaded before the ship sailed from Brisbane on 25 June.

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

3.2 Contributing safety factors

- The odour of carbon disulphide vapours from xanthates shipments, similar to *Kota Pahlawan*'s, was known to be commonplace by Australian importers of xanthates. This indicates that xanthates are frequently not hermetically sealed strictly in accordance with the International Maritime Dangerous Goods Code. This regular violation of the Code's requirements was not reported. *[Safety issue]*
- The odour of carbon disulphide vapours from xanthates containers on board *Kota Pahlawan* indicated that the xanthates were not hermetically sealed strictly in accordance with the International Maritime Dangerous Goods Code and there was an increased risk of a fire or toxic exposure incident. *[Safety issue]*

3.3 Other safety factors

- The Australian Maritime Safety Authority was not made aware of the dangerous goods leakage on board *Kota Pahlawan* until 18 June 2006, two days after it was first noted by the ship's crew. *[Safety issue]*
- The Australian Maritime Safety Authority did not appropriately assess the risks associated with the leakage of dangerous goods on board *Kota Pahlawan* until 19 June 2006, more than one day after the master had reported it and before the ship started its transit of the Great Barrier Reef Inner Route. *[Safety issue]*
- The actions taken by the Port of Brisbane Corporation on 24 June 2006, in relation to the reloading of the xanthates containers onto *Kota Pahlawan*, were inconsistent with its publicly stated core value of 'safety first' and did not adequately consider the master's legal and safety responsibilities to comply with the requirements of the International Maritime Dangerous Goods Code. *[Safety issue]*

- The packing group assigned to sodium isobutyl xanthate and sodium isopropyl xanthate in the dangerous goods declarations for carriage on board *Kota Pahlawan* was not consistent with the packing group assigned to them in the material data safety sheets provided by the consignees for these consignments. *[Safety issue]*
- The Australian Maritime Safety Authority has advised that xanthates have a recognised capacity to emit the odour of carbon disulphide even when packaged in accordance with the International Maritime Dangerous Goods Code and an odour from xanthates shipments, similar to *Kota Pahlawan*'s, is commonplace according to their Australian importers. This suggests that the information for xanthates and requirements for their carriage, in particular the packaging, provided in the Code should be reviewed. *[Safety issue]*

3.4 Other key findings

- The Brisbane regional harbour master, appropriately, initiated a risk assessment process for the leakage of dangerous goods on board *Kota Pahlawan* on 19 June 2006, soon after he had been notified and well in advance of the ship entering the Brisbane pilotage area.

4 SAFETY ACTIONS

4.1 Safety action by the Australian Martime Safety Authority

The ATSB has been advised that the following safety action has been taken by the Australian Maritime Safety Authority (AMSA) as a result of the leakage of dangerous goods on board *Kota Pahlawan* on 16 June 2006.

> AMSA is addressing the issue raised by this incident in relation to certain overseas suppliers of xanthates not exercising sufficient care in their packaging operations to ensure that no quantity of overfill of the chemical remains between the hermetically sealed bags containing the xanthates and the heavy duty liner, or bulker bags, in which they are packed. AMSA is drawing the industry's attention to the potential for even a few grams of the chemical in such an overfill situation to emit an odour of carbon disulphide. This may lead to the assumption by relevant authorities that there is a risk that the chemical is leaking from its packaging and result in remedial actions to ensure the safety of cargo handling operations. There is the potential for this situation to disrupt port operations and add to the costs incurred by charterers for the transport of xanthates cargo.

4.2 Safety action by Coogee Chemicals

The ATSB has been advised that the following safety action has been taken by the Coogee Chemicals as a result of the leakage of dangerous goods on board *Kota Pahlawan* on 16 June 2006.

- A directive has been issued to Coogee Chemicals business units that only PG [packing group] III xanthates will be imported, that liners will all be hermetically sealed by manufacturers, not just the inner two, so fugitive pellets will be contained within the sealed package.
- All customers who arrange to purchase their own xanthates, and utilise Coogee Chemicals within the logistical supply chain, will apply the above conditions.

4.3 Safety action by Maritime Safety Queensland

The ATSB has been advised that the following safety action has been taken by Maritime Safety Queensland (MSQ) as a result of the leakage of dangerous goods on board *Kota Pahlawan* on 16 June 2006.

