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*All times are given in Eastern Standard Time*

## Summary

On 4 October 1991 the Australian flag bulk carrier TNT Carpentaria was on passage from Weipa to Gladstone with a full cargo of bauxite and drawing a maximum draught of 12.13m.

At about 1716 Eastern Standard Time, a pilot from the Queensland Coast and Torres Strait Pilot Service boarded the ship about 2.4 miles west of Harrison Rock buoy at the western extreme of the Prince of Wales Channel.

After a brief discussion with the Master, the pilot advised that there was insufficient water in certain parts of the Prince of Wales Channel to allow the ship to make a safe 'passage. It was decided to wait off the channel until the transmitting tide gauges indicated sufficient under-keel clearance to allow the ship to transit the channel.

At about 1736 the pilot ordered the wheel be put hard to port, so as to make a turn on to a reciprocal course to await the tide.

At about 1754 the vessel grounded 0.7 miles north-west of Harrison Rock at the western end of Sunk Reefs.

At about 2103 the vessel refloated under its own power and the passage to Gladstone was resumed.

No-one was injured in the incident and there was no pollution.

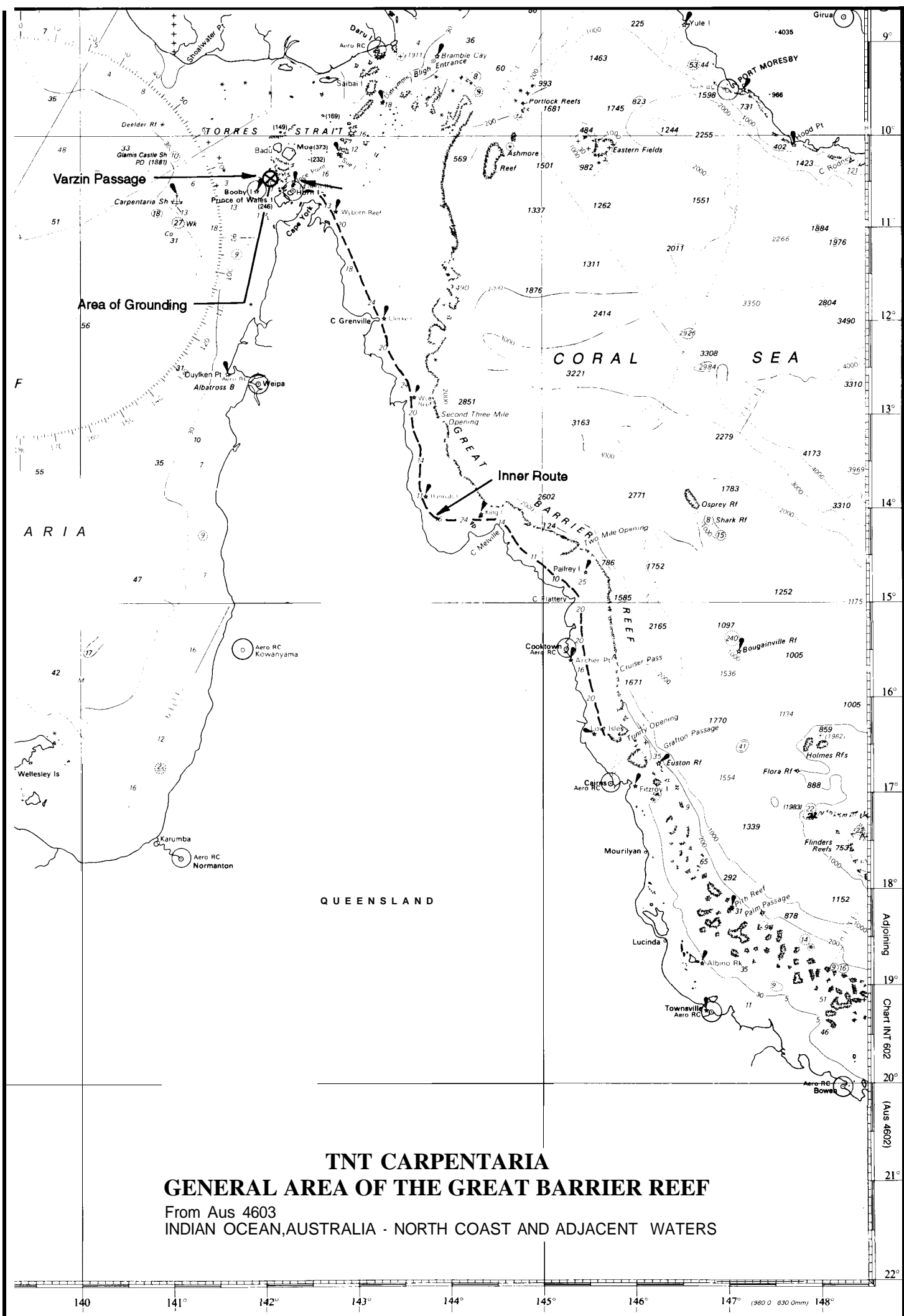
## People interviewed and sources of information

Interviews were conducted on 8 October 1991 with the Master, Mate, Helmsman and Lookout of the TNT Carpentaria and also the Pilot of the Queensland Coast and Torres Strait Pilot Service engaged for the south-bound passage.

Information was also volunteered by Captain D.Grant, a pilot of the Queensland Coast and Torres Strait Pilot Service.

The Hydrographic Office, Royal Australian Navy was consulted on chart data.

The Australian Maritime Safety Authority provided the recorded tidal heights for Booby Island, Goods Island, Turtle Head and Ince Point.



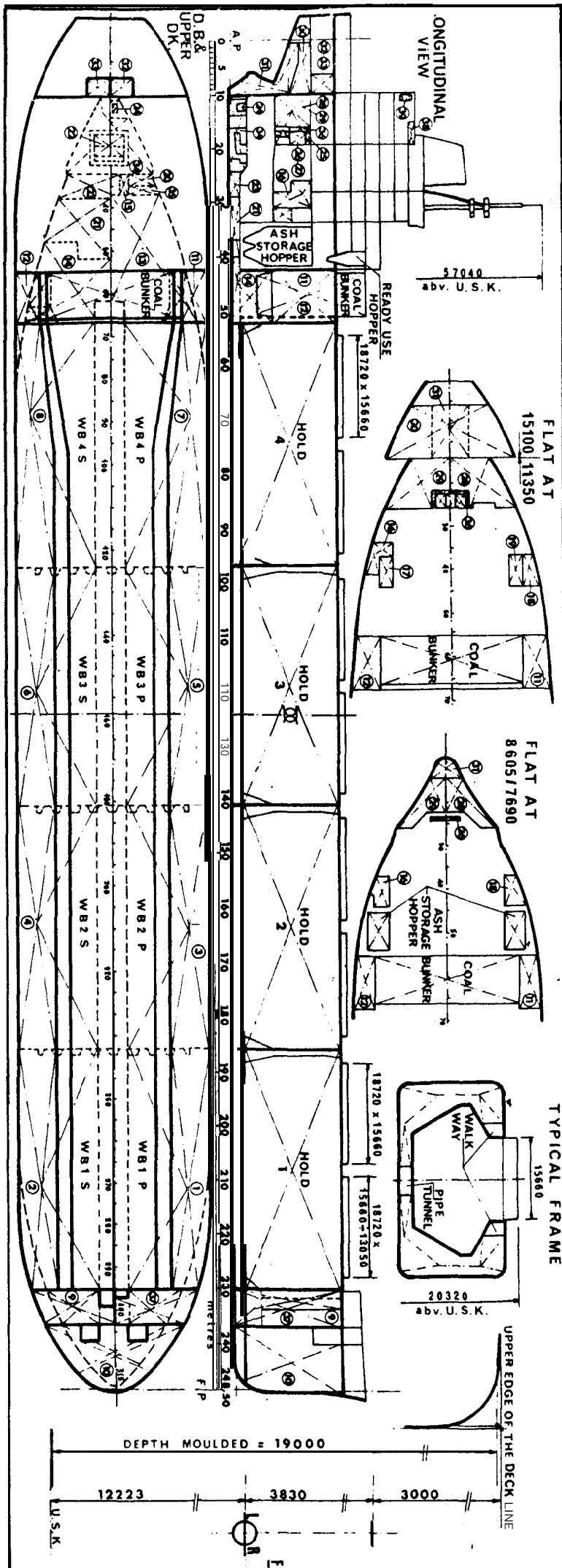
**TNT CARPENTARIA**  
**GENERAL AREA OF THE GREAT BARRIER REEF**  
 From Aus 4603  
 INDIAN OCEAN, AUSTRALIA - NORTH COAST AND ADJACENT WATERS

New Edition 10th MWG 1980

**DEPTHS IN METRES**

INT 603  
 Aus 4603

# TNT Carpentaria General Arrangements



Dwt	75,105
LAO	255.00
Breath	35.3m
Depth	19.0
Max. Draught	12.223
Displacement at 12.223m	93,628

# TNT Carpentaria

## The ship and personnel

The TNT Carpentaria is an Australian-registered bulk carrier, designed for the Weipa - Gladstone Bauxite trade. It was built in Italy in 1983 and is owned by TNT Bulkships Ltd of Sydney, and managed by Associated Steamships Pty Ltd, of Melbourne.

The ship has a summer deadweight of 75,105 tonnes at a draught of 12.224m. It is a single-screw steam-turbine vessel fuelled by pulverised coal, and is 255m in length, with a maximum beam of 35.36m and a moulded depth of 19m. The vessel has four cargo holds and ballast capacity in combined side and double-bottom tanks.

The TNT Carpentaria operates with an unmanned machinery space (UMS). The navigation bridge is 223m from the bow.

On 4 October 1991 the ship was under the command of a qualified Master and was manned by an Australian crew. The navigation watch was divided between three qualified deck officers on 4-hours on, 8-hours off.

For the passage through the Torres Strait and the inner two-way route of the Great Barrier Reef, the vessel embarked a pilot of the Queensland Coast and Torres Strait Pilot Service as a matter of policy. Since the introduction of compulsory pilotage for the two-way route on 1 October 1991, all ships have been required to do so.

The Master had been at sea since 1961 and held a certificate of competency as a Master Class 1. He had been on ships engaged in the Weipa-Gladstone bauxite trade since April 1989, initially as Mate. He had held command since January 1991 and served on the TNT Carpentaria's sister ship, the TNT Capricornia, from January 1991.

The Pilot of the Queensland Coast and Torres Strait Pilot service had 10 years experience of Reef pilotage and had made more than 150 passages through the inner route with vessels on maximum draught, 22 of these on either the TNT Carpentaria or the TNT Capricornia.

The Mate had held a certificate of competency equivalent to a Master Class 1 since 1968. He had served as a navigating officer on the Weipa - Gladstone run for 18 years and had undertaken about 150 voyages in the trade.

The Second Mate held a certificate of competency as Second Mate, issued in December 1971. He also was experienced on ships in the Weipa - Gladstone trade.

