Departmental investigation into the grounding of the Singapore flag container ship NOL AMBER on Larpent Bank, Torres Strait on 1 November 1997

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Incidents at sea

AUSTRALIA

Department of Workplace Relations and Small Business

Navigation Act 1912

Navigation (Marine Casualty) Regulations

investigation into the

grounding of the Singapore flag

container ship

NOL AMBER

on Larpent Bank, Torres Strait

on 1 November 1997

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NOL Amber

Summary

Early on the morning of 1 November 1997, the Singaporean flag container ship *NOL Amber* embarked a licensed coastal pilot to the south-west of Booby Island, for the passage through Torres Strait and the Inner Two-way Route of the Great Barrier Reef. The vessel was at maximum draught, 12.2 m even keel, for the passage.

After boarding, the Pilot explained to the Master that there was a two-hour tidal window for negotiating Varzin Passage and that the vessel would then have to "lose" about one and a half hours between Varzin Passage and Prince of Wales Channel, before there would be sufficient water in Prince of Wales to maintain the stipulated minimum under-keel clearance.

Proceeding at slow ahead, *NOL Amber* cleared Varzin Passage at 0640 and continued, at slow speed, towards the start of the delineated two-way route off Goods Island. The Pilot informed the Master that the earliest time for entry was 0900 and that he would therefore be turning the ship around to head west. The Third Mate maintained a plot of the ship's progress and a helmsman was on the wheel.

At about 0725, the Pilot gave a helm order to start the intended turn to starboard. At 0735, the ship was called by the Duty Officer at the REEFCENTRE and informed that his radar indicated *NOL Amber* was heading for shallow water. The Pilot replied that he was turning the ship around, to waste time and that "they were doing all right", but at 0738 the vessel grounded on Larpent Bank.

Immediate attempts to refloat the vessel were unsuccessful, as were the attempts on the next two high tides. However, after discharging most of the ballast, the vessel was refloated, with the assistance of two local vessels, on 4 November. There was no pollution, the vessel suffered minimal damage and was permitted to resume its voyage after an inspection by divers.

Sources of Information

Master, Third Mate, Cadet and Helmsman, *NOL Amber*

Coastal Pilot and relief Pilot.

REEFCENTRE, Hay Point.

Master and Coastal Pilot, River Embley.

Acknowledgement

Portion of chart Aus 296 reproduced by permission of the Hydrographic Office, RAN.

Photograph of NOL Amber (opposite Summary page) supplied by NOL Australia.

Narrative

NOL Amber, ex *Neptune Amber*, is a 33,113 grt, 2314 teu container vessel, owned by Iphigenia Pte Ltd., and operated by Neptune Orient Lines of Singapore. Built in 1980, the vessel has an overall length of 234 m, a beam of 32.25 m, a summer draught of 15.525 m and is powered by a single 12 cylinder Sulzer diesel engine of 26,627kW, driving a single, fixed propeller and providing a service speed of 23 knots. The vessel has a normal complement of 29, drawn from Singapore, Burma, China, Malaysia and India, and includes five deck and four engineer cadets.

Engaged in regular trade between Singapore, Port Klang and Australian ports, *NOL Amber* sailed from Singapore on the morning of 26 October 1997, bound for Brisbane, via the Torres Strait and Inner Route of the Great Barrier Reef. In addition to the cargo of containers, the vessel was carrying water ballast, for improved stability, and the draught on sailing was 12.38 m even keel, the GM 88 cm.

On 29 October, the Master received a radio message informing him that the tidal predictions indicated the time for starting the transit of Varzin Passage was from 0430 to 0630 on 1 November. On Friday 31 October, he received a radio message from the pilot station on Thursday Island, giving the times for transit of Varzin as 0530 to 0730, and advising him that the pilot would board at 0500 1 November. Ballast was discharged to provide an even keel draught of 12.2 m, the resultant GM being 64 cm.

Stand-by to the engine room, for arrival off Booby Island, was given at 0112 on Saturday 1 November and the engine was stopped at 0130, after which the ship was allowed to drift until shortly before the pilot launch arrived alongside. At 0400, the Third Mate relieved the Second Mate as watch officer and the duty cadet and the AB helmsman were also relieved.

The pilot assigned to *NOL Amber* had arrived at Thursday Island late on Thursday (30th) morning, having piloted the Chinese container vessel *Liao He* through the Inner Two-way Route and Torres Strait, from the south. On the Friday, because the tides were providing only a limited "window" at Varzin the next morning, he discussed the tidal situation and the problems it raised with colleagues. He also purchased a chart of Varzin Passage, so as to study the Passage more carefully. That night he was in bed by 2000 and slept well, until woken by his alarm, which he had set for 0200.

The Pilot was collected at 0300 and the pilot launch left the boat harbour at 0310. On the way to the boarding ground, west of Booby Island, the Pilot monitored the tide gauge transmissions on VHF channel 88; the tide at Booby Island was running close to prediction.

The Pilot boarded *NOL Amber* at 0500, at which time the vessel was 7¼ miles to the south-west of Varzin Passage C1 and C2 buoys. The weather was fine, with good visibility, the wind very light from the east-south-east. After an exchange of greetings, the Master confirmed that the draught was 12.2 m even keel. The Pilot then explained the under-keel clearance requirements, the limited tidal window in Varzin Passage and that, from the tide predictions, there would not be sufficient

water at Nardana Patches for *NOL Amber* to pass, maintaining the prescribed under-keel clearance, until 1000. He further explained that this meant the earliest time for *NOL Amber* to pass Harrison Rock, at the entrance to the Prince of Wales Channel, was 0900 and that they would need to "lose time" between Varzin Passage and Harrison Rock.

The Pilot also informed the Master that the pilotage was a team effort, that the officer of the watch should maintain checks on the ship's position and keep him informed. He saw that course lines had already been laid off on the charts and replaced those for Varzin Passage with his own, preferred courses.

The Booby Island tide gauge transmission indicated 2.1 m, so the Pilot decided to proceed towards C1 buoy at dead slow and slow speed. At a time recorded by the REEFCENTRE as 0527, the pilot called the REEFCENTRE on VHF and informed them that he had boarded *NOL Amber* and that the draught was 12.2 m.