> Since the incident MSQ and Queensland Fire and Rescue Service (QFRS) have signed a Memorandum of Understanding (MOU) on response to ship-sourced spills of hazardous and noxious substances. As part of the MOU the two organisations are working towards addressing issues and risks associated with the boarding of ships at sea. We will also discuss different ship types, cargoes and so on. Port of Brisbane Corporation will also be involved on issues of wharf access, land side exclusion zones and the different types of hazardous cargoes that go through the port.

4.4 ATSB recommendations

MR20070030

The Australian Maritime Safety Authority did not appropriately assess the risks associated with the leakage of dangerous goods on board *Kota Pahlawan* until 19 June 2006, more than one day after the master had reported it and before the ship started its transit of the Great Barrier Reef Inner Route.

The Australian Transport Safety Bureau recommends that the Australian Maritime Safety Authority take action to address this safety issue.

MR20070031

The actions taken by the Port of Brisbane Corporation on 24 June 2006, in relation to the reloading of the xanthates containers onto *Kota Pahlawan*, were inconsistent with its publicly stated core value of 'safety first' and did not adequately consider the master's legal and safety responsibilities to comply with the requirements of the International Maritime Dangerous Goods Code.

The Australian Transport Safety Bureau recommends that the Port of Brisbane Corporation take action to address this safety issue.

MR20070032

The Australian Maritime Safety Authority has advised that xanthates have a recognised capacity to emit the odour of carbon disulphide even when packaged in accordance with the International Maritime Dangerous Goods Code and an odour from xanthates shipments, similar to *Kota Pahlawan*'s, is commonplace according to their Australian importers. This suggests that the information for xanthates and requirements for their carriage, in particular the packaging, provided in the Code should be reviewed.

The Australian Transport Safety Bureau recommends that the Australian Maritime Safety Authority take action to address this safety issue

4.5 ATSB safety advisory notices

MS20070014

The odour of carbon disulphide vapours from xanthates shipments, similar to *Kota Pahlawan*'s, was known to be commonplace by Australian importers of xanthates. This indicates that xanthates are frequently not hermetically sealed strictly in accordance with the International Maritime Dangerous Goods Code. This regular violation of the Code's requirements was not reported.

The Australian Transport Safety Bureau advises that receivers, consignees and importers of xanthates and other dangerous goods should consider the safety implications of this safety issue and take action when considered appropriate.

MS20070015

The odour of carbon disulphide vapours from xanthates containers on board *Kota Pahlawan* indicated that the xanthates were not hermetically sealed strictly in accordance with the International Maritime Dangerous Goods Code and there was an increased risk of a fire or toxic exposure incident.

The Australian Transport Safety Bureau advises that shippers, receivers, consignees and importers of xanthates should consider the safety implications of this safety issue and take action when considered appropriate.

MS20070016

The Australian Maritime Safety Authority was not made aware of the dangerous goods leakage on board *Kota Pahlawan* until 18 June 2006, two days after it was first noted by the ship's crew.