10.0 15.0 20.0 25.0

1. The Two-way Route shown on this chart is not a Traffic Separation Scheme and its use is not mandatory. The International Code of Signals for Traffic Separation Schemes 1972 apply equally to all vessels whether navigating inside or outside the Two-way Route.
2. The Two-way Route indicates the route for vessels of moderate draught (up to nine metres) having regard to the charted contours of the seabed. It may be encountered in the Two-way Route and in its vicinity in certain areas.
3. In accordance with the Safety of Life at Sea Convention 1974 all vessels should maintain a safe speed in the Two-way Route.
4. The symbol ( ) indicates that traffic is free to move in either direction along the route.



20000 25000 30000 METRES

## **Chart information**

The depths in Torres Strait have been surveyed extensively. The international standard for accuracy for soundings in waters of the 0 to 30m range is +0.3m. While much of the Torres Strait is charted to this accuracy, the Hydrographer, in letters to the Marine Board of Queensland of 23 April 1981 and 16 April 1987, stated that errors in charted depths might be as much as 0.5m.

Charts AUS 296 (Goods Island to Proudfoot Shoal) and AUS 293 (Prince of Wales Channel) carry a note below the title sourcing survey data, which is further illustrated by the reliability diagram (Attachment 7).

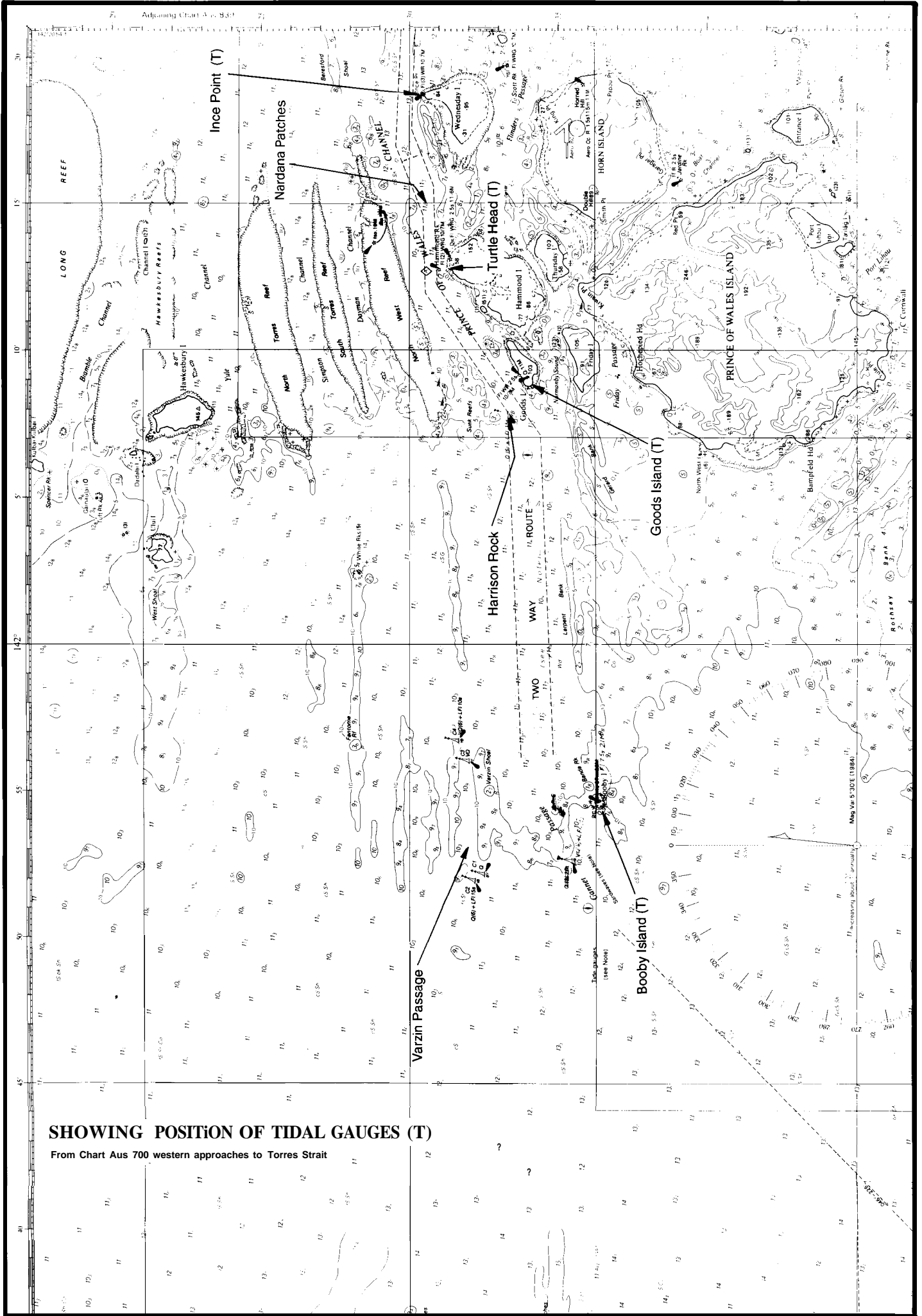
Large vessels regularly navigate the Torres Strait with a minimum clearance of 10 per cent of maximum draught (1m clearance in Gannet and Varzin Passages). While the route has proved safe and the hydrographic survey reliable, given the possible variables in charted depths and warnings of sand waves at the eastern entrance to the Prince of Wales Channel, caution must be observed in navigating the passage.

## **Under-keel clearance and tidal information**

Limiting factors for a safe passage of Varzin Passage and the Prince of Wales Channel are the availability of water and the maintenance of the recommended under-keel clearance based on the predicted tides for the area. The calculation of under-keel clearance is often to the nearest centimetre and this is applied to very large vessels which might be more than 250m in length and with draughts of more than 12m. It is important, therefore, that the very fine tolerances involved in the calculations are properly appreciated and that advice regarding the minimum recommended under-keel clearance is strictly observed (Attachment 6).

At deep draught, a master must ensure that the vessel maintains an adequate under-keel clearance at all times. Specific advice with regard to draught limitations is contained in the Annual Australian Notices to Mariners, No 23, "Queensland Coast and Torres Strait Pilot Service, Draught Limitations and Service Advice" (Attachment 3). This notice advises that the pilot service will accept vessels up to a maximum draught of 12.2m. The minimum under-keel clearance stipulated for Varzin (and Gannet) Passage is 1m, while in the Prince of Wales Channel, vessels drawing more than 11.9m should maintain a minimum under-keel clearance of 10 per cent of maximum draught.

This advice is found also in the 1991 Torres Strait Tide Tables published by the Department of Transport and Communications.



### SHOWING POSITION OF TIDAL GAUGES (T)

From Chart Aus 700 western approaches to Torres Strait

Tidal gauges (See Note)

Mag Var 0° 30'E (1984) If increasing about 1° annually

Tidal “ports” or stations are located at Booby Island, Goods Island, Turtle Head, Ince Point and Twin Island. Predicted times and heights (to the nearest 0.1m) of high and low water for these ports are given in the Australian National Tide Tables. Hourly predictions to the nearest centimetre are published in the Torres Strait Tide Tables.

It should be noted that the Torres Strait Tide Tables do not necessarily indicate the lowest water and reference should be made to both publications. Tidal details from both publications are at Attachment 1.

Tidal heights appearing in the tables are predictions only. Unusual meteorological conditions might also cause changes in sea level which might cause the height of tide to be more or less than that predicted, and/or might cause the tidal heights to lead or lag the predicted times. In the Torres Strait, these considerations are critical in transiting the area.

Because significant differences between the predicted and actual level of the water are known to occur in Torres Strait, transmitting tide gauges have been established at Booby Island, Goods Island, Turtle Head and Ince Point (Attachment 4). These gauges, broadcast by means of a morse code signal the actual height of tide, which can be compared with the predicted heights. Each transmitted signal is the height of the sea level averaged over 14.5 seconds, to allow for such conditions as the swell. The tide height is broadcast to the nearest 0.1m below the actual height (eg a reading of 3.89m is transmitted as 3.8m).

As a vessel approaches the Prince of Wales Channel, the predicted heights must be compared with the actual heights, as transmitted from the gauges, to ensure that sufficient water is available (Attachment 2).

The transmitting tide gauges also record the tidal information every hour to the nearest centimetre, on battery-backed random access memory cards .

## The voyage

The TNT Carpentaria sailed from Gladstone on 28 September 1991, in ballast, bound for Weipa to load a full cargo of bauxite.

In Gladstone the ship embarked a pilot of the Queensland Coast and Torres Strait Pilot Service, for the transit through the inner route of the Great Barrier Reef. Normally the pilot engaged for the north bound ballast passage would remain with the ship throughout the passage and return with the ship to Gladstone, also piloting the vessel on the loaded southward transit.

At about 1000 on 30 September, a message was received by the Master that no berth would be available on arrival and the vessel would be required to anchor for at least 24 hours. It was therefore decided that the Pilot would leave the ship at Goods Island and another pilot would be engaged for the loaded passage. A little before 1100, the Master confirmed by telex that the vessel would be delayed in Weipa and was due at Goods Island on the south-bound loaded passage at the maximum 12.2m draught, at 1800 on 4 October.

This meant that in the Prince of Wales Channel the vessel would need to rely on the tide heights to make the passage with an acceptable under-keel clearance at all times of 10 per cent of the vessel's maximum draught.

To ensure safe passage, careful planning is necessary and involves the calculation of under-keel clearance based on the tidal predictions for the area (Attachment 1). Using this information a series of tidal curves can be drawn as a graph to show the times at which passage through both Varzin Passage and the Prince of Wales Channel can be accomplished.

According to the Pilot, the Master showed him his tidal graphs for the south bound transit and the two men discussed the tidal considerations. The Pilot recalled that it was agreed it would not be possible to make the "tidal window" of the morning of 4 October, so the afternoon tidal pattern was discussed. The Pilot stated that he advised that the TNT Carpentaria should not arrive off Goods Island before 1800 on 4 October.

But the Master did not recall advice from the Pilot during the north-bound transit regarding the loaded passage, although if any advice had been given he believed he would have incorporated it in his tidal graphs. However, the Master did recall discussing the viability of retaining the Pilot while in Weipa and the penalty payments involved.

The Pilot for the north bound transit was disembarked at 0752 on 1 October off Goods Island.

The TNT Carpentaria dropped anchor off Weipa at 2038 on 1 October and went alongside to load on 2 October. While the ship was alongside, a representative of Queensland Aluminium Limited telephoned the Master to discuss the possibility of

arriving in Gladstone on the morning of 7 October. The Master explained the tidal situation in the Prince of Wales Channel and that it would not be possible to arrive before high water at 2050 on 7 October, elaborating on his explanation by facsimile.

To meet the proposed schedule it was necessary to arrive at the Gladstone fairway buoy 11/2 hours before high water, at 1920 on 7 October. The steaming time between Ince Point, in the Prince of Wales Channel and Gladstone fairway buoy is 72 hours, therefore the ship had to pass Ince Point at 1920 on 4 October. The Master planned the loaded transit on the basis of an arrival time at Gladstone fairway buoy of 1920 on 7 October.

