



Australian Government

Australian Transport Safety Bureau



ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Marine Occurrence Investigation No. 207
Final

Independent investigation into the grounding of the
Liberian registered general cargo ship

Mellum

in the port of Thevenard, South Australia

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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office location: 15 Mort Street, Canberra City, Australian Capital Territory
Telephone: 1800 621 372; from overseas + 61 2 6274 6590
Accident and serious incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6274 6474; from overseas + 61 2 6274 6474
E-mail: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

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CONTENTS

| | |
|--|------------|
| DOCUMENT RETRIEVAL INFORMATION | v |
| THE AUSTRALIAN TRANSPORT SAFETY BUREAU | vii |
| 1 EXECUTIVE SUMMARY | 1 |
| 2 FACTUAL INFORMATION | 3 |
| 2.1 Mellum | 3 |
| 2.2 Thevenard | 4 |
| 2.3 The incident | 5 |
| 3 ANALYSIS | 9 |
| 3.1 Evidence | 9 |
| 3.1.1 Master’s statement | 9 |
| 3.1.2 Pilot’s statement | 9 |
| 3.2 The grounding | 9 |
| 3.2.1 Time at which the pilot left the bridge | 10 |
| 3.2.2 Pilot’s instructions on leaving the bridge | 11 |
| 3.3 Bridge Resource Management | 11 |
| 3.3.1 Master/Pilot exchange | 12 |
| 3.3.2 Passage planning | 13 |
| 3.3.3 Bridge manning – position and speed monitoring | 13 |
| 3.4 Navigation chart Aus 120 | 15 |
| 3.5 Echo sounder | 15 |
| 3.6 Pilot training | 15 |
| 4 FINDINGS | 17 |
| 4.1 Contributing safety factors | 17 |
| 5 SAFETY ACTIONS | 19 |
| 5.1 Safety action by Flinders Ports | 19 |
| 5.2 Safety action by the Australian Hydrographic Service | 19 |
| 5.3 ATSB recommendations | 19 |

| | | |
|----------|--|-----------|
| 6 | APPENDIX A: EVENTS AND CONDITIONS CHART | 21 |
| 7 | APPENDIX B: SHIP INFORMATION | 23 |
| | 7.1 Mellum | 23 |
| 8 | APPENDIX C: SOURCES AND SUBMISSIONS | 25 |
| | 8.1 Sources of information | 25 |
| | References | 25 |
| | 8.2 Submissions | 25 |
| 9 | APPENDIX D: MEDIA RELEASE | 27 |

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Independent investigation into the grounding of the Liberian registered general cargo ship *Mellum* in the port of Thevenard, South Australia on 28 September 2004.

Prepared by

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

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Abstract

On 25 September 2004 the general cargo ship *Mellum* arrived at Thevenard, South Australia, loaded cargo and on 28 September sailed for Melbourne.

At about 1217 the ship cleared Yatala Channel beacons one and two at a speed of about seven knots. Shortly thereafter the pilot disembarked as the ship approached the entrance beacon. Once the pilot had disembarked the master ordered the helmsman to steer a course of 222° by gyro compass.

At 1233, the ship grounded with the entrance beacon bearing 005½°, at a range of 0.52 miles.

The master de-ballasted the ship and with the assistance of the pilot, who had reboarded, refloated the ship. At 2309 the pilot reported that the ship was afloat.

At 1606 on 30 September, *Mellum* weighed anchor and sailed for Melbourne after it had been checked for damage and seaworthiness.

The report found that a misunderstanding between the master and pilot and a lack of planning by the ship's crew were contributing factors. The master/pilot information exchange was found to be deficient. It was also found that the insets and scales of the navigational chart in use and the choice by the pilot to disembark before the ship arrived at the pilot boarding ground may have contributed to the grounding.

The report makes a recommendation relating to pilot training and practices.

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. Accordingly, the ATSB also conducts investigations and studies of the transport system to identify underlying factors and trends that have the potential to adversely affect safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements. The object of a safety investigation is to determine the circumstances to prevent other similar events. The results of these determinations form the basis for safety action, including recommendations where necessary. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations.

It is not the object of an investigation to determine blame or liability. However, it should be recognised that an investigation report must include factual material of sufficient weight to support the analysis and findings. That material will at times contain information reflecting on the performance of individuals and organisations, and how their actions may have contributed to the outcomes of the matter under investigation. 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.

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. While the Bureau issues recommendations to regulatory authorities, industry, or other agencies in order to address safety issues, its preference is for organisations to make safety enhancements during the course of an investigation. The Bureau is pleased to report positive safety action in its final reports rather than make formal recommendations. Recommendations may be issued in conjunction with ATSB reports or independently. A safety issue may lead to a number of similar recommendations, each issued to a different agency.

The ATSB does not have the resources to carry out a full cost-benefit analysis of each safety recommendation. The cost of a recommendation must be balanced against its benefits to safety, and transport safety involves the whole community. Such analysis is a matter for the body to which the recommendation is addressed (for example, the relevant regulatory authority in aviation, marine or rail in consultation with the industry).

1 EXECUTIVE SUMMARY

At 1124 Australian Central Standard Time (UTC +9.5 hrs) on 28 September 2004, the Liberian registered general cargo ship *Mellum* let go from the wharf at Thevenard and headed to sea with a pilot on board. The sky was overcast and there was occasional light rain, but visibility was good. The wind was from the southeast at about five knots and the tide was flooding at about one knot.

At about 1217 the ship cleared Yatala Channel beacons one and two at a speed of about seven knots. Shortly thereafter, with the entrance beacon on the starboard bow, the pilot informed the master that he intended to disembark as they had earlier agreed. The master moved to the bridge wing and watched as the pilot disembarked the ship. He then returned to the wheelhouse and ordered the helmsman to steer a course of 222° by gyro compass.

The master then noticed that the ship was to the south of the intended track and ordered a course of 225°. At 1233, before this last order could be executed, the ship grounded, with the entrance beacon bearing 005½° at a range of 0.52 miles.

The master stopped the main engine and then tried various manoeuvres to free the ship. He then called the pilot boat to request assistance. At 1320, the pilot reboarded the ship. Ballast water was moved and discharged from the ship to lighten it and change the trim.

Manoeuvres with the assistance of a local tug were carried out when the rising tide allowed, and at 2309 the pilot reported that the ship was afloat.

At 1606 on 30 September, *Mellum* weighed anchor and sailed for Melbourne after the ship had been checked for damage and seaworthiness.

The report found that a misunderstanding between the master and pilot and a lack of planning by the ship's crew were contributing factors. The master/pilot information exchange was found to be deficient. It was also found that the insets and scales of the navigation chart in use and the choice by the pilot to disembark before the ship arrived at the pilot boarding ground may have also contributed to the grounding.