The flooding tide set the vessel to the east, necessitating adjustments to the course and *NOL Amber* arrived at C1 buoy at 0600 on a heading of 026°. With the engine on Slow Ahead, the Pilot ordered "starboard 10" and brought the vessel around to put C4 buoy right ahead. Although the response to the helm was good, the vessel overshot the turn slightly, but not sufficiently to cause the Pilot concern.

At about this time the helmsman was relieved; the seamen were not assigned to watches, instead, they stood two-hour turns at the wheel.

C3 buoy, at the eastern end of Varzin Passage, was abeam to starboard at 0630 and course was altered to 115°. This was the course laid off on the chart by the Second Mate but, with the tide flooding, the Pilot expected to make good his normal course of 108°. The Third Mate monitored the vessel's progress, plotting the position at frequent intervals, while the Pilot used the radar to keep a check on the bearing of Goods Island.

As the vessel had an under-keel clearance of only 1.8 m, the Pilot's preferred course of action, to lose time before passing Harrison Rock buoy, was to turn the vessel about when about five miles west of the buoy, just before the start of the indicated two-way route, and head in the opposite direction.

At a time he later recalled as being about 0715, and when *NOL Amber* had reached a position where he thought it was two miles north of Larpent Bank, the Pilot decided to start the turn. Aware that another vessel was astern, which had also been reported to him by the Third Mate after that officer had plotted *NOL Amber's* position at 0715, he made VHF contact with the vessel, *River Embley*, also at maximum draught. *River Embley* was able to maintain steerage at a much slower speed than *NOL Amber* and intended entering the Prince of Wales Channel at 0830. Not wanting to turn across the bow of the other vessel, which appeared to him to be shaped up more towards Harrison Rock buoy, the Pilot decided to turn to starboard.

According to the Pilot, he initially ordered starboard 10, quickly followed by starboard 15, then when he saw the vessel was slow to respond, starboard 20 and half ahead. The Master, Third Mate and helmsman all said the Pilot gave just one order, starboard 20. Under starboard 20 helm, *NOL Amber* appeared to be making the turn satisfactorily. The Pilot had instructed the helmsman to come around

to 285°, saying that there was a long way to go, and the helmsman reported the change of heading every 10°.

Shortly before 0735, the duty officer at the REEFCENTRE saw, from the radar, that *NOL Amber* had made a turn to starboard and was headed towards the shallows of Larpent Bank. He immediately called the vessel on VHF, to warn those on the bridge. The Pilot and the Master both went to look at the chart, the Third Mate's 0735 position placing the vessel still within the delineated two-way route. According to the Pilot, he plotted a position on the chart at that time, but according to the Third Mate, the Pilot only checked the distance off Goods Island, using dividers. The Pilot then replied to the REEFCENTRE, passing the information that he was turning about and that "they were doing all right".

Very shortly after that, the Third Mate reported that the soundings were decreasing, that the under-keel clearance was now 1.5 m, which was acknowledged with an "O.K" by the Pilot. The helmsman then reported that the vessel had stopped turning, on a heading of 245°. The Pilot immediately ordered, at 0738½, hard to starboard and half ahead, fearing the vessel was "feeling the bank"*. The heading changed another 2°, but then remained steady, on 247°. The Pilot ordered full ahead, at 0740½, but the vessel still did not respond.

According to the Pilot, he informed the Master that the ship was aground and that they should stop the engine, whereas according to the ship's bridge team, the Pilot gave the order "hard to port".

At a time logged as 0743½, the Pilot contacted the REEFCENTRE on VHF and reported that *NOL Amber* appeared to have touched bottom, off Larpent Bank and that he was endeavouring to get the ship away from it. He also requested that the Centre advise the Australian Maritime Safety Authority and the Maritime Rescue Co-ordination Centre that the vessel had grounded, or touched bottom, on Larpent Bank.

After some discussion between the Pilot and the Master, and with the realisation that *NOL Amber* could not be manoeuvred away from Larpent Bank, the engine was stopped at 0749½. The Master informed the Chief Engineer that the vessel was aground, and instructed the Mate to sound all tanks and to obtain depth soundings around the vessel. He also brought out the company's emergency situation check list for groundings, to ensure nothing was overlooked. The position by GPS was recorded as 10° 35.16'S 142° 03.63'E.

The Third Mate plotted the position, using a radar bearing and distance of Tucker Point (Goods Island), which placed *NOL Amber* at the edge of the bank. The engine was put on slow astern at 0757 and on full astern at 0758½, then at 0820 the bow thruster was run at full starboard thrust, in an attempt to refloat the vessel. However, by 0830, it was becoming obvious that the vessel was not going to come off the bank at that time, particularly as the tide was now falling, and the engine and bow thruster were stopped at 0839.

* interactive effect and reduction in a vessel's manoeuvrability caused by a change in the hydrodynamic forces created by a decrease in the depth of water on one side.

At 0930, the Mate reported to the Master that the tank soundings indicated the hull had not been breached, and the soundings overside indicated the vessel was aground at the port bow. The Mate then carried out stability calculations and, at 1050, the vessel started deballasting, in preparation for refloating attempts on the next high tide.

Refloating operation

In line with company policy and in the spirit of 6.5.12 of Marine Orders Part 54 (Coastal Pilotage), the Pilot Company appointed a relief pilot, who arrived on board at 1236. Telephone contact was established with the Queensland Department of Transport and a minimum GM of 18 cm – 20 cm agreed for refloating. Deballasting operations continued until 1430 and attempts to refloat the vessel were renewed at 1500, using the main engine and bow thruster. However, these were also unsuccessful, the tide well short (0.25 m) of prediction, and the attempt was aborted at 1837.

The vessel's operator initiated the company's emergency response plan and suitable tugs were sought, also a suitable vessel to lighten *NOL Amber* should that be necessary. Negotiations were completed with a local company and two tugs, a small coastal trader and a barge were placed at the ship's disposal.

An underwater inspection by divers during slack water on the morning of 2 November revealed *NOL Amber* to be aground for 63% of its length. A salvage team boarded at 1515 and established that the tonnage ground effect, at high water, was approximately 1000 tonnes. Lines were passed from the stern to the vessels *Torres Express* and *Northern Express* and the engine run at full astern for two hours, but again the tide was below predicted height and again the effort was unsuccessful.