The Master calculated that the ship's draught on arrival at Booby Island, allowing for water density and the use of bunkers and water, would be 12.13m. On this basis, for the TNT Carpentaria to make the transit through the Prince of Wales Channel, a minimum under-keel clearance of 1.21m (10 per cent of maximum draught) and a minimum depth of water at all times of 13.34m was required. At such a draught the channel must be navigated at reduced speed to minimise the effect of squat and the passage planned accordingly.

The Master carefully planned the passage through Torres Strait with the aid of a graph of tidal predictions for Booby Island (for Varzin Passage), Goods Island, Nardana Patches (Turtle Head) and Ince Point. The plan demonstrated that, providing the tide reached its predicted heights, the limiting factor governing the timing of the passage was the depth of water off Nardana Patches, where there would not be sufficient water until 1815.

The predicted tidal heights showed that the ship had to clear the eastern end of Varzin Passage by 1640, or the water depth would have been less than the minimum required. Based on tidal predictions for the afternoon of 4 October and early morning of 5 October, the Master calculated that the minimum depth of water would be available off Goods Island for about 15 hours-from about 1130 to 0300, off Nardana Patches - from 1828 to 0230, and off Ince Point from 1800 to 0205. The direction of tide on arrival at Goods Island at 1730 was predicted as eastward going until approximately 1900.

The ship loaded over 2 and 3 October and sailed from Weipa at 2144 on 3 October, at a draught of 12.2m, with 71,950 tonnes of bauxite. The vessel cleared the fairway buoy and set course for Varzin Passage at a reduced speed of 50rpm. The anticipated ETA of the vessel at the pilot-boarding ground off Goods Island was 1730 on 4 October, and a pilot was ordered for that time.

The Master completed an entry in his night order book at 0001, noting the course as 320 degrees at 50rpm, to arrive at Varzin East buoys at 1600. He left the navigation watch in the charge of the Second Mate, who initialled the night orders.

The Second Mate noted the estimated time of arrival at Varzin East buoy. At interview he stated that, based on his experience and a minimum under-keel clearance of 1.2m, he believed that the timing at East Varzin was wrong. In his view there would be too much time to waste on the relatively short passage (10 miles) between the eastern end of Varzin

**GOODS ISLAND TO PROUDFOOT SHOAL**  
 From Chart 296 (Reduced)  
 TAKEN FROM CHART ON BOARD TNT CARPENTARIA

**NEW ZEALAND SYSTEM OF SOUNDINGS**

Depth in Fathoms	Depth in Metres
1	1.8
2	3.7
3	5.5
4	7.3
5	9.1
6	11.0
7	12.8
8	14.6
9	16.4
10	18.3
11	20.1
12	22.0
13	23.8
14	25.6
15	27.4
16	29.3
17	31.1
18	32.9
19	34.7
20	36.6
21	38.4
22	40.2
23	42.0
24	43.8
25	45.7
26	47.5
27	49.3
28	51.1
29	52.9
30	54.7
31	56.5
32	58.3
33	60.1
34	61.9
35	63.7
36	65.5
37	67.3
38	69.1
39	70.9
40	72.7
41	74.5
42	76.3
43	78.1
44	79.9
45	81.7
46	83.5
47	85.3
48	87.1
49	88.9
50	90.7
51	92.5
52	94.3
53	96.1
54	97.9
55	99.7
56	101.5
57	103.3
58	105.1
59	106.9
60	108.7
61	110.5
62	112.3
63	114.1
64	115.9
65	117.7
66	119.5
67	121.3
68	123.1
69	124.9
70	126.7
71	128.5
72	130.3
73	132.1
74	133.9
75	135.7
76	137.5
77	139.3
78	141.1
79	142.9
80	144.7
81	146.5
82	148.3
83	150.1
84	151.9
85	153.7
86	155.5
87	157.3
88	159.1
89	160.9
90	162.7
91	164.5
92	166.3
93	168.1
94	169.9
95	171.7
96	173.5
97	175.3
98	177.1
99	178.9
100	180.7

**GOODS ISLAND TO PROUDFOOT SHOAL**  
 SCALE 1:75,000 METRIC

**SYMBOLS AND ABBREVIATIONS**

**ROCKS**  
 Shaded areas indicate rocks of various heights above low water level. The height of the rock is given in fathoms or metres.

**SHOALS**  
 Shaded areas indicate shoals of various depths below low water level. The depth of the shoal is given in fathoms or metres.

**ISLANDS AND HEADLANDS**  
 Shaded areas indicate islands and headlands of various heights above low water level. The height of the island or headland is given in fathoms or metres.

**COASTLINE**  
 The coastline is shown by a solid line. The position of the low water mark is indicated by a dashed line.

**ANCHORAGE**  
 Anchorage areas are indicated by a shaded area with a central point. The depth of the anchorage is given in fathoms or metres.

**WATERS**  
 Waters of various depths are indicated by a shaded area. The depth of the water is given in fathoms or metres.

**BEACONS**  
 Beacons are indicated by a symbol. The height of the beacon is given in fathoms or metres.

**BUOYS**  
 Buoys are indicated by a symbol. The depth of the buoy is given in fathoms or metres.

**NETS**  
 Nets are indicated by a symbol. The depth of the net is given in fathoms or metres.

**REMARKS**  
 Remarks are given in the margin of the chart.

A R A F U R A

S E A



Passage and the pilot boarding ground off Goods Island. He further stated that he ringed the entry in pencil and at 0400, when relieved of the watch by the Mate, brought it to his attention. According to the Second Mate, the Mate agreed and the Second Mate expected him to raise the issue with the Master during the morning.

At 0930 the Master began to monitor the transmitting tide gauge at Booby Island on 320 kHz and at 1000 the officer of the watch, the Third Mate, began noting the height of tide on each hour. The transmitted figure was compared to the predicted hourly height and was found to be 0.2m below the predicted height of 1.79m above datum. Similarly, at 1100, the transmitted height of 2.1m was 0.2m below the predicted 2.30m. The other tidal stations, which transmitted on VHF frequencies, were not in range.

At 1200 the Second Mate took over the watch and the vessel was steering 060 degrees, making good 10 knots with the engine turning 50rpm. He continued to record the transmitted tide height at Booby Island and began to monitor the height of tide at Goods Island. At 1200, both sets of tidal data were transmitted as being 0.2m below predicted depth. At 1300 both tidal gauges transmitted tidal heights 0.2m and 0.1m respectively, below predicted height.

At 1400, Booby Island transmitted a tidal height of 2.9m, 0.3m less than the predicted 3.21m.

At 1410, the Master, who had been on the bridge at frequent intervals throughout the morning, came to the bridge as the vessel approached Varzin Passage and took charge of the navigation. The engine revolutions were reduced at this time to 25rpm and a seaman took the wheel and steered manually. At 1420 the TNT Carpentaria entered the western end of Varzin Passage. The Master used parallel indexing techniques for the passage and maintained a careful watch on the under-keel clearance by echo sounder.

At 1500, the transmitted tide heights at Booby Island and Goods Island were 0.3m below the predicted height on a falling tide. The transmission from Turtle Head had come into range and the hourly reading of 1.2m was 0.4m below the predicted height, also on a falling tide. The engine revolutions were further reduced to 20rpm.

At 1519 the TNT Carpentaria cleared the eastern buoys of Varzin Passage and altered course to 100 degrees with Goods Island lighthouse ahead. The depth of water as transmitted by Booby Island tide gauge was 0.3m below that predicted giving a least depth of 13.3m. At all times, therefore, the recommended 1m under-keel clearance for Varzin Passage was maintained. In fact, the minimum under-keel clearance recorded by echo sounder was 1.6m at the eastern exit of Varzin Passage.

At 1600, the Mate relieved the Second Mate and the Master continued in charge of the navigation. The wind was recorded as east-north-east force 3 to 4.

The vessel, which was at this time 7.8 miles from the pilot boarding ground, maintained its course and propeller revolutions for an ETA of 1730. The ship's position was fixed and the predicted tidal heights at Turtle Head and Ince point were compared with the



actual heights as transmitted, these were 0.4m and 0.2m respectively below predicted height. The 1600 transmission from Goods Island was not recorded.

Shortly after the Mate arrived on the bridge, he and the Master discussed whether or not to put the vessel into automatic steering. At about this time the Master spoke to the pilot station by VHF radio, giving the vessel's ETA at the pilot boarding ground. He was informed that the pilot boat had already left for the boarding ground. It was decided to increase the revolutions from 20 to 30 rpm. The Mate and helmsman recalled that the automatic helm was engaged at some time between 1615 and 1625. The course recorder (Attachment 5) indicates that some adjustment was made between 1616 and 1621.

At 1700, the transmitting tide gauge at Goods Island indicated that the water level was 0.3m below prediction, Turtle Head 0.4m below prediction and Lace Point 0.3m below prediction. The Second Mate relieved the Mate for "tea relief" and fixed the ship's position with Harrison Rock buoy bearing 096.5 by 4 miles. A seaman took the wheel and the ship reverted to manual steering.

At about 1708, with the pilot boat approaching, the Master ordered the helm to be put to starboard and the vessel was brought on to a heading of 112 degrees. The vessel at this time was 1.2 miles north-west of the designated pilot ground. At 1712 the Second Mate fixed the ship's position with Harrison Rock buoy bearing 099 degrees by 2.9 miles. At about 1714 the master ordered 20 degrees port helm to make a lee on the port side from the easterly wind, for the pilot boat.

The Pilot for the south-bound passage boarded at about 1716 and was met by the Mate. The Pilot arrived on the bridge at approximately 1720 and exchanged some pleasantries with the Mate and Second Mate, who were known to him, and with the Master. At 1720, with Harrison Rock buoy bearing 102 degrees by 2.5 miles, the ship was steadied on a course of 040 degrees for about 2 minutes. At about 1722 the Master ordered the helm be put hard to starboard and a new course of 110 degrees. The Pilot then assumed responsibility for the navigation and amended the required heading to 120 degrees. An entry in the deck log book for 1720 notes "Co var TPA 40 rpm" (courses variable, to pilots advice, 40rpm). At 1731 the vessel was steadied on a course of 120 degrees.

The Pilot and the Master discussed the tide but the Pilot was not informed of the amended draught of 12.13m. They listened to the tide height transmissions and discussed waiting for the tide to rise. As the actual tidal heights as transmitted were substantially below those predicted, the Pilot considered that there was insufficient water to maintain the required under-keel clearance to allow safe passage. According to the Master, the Pilot ordered the helm be put hard to port.

The Master accepted the Pilot's advice but was of the view that although there was insufficient water at that time at Nardana Patches, sufficient water would be available by the time the ship reached the area at slow speed.

The ships helm was put hard to port and at 1735 the vessel began to swing slowly to port at the rate of about 12 degrees a minute.

At this time the Mate went to the chart console and on the way checked the ship's position. He stated that he did not plot the position on the chart or pass the ship's position to the Master or Pilot, but he recalled that Harrison Rock buoy was 090 degrees by 1.23 miles. The Master and Pilot were standing in the wheel house forward of the steering console, where the digital read-out of the echo sounder could be monitored, the recorder itself was not in operation.