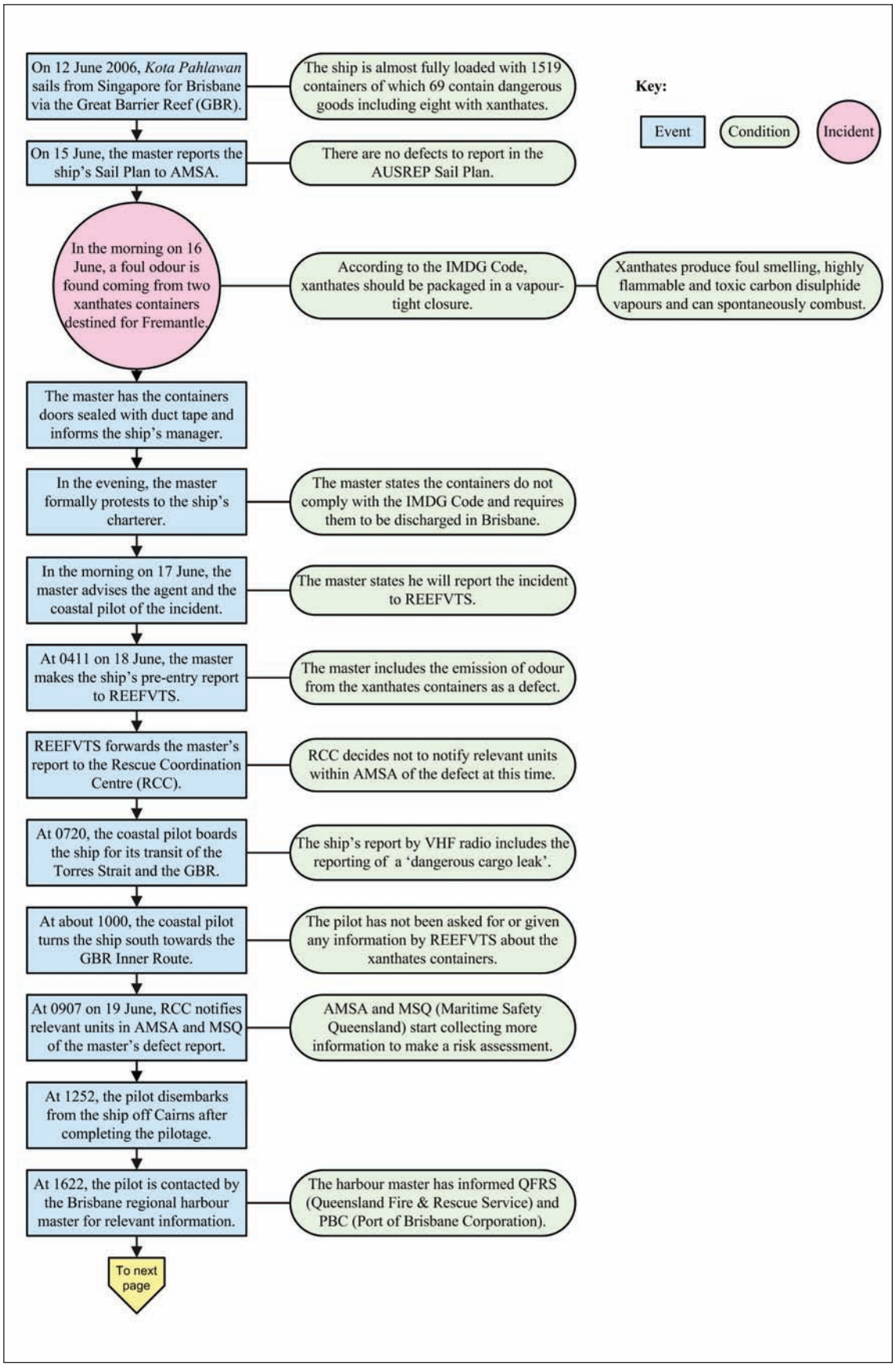
The Australian Transport Safety Bureau advises that owners, operators and masters of ships should consider the safety implications of this safety issue and take action when considered appropriate.