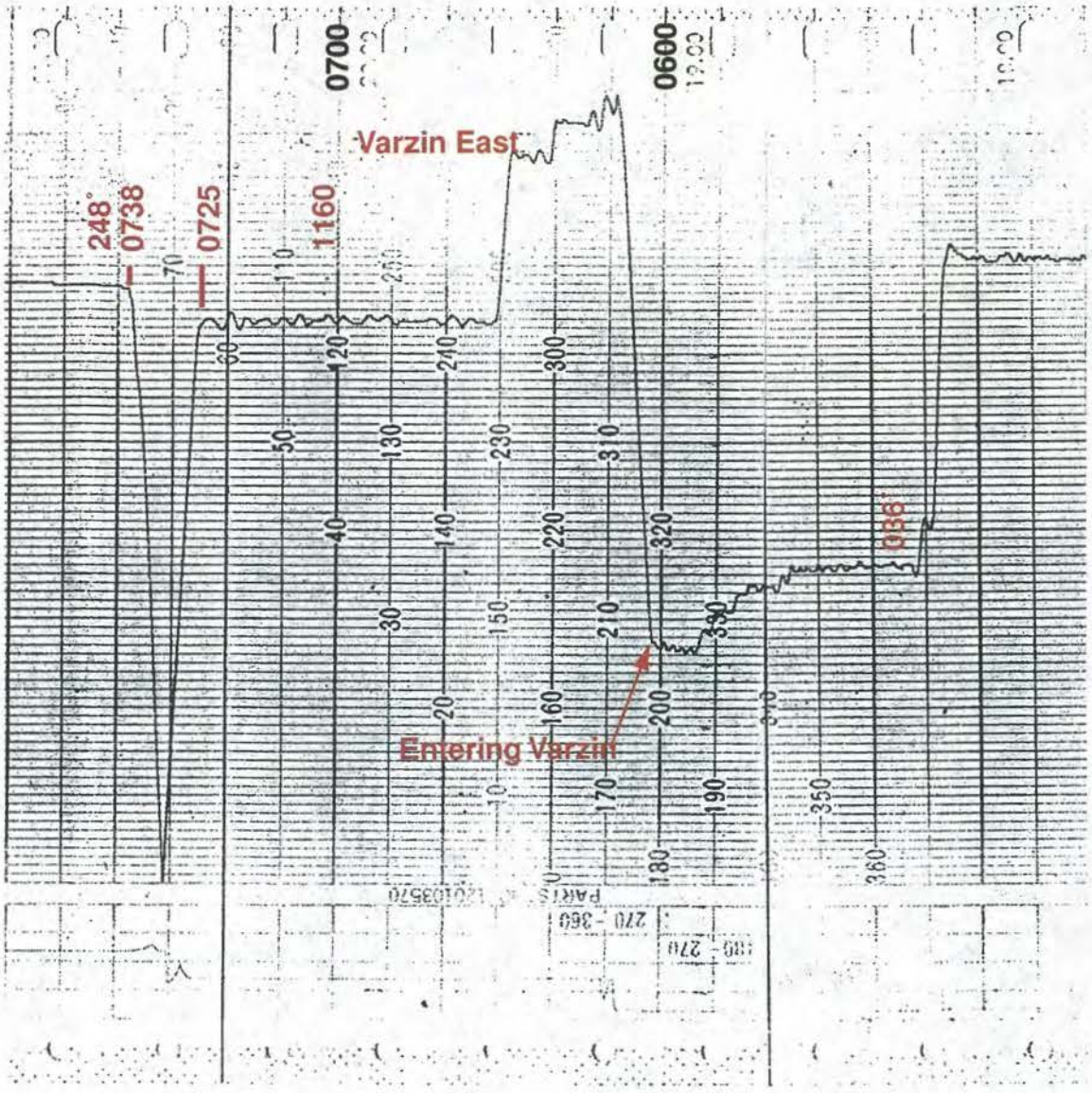
On the morning of 3 November, the Master and relief pilot decided that although the highest tide was not until 6 November, and although the salvage tug *Pacific Salvor* was on its way from Papua New Guinea, a further attempt at refloating should be made on the afternoon high water. After another inspection, the divers reported good clearance around the propeller and that some of the sand had been scoured from the starboard side, so ballast was altered to provide stern trim and a starboard list.

Owing to a disagreement over contractual arrangements, the vessel's operator instructed the Master to dismiss the salvage personnel, who disembarked at 1215.

The engine was placed on stand-by at 1530, at 1535 the heading moved slightly, from 247° to 245° and at 1552 the vessel heeled 3° to starboard. *Torres Express* made fast on the starboard quarter and commenced pulling at 1600. *NOL Amber* started to move astern at 1602, also swinging to port, and became upright, but came to a stop again at 1605, on a heading of 220°. However, with the engine still going astern and with *Torres Express* pulling, the heading continued to change slowly, until it stopped on 155° at 1640.

The vessel started to move again at 1735, when it also heeled 9° to starboard and the Master instructed the Mate to immediately start ballasting the forepeak, to improve the GM. The vessel refloated at 1744 on a heading of 137°, the position by GPS being recorded as 10° 35.06'S 142° 03.61'E. *NOL Amber* was manoeuvred clear of Larpent Bank and

taken to anchorage, where, after further inspection by divers, it was cleared to resume passage for Brisbane.



Portion of NOL Amber's course recorder chart

Comment and Analysis

NOL Amber grounded on a charted bank while carrying out a delaying manoeuvre under the conduct of a licensed pilot. The manoeuvre was one which the Pilot had performed on a number of occasions in the past.

Unfortunately, when the Pilot disembarked from the vessel the Master would not allow him to have a copy of the chart, showing the positions, or other relevant documents. At interview, therefore, he had to rely purely on memory.

The Pilot was of the opinion that he had commenced the alteration to starboard, to turn the vessel about, shortly after 0715, and when *NOL Amber* was about two miles to the north of Larpent Bank and, as the vessel had turned without any problems when manoeuvring into Varzin Passage, where the under-keel clearance had been similar (1.8 m), he had not anticipated difficulties in the later turn. Also, when he received the warning from REEFCENTRE, he believed *NOL Amber* to be still within the delineated two-way route and, therefore, had sufficient room in which to complete the turn, although the vessel would come close to the bank.