The report makes a recommendation relating to pilot training and practices.

2 FACTUAL INFORMATION

2.1 *Mellum*

Mellum is a general cargo ship (Figure 1) registered in Monrovia, Liberia. At the time of the incident the ship was managed by Briese Schiffahrts GmbH & Company KG of Leer, Germany and was classed with Germanischer Lloyd.

The ship was built in 1997 as *Libra Peru* and was renamed *Mellum* in 2002. It has an overall length of 153.2 m, a breadth of 23.6 m and a deadweight of 20 406 tonnes at a draught of 9.727 m.

The navigating bridge is located about 14 m from the stern and 139 m from the stem. The ship has five cargo holds and a cargo capacity of 1 300 TEU¹, of which 754 TEU may be stowed on deck.

Propulsive power is supplied by a six cylinder, single acting slow speed diesel engine developing 8 253 kW and driving a single, fixed-pitch propeller, giving the ship a service speed of 16.4 knots.

Figure 1: *Mellum*



The ship's navigational equipment, complying with the requirements of Chapter V of SOLAS 74 (the International Convention for the Safety of Life at Sea 1974 and amendments), included two GPS (Global Positioning System) units and two Racal Decca Bridgmaster radars, one three centimetre and one ten centimetre, each with an automatic radar plotting aid (ARPA).

¹ Twenty-foot Equivalent Unit, the term for a 20 ft container. The nominal size of ships in TEU refers to the number of twenty-foot containers that may be carried.

Mounted near the chart table was an echo sounder graphic recorder and display. The bridge equipment also included an engine movement logger and a course recorder, neither of which were operating at the time of the incident.

At the time of the incident the master was a German national, and the officers and crew were all Russian.

The master first went to sea in 1955 as a deck boy, and progressed through the ranks to master in 1964 with a license as a coastal master from Germany. He obtained a deep sea master's license in 1984 and sailed mostly on general cargo ships. He had been master of *Mellum* for more than two months and it was his third assignment with the ship's owners, the earlier two being on container ships. This was his first visit to Thevenard.

The second mate had seven years experience at sea. After graduating from a maritime college in Russia he served as a cadet and then progressed through the ranks. He had joined *Mellum* in Thevenard, and this was his fourth assignment as second mate, but the first with the ship's owners. He was licensed to keep watches as an officer.

The pilot for *Mellum* was the sole pilot for the port. He was resident at Thevenard at the time of the grounding of *Mellum*, and was relieved by pilots from Adelaide or elsewhere in South Australia when necessary. He had an Australian master class one certificate of competency and over 30 years of seagoing experience on a variety of ship types including tugs. He had been employed as a pilot by Flinders Ports since July 2004. His original pilot training was carried out in the port of Adelaide and after the completion of the three week training period he was transferred to Thevenard where he held a daytime only pilotage licence.

2.2 Thevenard

The port of Thevenard (Figure 2) is located on Cape Thevenard at the entrance to Murat Bay, South Australia. The port is managed by Flinders Ports. In 2003, 106 commercial ships visited the port, including 98 bulk carriers and four general cargo ships.

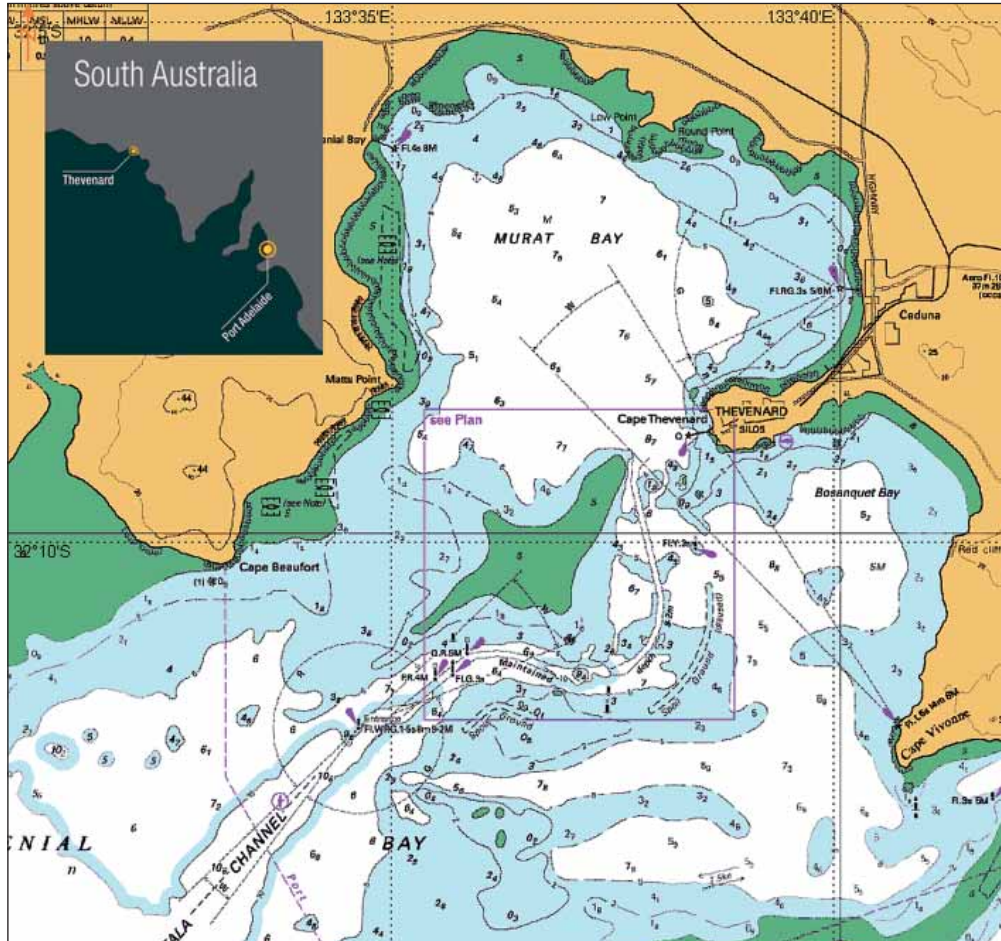
A single concrete jetty is used for the export of gypsum, salt and grain and the importation of fertiliser. The jetty is 392 m long, with a berth on each side, and extends towards the west-south-west from Cape Thevenard. The maximum permitted size of ship for the port is 180 m overall length and 28 m maximum beam.

