



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

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.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements.

ATSB investigations are independent of regulatory, operator or other external bodies. It is not the objective of an investigation to determine blame or liability.

© Commonwealth of Australia 2007.

This work is copyright. In the interests of enhancing the value of the information contained in this publication you may copy, download, display, print, reproduce and distribute this material in unaltered form (retaining this notice). However, copyright in the material obtained from other Government agencies, private individuals or organisations, belongs to those agencies, individuals or organisations. Where you want to use their material you will need to contact them directly.

Subject to the provisions of the Copyright Act 1968, you must not make any other use of the material in this publication unless you have the permission of the Australian Transport Safety Bureau.

Please direct requests for further information or authorisation to:

Commonwealth Copyright Administration,
Copyright Law Branch
Attorney-General's Department
Robert Garran Offices
National Circuit
BARTON ACT 2600
www.ag.gov.au/cca

Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608
Australia
1800 621 372
www.atsb.gov.au

Released in accordance
with section 25 of the
Transport Safety Investigation Act 2003

Hawser failure and manoeuvring difficulties on board *Dampier Spirit* during cyclone Hubert

At 0958¹ on 6 April 2006, the mooring line (hawser) attaching *Dampier Spirit* to the CALM² buoy at the Stag oil platform off Dampier, Western Australia, parted and forced the ship to put to sea as a cyclone approached.

Once disconnected, the ship had difficulty making headway while trying to avoid the cyclone and was tracking towards Tryal Rocks until the wind eased, allowing it to sail into safer water.

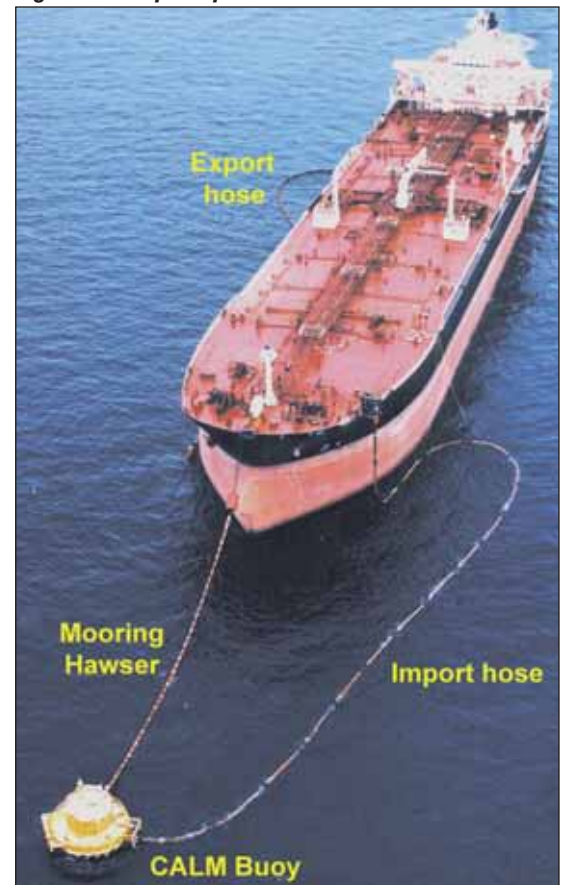
If *Dampier Spirit* had grounded on Tryal Rocks, its 12 100 tonnes of crude oil cargo may have been spilled into the sea, resulting in significant damage to the environmentally sensitive mangroves and turtle nesting grounds in the area.

Dampier Spirit

Dampier Spirit is a floating storage and offloading (FSO) tanker registered in the Bahamas. The ship is classed with the American Bureau of Shipping (ABS) and managed by Teekay Shipping, Australia. It is 244.69 m long, has a beam of 42.70 m and a depth of 21.52 m. At its summer draught of 14.663 m, the ship has a deadweight of 106 668 tonnes.