The Mate remained behind the chart console, preparing the chart for the Prince of Wales Channel, AUS 293, and occupied himself in completing paper work relating to the cargo.

At about 1750 the Master noted that the echo sounder reading showed zero and the lookout reported that the ship had stopped swinging. This was confirmed by the Helmsman. The ship's head at this time was 310 degrees. The Master and Pilot assumed that the vessel was aground. At 1753 hours the engine was stopped and at 1754 the engine was run astern until 1804.

The crew were alerted and the ship sounded internally and the depth of water was checked externally. All tanks were found to be intact and the vessel was found to be aground forward in way of the fore-peak with the minimum depth being on the starboard bow.

The Master informed the ship's managers.

At about 1910 the east-going tidal stream changed to a west-going stream and the water at Goods Island began to rise. At 1939 the vessel was felt to move and the engine was put astern; the ship's head moved to starboard and settled on 0.50 degrees but the ship did not gain any stern-way. The engine was stopped at 2018.

At 2041 the engine was again put astern and at 2103 the vessel began to move slowly astern. At 2108, with the vessel clear of shoal water, the engine was put ahead and the voyage for Gladstone resumed. Tanks and spaces were checked for ingress of water and all were found to be intact.

At 2335 the vessel cleared the eastern end of Prince of Wales Channel and normal full sea speed was set for the voyage to Gladstone.

At 2343 the Master sent a casualty report to the Maritime Rescue Coordination Centre, advising of the incident.

# Comment

## Introduction

Times have been taken from the log book and bridge movement book. Times of course changes and headings have been taken from the course recorder trace (Attachment 5), which was reset and synchronised at 1100 on 4 October; these times appear accurate within one minute, but the trace of the courses steered seems to be about 1 degree low. Any time or course difference is considered to be minimal and not significant in terms of this investigation.

The visibility and sea conditions were recorded as fine and clear with a slight sea. The visibility and sea state are not considered factors in this incident, but the state of the tidal stream and the tidal heights are relevant.

After the vessel was refloated it was established that Harrison Rock Buoy was in its correct position.

## The grounding

There are two major elements that must be considered:

- (1) The actions or omissions of those on the bridge, which led to the grounding.
- (2) The issue of the timing of the passage and available water in the Prince of Wales Channel.

### **The actions and omissions of those on the bridge.**

Neither the Master, nor the officers concerned, suggested they were fatigued and their hours on duty during the days preceding the grounding support this. They stated, and it is accepted, that they had not consumed alcohol in the hours leading up to the incident.

The Pilot had arrived at the pilot station at Thursday Island at about 2030 on 2 October 1991, having piloted a north-bound vessel. In accordance with Pilotage Service policy, the Pilot was not due to take a south-bound ship until 4 October, thus allowing a full night's rest (night of 3 October) before resuming duty.

The Pilot stated, and it is accepted, that he did not consume any alcohol or medication in the eight hours before boarding the TNT Carpentaria.

He had extensive experience as a Queensland Coast and Torres Strait Pilot, including ships at maximum permissible draught.

He boarded the TNT Carpentaria at a time entered in the log book as 1716 on 4 October 1991, in a position about 1.3 miles to the north and west of the recommended

pilot boarding ground. He took over responsibility for the navigation and, at about 1722, directed that the vessel should be steadied on a course of 120 degrees. At about 1730 the ship was steadied on a course of 120 degrees. As there was insufficient water in the Prince of Wales Channel he ordered full port rudder to turn the ship on to a westerly course. The vessel began its turn at 1736.

The Master did not question the Pilot's plan or his choice of turning to port.

At about this time the Mate checked the ship's position by radar. It was confirmed at interview that he neither plotted the position on the chart, nor did he inform the Master or Pilot of the ship's position. He stated that he thought he was wasting his time standing at the steering console while the ship was turning around and he went behind the chart console to complete some routine work. He made no further check on the ship's position until after 1750.

Neither the Pilot nor the Master checked the ship's position relative to the shoal water at any time.

The Pilot stated that his choice of port rudder was dictated by the fact that in a right-handed-turning propeller vessel the turning circle to starboard is larger. In the case of the TNT Carpentaria, in deep water at full speed, the turning-circle diameter to port is about 14 per cent less than a turn to starboard.

But, the nearest shoal water lay 0.9 of a mile to the north, on the port bow of the ship, off Sunk Reef, and the nearest shoal water to the south, at 10.3m sounding, was 1.55 miles to the south and west of the vessel.

The option of anchoring was dismissed by the Pilot, who stated that, given the speed and position of the vessel and the minimum under-keel clearance, there was a danger of running over the anchor and damaging the bottom of the ship. The vessel would have had to be slowed so that it was virtually stopped in the water to avoid damage.

The Inspector accepts that using an anchor would have been impracticable, either to anchor the vessel or, in such shallow water, to snub the vessel around. To delay the ship's entry into the Prince of Wales Channel, the pilot's best and most realistic option was to turn the vessel and steam slowly to the west.

From the heading at 1736 of 120 degrees, the ship had to turn through over 210 degrees to make the westerly course required, whereas if the ship had turned to starboard, a course change of less than 170 degrees, would have provided a safe course clear of shoal water.

A turn to port would theoretically involve a smaller turning circle, but require a larger overall change of heading. The only way to accelerate the rate of turn was by significantly increasing revolutions, which would not immediately increase the ship's speed, with the attendant increase in draught due to squat, but would put more thrust on to the rudder to increase the rate of turn.

A turn to starboard would have meant a larger turning circle, but this would have been offset by the ability to put the vessel's engine astern and use the force of the propeller to maintain the swing to starboard, and so turn the vessel "short round", should this have been necessary.

And the turn to port took the vessel from waters that had been surveyed in 1971 and 1988 to a depth accuracy of 0.5m, to waters surveyed in 1945 to an accuracy of 1m.

There was a marked east-going tidal stream setting the ship towards shoal water. Once committed to a turn to port, the only option for the Pilot and Master, had they realised that the ship was closing shoal waters, was to increase the rate of turn. But given the proximity of the shoals it is doubtful if such a manoeuvre would have been successful.

As it is the Inspector is satisfied that no real appraisal was made of the options by either the Master or the Pilot. Nobody fixed the ship's position before the manoeuvre began and nobody monitored the ship's position during the swing.

Basic seamanship requires that a ship's position, relative to any given hazard, should be known and monitored by those responsible for navigating the ship.

Regardless of whether a pilot is embarked, a master and officers have a duty to establish that the ship is being navigated safely. Regulation II/1.10 of the Annex to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 states:

"Despite the duties and obligations of a pilot, his presence on board does not relieve the master or officer in charge of the watch from their duties and obligations for the safety of the ship. The master and the pilot shall exchange information regarding navigation procedures, local conditions and the ship's characteristics. The master and officer of the watch shall cooperate closely with the pilot and maintain an accurate check on the ship's position and movement."

The Convention is closely mirrored in comprehensive Company Standing Orders, which all officers are required to read and sign to confirm their understanding of the orders. A number of sections (2.1.6, 2.4, 5.9, 5.13.1, 7.2.2) clearly state what is expected of a master and officers of the watch, when a pilot is on board, and this includes fixing the ship's position to reduce the risk of grounding, particularly in restricted areas. It is apparent that the officers had either not kept themselves familiar with, or had ignored, the company's standing orders.

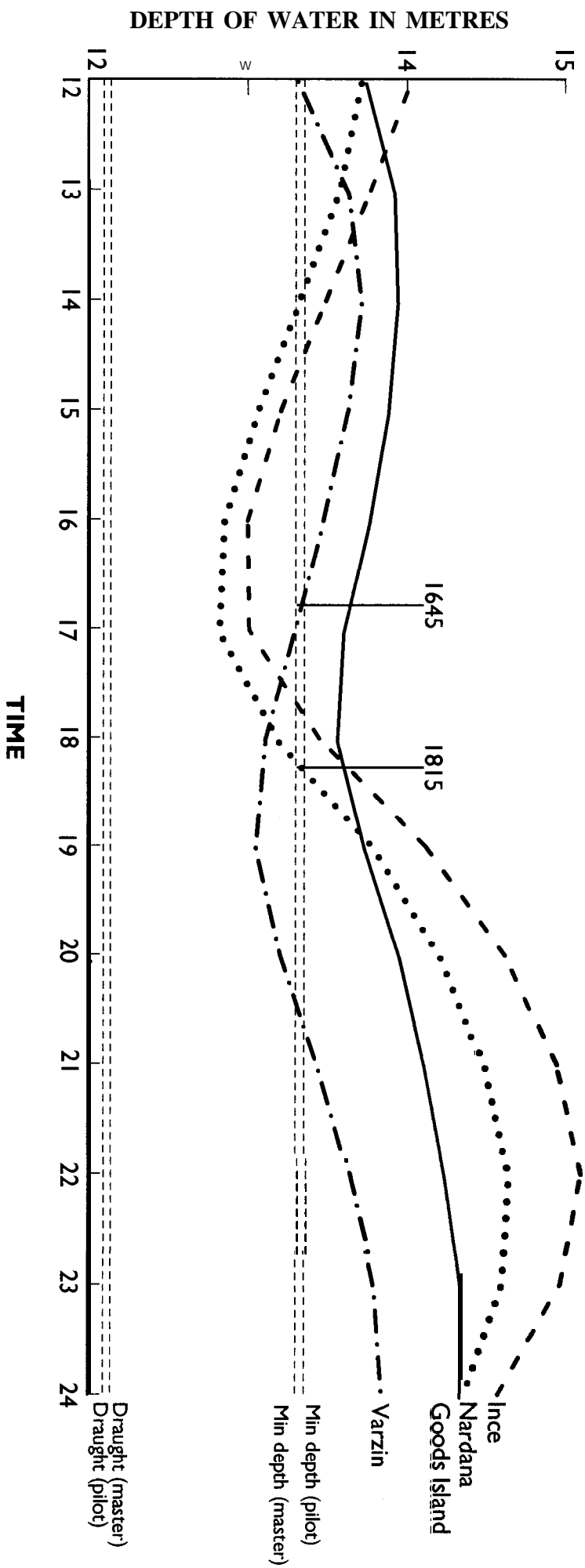
The TNT Carpentaria's Master submitted that he had maintained a check on the ship's position as entered by the officers on watch and a careful check on the read-out of the ship's echo sounder. However, it must be born in mind that the ship was already in shoal water with general depths under the keel in the region of 2 to 2.5m. The echo sounder gives only a historical record of the depth of water and, under the circumstances in which the TNT Carpentaria was operating, was not an effective tool to give warning of grounding.

The Master submitted that he had been placed in an invidious position by “having to pick up the Pilot some 20 minutes earlier than requested”. The Pilot submitted that the Master had not presented the ship at the designated pilot boarding ground in the two-way route. The Inspector accepts that the Pilot boarded more than a mile to the north and west of the designated position. The Pilot, however, had the option of waiting at the pilot boarding ground, and both he and the Master could have established direct VHF contact between the ship and the pilot boat.