Pilotage for the port of Thevenard is compulsory for ships over 35 m in length and the pilot boarding ground is about a mile² to the south-west of the entrance beacon. The approach to the port is through Yatala Channel, which has a minimum charted depth of 8.2 m. The channel, marked throughout its length by beacons, is about 108 metres wide at its narrowest part. The distance from the entrance beacon, at the seaward end of the channel, to the berth is about five miles.

² Mile refers to a nautical mile of 1 852 metres.

The recommended anchorage for ships awaiting a berth is with the entrance beacon bearing 055° (T)³, at a range of four miles. As sea room is restricted, masters of inbound ships are cautioned not to approach the entrance beacon until the pilot has boarded.

Figure 2: Section of navigation chart Aus 120 showing Yatala Channel and Thevenard



Outbound ships usually sail an hour before predicted high water to ensure that there is sufficient under keel clearance during the passage of the channel. After clearing the marked channel at number two beacon (about 1.8 miles east north east of the entrance beacon), ships steer a course of 232°(T) before altering course to 222°(T) about six cables⁴ south-west of the entrance beacon to clear the port.

2.3 The incident

At 0700 Australian Central Standard Time⁵ on 25 September 2004, *Mellum* completed its sea passage to Thevenard and, as another ship was to berth and load before it, *Mellum* was instructed to anchor outside the harbour.

3 Australian Pilot Volume 1 (1992), Seventh Edition, HMSO, pp 72-74.

4 One cable = 185 metres.

5 *Mellum*'s clocks were set to Australian Eastern Standard Time, 30 minutes fast of Australian Central Standard Time (local time). For this report, times recorded by the ship have been retarded 30 minutes so that all events are in local time.

At 0730, the ship was anchored with the entrance beacon bearing 069° at a range of 0.75 miles. Partly laden with steel pipes, empty containers and ballast, *Mellum* was to load 12 000 tonnes of gypsum at Thevenard and then return to Melbourne, its previous port.

Before boarding an inbound ship at about 0730, the Thevenard pilot noticed that *Mellum* appeared to be too close to the entrance beacon and adjacent shoal water. He advised the ship, by very high frequency (VHF) radio, to anchor further to seaward. After boarding the inbound ship, it appeared to the pilot that *Mellum*'s master had followed his advice to anchor further to seaward.

At 1348 on 26 September, the pilot berthed *Mellum*, head in, on the northern side of the Thevenard jetty. The inbound passage had been uneventful, the pilot noting only that the ship had steered well.

On 28 September the ship completed loading 12 006 tonnes of gypsum at 0017 and waited alongside for the tidal window for its departure. Its departure draught was 8.3 m, with the ship on an even keel.

At 1000, after checking the remote tide recorder in the harbourmaster's office, adjacent to the main wharf, the pilot prepared the plan for *Mellum*'s departure. He then briefed the tug master and checked the ship's draughts. At 1050, accompanied by a relative of the pilot boat's coxswain, the pilot boarded the ship.

After arriving on the ship's bridge, the pilot, master and chief mate discussed and agreed on the plan for the outbound passage including such matters as turning the ship off the berth, the position for the tug, the tides and the position at which the pilot would like to disembark.

At 1124, the ship let go from the wharf and with the assistance of the tug *Waibuna* cleared the berth, then turned bow to starboard towards the northern entrance of Yatala Channel. On the bridge were the master, chief mate, a seaman acting as helmsman, the pilot and his guest. At 1154, when *Mellum* was steering satisfactorily in the channel, the tug was released. On the southerly heading, at about 7.6 knots⁶, the pilot observed that the gyro compass error was approximately 1° low.

The sky was overcast and, with occasional light rain, the visibility was good. The wind was south-easterly at force two⁷ (4–6 knots) and the tide was flooding at about one knot. A high water of 1.9 m above chart datum was predicted to occur at 1240.

At about 1210, the chief mate was relieved on the bridge by the second mate.

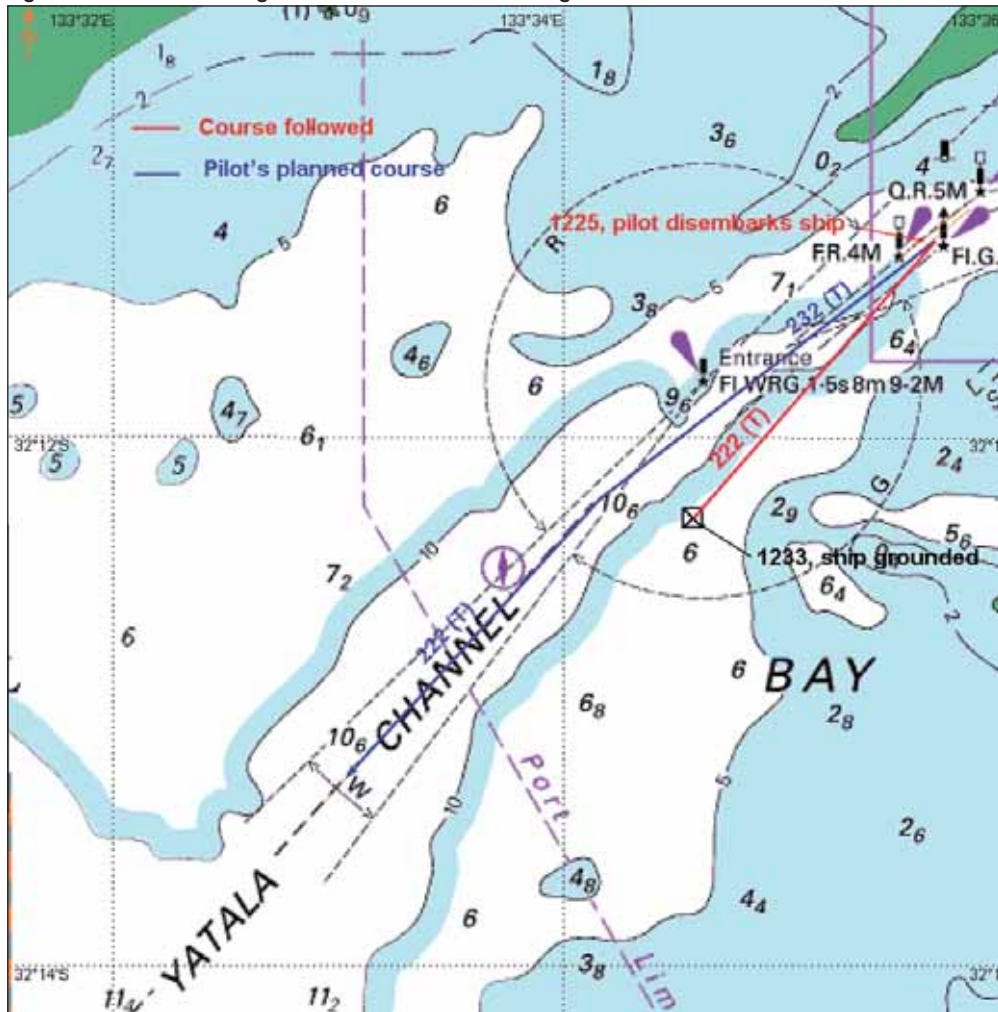
At about 1217, on a course, according to the pilot, of 232° (T), and a speed of about seven knots, *Mellum* cleared beacons one and two (Figure 3). The entrance beacon was about one point (11.25°) on the starboard bow and, shortly thereafter, the pilot informed the master that he intended to disembark as agreed.