The ship was built in 1988 in Ulsan, Korea, as *Frontier Spirit* by Hyundai Heavy Industries. Originally a single hull Aframax³ tanker, it was converted to an FSO at the Keppel Shipyard, Singapore, and renamed *Dampier Spirit*, in

Figure 1: *Dampier Spirit*



1998. All of its nine cargo tanks are located forward of the accommodation.

When moored at the CALM buoy, *Dampier Spirit* acts as a crude oil storage vessel for the Stag oil platform.

Oil is delivered from the platform through a pipe on the seabed and up to the CALM buoy. From the CALM buoy, oil is transferred to *Dampier Spirit* through an import hose (Figure 1). The import hose is fitted with a

- 1 All times referred to in this report are local time, coordinated universal time (UTC) + 8 hours.
- 2 Catenary Anchor Leg Mooring – a buoy moored to the seabed using anchors and cables.
- 3 A tanker, usually between 80 000 and 120 000 deadweight tonnes.

breakaway coupling, designed to separate and shut off the hose when it is subjected to a load of more than 15 tonnes.

When an off-take tanker arrives, it is moored astern of *Dampier Spirit* using a single hawser and oil is pumped into it through an export hose.

At the time of the incident, *Dampier Spirit* was moored to the CALM buoy using a single hawser. The hawser was a 70 m long, 19 inch circumference (154 mm diameter) double braided nylon grommet⁴ with a safe working load (SWL) of 250 tonnes. The actual breaking load of the hawser was listed on the ABS survey certificate as 5198.8 kN or 530 tonnes.

The hawser was attached to one of two quick release hooks, mounted on the bow of the ship, using a length of chain. Each quick release hook had a SWL of 200 tonnes. The load on the hawser was remotely monitored on board *Dampier Spirit* and in the Stag platform control room.

Dampier Spirit's propulsion is provided by a B&W 6S60MC slow speed diesel engine developing 9330 kW at 89 RPM. As part of the ship's conversion to an FSO, the main engine was modified to allow it to run at slow astern for extended periods of time, if needed, to reduce snatch loads on the mooring. The modifications included fitting 'slow steaming' fuel injector nozzles which effectively reduced the power output of the engine. The chief engineer had limited the engine to running at half ahead for no more than one hour due to operating constraints suggested by the engine manufacturer at the time of the ship's conversion.

Dampier Spirit's crew of 17 were all Australian nationals.

The master had 27 years experience at sea. He had been master of *Dampier Spirit* for about two years and had rejoined the ship three weeks before the incident.

The chief engineer had 13 years experience at sea. He had been promoted to the rank of

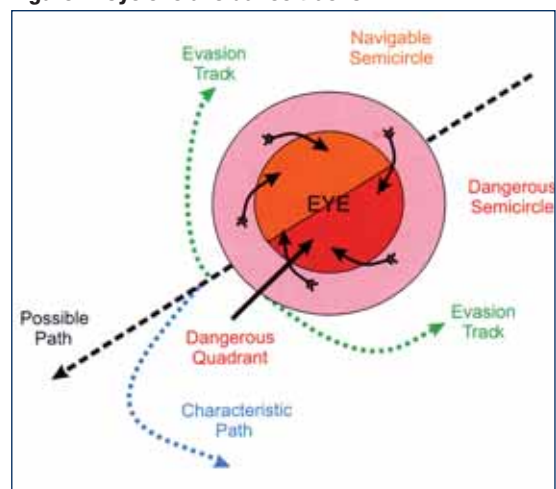
chief engineer three days before the incident and had worked on the ship as first engineer for a year before being promoted.

Tropical cyclones

The Australian Seafarer's Handbook provides advice to seafarers about cyclones. In the northwest of Australia, cyclones generally move in a south-westerly direction before curving towards the south or southeast. Category one cyclones, the lowest category, have wind speeds in excess of 35 knots⁵ with gusts of up to 50 knots.

The dangerous semi-circle of a cyclone in the southern hemisphere is on its south-eastern side (Figure 2). This is the area which has the strongest winds and it is also the direction in which the cyclone is expected to move.