It is concluded therefore, that:

- 1 The grounding was caused by an error of judgment by the pilot turning the ship to port rather than starboard.
- The ship’s position relative to adjacent shoal water was not known by the pilot.
  - The Master and Mate failed to properly assess the option of turning to starboard.
  - The Master and Mate failed to fix the ship’s position before the turn to port was made.
  - The Master and Mate failed to monitor the ship’s position through the course of the turn.
  - The consumption of alcohol was not a factor in the grounding.
  - There is no evidence that either the Master, or Pilot, or Mate, or Second Mate, were affected by acute fatigue.

Ship's Draught	12.2m			
UKC Allowance (10%)	1.22m			
Min Depth of water	13.42m			
Critical depths	Varzin Passage	Goods Island	Nardana	Ince Point
Datum	10.5m	11.3m	11.6m	11.9m



Graph of tidal curves taken from hourly predictions  
4 October 1991

GRAPH 1

### **Timing and the availability of water**

The issue of the available depth of water in the Prince of Wales Channel cannot be considered the direct cause of the grounding. But, the time of arrival and the height of tide are part of the circumstances under which the incident happened.

The TNT Carpentaria's draught in salt water was 12.13m, requiring that the ship have a minimum depth of water of 13.34m in Prince of Wales Channel and 13.13m in Varzin Passage.

The Master had calculated his passage through the Prince of Wales Channel based on the predicted height of tide contained in the 1991 edition of the Torres Strait Tide Tables. He drew up a series of tidal curves based on the predictions for the afternoon of 4 October and early 5 October and added them to the chart datum soundings (Booby Island 10.5m, Goods Island 11.3m, Nardana Patches 11.6m, Ince Point 11.9m).

The height of tide in Varzin Passage is accepted as being the same as the predictions for and the transmissions from Booby Island. The height of tide at Nardana Patches is taken as the mean between the tidal predictions and transmissions from Turtle Head and Ince Point.

Based on the tide predictions and a minimum under-keel clearance of 1.21m, the Master's two limiting points were Varzin Passage and Nardana Patches.

On this basis the ship had to clear Varzin Passage by 1640, otherwise there would have been less water than the Master required. Had he adopted a 1m under-keel clearance, being the minimum recommended for Varzin Passage on the basis of tidal predictions, there would have been two windows of opportunity through which to navigate Varzin Passage. The first between 1145 and 1755 and the second between 1940 and some time after 0200 on 5 October.

In view of his telephone conversation with a representative of Queensland Aluminium Limited, there is little doubt that the Master believed he had to make every effort to arrive off Gladstone at 1920 on 7 October, to meet the company's requirements. The ship, therefore, had to pass Ince Point at about 1920 on 4 October.

The Master chose the earlier tidal "window" in Varzin Passage to make his approach to the pilot boarding ground 2.5 miles west of Goods Island.

Transmissions from the tidal stations were monitored as soon as reception allowed, and Booby Island, being the closest and having the longest range, was picked up first. Comparisons between the actual tide heights and the predicted heights were made on each hour. The Master said that this was the only time they could be compared, because the tide tables gave the height on each hour and that three such comparisons were required to establish consistency of the height of tide.

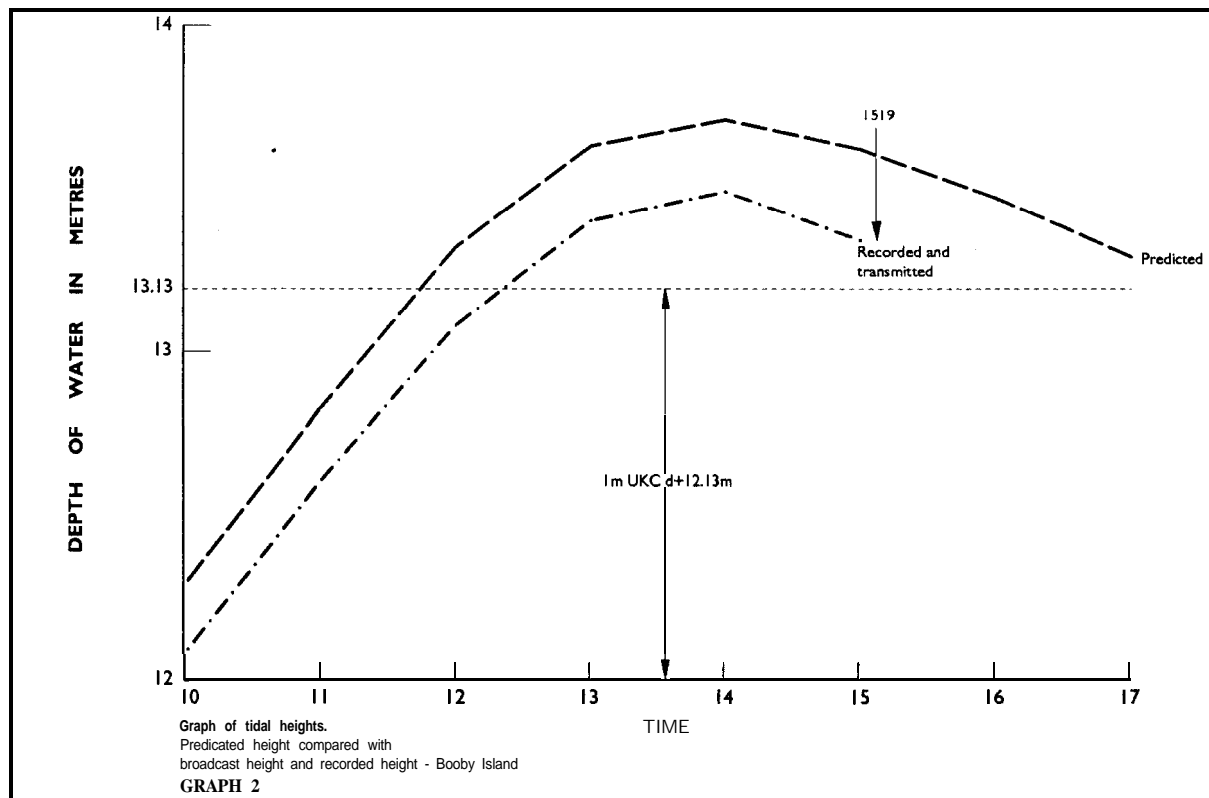
However, the Inspector cannot accept this. By drawing the tidal curves for each station, the predicted height of tide at any time can be taken from the graph and compared with the actual height as transmitted, with sufficient accuracy for practical purposes.

From 1000 on 4 October, Booby Island tidal station was transmitting a height of tide below that predicted. Up to and including 1300 the actual height was 0.2m below predicted height, at 1400 and 1500 the actual height was 0.3m below that predicted.

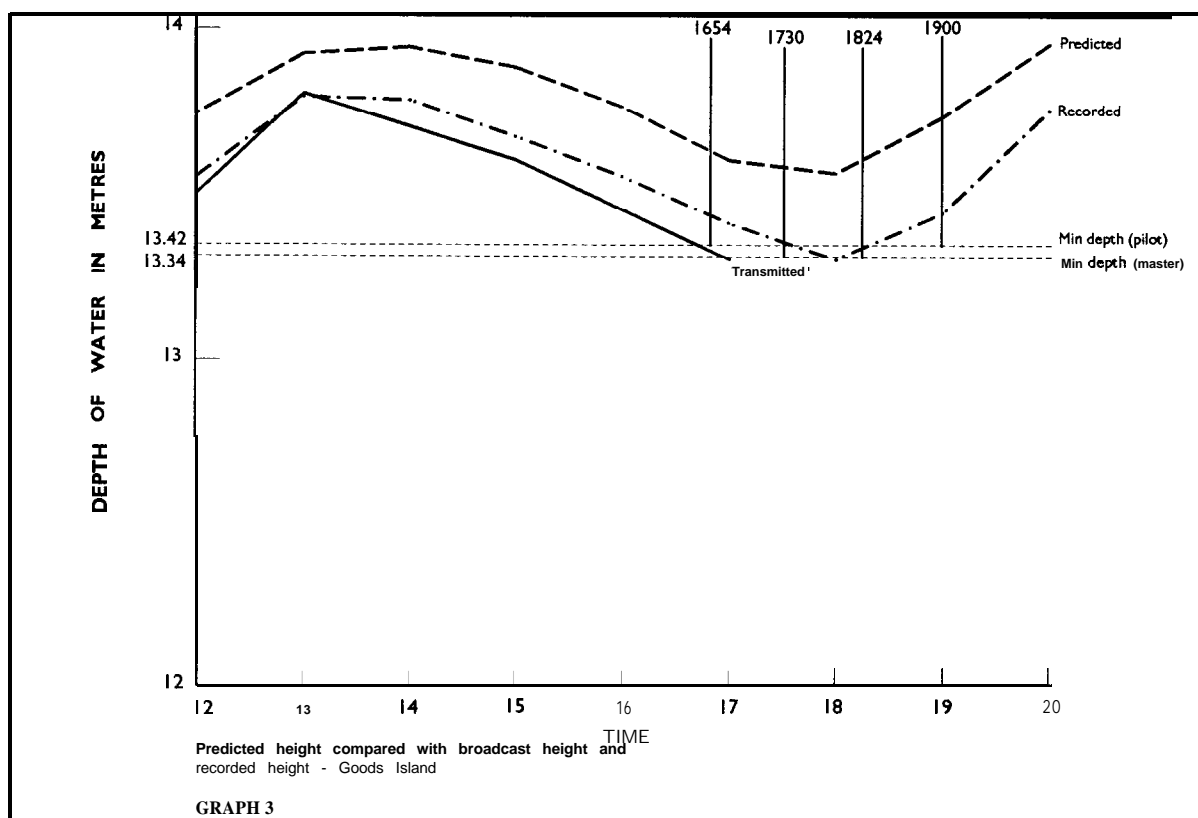
The recorded data for Goods Island and Turtle Head (Attachment 1) shows that the actual water level was significantly below the predicted level, up to 0.5m at Turtle Head and that the tidal transmissions indicated this.

The TNT' Carpentaria entered Varzin passage at 1420 on a falling tide with 13.7m of water at the western approaches to the Passage (datum 10.8m). At 1519, based on the chart datum of 10.5m and the transmitted tidal height indicating a tidal height of 2.8m (at 1500), the minimum depth of water at the eastern end of Varzin Passage was 13.25m, 0.32m less than the Master anticipated. But the vessel maintained an under-keel clearance of more than the 1m recommended minimum. The Master also carefully monitored the ship's position through the passage and also monitored the echo sounder trace which showed that the ship cleared Varzin Passage with a minimum of 1.6m under the keel.