The pilot entered a completion time of 1225 on his pilotage certificate and the master signed the certificate. *Mellum* was still on a course of 232° (T) and according to the pilot his last instruction to the master was to maintain this course until the ship had passed the entrance beacon, and then steer a course of 222° (T).

6 One knot, or one nautical mile per hour = 1 852 metres per hour

7 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.

Figure 3: Extract of navigation chart Aus 120 showing *Mellum's* track



The pilot and his guest, escorted by the second mate, went below to the pilot ladder on the port side of the main deck.

From the port bridge wing, the master watched as both men boarded the pilot launch and until the launch was clear of the ship. He returned to the wheelhouse and ordered the helmsman to steer a course of 222° (G).

The second mate returned to the bridge and, at 1230, plotted a GPS position on the chart. This position indicated that the ship was south of the intended track on the chart. The second mate did not inform the master of this as the master had asked him to set up the 'route line' on the radar.

While the second mate was setting the 'route line', the master noticed that the ship was south of its track and he instructed the helmsman to steer 225° (G). At 1233, before this order could be executed, the ship grounded with the entrance beacon bearing 005½°, at a range of 0.52 miles.

The master stopped the main engine. He attempted to use the main engine running astern to refloat *Mellum*, without success. He then used the main engine and rudder in various combinations, but the ship remained aground. At 1243, he contacted the pilot boat on VHF Channel 12 to request assistance from the pilot.

At 1320, the pilot reboarded *Mellum* and the tug *Waibuna* left Thevenard wharf, arriving at the ship at 1335 to assist with refloating. Attempts soon afterward by *Waibuna* to push, then tow, the ship free were unsuccessful.

The master arranged for the de-ballasting of the ship in readiness for an attempt to refloat it on the next high tide, which was predicted for 0051 on 29 September. The ship's mean draught had been reduced by about 0.5 m and it was trimmed about 1.3 m by the stern.

At 2309, the pilot reported that *Mellum* was afloat, and at 2325, *Waibuna* assisted the ship safely into the channel, and then manoeuvred clear. *Mellum* anchored southwest of the entrance beacon and was detained by the Australian Maritime Safety Authority (AMSA) until the integrity of its hull could be checked.

The ship was found to have sustained only minor scratching of the hull. At 1500 on 30 September, the AMSA detention order was lifted, and at 1606, *Mellum* weighed anchor and sailed for Melbourne.

3 ANALYSIS

3.1 Evidence

Investigators from the Australian Transport Safety Bureau (ATSB) interviewed the pilot, master, chief mate, second mate and helmsman of *Mellum*. The investigators also made copies of relevant parts of the deck log book, the bell book, statements, charts and other documents.

The records of interview, supported by written statements from the master and pilot, formed the main source of evidence for the investigation as the course recorder and main engine movement logger were not operating at the time of the incident.

Engine movements and speed changes were not recorded by the ship's crew in any way, at any time, although the times of passing some navigation marks were marked on the ship's navigation chart.

There were marked differences between statements by certain ship's crew and those of the pilot. These differences centre on the time/point at which the pilot left the bridge and what instructions he gave the master with respect to course, particularly, as he left the bridge.

3.1.1 Master's statement

The master's written statement, in part, read:

Pilot left at the entrance beacon at 1230 at a speed of about 6 knots and a course given by the pilot of 221 degrees.

We altered course to 222 degree when the pilot was off. At 1233, I noticed the speed on the GPS was reducing and the sounder was showing 2.3 m and then only bars. Engine was stopped and optical observation showed no movement.

3.1.2 Pilot's statement

The pilot's written statement, in part, read:

The ship cleared #1 + #2 beacons with the entrance beacon about a point on the starboard bow on a course of 232T and a speed of about 7 knots.

Shortly thereafter I made my intention to disembark known to the master. I passed our course and engine speed to him and gave him clear instructions at least twice to follow the recommended tracks...

3.2 The grounding

Mellum grounded on a gyro heading of between 221° and 225° at about 1233 on 24 September 2004. The course steered from the time the ship left the marked channel, almost up to the time of the grounding, was 221°. The gyro error, determined during the transit of the channel, was 1° low. The ship grounded because the master ordered a premature course alteration when the pilot disembarked the ship.

There are a number of possible explanations for the course steered from number two beacon to the grounding position:

- The pilot advised an incorrect heading of 221° before he left the bridge.
- The master did not notice the 052° lead for the Yatala Channel but focused on the 042° - 222° track west of the entrance beacon.
- The master misunderstood the pilot's advice and applied a course of 221° as, or soon after, the pilot left the bridge rather than after passing the entrance beacon.

In each of these cases the lack of proper passage planning and information exchange contributed to the master's decision to order a premature course change.

3.2.1 Time at which the pilot left the bridge

The pilot stated that *Mellum* passed number two beacon at about 1222. He completed his pilot certificate (pilotage receipt) as the ship passed between number one and two beacons, anticipating the time at which he would disembark the ship. He left the bridge at about 1225. The second mate escorted him from the bridge to the port side of the main deck where the pilot ladder was rigged.

According to the pilot's account it would have taken the ship 11 minutes, at an average speed of 6.9 knots, to travel from number two beacon to the position at which the ship grounded.

The Yatala Channel insert of the ship's Aus 120 navigation chart shows a time notation of 1225 for passing number two beacon. The chart also shows that at 1230 the entrance beacon was just forward of *Mellum*'s bridge at a range of about 470 m. This position was an uncorrected (for datum) GPS position.

It would have taken some minutes for the pilot and second mate to descend the six decks from the bridge (about 18 m vertical distance), walk to the pilot ladder and disembark to the launch. It would have taken a further period of time for the second mate to return to the bridge and fix the ship's position. Given the short distance of marginally over 1400 m between number two beacon and the 1230 position and the rough time measure, any calculation of the time of passing number two beacon based on the 1230 position would be indicative only.

Based on the ship's timings it would have taken the ship eight minutes, at an average speed of 9.49 knots, to travel from number two beacon to the position in which the ship grounded.