Figure 2: Cyclone avoidance tracks⁶



The handbook provides advice on the best tracks to use when evading a cyclone. If the ship is in the dangerous semi-circle the wind should be kept on the port bow and the ship should make its best possible speed to manoeuvre away from the cyclone. If the ship is in the navigable semi-circle, the wind should be placed on the port quarter to allow the ship to move clear.

⁴ A continuous loop of rope seized together to form a single rope with an eye at each end.

⁵ One knot, or one nautical mile per hour = 1.852 kilometres per hour.

⁶ Australian Seafarer's Handbook, Edition 1, 2004, P 51. Reproduced with permission from the Australian Hydrographic Service.

The Bureau of Meteorology (BoM) provides daily weather forecasts for the northern, Western Australian ports and oil fields to allow ship masters, harbour masters and oil platform managers to prepare for changes in the weather.

If a tropical depression is approaching, the forecasts are issued every six hours and if a cyclone has been declared, the forecasts are issued every three hours.

Dampier Spirit's operator provided 'Cyclone Alert Guidelines' for the ship which defined the 'Cyclone Alert' stages as:

Blue Alert: Gale force winds (34 knots) at 700 miles⁷ from the facility.

Yellow Alert: Gale force winds at 400 miles from the facility.

Red Alert: Gale force winds at 250 miles from the facility.

The incident

On 2 April 2006, *Dampier Spirit* reconnected to the CALM buoy after Cyclone Glenda had passed. An off-take tanker, *Pacific Leo*, moored astern of *Dampier Spirit* at 0942 on 4 April and a cargo transfer was started. *Pacific Leo* completed loading its cargo and departed at 0800 on 5 April. The cargo export hose was disconnected from *Dampier Spirit* and towed away to the cyclone mooring, as was the normal practice during the cyclone season.

The weather forecast issued by the BoM at 0900 on 5 April indicated that a tropical low which it had been monitoring could develop into a category one cyclone in about 12 hours. An updated forecast, issued at 1500, predicted that the tropical low would become a cyclone in about six to twelve hours.

At 2100, the BoM declared that the tropical low had developed into a category one cyclone and had named it Tropical Cyclone Hubert. Tropical Cyclone Hubert was centred about 200 miles north of the Stag platform. A significant wave height of over 3.8 m was predicted at the Stag platform before 0600 on 6 April.

⁷ Mile refers to a nautical mile.

Dampier Spirit was experiencing 25 knot easterly winds and 2.5 m seas when it received the cyclone warning. The master chose to wait until the following morning, 6 April, to make a decision about disconnecting from the CALM buoy. He did not leave any night orders or written instructions on the bridge before he went to bed.

At 0700 on 6 April, a meeting was held between the master, chief engineer, first engineer and chief mate to discuss the cyclone warning. The chief engineer informed the master that the main engine was available for use but he would prefer to minimise its use while at the buoy, if possible, to reduce the temperature inside the composite boiler⁸. The engineers had started cleaning the tubes inside the furnace of the composite boiler on 5 April and would be working on it again on 6 April.

After the meeting, the engineers prepared the main engine for use. The engine was lubricated and turned at 0755 before being blown over on air. Control of the engine was passed to the cargo control room⁹ at 0820.

At 0746, the snatch loads on the hawser started to exceed the 100 tonne alarm point and by 0800 the ship was surging on its moorings in seas that were 3.3 m high and rising. However, the engine was not run at this time to reduce the snatch loads.

The master telephoned the Stag platform at 0810 and was informed that the wind was 35-45 knots and that oil production had not stopped in anticipation of evacuating personnel from the platform. He planned to contact the platform again at 1000 to discuss the deteriorating weather and the possible disconnection of *Dampier Spirit* from the CALM buoy.

At 0955, the hawser load cell recorded that the hawser load had peaked at 181 tonnes. The hawser probably parted at this time although the time of it failing was recorded in the deck

⁸ The composite boiler generates steam from either main engine exhaust gas or from an oil fired furnace. Running the main engine would heat the boiler, thereby increasing the temperature in the furnace.