**Graphs of tidal heights  
predicted height compared with  
transmitted height and  
recorded height - Bobby Island**



**Graphs of tidal heights  
predicted height compared with  
transmitted height and  
recorded height - Goods Island**



Low water at Goods Island was predicted at 1746 at a height of 2.2m above datum giving a height of 13.5m. At 1500 and at 1700 the tide gauge at Goods Island was transmitting a height of tide 0.3m below that predicted (the 1600 Goods Island transmission was not recorded). While the depth in the approaches to the west of Goods Island is about 12m, the datum at the western entrance to the Prince of Wales Channel is based on a sounding of 11.3m. On the information available to the Master, from the transmitting tide gauges, that the actual depth of water at Goods Island at 1500 was 13.6m on a falling tide, he should have realised that from about 1700 he would not be able to enter the Prince of Wales Channel with the recommended under-keel clearance. Further, the ship could not have passed the critical area off Nardana Patches until 1912.

The Master submitted later that the vessel could have continued and that, based on a tidal height 0.3m below prediction, at no point would the under-keel clearance have been less than 1.14m in any part of the passage, and that at 1830 the ship would have passed Nardana Patches with an under-keel clearance of 1.14m. To continue the passage on this basis, the Master would have to have ignored the recommended minimum under-keel clearance.

In fact, according to the records from the Turtle Head tidal station (Attachment 2) the tidal height was between 0.4m and 0.5m below prediction between 1800 and 2300 that night.

The Master did not base his opinion, that the ship could safely proceed on the passage, on the minimum recommended under-keel clearance or the information available.

The Second Mate, as navigating officer, stated in an interview that he was not happy with the timing of the passage. He had many years experience in the trade and considered that it would be necessary to use up time before beginning the transit of the Prince of Wales Channel. He stated that he made his opinion known to the Mate, who agreed with him and who, the Second Mate believed, would discuss the plan with the Master.

The Mate stated that he had not discussed the issue of tides and under-keel clearance with the Master.

The Master stated that the Second Mate queried the notation of "Varzin East" buoys, rather than "Varzin West" buoys, in the night order book. The Master explained the reason for stipulating the east buoys (being the area of least depth in the passage) and, according to the Master, the Second Mate had no other concern.

There is in this area a conflict of evidence. However had the Second Mate checked the tidal information and had doubts about it he had ample opportunity to bring any concern to the Master's notice, either in the morning of 4 October or in the early part of his afternoon watch between 1200 and 1420, before the vessel entered Varzin Passage.

Regardless of the water available at Nardana Patches, there was, according to the transmitting tide gauge at Goods Island, insufficient water off Harrison Rock to enter the Prince of Wales Channel with the minimum recommended under-keel clearance at 1730.

The Pilot had prepared a voyage plan which included a graph of tidal predictions for Goods Island, Nardana Patches (Turtle Head) and Ince Point, based on a ship of maximum draught (12.2m), 1.22m under-keel clearance, requiring a minimum depth of water of 13.42m.

But the Pilot stated that he had not monitored the tidal heights from the transmitting tide station until after he had boarded the vessel, when he and the Master had listened to the transmissions together. He was therefore not aware that the tide was significantly

below the predicted height at Goods Island, Turtle Head and Ince Point until after he boarded the ship.

The Pilot submitted that whether or not he had established tidal conditions before boarding the ship was irrelevant and would not have affected the outcome. The Inspector cannot accept this argument. Had the Pilot monitored the tidal transmissions before boarding the TNT Carpentaria he would have known that there was insufficient water to make the passage. Immediately on boarding the ship he could have advised that the ship should be turned to a reciprocal course.

When the Pilot arrived on the bridge at 1720, the necessary information on the depth of water in the Prince of Wales Channel was available. The time taken to make the decision not to proceed on the passage was critical. At 1720 the vessel was heading 040 degrees and would have had to turn through 130 degrees to make a westerly course. Between 1722 and 1730 the vessel altered 80 degrees to starboard and the turn to port did not begin until 1736. Thirteen minutes lapsed before the decision was executed to turn the vessel to a westerly course, after which time the vessel was 0.8 miles closer to Harrison Rock buoy, and to shoal water, and the vessel then had to turn through about 210 degrees to make the desired course.

The Pilot was not informed by the Master that the ship's draught was 12.13m rather than 12.2m. Notwithstanding which of these two draughts were used, the Pilot was correct in his assessment that the ship did not have sufficient under-keel clearance to make the passage through the Prince of Wales Channel. Based on predictions there would not have been sufficient water at Nardana Patches, about 7 miles from Harrison Rock buoy, until 1830 and with the actual height of tide, there would not have been sufficient water until 1912.

It is concluded, therefore, that:

- It would have been prudent for the Pilot to establish the tidal conditions before arriving on board the ship.
- Notwithstanding the Pilot's error of judgement and his failure to make an early appraisal of the tidal situation, he was placed in an invidious position by the arrival of the TNT Carpentaria at a time when there was insufficient water to navigate the Prince of Wales Channel.
- The Master, having completed a passage plan, did not properly appraise and appreciate the significance of the transmissions from the tidal stations.
- The Master allowed commercial considerations to influence his judgment.
- The Second Mate failed to advise the Master of his concern with regard to the passage plan, and failed also to properly monitor the tidal heights and advise the Master of their significance.
- The Mate failed to discuss the passage plan with the Master and, with the benefit of his considerable experience in the trade, properly advise him on alternative plans.

## Conclusions

It is concluded that:

1. The grounding was caused by an error of judgment by the Pilot turning the ship to port rather than to starboard.
2. The ship's position relative to adjacent shoal water was not known by the Pilot
3. The Master and Mate failed to fix the ship's position before the turn to port was made and failed to monitor the ship's position through the course of the turn.
4. The Master and Mate failed to properly assess the option of turning to starboard.
5. It would have been prudent for the Pilot to establish the tidal conditions before arriving on board the ship.
6. Notwithstanding the pilot's error of judgment and his failure to make an early appraisal of the tidal situation, he was placed in an invidious position by the arrival of the TNT Carpentaria at a time when there was insufficient water to navigate the Prince of Wales Channel.
7. The Master, having completed a passage plan, did not properly appraise and appreciate the significance of the transmissions from tidal stations.
8. The Second Mate failed to advise the Master of his concern with regard to the passage plan, and also failed to properly monitor the tidal heights and advise the Master of their significance.
9. The Mate failed to discuss the passage plan with the Master and, with the benefit of his considerable experience in the trade, properly advise him on alternative plans.
10. The consumption of alcohol was not a factor in the grounding;
11. There is no evidence that either the Master, or Pilot, or Mate, or Second Mate, were affected by acute fatigue.

## Submissions

Under the provisions of sub-regulations 16 (3) and (4) of the Navigation (Marine Casualty) Regulations if a report, or part of the report, refers to a person's affairs to a material extent, the Inspector must, if it is reasonable, give the person the report, or part of the report, to allow the person to provide written comments or information relating to the report.

Comments were received from the Pilot, the Master, the Mate and Second Mate. Where appropriate the text of the draft report has been amended. Outstanding issues are considered below.

### The Master

The Master, submitted a graph of tidal curves based on tidal heights 30cm below prediction. He submitted that, had his original plan been followed, the under-keel clearance would at no point have been less than 1.14m in any part of the passage, and that at 1830 the ship would have passed Nardana Patches on a rising tide.

He also commented on the conclusions as follows:

#### *Conclusion 4:*

The Master and Mate were not offered any option to turning the vessel to port or to starboard. The Master suggested slowing down by use of the engine, which was available for such a contingency. The Pilot took upon himself the decision to turn the vessel, and the order to turn to port was made by him on the basis of his local knowledge of the Pilot boarding ground.

#### *Conclusion 5:*

The Master had seen the positions marked on the chart at 1720 hours and was confident that the course of 110 degrees from that position would lead the ship on a safetrack. The Master could reasonably expect that the Mate would warn him of any danger if the ship was in a position of danger.

The Master did not check the position on the chart at 1730 hours, having just done so when returning to the charu-oom at 1720 when the Pilot boarded. It is reasonable to conclude that the ship was in no danger until after the order was made by the Pilot to turn around to port. In the process of the turn where an error of judgment is attributed to the Pilot, the ship was put in imminent danger and ran aground.

#### *Conclusion 6:*

The Pilot Station was kept fully informed of the vessel's arrival time. The Master was placed in the invidious position of having to pick up the Pilot some 20 minutes earlier than requested.

*Conclusion 7:*

The Master's passage plan was made with meticulous care having regard to the commercial, tidal, navigational and safety requirements of the trade, and every navigational aid available was used to conduct a safe passage with the recommended under-keel clearance until the time of the Pilot's error of judgment.

*Conclusion 8:*

The Second Mate discussed his concern of the night order book notation "Varzin East" buoys, when he believed that what he ought to have written was "Varzin West" buoys. He was mistaken in that belief as was explained to him later. Other than that notation, the Second Mate had no other concern with regard to the passage plan, tidal heights or tide times.

The Inspector notes these comments, but considers the issues raised are properly reflected in the report.

## **The Pilot**

The Pilot advised that he objected to the conclusions on the grounds:

- i) The Captain and the Mate were aware that tidal heights at Goods Island, Turtle Head and Ince Point were 0.3-0.4m below prediction. The vessel arrived before sufficient tide was available for the required under-keel clearance.
- ii) The vessel advised an ETA off Goods Island at 1730, yet the vessel arrived in the vicinity of the western entrance to the Prince of Wales Channel at 1716.
- iii) The Captain presented the vessel to the Pilot at a position which was north and west of the Pilot's designated boarding ground. The Pilot's designated boarding ground is 2.5 miles west of Goods Island; Lat 10° 25'S Long 145° 06'E. The vessel was not presented to the Pilot in the two-way route as described on the chart.
- iv) It is accepted in the report that the Pilot made the correct decision that there was insufficient under-keel clearance to allow safe passage. Therefore, whether or not the Pilot had established tidal conditions before boarding the ship is irrelevant and would not have affected the outcome.
- v) In the circumstances, with the time available, the Pilot's decision to turn the vessel to port was reasonable, even though, with benefit of hindsight there may have been a better option.
- vi) The Pilot took reasonable steps to retrieve a difficult situation caused by:
  - a) the arrival of the vessel prior to the required tide when the vessel was aware of the actual transmitted tide heights;
  - b) the positioning of the vessel to the north and west of the Pilot's designated boarding ground.

The Inspector notes the objections raised, but considers that the issues are properly reflected in the report and its conclusions.

**Tidal data**  
**4 October 1991**

Tidal Information from Australian National Tide Tables

**Booby Island (Varzin Passage)**

HW	1353	3.2m
LW	1848	2.5m
HW	2346	3.3m

**Goods Island**

	1345	2.6m
	1746	2.2m
	2317	3.1m

**Turtle Head\***

H W	1220	2.2m
L W	1636	1.3m
HW	2239	2.9m

**Ince Point\***

	1055	2.2m
	1630	1.0m
	2207	3.2m

\*Tidal height at Nardana Patches is taken as the mean between Turtle Head and Ince Point.

**Actual tidal heights compared with  
predicted heights  
Goods Island and Turtle Head**

Actual (A) hourly height of tide, as recorded by the tide gauges at Booby Island, Goods Island, Turtle Head and Ince Point for the period 1000 on 4 October 1991 to 0000 on 5 October 1991, compared with the predicted (P) heights, showing the difference between the two (A-P). All readings in metres.