REEFCENTRE

REEFCENTRE, located at Hay Point, just to the south of Mackay, Queensland, is the operations centre for the Mandatory Ship Reporting System in the Torres Strait and the Great Barrier Reef Inner Route (REEFREP SRS). A joint Australian Maritime Safety Authority (AMSA) and Queensland Department of Transport (Queensland Transport) venture, REEFCENTRE is operated by Queensland Transport around the clock. The system provides a surface picture of shipping operations in the region, assembled from data contained in ships' REEFREP radio reports to the centre and from information gathered by SRS radar systems at three focal points in the area, one of which is the Torres Strait, which were commissioned on 31 October 1997. A number of ships are now equipped with automatic identification systems (AISs) and such information is also utilised in compiling the surface picture.

VHF radio communications with all ships are recorded, as is full radar target information in the three sections covered, which provides vessel position/time, track and speed details at six-second intervals. The *NOL Amber* information was made available to the investigation and was invaluable in the analysis of the incident.

A further enhancement, which took effect within REEFCENTRE on 19 November 1997, provides the ability to record and playback the full surface picture of events from that date onwards.

Course Recorder Chart

The vessel is equipped with a course recorder and examination of the chart indicates that the recorder was set up reasonably accurately for time, but was one degree high on the gyro compass steering repeater. In common with the majority of course recorders, there is no rudder angle recorder, so there is no record to confirm helm orders.

During the turn off C1 buoy, into Varzin Passage, *NOL Amber* turned at a uniform rate of 10°/min. The position plotted on the navigation chart at 0610 showed only a slight overshoot on the turn.

The course recorder chart shows that the turn to starboard, to lose time, commenced at 0725 and *NOL Amber* turned at a uniform rate of 11°/min until 0736, passing through a heading of 180° gyro at 0731½. When called by REEFCENTRE, at 0735, the vessel was passing through a heading of 225° gyro. At 0736, when the heading was 236° gyro, there was a reduction in rate of turn to 8°/min, followed by a much greater reduction in rate of turn, to 2½°/min at 0737. At 0738, the vessel stopped turning, on a heading of 246½° gyro, but there was a another, slight movement of the heading, to 247° gyro, at 0739½.

The reduction in the rate of turn at 0736 probably coincides with the decrease in under-keel clearance as reported by the Third Mate, while the cessation of turn at 0738 provides the time of the vessel being hard aground. Initial contact with the bank was probably at 0737, when the rate of turn dropped to 2½°/min.

Gyro compass error

The entries in the Compass Deviation Book show that the compass errors were normally checked each watch. On the passage from Singapore, the error on the gyro compass varied from 0.1° high to 1.4° high, with the majority of the errors obtained being 1° or greater. The last compass error obtained prior to arrival off Booby Island and before the grounding was during the evening 4-8 watch on 31 October and was 1° high.

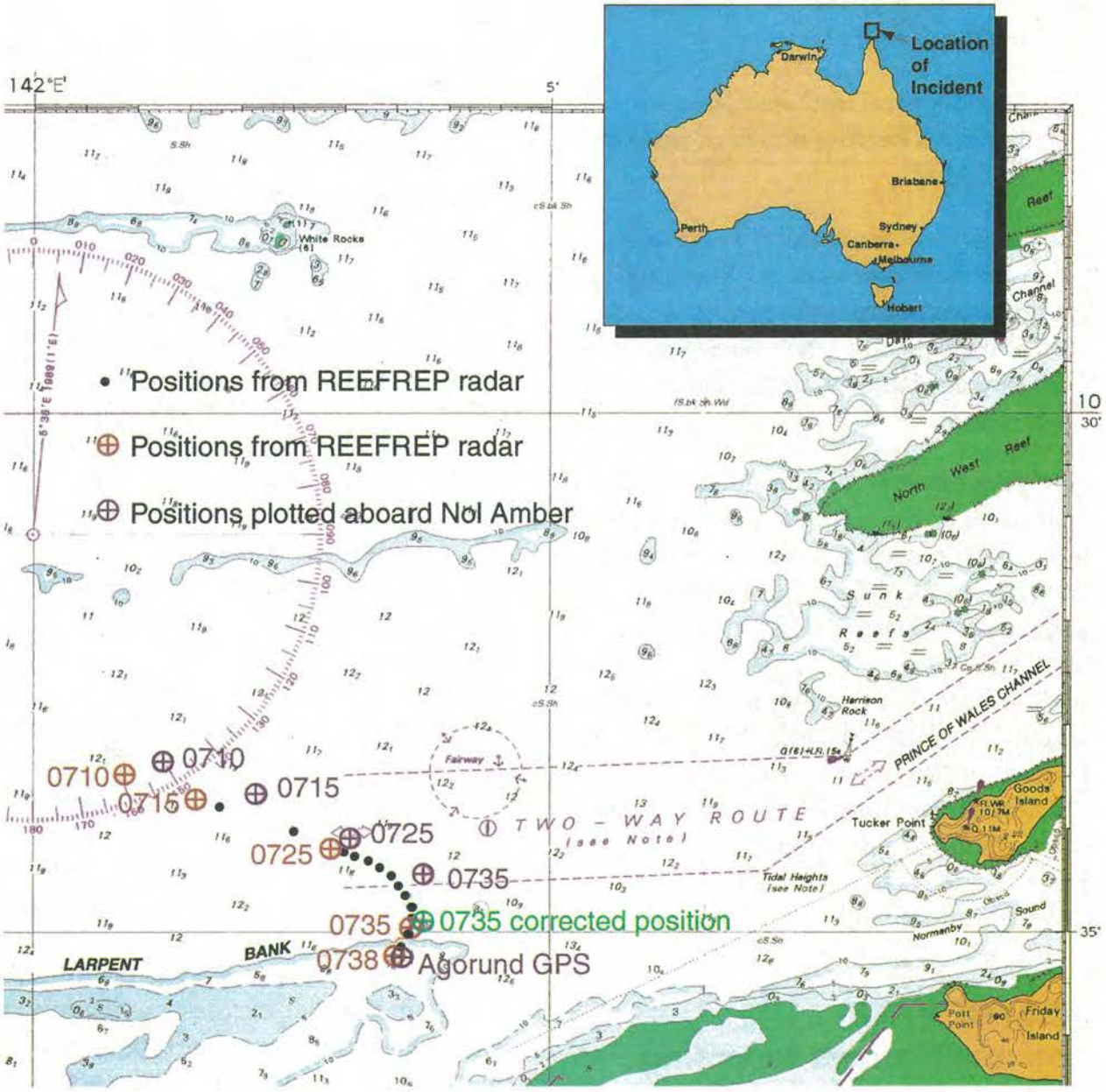
After turning into Varzin Passage, *NOL Amber* was steadied on 092° gyro, with C4 buoy right ahead. From the position plotted on the chart at 0610 the True course required was 090°, thus a gyro error of 2° high is indicated at that time.