⁹ The cargo control room is used for cargo and ballast operations and the main engine and steering can be controlled from here if needed to limit hawser loads.

log as 0958. *Dampier Spirit* was still loading cargo when the hawser failed causing the breakaway coupling on the import hose to activate, releasing about 15 litres of oil into the sea. At the time of disconnection, the ship had about 12 100 tonnes of crude oil on board.

After the hawser parted, the main engine was run at slow astern to move the ship clear of the CALM buoy. After clearing the buoy, the master attempted to take the ship to the northeast but the strong head winds, and the reduced engine power, made it impossible. He then decided to take the ship north, with the wind on the starboard bow, to move clear of the Dampier Archipelago. With the main engine running at slow ahead, *Dampier Spirit* was making good a course of 325° while steering due north (Figure 3).

By 1230, the wind was from the east at force eight¹⁰ (34–40 knots). The master set the ship on a heading of 030° in an attempt to track north but the ship was making good 322° due to the effect of the wind on the starboard side of the ship.

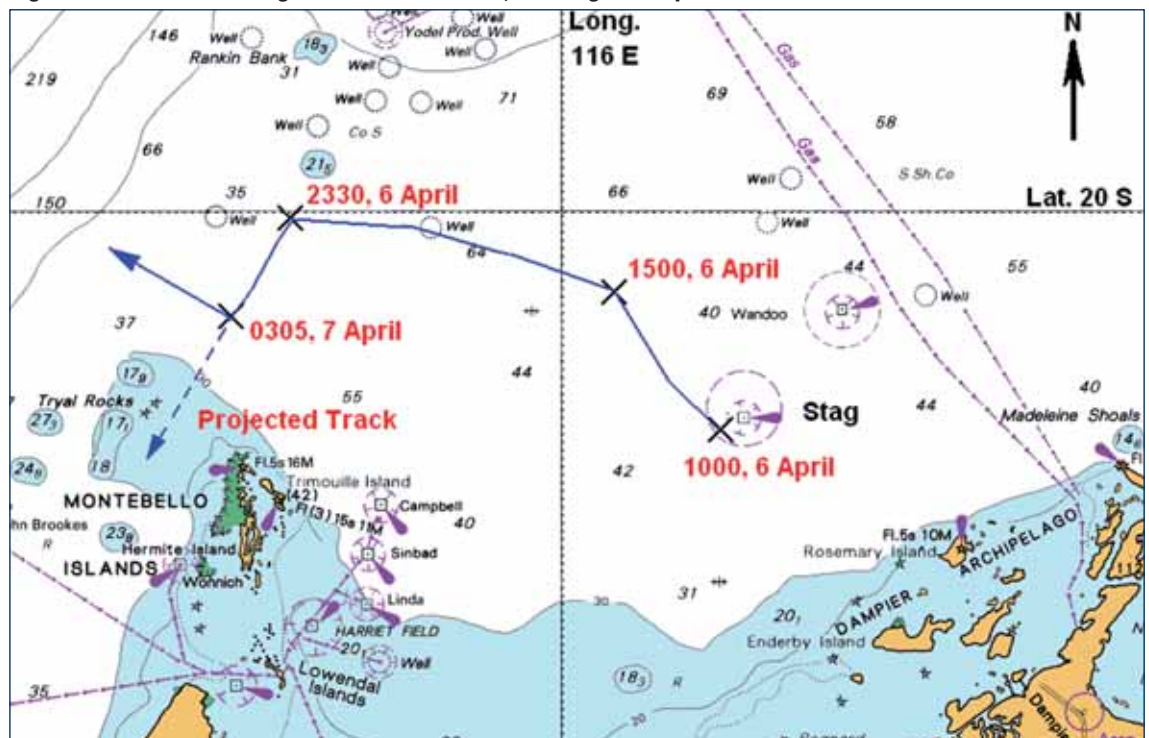
At 1330, the ship's heading was altered to 060° but its track remained 322° at a speed of between two and three knots.