There is no independent objective evidence to support either the ship's account or the pilot's, such as engine movement records, course recorders, data loggers or a bell book on which any reliance can be placed. Given, however, the ship's positions recorded off the entrance beacon and the recorded time of grounding, the pilot's account of where and when he disembarked is preferred.

It is therefore reasonable to assume that the pilot left the bridge at about 1225.

3.2.2 Pilot's instructions on leaving the bridge

According to the pilot, the ship had been steering 231° (G) from the turn at number five beacon (as per the standard pilot passage plan). Before disembarking, he had confirmed that the master was happy for him to disembark once the ship was clear of number one beacon. This was the usual practice for pilots at Thevenard and was done with the concurrence of the master in each case. He advised the master that the course from the entrance beacon was 222° (T). The pilot stated that he had not altered the ship's course to 222° (T) before he disembarked and there was no need to deviate from a heading of 232° (T) as the sea conditions allowed a safe transfer to the pilot launch.

The master stated that after the pilot launch was clear of the ship, he returned to the wheelhouse from the port bridge wing and ordered the helmsman to steer 222° (G). A course of 221° drawn from the mid point at the end of the main channel passes through the position of the grounding. It was the master's recollection that the pilot had ordered a course of 221° before leaving the bridge. This was supported by the helmsman, who stated that he heard the pilot's order.

Without a voyage data recorder (VDR), with voice recordings of what the pilot said to the master before he left the bridge, it is not possible to positively determine whether the master or pilot's version of events is correct.

3.3 Bridge Resource Management

Bridge Resource Management (BRM) is a form of management taught to ship's deck officers that provides a method of organising the best use of human and other resources on the bridge to reduce the level of operational risk. A key safety aspect of BRM is that it builds a 'shared mental model' and puts in place defences against 'single person errors', which may result in a serious casualty.

The Australian Maritime Safety Authority, Marine Notice No. 34/2002, states the following:

BRM should begin at the initial pre-passage planning stage to identify the dangers to be met and the necessary precautions and contingency arrangements, and continue until the end of the passage...BRM should include a clear identification of all the bridge team members at all stages of the voyage, their relative duties and responsibilities, and the line of command including the levels of authority in making, challenging or responding to decisions and instructions.

The master/pilot information exchange and voyage planning are integral parts of good BRM practice.

3.3.1 Master/Pilot exchange

A ship's master;

...is charged with the responsibility for the safety of the ship and the efficient prosecution of the voyage. Pilots are engaged to assist with navigation in confined waters and to facilitate port approach berthing, un-berthing and departure. The shipmaster carries the ultimate responsibility and has the right to take over from the pilot in cases, albeit rare, where inexperience or misjudgement can hazard the ship⁸.

Section 35 of the South Australian Harbours and Navigation Act 1993 provides:

(1) The duty of a pilot is to pilot the ship subject to the authority of the master, and the fact that a ship is under pilotage does not relieve the master from responsibility for the navigation of the ship.

When berthing *Mellum* on 26 September the pilot presented the master with a pro-forma Thevenard Pilot Passage Plan. This consisted of a two-sided document which included a short check list related to the ship's machinery and equipment, draughts and environmental conditions. One side showed a plan of the approaches to Thevenard from the pilot boarding ground, including Yatala Channel. The other side showed details of the Thevenard finger wharf and its berthing arrangements.

The pilot's passage plan included a series of cautionary notes:

1. Chart is not suitable for navigation purposes.
2. Courses on the chart are an indication only.
3. Bridge team to continuously monitor that the ship is proceeding according to the plan and immediately bring to the attention of the pilot any matter which causes concern.
4. Chart datum is Indian Springs Low Water (ISLW). – refer to chart Aus 120.

The master recalled that he and the pilot referred to the passage plan while discussing the inward passage and the berthing arrangements.

On 28 September the pilot and master discussed the unberthing manoeuvre and the turn off the wharf. The pilot also sought the master's agreement that he could disembark before the ship passed the entrance beacon.

The critical phase of the outward passage for the purposes of this investigation is the course from number three beacon to the position of the grounding. The pilot's passage plan and the navigation chart (Aus 120 – Approaches to Thevenard) show an approach course from the pilot boarding ground of 052° to align with Yatala Channel. This course takes a ship through waters with a least depth of 8.2 m bounded by shoal water of seven metres to the north and six metres to the south, 250 m from the recommended track.

Neither the plan nor the chart shows the reciprocal course of 232° which is the required course for departing ships.

⁸ *Pilotage and the Ship's Captain*, A discussion paper prepared by the Command Working Group of the Nautical Institute. The Nautical Institute on Pilotage and Shiphandling (1990).

Regardless of what the pilot did or did not advise the master, there was sufficient information on board to indicate that the correct course from Yatala Channel to the entrance beacon was 232° (T). Also, given *Mellum*'s draught of 8.3 m, the course was critical in ensuring that the ship remained in the fairway. A deviation of one or two degrees would drive the ship into shoal water.

It is reasonable to conclude that neither the master nor the ship's watch keeping officers had studied the pilot's passage plan, particularly the outward passage, and just accepted what they thought was the pilot's advice. If they had checked the plan, the error in steering 222° before the entrance beacon would have been readily apparent. This should have been reinforced when the second mate's position at 1230 put the ship south of the 10 m depth contour.

3.3.2 Passage planning

The third edition of the Bridge Procedures Guide published by the International Chamber of Shipping in 1998 makes recommendations on passage planning in coastal or restricted waters and passage planning and pilotage.

Section 2.1 of the Bridge Procedures Guide recommends:

Passage planning is necessary to support the bridge team and ensure that the ship can be navigated safely between ports from berth to berth. The passage plan should cover ocean, coastal and pilotage waters.

It was a standard practice on board *Mellum* for the second mate to prepare a sailing plan. The plan was entered into the GPS and the ten centimetre radar, providing a track to compare against the ship's actual position and heading. The practice had been to prepare such plans from pilot boarding ground to pilot boarding ground. On 28 September the route indicator facility on the radar screen was not switched on until moments before the grounding and the action of turning it on may have distracted the master and second mate immediately before the grounding.

The ship's master and crew had not used the information available from the Australia Pilot, the navigation chart Aus 120 or the pilot's passage plan to formulate a berth to berth passage plan. Had this been done, the timing and position for the final course alteration to 222° (T) would have been clear and reinforced in their minds and the risk of error would have been significantly reduced.

3.3.3 Bridge manning – position and speed monitoring

Mellum's bell book provided very little detail of either the arrival or departure pilotage passages. The bell book record should have contained sufficient details to enable an accurate reconstruction of the pilotage. However, the engine movements ordered and the times the ship entered channels, passed beacons or other significant land marks, were not recorded.