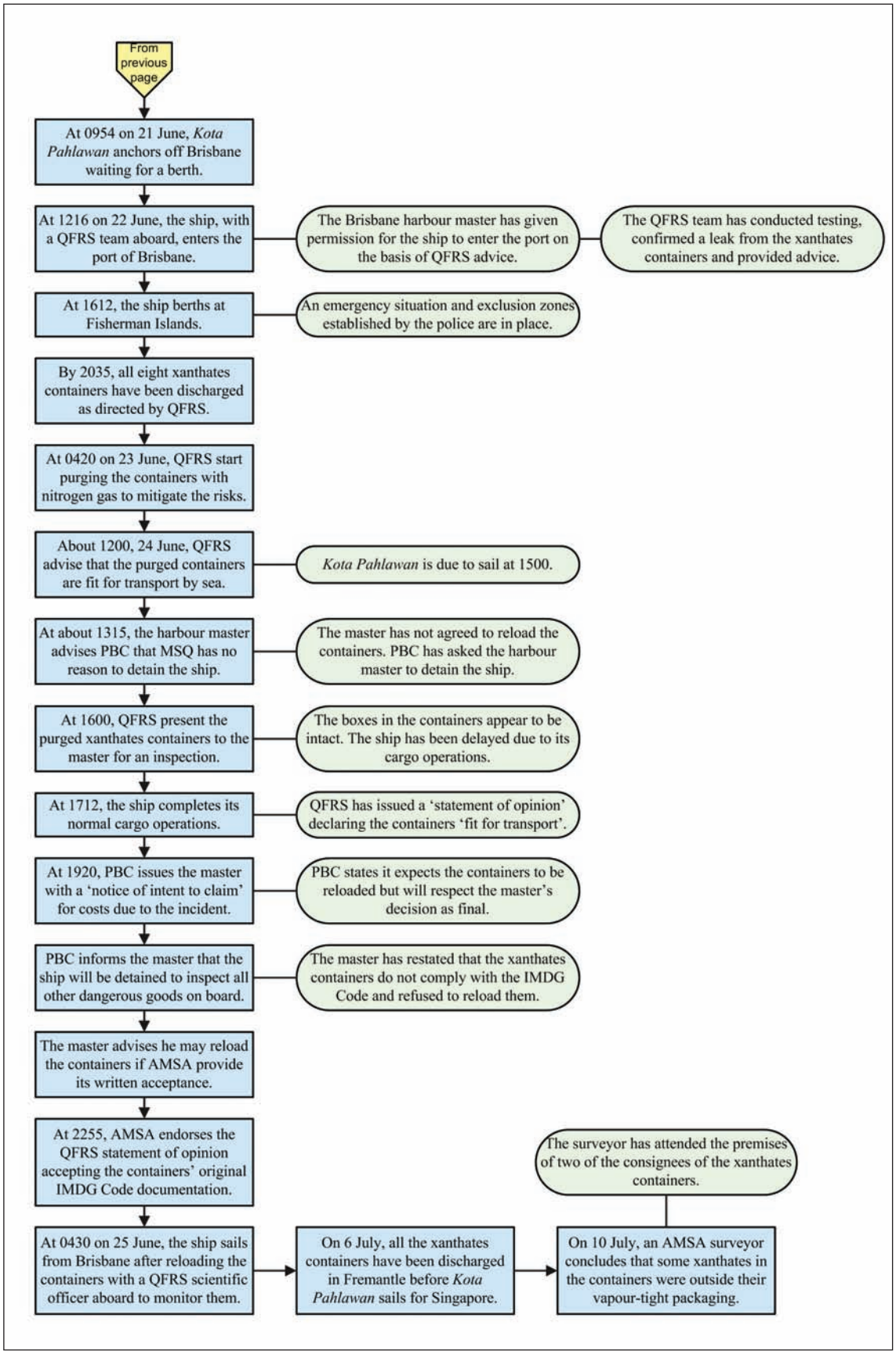
MS20070017

The packing group assigned to sodium isobutyl xanthate and sodium isopropyl xanthate in the dangerous goods declarations for carriage on board *Kota Pahlawan* was not consistent with the packing group assigned to them in the material data safety sheets provided by the consignees for these consignments.

The Australian Transport Safety Bureau advises that receivers, consignees and importers of xanthates should consider the safety implications of this safety issue and take action when considered appropriate.

APPENDIX A: EVENTS AND CONDITIONS




From previous page
At 0954 on 21 June, *Kota Pahlawan* anchors off Brisbane waiting for a berth.
At 1216 on 22 June, the ship, with a QFRS team aboard, enters the port of Brisbane.
The Brisbane harbour master has given permission for the ship to enter the port on the basis of QFRS advice.
The QFRS team has conducted testing, confirmed a leak from the xanthates containers and provided advice.
At 1612, the ship berths at Fisherman Islands.
An emergency situation and exclusion zones established by the police are in place.
By 2035, all eight xanthates containers have been discharged as directed by QFRS.
At 0420 on 23 June, QFRS start purging the containers with nitrogen gas to mitigate the risks.
About 1200, 24 June, QFRS advise that the purged containers are fit for transport by sea.
Kota Pahlawan is due to sail at 1500.
At about 1315, the harbour master advises PBC that MSQ has no reason to detain the ship.
The master has not agreed to reload the containers. PBC has asked the harbour master to detain the ship.
At 1600, QFRS present the purged xanthates containers to the master for an inspection.
The boxes in the containers appear to be intact. The ship has been delayed due to its cargo operations.
At 1712, the ship completes its normal cargo operations.
QFRS has issued a 'statement of opinion' declaring the containers 'fit for transport'.
At 1920, PBC issues the master with a 'notice of intent to claim' for costs due to the incident.
PBC states it expects the containers to be reloaded but will respect the master's decision as final.
PBC informs the master that the ship will be detained to inspect all other dangerous goods on board.
The master has restated that the xanthates containers do not comply with the IMDG Code and refused to reload them.
The master advises he may reload the containers if AMSA provide its written acceptance.
At 2255, AMSA endorses the QFRS statement of opinion accepting the containers' original IMDG Code documentation.
The surveyor has attended the premises of two of the consignees of the xanthates containers.
At 0430 on 25 June, the ship sails from Brisbane after reloading the containers with a QFRS scientific officer aboard to monitor them.
On 6 July, all the xanthates containers have been discharged in Fremantle before *Kota Pahlawan* sails for Singapore.
On 10 July, an AMSA surveyor concludes that some xanthates in the containers were outside their vapour-tight packaging.