At 1500, a sudden change in the wind direction brought the wind around onto the ship's port bow. The main engine was increased to half ahead, 61 RPM, and unsuccessful attempts were made to bring the ship's head around to port so that the wind was again on the starboard side. The master then swung the ship around to starboard, passing the stern through the wind, to bring the wind back onto the starboard side of the ship.

At about 2330, the wind swung around to the port bow. By midnight the ship's heading was between 060° and 105° with the wind on the port side. However, the ship was being pushed astern and making good 212°.

At midnight, *Dampier Spirit* was 17.2 miles from Tryal Rocks and the projected track would put the ship within one mile of Tryal Rocks.

Figure 3: Extract from navigational chart Aus 416, showing the ship's track



¹⁰ The Beaufort scale of wind force, developed in 1805 by Admiral Sir Francis Beaufort, enables sailors to estimate wind speeds through visual observations of sea states.

At about 0140 on 7 April, the master contacted the ship's managers in Perth with concerns about the ship's progress. The master discussed the option of dropping both anchors to slow the ship's drift and to hold the ship clear of Tryal Rocks. This was agreed to but was, ultimately, not required.

He called again at about 0210 because the conditions were not improving and he was unable to turn the ship. He was told that he should contact the Australian Maritime Safety Authority (AMSA) and inform them of the situation, which he did at about 0255.

At about 0305, there was a sudden drop in the wind speed. This allowed the master to bring the ship around to a heading of 330° and make good a course to clear Tryal Rocks. By 0330, *Dampier Spirit* was on a heading of 350° and making good 302°.

At 1130, the weather had improved significantly and the ship sailed back to the CALM buoy. The ship arrived at the anchorage at 2242 and the master decided to drift overnight. *Dampier Spirit* let go its starboard anchor near the CALM buoy at 0836 on 8 April.

Analysis

On 7 April, *Dampier Spirit* was at risk of grounding on Tryal Rocks after the failure of the mooring hawser effectively forced the ship to depart the Stag field and put to sea.

Dampier Spirit's master had delayed making the decision to disconnect from the CALM buoy when a cyclone, centred 200 miles from the ship, was declared. His decision may have been delayed because:

- The company's decision guidelines were ambiguous.
- The ship had safely remained at the buoy during a previous cyclone.
- The procedures did not accurately reflect the ship's ability to sail away from danger.
- The Stag platform was still discharging crude oil into the ship's cargo tanks.

The delay in making a decision to disconnect reduced the time available, and the master's options, for taking the ship clear of the cyclone to safety.

After the ship had separated from the buoy, it had difficulty in manoeuvring away from the area because the performance of the ship was reduced by the 'slow steaming' fuel injector nozzles fitted in the main engine and by the build-up of barnacle and coral growth on the hull.

Mooring hawser

The hawser connecting *Dampier Spirit* to the CALM buoy had been replaced on 5 April 2005, twelve months before the incident, as part of the hawser's annual maintenance programme. An attempt was made to replace it again on 28 March 2006 but this was deferred by the ship's master because of concerns about the prevailing weather.

The hawsers used on *Dampier Spirit* had a manufacturer's warranty of 12 months. An independent study into hawser fatigue, which had been undertaken for the Stag facility in 1997, had concluded that:

...it may be prudent, in the first instance, to adopt a non-fatigue based retirement policy. It is recommended that the hawser be initially retired after 12 to 18 months.

A service life profile, which had been calculated for the hawser when the ship first arrived on station in 1998, was used for guidance until the first retired hawsers were inspected. The service life profile suggested that the hawser should be replaced after 206 days if the hawser was subjected to its usual loading of 15 to 30 tonnes. The inspection of the retired hawsers suggested that the replacement interval should be one year.

Based on this information, the ship's operator decided that the replacement interval should be one year if the hawser was subjected to its usual loads. However, the hawser which failed had been subjected to loads of up to 172 tonnes in the previous months and these loads would have significantly shortened the hawser's life expectancy and thus it should have been replaced earlier.