Time	Booby Island Datum 10.5			Goods Island Datum 11.3m		
	A	P	A-P			
1000	1.58	1.79	-0.21	1.40	1.62	-0.22
1100	2.11	2.33	-0.22	1.86	2.07	-0.21
1200	2.58	2.82	-0.24	2.25	2.44	-0.19
1300	2.90	3.13	-0.23	2.49	2.62	-0.13
1400	2.99	3.21	-0.22	2.48	2.64	-0.16
1500	2.84	3.12	-0.28	2.37	2.58	-0.21
1600	2.69	2.97	-0.28	2.25	2.46	-0.21
1700	2.54	2.79	-0.25	2.11	2.30	-0.19
1800	2.34	2.61	-0.27	2.00	2.26	-0.26
1900	2.26	2.55	-0.29	2.14	2.43	-0.29
2000	2.44	2.71	-0.27	2.45	2.65	-0.21
2100	2.69	2.94	-0.25	2.64	2.81	-0.17
2200	2.85	3.14	-0.29	2.80	2.94	-0.14
2300	2.98	3.29	-0.31	2.90	3.04	-0.14
0000	3.07	3.34	-0.27	2.91	3.02	-0.11

<b>Time</b>	<b>Turtle Head</b>			<b>Ince Point</b>		
	Datum 11.6m			Datum 11.9		
	A	P	A-P	A	P	A-P
1000	1.10	1.51	-0.41	1.91	2.13	-0.18
1100	1.45	1.88	-0.43	2.06	2.23	-0.17
1200	1.66	2.10	-0.44	1.94	2.12	-0.18
1300	1.77	2.08	-0.31	1.67	1.86	-0.19
1400	1.60	1.87	-0.27	1.42	1.58	-0.16
1500	1.35	1.62	-0.27	1.19	1.30	-0.21
1600	1.11	1.42	-0.31	0.92	1.09	-0.17
1700	0.97	1.34	-0.37	0.85	1.10	-0.25
1800	1.14	1.64	-0.50	1.22	1.54	-0.32
1900	1.73	2.18	-0.45	1.97	2.21	-0.24
2000	2.05	2.52	-0.47	2.45	2.71	-0.26
2100	2.24	2.73	-0.48	2.83	3.03	-0.20
2200	2.40	2.88	-0.48	3.11	3.18	-0.07
2300	2.45	2.92	-0.47	3.11	3.05	+0.06
0000	2.40	2.78	-0.38	2.80	2.65	+0.15

<b>Time</b>	<b>Nardana Patches</b>		
	Datum 11.6m		
	A	P	A-P
1000	1.50	1.82	-0.32
1100	1.75	2.05	-0.30
1200	1.80	2.11	-0.31
1300	1.72	1.97	-0.25
1400	1.51	1.72	-0.21
1500	1.27	1.46	-0.19
1600	1.01	1.25	-0.24
1700	0.91	1.22	-0.31
1800	1.33	1.59	-0.26
1900	1.85	2.19	-0.34
2000	2.25	2.61	-0.36
2100	2.53	2.88	-0.35
2200	2.75	3.03	-0.28
2300	2.78	2.98	-0.20
0000	2.60	2.71	-0.11

**Tidal heights  
predicted heights (P) compared with  
transmitted heights (T)  
All heights in metres.**

As recorded by the Officers of TNT Carpentaria

**Booby Island**

Time	P	T	d
1000	1.79	1.6	-0.2
1100	2.30	2.1	-0.2
1200	2.80	2.6	-0.2
1300	3.13	2.9	-0.2
1400	3.21	2.9	-0.3
1500	3.12	2.8	-0.3
1600			
1700			

**Goods Island**

P	T	d
2.44	2.2	-0.2
2.62	2.5	-0.1
2.64	2.4	-0.2
2.58	2.3	-0.3
2.28	2.0	-0.3

**Turtle Head**

Time	P	T	d
1500	1.62	1.2	-0.4
1600	1.42	1.0	-0.4
1700	1.34	0.9	-0.4

**Ince Point**

P	T	d
1.09	0.9	-0.2
1.10	0.8	-0.3

### 23. QUEENSLAND COAST AND TORRES STRAIT PILOT SERVICE DRAUGHT LIMITATION AND SERVICE ADVICE.

1. The Queensland Coast and Torres Strait Pilot Service will pilot vessels through Gannet Passage and Prince of Wales Channel, Torres Strait with a maximum draught of 12.2 metres.
2. The minimum underkeel clearances are:
  - (a) Gannet and Vaxzin Passages — 1.0 metre.
  - (b) Prince of Wales Channel - 1.0 metre for vessels with a draught less than 11.90 metres or 10% of draught for vessels with a draught exceeding 11.90 metres.
3. The draught limitation of 12.2 metres applies only to vessels entering or leaving the Great Barrier Reef Inner Route by way of Torres Strait or the Great North East Channel.
4. Vessels entering or leaving the Inner Route by way of Grafton, Palm and Hydrographers Passages are restricted only by any draught limitation at the Australian port of arrival or departure.

#### Pilot Advice — Torres Strait

##### 5. South and east bound vessels:

- (a) Pilots board 4.5 miles west of Booby Island or 2.2 miles west of Goods Island. Vessels requiring pilots should give 4 to 5 days notice to 2S TORRES SYDNEY advising ETA, at Booby or Goods pilot station, maximum draught and destination.
- (b) Confirmation or adjustment of the ETA should be sent direct to 4I TORIND THURSDAY ISLAND — 24 and 6 hours prior to arrival, giving local time which is GMT + 10 hours.
- (c) Pilot Station (call sign *Reef Pilots*) maintains watch on VHF Channel 16 and 20. The Pilot Station should be called at least 2 hours before arriving at the pilot boarding place. The initial call should be made on VHF Channel 20 which has extended range, if no contact is made on Channel 20 calls should be made on Channel 16. The working Channel for the Pilot Station is Channel 20. Pilot Launches maintain watch on Channel 16 when on station.
- (d) All ships traversing the pilotage district should maintain a continuous VHF watch on Channel 16, as required by 1974 SOLAS *Convention (amended 1981, Ch 4, Reg 8)*.

##### 6. North and west bound vessels:

- (a) If in an Australian port, advise 2S TORRES SYDNEY of pilotage requirements, giving as much notice as possible.
- (b) If from an overseas port, advise 2S TORRES SYDNEY 4-5 days in advance of pilotage requirements, stating ETA (name of boarding place), maximum draught and destination.
- (c) Confirm or adjust ETA 48 and 12 hours before arrival to 2S TORRES SYDNEY.
- (d) Pilots can board at any port in New South Wales and Queensland or:
  - (i) Off Port Moresby — Basilisk Beacon for the Great North East Channel — launch service.
  - (ii) Off Point Cartwright (Brisbane Pilot Station) — launch service.
  - (iii) Off North Point (Gladstone) (23°44'.0S, 151°21'.5E) - launch service or helicopter land-on operation.
  - (iv) Off Cairns fairway (16°49' S, 145°50 E) — launch service. Long range VHF Channel 20 callsign TORRES PILOTS.
  - (v) Edward Island (Whitsunday Island) (20°12' S, 149°14' E) — Land-on helicopter only.
  - (vi) Any other port or place by arrangement with 2S TORRES SYDNEY.

### 7. Reef Entrances:

(a) Grafton Passage pilot boarding place off Euston Reef (16°39' S, 146°14' E) — launch service. Long range VHF Channel 20 callsign TORRES PILOTS.

(b) Palm Passage pilot boarding place off Pith Reef (18°13' S, 147°07' E) — land-on helicopter subject to suitable aircraft availability. Vessels unable to accept a land-on helicopter are advised that a launch service is available at Grafton Passage (see *para 8*).

(c) Hydrographers Passage pilot boarding place off Blossom Bank (19°47' S, 150°24' E) - helicopter land-on operation. VHF Channel 16, work Channel 9 callsign TORRES HELICOPTER.

8. Boardings and landings are by launch with the exception of Hydrographers Passage and Edward Island and Palm Passage (see *para 7b*) where a land-on helicopter is used. Limited use of land-on helicopters are available at other boarding places. This, however, depends on aircraft availability and suitability of the vessel to accept a land-on helicopter. Masters requiring Pilot boarding by helicopter should request this service when ordering a Pilot through 2S TORRES SYDNEY. Winch-down operations will be introduced when suitable aircraft are available.

9. For Department of Transport and Communications recommendations on pilotage see:

(a) *Notice, to Mariners No 22.*

(b) Department of Transport and Communications *Hydrographers Passage Sailing Directions – Third Edition June 1988 Set I:11 and Ch 3.*

(c) See *IMO Assembly Resolution No A619(15) adopted 19 November 1987*, for recommendations on pilotage in the Great Barrier Reef and Reef Entrances.

Department of Transport, Queensland  
Queensland Coast and Torres Strait Pilot Service.

(AH 70/116)

### 10C. TORRES STRAIT TIDE GAUGES

1. Radio reporting tide gauges are located in the Torres Strait area as listed in the table below.
2. The tidal height is transmitted as groups of pseudo morse 'dots', the number of dots in groups indicating respectively metres and tenths of metres of tide height above chart datum. A zero is indicated by a 'dash' and negative heights indicated by a preceding 1.5 second warbling tone.
3. The nominal ranges quoted refer to unobstructed situations. Where direct line of sight to the transmitter is shielded, reception maybe lost.