Comparison of recorded tracks

The comprehensive information stored from the REEFCENTRE radar system provides the geographic position, as latitude and longitude, of a vessel at 6-second intervals, thus a reliable trackline can be reconstructed.

Plotting the radar derived positions against the positions plotted on *NOL Amber's* navigation chart reveals a number of differences. Using Tucker Point (Goods Island) as the point of reference, the following differences are obtained:

Time		bearing and distance	NOL Amber difference bearing	distance
0710	*NA*	095° x 7.39 miles	1¼° high	-0.33 miles
	Ra	093¾° x 7.72 miles		
0715	*NA*	094° x 6.48 miles	1° high	-0.56 miles
	Ra	093° x 7.04 miles		
0717	Ra	092½° x 6.84 miles	1½° high	-0.36 miles
0725	*NA*	088¾° x 5.57 miles	¾° high	-0.14 miles
	Ra	088° x 5.71 miles		
0735	*NA*	085½° x 4.87 miles	6½° high	-0.18 miles
	Ra	080° x 5.05 miles		
	*NA**	080½° x 4.87 miles	½° high	-0.18 miles
	(* probable position of *NOL Amber* at 0735)			
Position of grounding				
	NA (GPS)	077° x 5.26 miles		-0.09 miles (167 m)
	Ra	077° x 5.35 miles		



Portion of chart Aus 296 showing track of NOL Amber

From the above, it is apparent that:

- the Third Mate was not applying the gyro error (1¼°-1½° high) to the bearings he obtained by radar;
- the 0715 position was probably obtained at 0717;
- at 0735, the Third Mate, in error, laid off a bearing of 085½° instead of 080½°.

The radar positions provide a constant speed for *NOL Amber* of 8.1 knots and the distances between the positions plotted by the Third Mate, other than at 0735, are consistent with the above observations.

Applying the 0.09 miles difference in the grounding positions to the other positions, as a possible error in the calibration of the shore radar, the differences in the distances at 0725 and 0735 become negligable. However, the differences at 0710 and 0717, are still in the region of a quarter of a mile (460 m). While on passage between ports, the Master checked the variable range marker against the range rings and reported no errors, therefore, the differences are most probably attributable to operator error.

REEFCENTRE communications recording

From the recording of the communications, the start time of the call by REEFCENTRE was 0735:22. There was a brief delay while the operator changed channels before passing the message that the radar showed the vessel running into shallow water. There was then a six second pause before the Pilot replied, at 0735:58, that he was coming round on a northerly heading shortly, just to waste time, and was doing all right.

The time between the exchanges would not provide sufficient time for the pilot to physically check the position on the chart, therefore the checking must have been after the exchange of messages.

There is also a curt "OK" recorded at 0736:11, 5½ seconds after the end of the Pilot's message to REEFCENTRE, which is possibly the Pilot's acknowledgement of the Third Mate's reporting of the decrease in under-keel clearance.

Actions of the Pilot

The Pilot was well experienced, having been a Reef Pilot since July 1980. Up to the time of boarding *NOL Amber*, he had conducted 794 pilotages, 50 of which had been at, or near, maximum draught.

The Pilot had calculated that the tidal window for Varzin Passage, based on the predictions for Booby Island and requiring a height of tide of 2.7 m, was from 0530 to 0730. However, the predicted height of tide at high water, at 0638, was only 2.8 m, a margin of just 10 cm. The Pilot, therefore, considered it prudent to negotiate the eastern part of the passage, where there is the least depth of water, near to the time of high water, in case the tidal height did not meet predictions. To have delayed the transit of Varzin Passage, to lose time that way, would have introduced the risk of missing that day's tides altogether, if the tide did not make sufficiently.

The Pilot's prudence was sensible, as his record of the tidal broadcasts show the tide as running 0.1 m below predictions and the heights recorded by the gauge indicate a high water of 2.75 m and that the tide fell below the required 2.7 m at about 0715. Even had he delayed the passage through Varzin, to negotiate the Passage just ahead of *River Embley, NOL*

Amber would still have arrived off the Prince of Wales Channel too early, at about 0830.

To lose time to the west of Prince of Wales Channel, the Pilot considered there were three options: to anchor; to stop and drift; to reverse course. With such limited under-keel clearance, he considered there was a distinct possibility of the vessel sitting on the anchor, while with the vessel stopped and drifting, in a strong tide, control of the vessel is lost. His preferred option was, therefore, to turn about, a manoeuvre he had carried out on a number of previous occasions.

When he boarded, the Pilot had informed the Master that it would be necessary to "lose time" between Varzin Passage and Prince of Wales Channel and that he proposed to turn the ship about, to head in the opposite direction for a while. He had also told the Master that the pilotage was a team effort and he had requested that the officer of the watch maintain a frequent check of the vessel's position. However, contrary to Bridge Resource Management principles, he did not discuss his plans in detail with the Master and Third Mate and, without full knowledge of what was to take place, they were unable to monitor the situation properly or provide proper support to the Pilot.

In fact, the Pilot did not have a properly prepared plan, taking into account diminished manoeuvring capabilities, for the intended manoeuvre. He did not have a predetermined starting point for the turn, defined by bearings and distances of prominent points of land. Nor did he have a series of check bearings and a limiting bearing, by which he could monitor the turn. Instead, he had followed his normal track to the start of the delineated two-way route, with the decision on the turn left "open", to be determined at the time. Although he was using the radar, he did not fix, or ask the Third Mate to fix, the vessel's position immediately before he commenced the turn, so he did not know exactly where *NOL Amber* was, in relation to Larpent Bank, when he initiated the turn and was unable to monitor the turn.

Although the Pilot's recollection, and that of the other Bridge Team members, was that the turn to starboard was commenced closer to 0715 than 0725, the course recorder shows that the turn did not start until 0725. It also shows that the ship responded relatively quickly, rather than the slow response recalled by the Pilot.

At 0717, the time it is considered that the 0715 position was plotted, *NOL Amber* was 1.65 miles from the edge of Larpent Bank and, had the turn been commenced at that point, it would have been completed satisfactorily. However, when the turn was in fact started, eight minutes later, *NOL Amber* was only 1.03 miles from the bank, not two miles as the Pilot had thought.