The 'CALM Buoy Disconnect Criteria Guidelines' stated that the main engine should be run astern to reduce the snatch loads, and thereby extend the hawser lifespan, before the snatch loads on the

hawser exceeded 50 tonnes. The engine was not run after the cyclone was declared, or on the morning of 6 April, until after the hawser had parted.

The single mooring hawser was not replaced when its service conditions suggested that it should have been, and the main engine was not run to reduce the snatch loads after Cyclone Hubert was declared. The hawser subsequently failed at a load of 181 tonnes, well below its certified 530 tonne breaking load.

Decision to disconnect

The ship's operator had issued guidelines and procedures to provide guidance for the master when making the decision to disconnect from the CALM buoy.

The company's 'CALM Buoy Mooring Arrangements Guideline' described the mooring arrangements for the ship. It referred to a hawser load threshold of 250 tonnes and stated that when the hawser load exceeded 80% of the threshold (200 tonnes) the hawser is to be disconnected.

The 'CALM Buoy Disconnect Criteria Guidelines' required the ship to disconnect from the CALM buoy when:

- The hawser load exceeded 250 tonnes.
- The significant wave height exceeded 3.7 m.
- The cyclone alert status, as defined in the 'Cyclone Alert Guidelines', required disconnection.

There is an inconsistency in these two documents in that the 250 tonne limit in the 'CALM Buoy Disconnect Criteria Guidelines' is higher than the 200 tonne disconnection limit stated in the 'CALM Buoy Mooring Arrangements Guideline'.

The wave height predicted by the BoM at the Stag platform for 0600 on 6 April was over 3.8 m, which would be in excess of the limit stated in the 'CALM Buoy Disconnect Criteria Guidelines'. Given this forecast, the master should have ensured that *Dampier Spirit* was ready to disconnect on 6 April when the actual wave height exceeded the 3.7 m

limit. However, if the master had waited until then to disconnect from the buoy, the ship would not have had sufficient time to safely move into open water.

According to the vessel's 'Cyclone Alert Guidelines', when the FSO is on Red or Yellow alert, the master must consider the position and category of the cyclone, the conditions at the CALM buoy to allow safe disconnection, and the expected speed of the ship when clearing the cyclone. It also stated that the master may stop loading and disconnect if the weather conditions at the time endangered the ship, personnel or buoy or if extra steaming time was required to clear the danger sector of the approaching cyclone.

The cyclone alert status stated in the 'Cyclone Alert Guidelines' did not provide specific disconnection criteria, but placed the decision to disconnect from the CALM buoy at the master's discretion, usually in consultation with the production facility manager, and recommended that the ship should stay at least 150 miles away from the centre of a cyclone if crossing the predicted track of a cyclone from the dangerous to the navigable semi-circle.

When the master contacted the facility production manager, he was informed that the Stag platform was still producing oil and was not yet preparing for evacuation. The personnel on the Stag platform can be evacuated by helicopter and the time taken for their evacuation is considerably shorter than the time required for the ship to sail into open waters.

Dampier Spirit's contractual obligations allowed the ship to disconnect from the CALM buoy when the cyclone was declared and the ship would not have been taken 'off-hire' by the charterer.

When Cyclone Hubert was declared, it was a category one cyclone with winds in excess of 35 knots, centred approximately 200 miles north of the Stag oil field. This fell within the Red Alert status as defined in the guidelines and placed *Dampier Spirit* in the dangerous semi-circle of the cyclone.

The ship could not track to the southeast to avoid the dangerous semi-circle of the

cyclone, as recommended in the Australian Seafarer's Handbook, because of its close proximity to the Dampier Archipelago. The master should have considered this factor in the circumstances and, thus, needed to make the decision to disconnect early enough to allow the ship to sail safely into open waters.