Six positions were marked on the navigation chart to the nearest minute, which gave the ship's position at various times during its passage in Yatala Channel. These positions were entered on the 1:25 000 scale Yatala Channel inset on chart Aus 120. How these positions were derived is not clear as three of the positions did

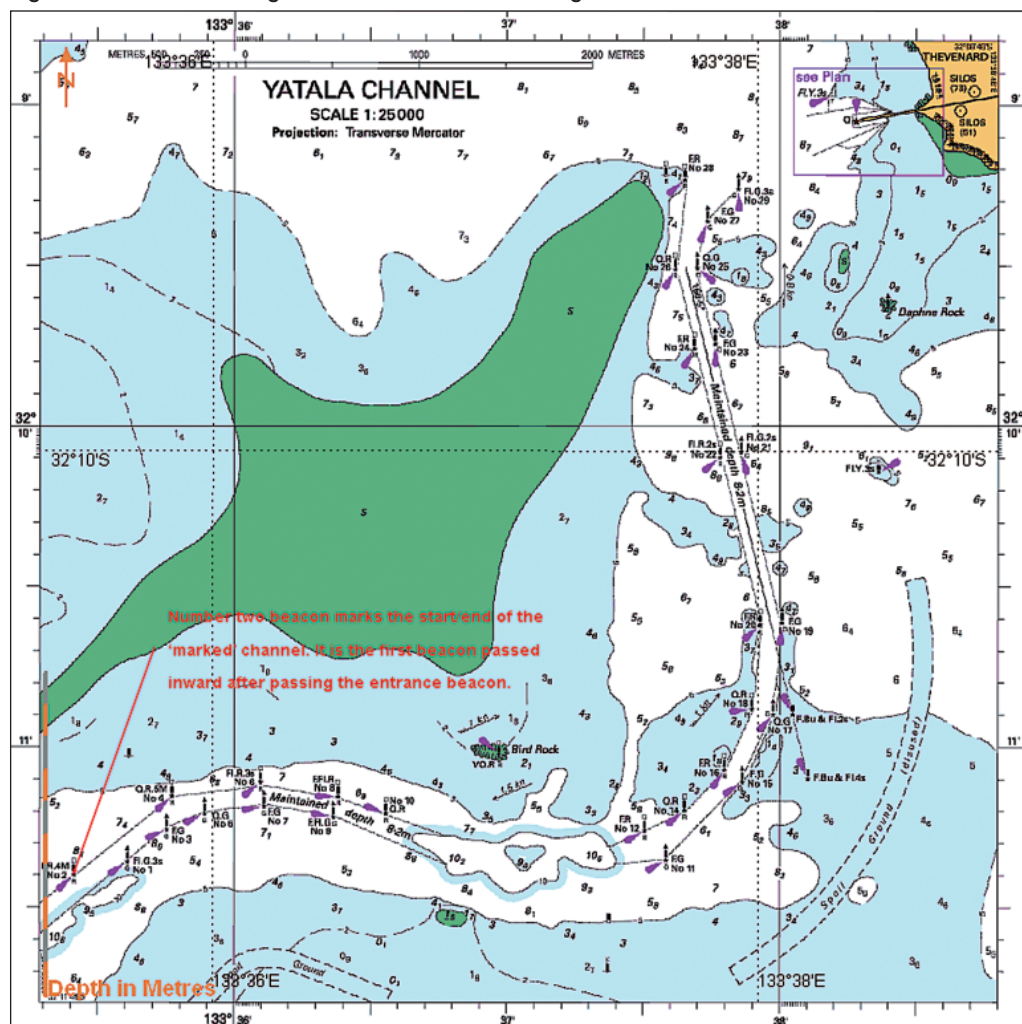
not relate to passing any navigation mark. The positions are therefore only taken as approximate. It should also be noted that when the pilot reboarded the ship after the grounding, he did not recall seeing any positions marked on the chart inset.

While there is no disagreement that *Mellum* maintained an average speed over the ground of about seven knots through the channel, the bridge team's monitoring of the ship's speed and position during the pilotage seems, at best, cursory.

When the pilot left the bridge with the second mate, the master was left alone with the helmsman for at least three minutes, probably longer. The master did not monitor the ship's position but went to the bridge wing to watch the pilot transfer and see the launch clear the ship. While it was certainly necessary to ensure that the pilot's transfer to the launch was achieved safely and that the launch cleared the ship, given the proximity of shoal water and the absence of a pilot, it was also necessary to know where the ship was relative to these hazards.

During this critical period of the pilotage there were not enough navigating officers on the bridge to monitor the ship's position and attend to the pilot transfer. In the circumstances the master could not, and should not have to, fulfil both roles. The master and pilot should have taken these factors into account during passage planning and formulated an appropriate short term strategy.

Figure 4: Inset from navigation chart Aus 120 showing Yatala Channel



3.4 Navigation chart Aus 120

Navigation chart Aus 120, 'Approaches to Thevenard' is on a scale of 1:75 000. There are two insets on the chart, 'Yatala Channel' on a scale of 1:25 000 (Figure 4) and 'Thevenard Wharf' on a scale of 1:5000.

The 1:25 000 inset covering Yatala Channel encompasses an area extending from Thevenard wharf in its north-east corner to number one and two beacons in its south-west corner. This inset is used for pilotage passages when using the channel to navigate to and from the berth at Thevenard.

The Yatala Channel inset does not cover the whole passage to the pilot boarding ground and does not show the 052° – 232° heading required between the pilot boarding ground and beacons one and two. The smaller scale main chart shows a 052° lead starting from west of the entrance beacon towards Yatala Channel. On the smaller scale chart section, this important notation is closely grouped with other chart notations close to the symbol of the entrance beacon and hence is difficult to discern. The annotation is not as attention focussing as the start of the preferred track (042° – 222°) and is therefore relatively easily overlooked.

The limited area of coverage of the channel inset and the differing scales of the inset and main chart means the navigator must switch from a larger scale chart, to one three times smaller, at a critical phase of the pilotage. These deficiencies in the navigation chart Aus 120 may also have contributed to the grounding.

3.5 Echo sounder

Echo sounders are limited in their effectiveness, particularly when navigating extensively in shallow water. *Mellum*'s echo sounder measured the depth of water below the transducer located close to the bow of the ship.

The ship's draught was 8.3 m and the predicted height of tide above datum was 1.9 m at 1240. In the Yatala Channel, with a maintained depth of 8.2 m, the under keel echo sounder reading would have been in the region of 1.8 m and there would have been no quick discernible difference as the ship left the channel. The sounder would need to have been constantly monitored for any indication of taking the ground and even then it is doubtful, given the ship's headway, whether there would have been time to react to prevent the ship from grounding, based on the echo sounder information alone.