Based on the times of the REEFCENTRE communication recordings, and allowing him time to obtain a radar bearing and distance, it is apparent the Pilot did not check the position on the chart until about 0736½. The Pilot stated that he had plotted the position himself, but did not mark the time, and this position placed *NOL Amber* within the delineated two-way route. However, the Third Mate stated that he had plotted the position timed 0735, and that the Pilot had merely checked the distance using the dividers.

The REEFCENTRE radar plot shows that *NOL Amber* was on the southern limit of the delineated two-way route at 0732. If the Pilot did plot a position that placed

the vessel within the two-way route, then it had to have been before that time, at least three minutes before the VHF call from the REEFCENTRE. Had the Pilot laid off the bearing of Tucker Point, after receiving the call from the REEFCENTRE, he would have been made aware that grounding was imminent, although at that late stage preventive action is unlikely to have been effective.

It is a matter of conjecture whether the grounding could have been avoided had the 0735 bearing been laid off correctly. The vessel's manoeuvring data indicates that, under full astern, the vessel might have been brought up within two cables, but such action may have resulted in the propeller and rudder coming into contact with the bank, due to an increased swing to starboard. Everything would have depended upon promptness of action, both on the part of the Third Mate, in reporting the situation, and the Pilot in his response.

The engine was run for a further 11 minutes after the helmsman had reported that the vessel had stopped turning. Accounts differed as to why this was the case. The Pilot stated that the engine was on full ahead when the vessel grounded, that he advised the Master that the vessel was aground and that the engine should be stopped, but the Master didn't want to stop the engine. The Master stated that the Pilot initially did not seem to think the vessel was actually aground.

The data-log record shows that the engine was put to half ahead at 0738° and to full ahead at 0740°. The Pilot's report to the REEFCENTRE at 0743° was that "We appear to have touched bottom, off Larpent Bank. I'm endeavouring to get the ship away from it, but we are very close to the bottom here. If we haven't touched bottom I'm surprised".

It is apparent that initially the Pilot was of the opinion that *NOL Amber* was just very close to the bank, rather than actually aground, and hoped to manoeuvre the ship clear.

There had been no physical shock or heeling of the vessel, to indicate that it had grounded, and the tide was still flooding, so there would have been an impression of the vessel still moving ahead through the water. However, the fact that *NOL Amber* had stopped turning should have been sufficient indication to the Pilot that the bow, at least, had taken the ground. Also, the GPS should have indicated zero speed. Larpent Bank is not steep-to, there is no steep, defined edge, the rise from the 10 m contour to a depth of 7.6 m near to the point of grounding being over a distance of 260 m. The fact that the engine speed was increased, rather than the engine being stopped, probably drove the vessel harder aground.

At 0715, *NOL Amber* was approximately mid way between Larpent Bank and the 9° m bank to the north. However, from that time, the room in which to manoeuvre decreased to the south and increased to the north. The Pilot chose to turn to starboard, to the south, because of the presence of *River Embley*, which he recalled as being on the port quarter, shaped up more towards Harrison Rock buoy and he did not want to pass across its bow, as that would be an act of bad seamanship.

However, when he initiated the turn, *River Embley* was still negotiating Varzin Passage, approaching C3 buoy, and was about 7° miles away, 5° on the starboard quarter. That vessel did not clear Varzin Passage, with C4 abeam to port, until

0734 and was still 6½ miles away at the time *NOL Amber* ran aground.

It is evident the Pilot did not assess the *River Embley* situation fully. The radar was being operated with "off-centre" display on the 6-mile range, therefore *River Embley* would not have been depicted on the screen. However, it would not have been difficult for the Pilot to change the range and centre the display, or to have asked the Master to do so for him. Although VHF contact was made with *River Embley*, the exchange apears to have been rather brief and the opportunity was not taken to ascertain exactly where that vessel was. The fact that the *River Embley* pilot was working for the competing pilotage company may have had an inhibiting effect on the exchange of information.

Consideration of NOL Amber bridge procedures

The bridge operations aboard *NOL Amber* were well organised in that the Second Mate had prepared courses for the whole of the transit of Torres Strait and the Inner Two-way Route, the Third Mate, as Officer of the Watch, plotted the position at frequent intervals and monitored the under-keel clearance, and the Helmsman kept the Pilot informed on the progress of the turn.