When Cyclone Hubert was declared at 2100 on 5 April, the master did not make the decision to disconnect from the CALM buoy. The inconsistencies between the different guidelines did not provide unambiguous guidance for the master. Furthermore, the master did not adequately consider the path of the cyclone, and the time needed to avoid it, when he delayed his decision to disconnect from the buoy.

Performance guidelines

Both the 'CALM Buoy Disconnect Criteria Guidelines' and the 'Cyclone Alert Guidelines' referred to the estimated speed of the ship as five knots when towing the export hose and nine knots without it.

Dampier Spirit's engineering procedure for departing from the CALM Buoy, dated 15 March 2003, states:

Experience has shown that max RPM in this situation is 61 RPM with a speed of approx. 7.5 to 8.0 knots.

On 6 April, *Dampier Spirit* was unable to make any headway into the wind and the ship returned to the CALM Buoy at a speed of 7.3 knots on 7 April with the wind astern.

Dampier Spirit was last dry-docked in 1998 when it was converted to an FSO. During that docking, the hull was prepared and a five year antifouling paint scheme was applied. The ship had been mostly stationary in tropical waters for eight years since its conversion. It had significant barnacle and soft coral growth on the underwater areas. The last in-water survey, in September 2005, reported that the growth was between 50 and 80 mm thick on the ship's sides and around 150 mm thick on the rudder.

The ship's operator had not adequately identified the need to mitigate the effects on the ship's speed of fouling on the hull through

dry docking or by cleaning while on station at the CALM buoy.

The main engine was fitted with 'slow steaming' fuel injector nozzles, significantly reducing its performance. The ship's performance was further degraded by the thick marine growth on the hull. The documentation had not adequately considered these factors and, therefore, over-estimated the performance of the ship.

If *Dampier Spirit's* performance had not been degraded, the ship may have been able to manoeuvre clear of Cyclone Hubert when the mooring hawser parted on 6 April.

Night orders

On the evening of 6 April, the master asked the second mate to prepare a passage plan to move the ship away from the CALM Buoy on a course of 075° but he left no other orders or instructions.

The Bridge Procedures Guide details the recommended practices for masters and mates on the bridge of a ship. The Bridge Procedures Guide¹¹, section 1.3.1.1, states:

In addition to general standing orders, specific instructions may be needed for special circumstances.

At night, the master should write in the bridge order book what is expected of the OOW¹². These orders must be signed by the OOW when going on watch.

When Cyclone Hubert was declared at 2100 on 6 April, the declaration should have been considered as a 'special circumstance'. The master did not issue any night orders to provide guidance for the mates during the night.

The master did not leave any instructions for the mates about the criteria for disconnecting from the CALM buoy when a cyclone was in the vicinity or for reducing the hawser loads. The mates did not have any guidelines on how to monitor the cyclone or when to alert the master to a change in conditions.

¹¹ Bridge Procedures Guide, Third edition 1998, International Chamber of Shipping.

¹² Officer of the watch.

The lack of night orders on 6 April meant that the master was uninformed about the progress of the cyclone during the night and the main engine was not run during the night to reduce the snatch loads on the hawser.

Previous cyclones

Dampier Spirit disconnected from the CALM buoy on five other occasions during the 2005 to 2006 cyclone season, more frequently than during previous cyclone seasons.

The decision to remain at the CALM Buoy is at the discretion of the master, within the criteria stated in the guidelines. Another master, who was on board *Dampier Spirit* during Cyclone Emma, exercised his discretion and did not disconnect from the CALM buoy.

The ship remained at the CALM buoy, using its main engine to reduce the hawser loads, when Cyclone Emma passed through the region in February 2006. The hawser load peaked at 172 tonnes during Cyclone Emma but the hawser did not fail.

The master's decision to remain at the CALM buoy during Cyclone Hubert may have been influenced by the ship safely remaining at the buoy during Cyclone Emma.

Findings

Based on the evidence available, the following factors are considered to have contributed to the hawser failure and subsequent manoeuvring difficulties on board *Dampier Spirit*.