3.6 Pilot training

In March 2003 another grounding incident occurred in the port of Thevenard (ATSB investigation report number 192). While the two incidents are for the most part different, the issue of pilotage training, oversight and career progression in South Australian ports was highlighted in both incidents and the issue of pilot oversight for the port was also raised.

To generalise, pilots employed by Flinders Ports are trained for about three weeks under the most experienced and senior pilots in the port of Adelaide, and then sent

to the outports for which they were employed. They then complete their port specific training and experience requirements. As the new pilots gain experience, and more importantly seniority within the organisation, they may apply for 'promotion' to the other South Australian ports and eventually the port of Adelaide.

These practices mean that, generally, the least experienced pilots are assigned to the ports furthest from the immediate support of the most experienced pilots and often are in an outport where the level of direct supervision is minimal. Early in a pilot's career is the time when they acquire the finer points of a pilot's skill set. The physical and professional isolation of a new pilot stationed in an outport means that they may perpetuate previous poor practices.

Little thought had been given to the risks associated with the established practice of pilots disembarking departing ships before they arrive at the pilot boarding ground. In this instance this poor practice probably contributed to the ship's grounding.

The pilot on board *Mellum* was licensed for the pilotage. However, he had not undertaken any pilotage training other than the initial three week understudy and training period in Adelaide and the initial training in Thevenard.

While the pilot had undertaken Bridge Resource Management (BRM) training when he was working as a deck officer at sea, the application of BRM principles can be very different from a pilot's perspective. The grounding is evidence that the pilot did not ensure that the information imparted to the master at the time of his departure was clearly understood. He did not ensure that the safe transit of the ship continued even though he was leaving the ship before it had reached the designated pilot boarding ground. The ship was not clear of navigational dangers nor was it on the final clearing course for the port.

Resolution A. 960 (23) of the International Maritime Organization (IMO) states:

Section 5.3: Training, certification and procedures for pilots

Every pilot should be trained in bridge resource management with an emphasis on the exchange of information that is essential to a safe transit.

Section 5.4: Initial training

Initial and continuous training in the master-pilot information exchange should also cover...recognition of language, cultural and physiological impediments to effective communication and interaction and techniques for overcoming these impediments...

This incident is evidence that poor communication between the master and pilot, even something as minor as missing a word or emphasis, can have dire consequences. Pilots need to be particularly aware of the other duties of the master and deck officers when the ship has a port visit, as these other duties may distract them from the pilotage task. Pilots need to make certain that their instructions are clearly understood, most particularly those that are to be actioned after the pilot has disembarked the ship.

4 FINDINGS

From the evidence available, the following findings are made with respect to the grounding of *Mellum* on 28 September 2004 and should not be read as apportioning blame or liability to any particular organisation or individual.

4.1 Contributing safety factors

These findings identify the various events and conditions that increased safety risk and contributed to the incident.

1. The pilot disembarked *Mellum* before the ship had effectively completed the pilotage passage.
2. *Mellum*'s heading from the time at which the pilot disembarked the ship in the Yatala Channel to the entrance beacon was in error by ten degrees because the master had ordered a premature course change from 232° (T) to 222° (T).
3. The pilot did not ensure that the master fully understood the course required from the Yatala Channel number two beacon to the entrance beacon, and did not emphasise the limited fairway available to a ship at 8.3 m draught departing Thevenard.
4. There was a complete absence of planning by the ship's staff for the pilotage phase of the voyage. No attention was paid to the information contained in the Australia Pilot, the navigation chart Aus 120 or the pilot's passage plan.
5. The master/pilot exchange was deficient in that the departure passage was not fully and clearly explained to the bridge team, and the limits of the fairway at the entrance beacon were not discussed.
6. The master may have been confused about the correct course from number two beacon to the entrance beacon due to the change of scale between the chart and inset and the more conspicuous nature of the final course required outward from the pilot boarding ground. He did not conscientiously check the chart before ordering the final 222° (T) course.
7. The bridge team was critically depleted from the time the second mate left the bridge at about 1225 until he returned at about 1230.
8. The scale of navigation chart Aus 120 at 1:75 000 is such that it does not clearly show the approach and reciprocal courses for the approach to Yatala Channel.

5 SAFETY ACTIONS

5.1 Safety action by Flinders Ports

The ATSB has been advised that the following safety actions have been taken as a result of the grounding of *Mellum*.

1. The Thevenard port practices have been changed so that the pilot remains at the con of a departing ship until it passes the pilot boarding ground and is on the final clearing course for the port if circumstances permit.
2. A simulation exercise using the simulator at the Australian Maritime College in Launceston, Tasmania, has been undertaken. The results of the various trials undertaken tend to confirm the view that the master altered course to 222° after the pilot had departed but before the ship had reached the position marked on the chart.

5.2 Safety action by the Australian Hydrographic Service

The ATSB has been advised that the following safety actions have been taken as a result of the grounding of *Mellum*.