Name and Identification	Frequency (kHz)	Daylight Ranges (NM)	Position Lat S, Long E	Approx Repetition Period (mins)	Hours of Operation
Booby Island VND	320 kHz	200	10°36'20" 141°54'30"	5	H 24
Goods Island CD	Marine Ch 86 (161.925 MHz)	17	10°33'53" 142°08'44"	2.5	H 24
Turtle Head (Hammond I) TH	Marine Ch 87 (161.975 MHz)	17	10°31'20" 142°12'43"	2.5	H 24
*Ince Point (Wednesday I) IP	Marine Ch 88 (162.025 MHz)	35	10°30'56" 142°18'14"	2.5	H 24

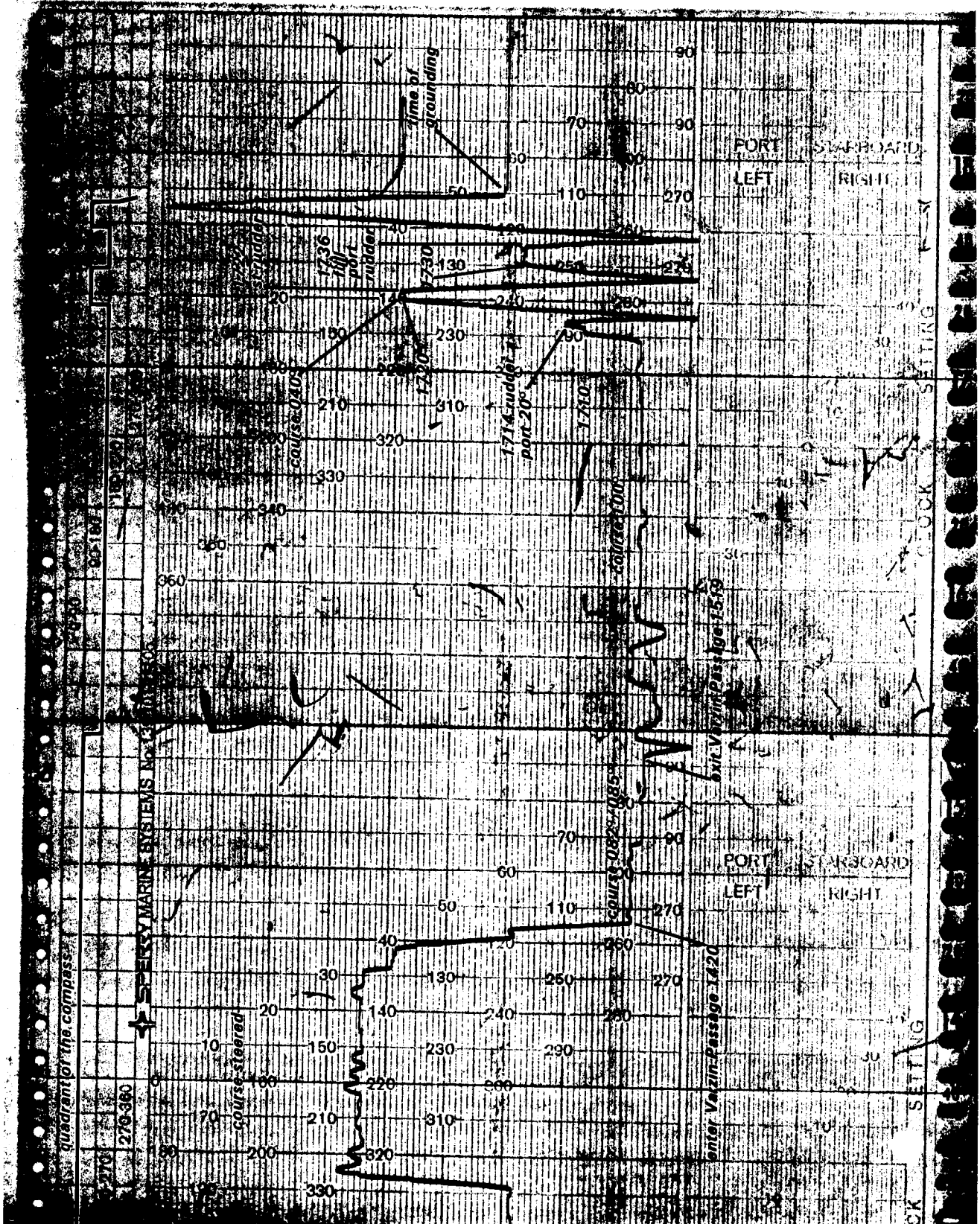
\*Ince Point tidal information is broadcast from Milman Hill on Thursday Island (10°34'.80 S, 141°13'.53 E)

Transport and Communications, Canberra.

(AH 16/129)

# TNT CARPENTARIA

COURSE RECORDER TRACE 1300 TO 1800 4 OCTOBER 1991



#### 24. UNDER-KEEL CLEARANCE-RELIANCE ON CHARTS AND PREDICTED TIDES

1. Prudent mariners navigate with adequate under-keel clearance at all times, making due allowances for all the factors that are likely to reduce the depth beneath their keels. To ensure an adequate under-keel clearance throughout a passage an under-keel allowance may be laid down by a competent authority or determined onboard when planning the passage. The factors to be taken into account when determining this allowance are given *The Mariners Handbook (NP 100) 5th Edition* as amended by *Supplement No 3 of 1985*.

2. It has become increasingly evident that economic pressures are causing mariners to navigate through waters of barely adequate depth, with under-keel clearance being finely assessed from the charted depths and predicted tide levels.

3. Hydrographic surveys have inherent technical limitations, due partly, in off-shore areas, to uncertainties in the tidal reductions. Furthermore, in some areas the shape and hence the depth of the sea-bed is constantly changing. Nautical charts can seldom, therefore, be absolutely reliable in their representation of depth — and when tidal predictions are applied to the chart as if they were actual tide levels the uncertainties are clearly compounded.

4. The limitations of hydrographic surveys are discussed at length in the *Mariner's Handbook (NP 100) 5th Edition* and factors affecting tide levels are described in the introduction to the *Australian National Tide Tables*.

5. It cannot be too strongly emphasised that even charts based on modern surveys may not show all sea-bed obstructions or the shoalest depths and actual tide levels may be appreciably lower than those predicted.

RAN Hydrographic Service.

(AH 56/116)

Chart reliability diagrams

chart 296

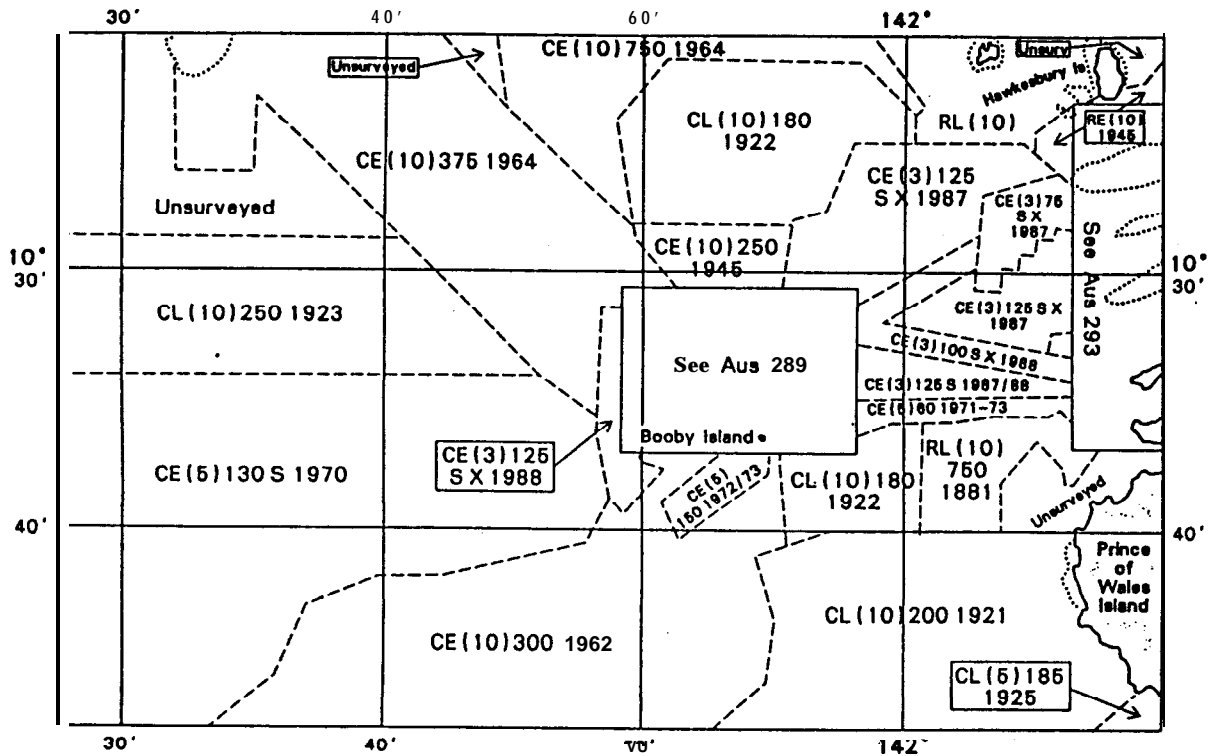
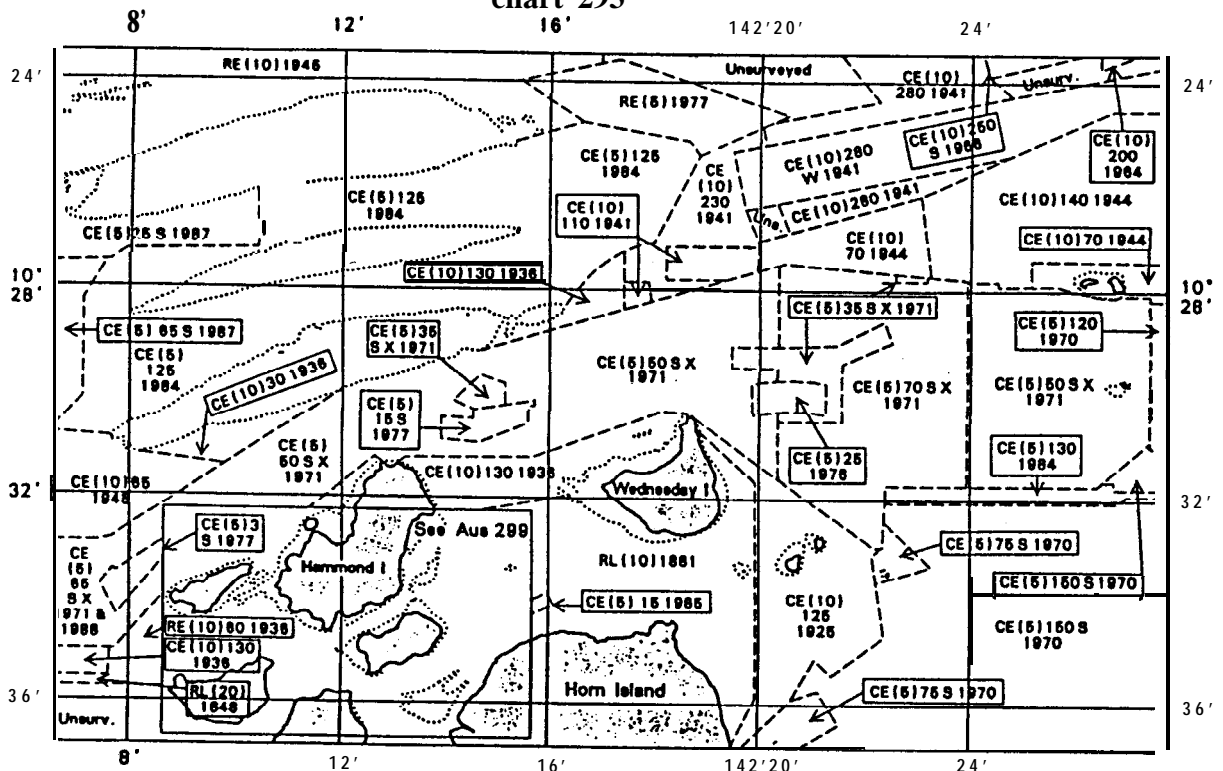


chart 293



KEY TO SYMBOLS

R	Rconnaissance or incomplete survey	400	Distance apart of main lines of soundings in metres
C	Controlled survey	S	Sonar swept
L	Sounded by lead line	X	Shoals have been examined
E	Sounded by echo sounder		
(5)	Accuracy of soundings in decimetres		
1988	Year of survey		