- When the master delayed making the decision to depart the CALM buoy when Cyclone Hubert was declared, he did not adequately consider the time needed to safely avoid the cyclone. His decision was not in accordance with the company's guidelines for disconnection from the CALM buoy.
- The company guidelines for disconnection from the CALM buoy were not consistent and did not provide unambiguous advice to the master.
- The master did not adequately consider the implications of the local weather

conditions and the approaching cyclone and did not issue appropriate night orders to the mates.

- The ship remaining at the CALM buoy during Cyclone Emma may have influenced the master's decision to stay connected to the CALM buoy as Cyclone Hubert approached.
- The CALM buoy mooring hawser was weakened due to the effects of its service conditions and it failed at a load of 181 tonnes, well below its safe working load.
- The hawser had not been replaced when its service conditions indicated that it needed replacement.
- The ship's performance was limited by the 'slow steaming' fuel injector nozzles fitted in the main engine and by the marine growth on the hull which, together, significantly reduced the ship's ability to make headway.
- The procedures and guidelines for disconnection from the CALM buoy did not accurately reflect the performance of the ship.

Safety Actions

Teekay Shipping conducted an investigation of the incident and recommended the following corrective actions:

- Carry out another independent study of hawser loading, discuss the hawser life expectancy with the manufacturer, undertake a feasibility study for using a second hawser and review the procedures for hawser replacement.
- Investigate options to limit the effect of marine growth on ship performance.
- Brief all FSO masters about the importance of issuing night orders, and discuss night orders at masters' and chief engineers' meetings.
- Consolidate the station keeping procedures and disconnection criteria into a single, unambiguous, document and implement the changes on the FSO ships.

- Brief FSO masters about making a proper appraisal of the prevailing weather conditions when making a decision to disconnect from the CALM buoy so that the safety of the ship is not compromised at any time because it has not disconnected in ample time.
- Provide better guidance for masters and chief engineers when additional engine power is required at crucial navigational periods.

ATSB Recommendations

MR20060040

Owners and operators of FSO and FPSO ships should provide unambiguous procedures and guidelines for the disconnection and manoeuvring of their ships during cyclones.

MR20060041

Owners and operators of FSO and FPSO ships should ensure that mooring hawsers and associated equipment are inspected and replaced according to their service conditions and loading.

Media Release

Cyclone threatened to ground oil tanker

The ATSB has found that the tanker, *Dampier Spirit*, did not have sufficient speed to safely evade a cyclone that was approaching the coast of Western Australia after its mooring hawser failed on 6 April 2006.

Dampier Spirit is a floating storage and offloading tanker for the Stag oil platform near Dampier, Western Australia, that is usually attached to a mooring buoy one nautical mile from the platform. At the time of the incident, the 106 668 tonne tanker had a partial load of about 12 100 tonnes of crude oil on board.

At 0958 on 6 April 2006, the ship was forced to put to sea as Cyclone Hubert approached when the mooring hawser attaching the ship to the buoy failed under load. The ship's master had delayed making the decision to disconnect from the buoy when the cyclone was declared, a delay which effectively reduced the time available to navigate the ship safely out of the cyclone's path.

Once disconnected from the buoy, the ship had difficulty making sufficient headway in the strong winds and heavy seas produced by the cyclone because its speed was limited by 'slow steaming' fuel injector nozzles that had been fitted in the main engine and by the build-up of marine growth on the hull.

Dampier Spirit was tracking towards Tryal Rocks for over three hours until the wind eased at 0305 on 7 April, allowing the tanker to sail into safer water. If it had grounded on Tryal Rocks, its cargo of crude oil may have spilled into the sea, resulting in significant damage to the environmentally sensitive mangroves and turtle nesting grounds in the area.

The report concludes that the company guidelines for disconnection from the CALM buoy did not provide unambiguous advice to the master, the mooring hawser had been weakened by its service conditions and the master did not adequately consider the time needed to safely avoid the cyclone when making the decision to disconnect and depart from the buoy.

The ATSB has made two safety recommendations with the aim of preventing further incidents of this type.





www.atseb.gov.au