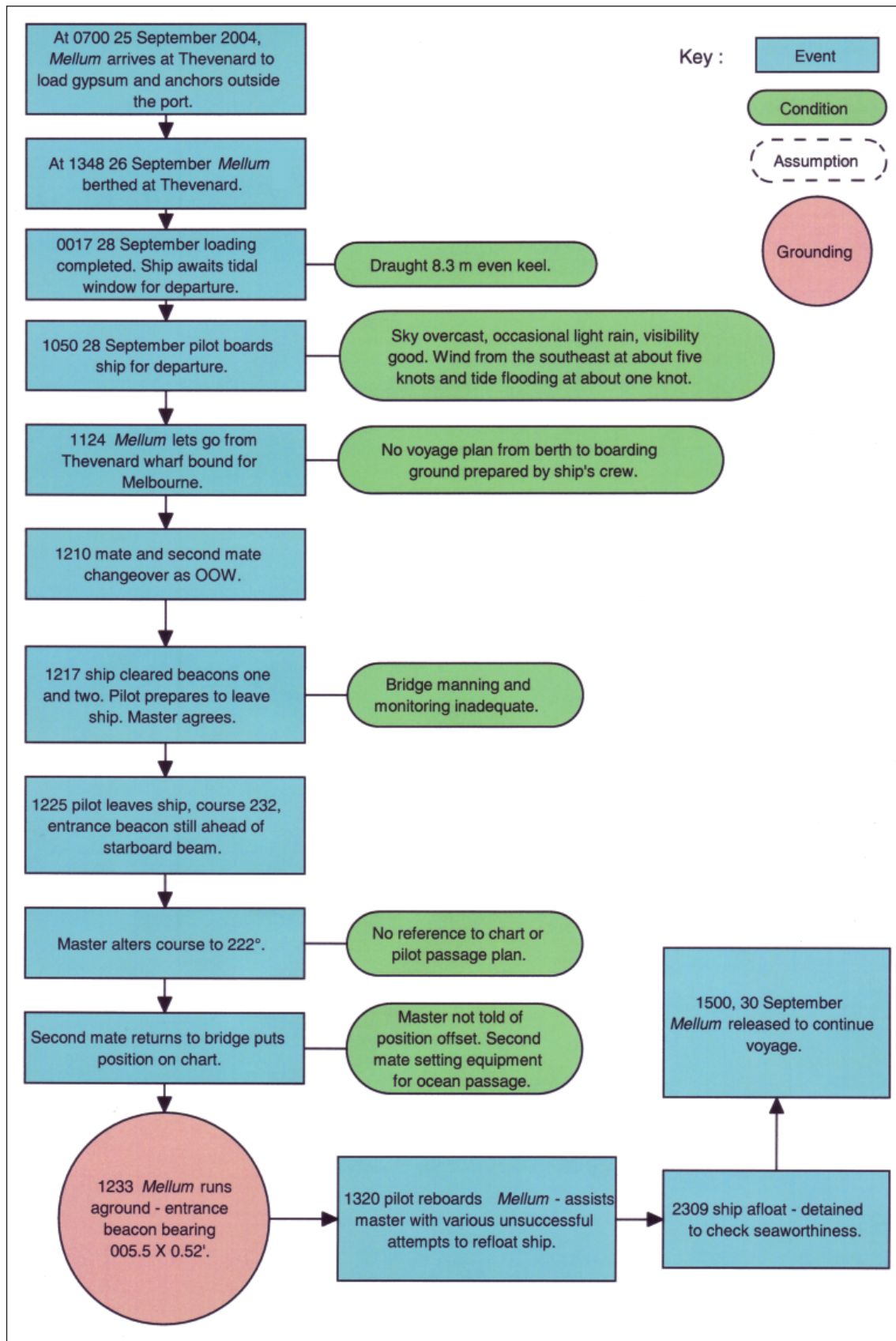
1. Limitations in the charting of Thevenard were highlighted in early 2004. Subsequently the requirement for a new chart, Aus 122 (Yatala Channel and Thevenard), at a scale of 1:15 000 was identified. The publication of the chart has been programmed for 2007/08.

5.3 ATSB recommendations

MR20060035

Flinders Ports should review their training regime and pilotage procedures to ensure that all pilots are adequately trained in the principles and practices of bridge resource management (BRM) as soon as possible after starting pilotage training with particular emphasis on the pilot's role and the master/pilot information exchange.

APPENDIX A: EVENTS AND CONDITIONS CHART



7 APPENDIX B: SHIP INFORMATION

7.1 *Mellum*

| | |
|-------------------------------|---|
| IMO Number | 9161168 |
| Flag | Liberia |
| Port of Registry | Monrovia |
| Classification society | Germanischer Lloyd |
| Ship Type | General cargo |
| Builder | Flensburger Schiffbau-Ges mbH & Company |
| Year built | 1997 |
| Ship managers | Briese Schiffahrts GmbH & Company |
| Gross tonnage | 13 066 |
| Net tonnage | 6 914 |
| Deadweight (summer) | 20 406 tonnes |
| Summer draught | 9.727 m |
| Length overall | 153.2 m |
| Length between perpendiculars | 145.75 m |
| Moulded breadth | 23.6 m |
| Moulded depth | 13.5 m |
| Engine | 1 x Mitsubishi 6UEC50LSII |
| Total power | 8 253 kW |

8.1 Sources of information

The master and crew of *Mellum*

The pilot

Flinders Ports, South Australia

Australian Hydrographic Service (AHS)

References

Australian Pilot Volume 1 (1992), Seventh Edition, HMSO

South Australian Harbours and Navigation Act 1993

Pilotage and the Ship's Captain, A discussion paper prepared by the Command Working Group of the Nautical Institute. The Nautical Institute on Pilotage and Shiphandling (1990)

The Third edition of the Bridge Procedures Guide published by the International Chamber of Shipping in 1998

The Australian Maritime Safety Authority, Marine Notice No. 34/2002

8.2 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, second mate and owners of *Mellum*, the pilot, Flinders Ports, the Australian Hydrographic Service and the Australian Maritime Safety Authority.

Submissions were received from the Australian Hydrographic Service, Flinders Ports and the pilot. The submissions have been included and/or the text of the report amended where appropriate.

Grounding of ship in the port of Thevenard

The ATSB has found that a misunderstanding between the master and pilot, and the lack of planning by the ship's crew were contributing factors in the grounding of the Liberian flagged general cargo ship *Mellum* on 28 September 2004.

The Australian Transport Safety Bureau investigation found the master/pilot information exchange was deficient, and that the insets and scales of the navigation chart in use may have contributed to the grounding.

At 1124 Australian Central Standard Time on 28 September, the general cargo ship *Mellum* let go from the wharf at Thevenard and headed to sea with a pilot on board. The sky was overcast and there was occasional light rain, but visibility was good. The wind was from the southeast at about five knots and the tide was flooding at about one knot.

At about 1217, the ship cleared Yatala Channel beacons one and two at a speed of about seven knots. Shortly thereafter, with the entrance beacon on the starboard bow, the pilot informed the master that he intended to disembark as they had earlier agreed. The master moved to the bridge wing and watched as the pilot disembarked the ship. He then returned to the wheelhouse and ordered the helmsman to steer a course of 222° by gyro compass.

The master soon noticed that the ship was to the south of the intended track and ordered a course of 225°. At 1233, before this last order could be executed, the ship grounded just south of the entrance beacon.

The master stopped the main engine and then tried various manoeuvres to free the ship. He then called the pilot boat to request assistance. At 1320, the pilot reboarded the ship. Ballast water was moved and discharged from the ship to lighten it and change the trim.

Manoeuvres with the assistance of a local tug were carried out when the rising tide allowed, and at 2309 the pilot reported that the ship was afloat.

At 1500 on 30 September the detention order that had been issued after the grounding was lifted when the ship had been checked for damage and seaworthiness. At 1606, *Mellum* weighed anchor and sailed for Melbourne.

The ATSB has made a safety recommendation to Flinders Ports in relation to pilot training with the aim of preventing further incidents of this type.

Independent investigation into the grounding of the
Liberian registered general cargo ship *Mellum*
in the port of Thevenard, South Australia, 28 September 2004