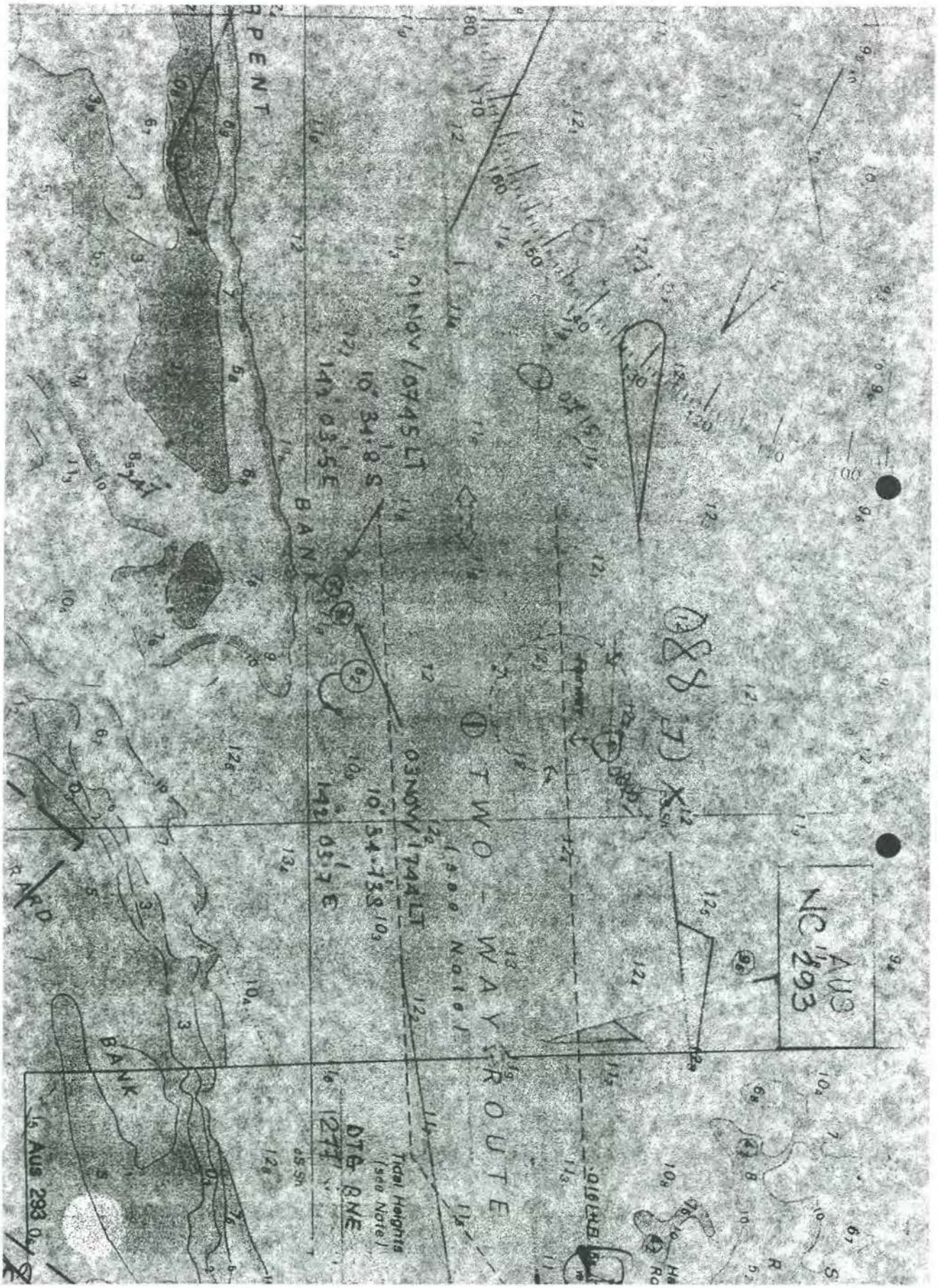
However, no proper passage plan had been drawn up, detailing limiting bearings, safety distances and parallel indexing distances. Had such information been prepared on the navigation chart, the pilotage would have been more readily monitored and those monitoring the progress would have been made immediately aware that *NOL Amber* was getting closer to Larpent Bank than had been intended.

Although the error on the gyro and magnetic compasses were normally ascertained each watch, this procedure was not carried out on the morning of 1 November, at a time when it was important that the gyro error was known for navigating in confined waters. Not only that, but the Third Mate used only single radar bearings and distances for fixing the vessel's position and, apparently, assumed the gyro eror to be nil. Also, having plotted a position, the Third Mate did not take the precautionary measure of checking the distance between that and the preceeding position against time and speed. Such a check procedure would have indicated to him that the 0735 position was probably incorrect.

When the Pilot initiated the turn to starboard at 0725, the two persons in a position to challenge the action did not do so. The Master did not refer to the chart, to satisfy himself that there was sufficient sea room to carry out the manoeuvre, he just accepted the Pilot's decision. The Third Mate, who plotted the vessel's position on the chart at about that time, did not check and advise the Pilot of the distance from Larpent Bank.

Fatigue and alcohol

The Pilot had returned to duty, after a period of 10 days leave, on 17 October 1997. In the intervening period, before he boarded *NOL Amber*, he had conducted the pilotage of three vessels through the inner route and Torres Strait. Between the first and second vessels he had a break of 50 hours on Thursday Island, while between the second and third vessels he had a break of 81 hours in Cairns. Before boarding *NOL Amber* he had a break of 39 hours on Thursday Island.



Portion of NOL Amber chart showing adjusted grounding and refloating positions

On 31 October, he had drunk one glass of red wine at dinner, other than that, he had not consumed any alcohol that day.

Neither fatigue nor alcohol are indicated as being contributing factors in the incident.

Manoeuvring data

NOL Amber is provided with a manoeuvring data sheet, which includes information on turning circles and stopping distances. However, the turning circle information is not complete in that it only provides transfer information for a change of heading of 90°, it does not provide information on the maximum transfer experienced in a full turn, which is the information of interest when making a full, or 180° turn in confined waters, or taking evasive action in a close quarters situation.

It must always be remembered that the manoeuvring data is based on calm weather conditions, no current and a depth of water at least twice the vessel's draught. The majority of mariners are well aware that a vessel's manoeuvring characteristics are changed considerably, the transfer in particular increasing dramatically*, as the under-keel clearance is reduced significantly, However, although the majority of tight manoeuvring is done in restricted water depths, such increases are rarely quantified, either by calculation or during builders' trials.

During interview the Pilot remarked on the fact that turning circle data tended to be in metres rather than cables and, therefore, of little use. Certainly in open water, even if it is confined by banks, where nautical miles and cables are the mariners' yardsticks, metres tend to be irrelevant and are only meaningful when manoeuvring in harbours and fairways. On board *NOL Amber*, the distances had in fact been converted to cables and added to the form in handscript.

Grounding position

Of necessity, the navigation chart was cleaned off for the refloating operation. However, two positions were replotted: one for 1 NOV/0745LT as 10°34.8'S 142° 03.5'E, the other for 3 NOV/1744LT as 10° 34.73'S 142° 03.7E'. Both these positions place *NOL Amber* more than a quarter of a mile northward of Larpent Bank.

At interview, the Master expressed the view that Larpent Bank had extended northwards, as an extension of the 8.2 m patch 7° cables eastward of the grounding position. However, the GPS position for the grounding was recorded at the time as being 10° 35.16'S 142° 03.64'E and, according to the relief pilot, this remained constant throughout the period the vessel was aground.

The 1744 position on 3 November was initially recorded in the bridge note book as 10° 35.06'S 142° 03.61'E, but this was crossed out and amended, by the Second Mate, to read the same as the position replotted on the chart.

The Officer of the Watch aboard *River Embley* plotted the position of *NOL Amber* on their chart at various times as *River Embley* passed on its way through to the Prince of Wales Channel. These positions all placed *NOL Amber* to the

* At an approach speed of 7 knots and a depth/ draught ratio of 1.2, the increase in tactical diameter can be as much as 65% and even greater with a ratio of 1.1.

south of the 10 m contour of the bank, in agreement with the REEFCENTRE radar plot and with the *NOL Amber* GPS position.