APPENDIX B: SHIP INFORMATION

Kota Pahlawan

IMO Number	9142942
Call sign	A8BW8
Flag	Liberian
Port of Registry	Monrovia
Classification society	Germanischer Lloyd (GL)
Ship Type	Container ship
Builder	Thyssen Nordseewerke, Germany
Year built	1997
Owners	M.S. Pembroke Senator, Germany
Ship managers	Reederei F. Laeisz, Germany
Gross tonnage	25 499
Net tonnage	12 450
Deadweight (summer)	33 950 tonnes
Summer draught	11.55 m
Length overall	198.90 m
Length between perpendiculars	187.90 m
Moulded breadth	29.80 m
Moulded depth	16.50 m
Engine	Mitsubishi 8UEC60LS
Total power	16 000 kW
Crew	19

APPENDIX C: SOURCES AND SUBMISSIONS

Sources of information

Master and crew of *Kota Pahlawan*

Kota Pahlawan's coastal pilot

Australian Maritime Safety Authority

Maritime Safety Queensland

Port of Brisbane Corporation

Queensland Fire and Rescue Service

Queensland Police Service

Pacific Asia Express

Torres Pilots

Coogee Chemicals

Redox

Orica Australia

SNF Australia

Aotong International

Pacific International Lines

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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 master of *Kota Pahlawan*, Reederei F. Laeisz, the coastal pilot, the Australian Maritime Safety Authority, the Queensland Fire and Rescue Service, the Queensland Police Service, the Port of Brisbane Corporation, Maritime Safety Queensland, Coogee Chemicals, Orica Australia, Redox, SNF Australia, Aotong International, Pacific Asia Express and Pacific International Lines.

Submissions were received from the master of *Kota Pahlawan*, Reederei F. Laeisz, the Australian Maritime Safety Authority, the Port of Brisbane Corporation, Maritime Safety Queensland, Coogee Chemicals, Orica Australia, Redox, Pacific Asia Express and Pacific International Lines. The submissions have been included and/or the text of the report was amended where appropriate.

APPENDIX D: MEDIA RELEASE

Poor packing led to toxic marine incident through Great Barrier Reef

The ATSB has found that a leakage of dangerous goods on board the Liberian registered container ship *Kota Pahlawan*, off the coast of Australia, on 16 June 2006, occurred because the dangerous goods were not packaged properly.

The Australian Transport Safety Bureau investigation found that packaging deficiencies in similar past shipments of xanthates, the dangerous goods being shipped, were commonplace but not reported. It was also found that *Kota Pahlawan* transited the northern part of the Great Barrier Reef Inner Route before authorities made an appropriate risk assessment.

On the morning of 16 June, a foul odour was found to be coming from two containers of xanthates on board *Kota Pahlawan*. Xanthates, on contact with moisture, produce foul smelling, highly flammable and toxic carbon disulphide vapours and can spontaneously combust. Duct tape was used to seal the containers' doors and the master reported the incident to the ship's manager.

In the evening on 16 June, the master informed the ship's charterer that the packaging of the xanthates was not vapour-tight in accordance with international rules. He demanded that the containers be unloaded in Brisbane, the next port.

At 0411 on Sunday 18 June, a few hours before entering the Torres Strait, *Kota Pahlawan*'s master reported the emission of odours to the Australian Maritime Safety Authority (AMSA). At 0720, the ship embarked a coastal pilot for its transit of the northern part of the Great Barrier Reef Inner Route.

At 0907 on Monday 19 June, AMSA issued a defect report for *Kota Pahlawan* and notified relevant areas within AMSA and Maritime Safety Queensland (MSQ). Both AMSA and MSQ then started collecting more information to make a risk assessment.

On 22 June, the ship berthed in Brisbane after an emergency was declared and exclusion zones were established. Emergency services attending the ship had confirmed a dangerous goods leakage. All eight xanthates containers on board the ship were unloaded and purged with nitrogen gas.

On 24 June, the emergency services declared the purged containers to be fit for transport and *Kota Pahlawan*'s master was asked to reload them. The master agreed to reload the containers after AMSA provided its written acceptance.

On 25 June, *Kota Pahlawan* sailed from Brisbane with an emergency services scientific officer aboard to monitor the xanthates containers. The ship continued its voyage to Sydney, Bell Bay and Fremantle where the last of the containers were discharged on 6 July.

The ATSB report includes safety actions already taken and a number of recommendations and safety advisory notices with the aim of preventing similar incidents in the future.

Independent investigation into the leakage of dangerous goods on board the Liberian registered container ship *Kota Pahlawa*n off the coast of Australia, 16 June 2006.