The correction to be applied to GPS derived positions, to agree with chart Aus 296 is 0.09 minutes southward and 0.06 minutes westward. The correction applied by the vessel was 0.36 minutes northward, which would appear to be in an attempt to indicate an extension northwards of Larpent Bank. During refloating, on 3 November, the ship's movement was arrested two or three times by what were taken to be sand ridges, which is consisent with the vessel being well on the bank.

Following the apparent grounding of *M Nuri Cerrahoglu* north of Larpent Bank on 5 November 1994, the Hydrographic Office of the Royal Australian Navy conducted an aerial survey of the area by Laser Airborne Depth Sounder (LADS) on 9 December 1994. This survey located the 8.6 m shoal off the northeastern extremity of the bank, but otherwise the bank was found to be as charted.

At the request of both the Marine Incident Investigation Unit and AMSA, the Hydrographic Office arranged another LADS survey of Larpent Bank, conducted on 20 December 1997. This survey showed the 10 m contour on the northern side of Larpent Bank to be within 100 m (0.5 cable) as indicated on chart Aus 296, with no ridges immediately northward.

Navigation aids

During the investigation the Pilot passed the remark that there were no suitable points for parallel indexing procedures, while the Master remarked on the fact that Larpent Bank is not marked.

The direction of the first section of the delineated Two-way Route is 087½°, with the northern boundary aligned on Harrison Rock buoy and 1.6 miles north of the 10 m contour of Larpent Bank and the southern boundary aligned on the southern point of Goods Island and half a mile north of the bank. The northern head of Tucker Point provides a near centre axis of the route, one mile north of the bank. These three points, combined with the fact that at a distance of six miles, an angle of 1° subtends a distance of one cable, provide a very quick indication of the distance a vessel is from Larpent Bank.

It is to be expected that the above information is known to the pilots and is, therefore, part of the information in their passage plans, along with the parallel indexing distances and limiting safety bearings for other sections of the route.

However, as the Master pointed out, there are no buoys marking the bank and no other visual points of reference in the immediate area where the turns are conducted. Also, as vessels turn towards a westerly direction, Goods Island becomes towards the stern and, therefore, not so suitable for visual conning.

There have been three groundings, in recent years, to the west of the Prince of Wales Channel during time-losing manoeuvres, two of which were on Larpent Bank. In June 1997 there was also a grounding at the western end of the bank. With vessels becoming larger and with more vessels requiring to transit the Torres Strait at maximum permissable draught, there are likely to be more occasions when pilots have to carry out delaying manoeuvres in such vessels. Navigation buoys or beacons, marking the eastern and western ends of Larpent

Bank, would provide immediate visual reference points for the pilots when having to turn vessels about and would help facilitate the manoeuvre.

Following a submission by the Inspector and an appraisal of the navigation aids in the area, AMSA are to install a light buoy on the 8.2 m shoal patch at the eastern end of Larpent Bank and a racon beacon on White Rocks, 6¾ miles northward.

Conclusions

These conclusions identify the factors contributing to the incident and should not be taken as apportioning either blame or liability.

- The Pilot did not have a properly prepared plan for the necessary delay between Varzin Passage and Prince of Wales Channel, including the turning about manoeuvre.
- The vessel's Bridge Team had not prepared a proper passage plan, identifying limiting bearings and safety distances.
- The Pilot did not fully brief the Master and Third Mate on the manoeuvre, to enable them to operate as a fully integrated, supportive team.
- The Pilot did not ascertain the vessel's position immediately before starting the manoeuvre.
- The Pilot did not fully evaluate the situation regarding *River Embley* before deciding which way to turn the vessel.
- At the start of the turn, the Master did not satisfy himself that the vessel had sufficient room in which to carry out the manoeuvre.
- At the start of the turn, the Third Mate did not advise the Pilot on the distance off Larpent Bank.
- Neither the Pilot nor the Master instructed the Third Mate to keep them informed about the distance off Larpent Bank during the turn.
- The 0735 position was incorrectly plotted on the chart.

Submissions

Under sub-regulation 16(3) of the Navigation (Marine Casualty) Regulations, if a report, or part of a report, relates to a person's affairs to a material extent, the Inspector must, if it is reasonable to do so, give that person a copy of the report or the relevant part of the report. Sub-regulation 16(4) provides that such a person may provide written comments or information relating to the report.

The final draft of the report was sent to the following:

The Master, Third Mate and Helmsman, *NOL Amber*

Pilot.

Sections of the report were sent to:

Queensland Transport REEFCENTRE

Queensland Transport provided helpful information on the REEFCENTRE, while the Pilot provided the following submission:

1. Unfortunately I was unable to obtain a copy of the chart in use during the incident despite my request to the master. I did not have details of the positions and times leading up to the incident. My recollections of these very pertinent details, during my interview, were based on memory only. I assume that the details recorded on the chart in use are correct.

2. I do not agree with the statement that I did not fix the ship's position but only used the dividers to check the distance. I did indeed check the position. I used a radar bearing of Tucker Point and a radar distance. I used the dividers to prick the distance on the bearing line, circled that position, but did not time the result.

3. Advice from 'Reef Centre' regarding the vessel's proximity to shallow water came at a time when I had already realised that the vessel was in hazard, and was trying to do something about it. The warning came too late to be effective.

4. I agree that the extremity of Larpent Bank should be delineated by a navigational aid, the type of manoeuvre I was attempting to complete is quite common at times of unsuitable tidal rises.

5. My remarks regarding the Manoeuvring Data being in metres not cables were made in general terms. I was referring to modern vessels where this appears to be the norm. These remarks did not refer to the data on NOL Amber.

6. Bridge Resource Management principles have been mentioned in this report. ***For these principles to be effective, both the bridge personnel and the pilot should be well versed in the subject not just the pilot alone**.*

* Inspector's emphasis

Details of 'NOL Amber

Former name	Neptune Amber
IMO No.	7819357
Flag	Singapore
Classification Society	American Bureau of Shipping
Ship type	Container
Owner	Iphigenia Pte Ltd
Operator	Neptune Orient Lines
Year of build	1980
Builder	IHI, Kure, Japan
Gross tonnage	33,113
Net tonnage	13,412
Summer deadweight	38,485 tonnes
Length overall	234 m
Beam	32.25 m
Draught (summer)	12.525 m
Engine	12 cylinder Sulzer diesel
Engine power	26,627kW
Crew	31