



Australian Government
Australian Transport Safety Bureau

Contact with buoy by *Navios Northern Star*

Prince of Wales Channel, Torres Strait, Australia | 15 March 2016



Investigation

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Addendum

Page	Change	Date

Safety summary

What happened

On 15 March, shortly after 2300, *Navios Northern Star* was transiting the Prince of Wales Channel, Torres Strait, on an easterly heading towards the waypoint north of OG Rock. The coastal pilot's cue for altering course for the waypoint was to use a radar range from Alert Patches buoy. Shortly after 2314, the pilot ordered starboard rudder for the course alteration.

At about 2316, with the buoy directly ahead, the ship's master asked the pilot if they were going to collide with it. The pilot then ordered progressive starboard rudder movements in quick succession.

At 2317, as the ship was swinging to starboard, the ship's port quarter contacted the Alert Patches buoy. Damage to the buoy and ship was limited to paintwork.

What the ATSB found

The ATSB investigation found *Navios Northern Star*'s planned course alteration to pass Alert Patches buoy was not made in time nor was the alteration properly executed and monitored to avoid contacting the buoy.

The pilot was using Alert Patches buoy's radar distance as his primary means to carry out the course alteration, so he remained focused on regaining its lost echo for more than 2 minutes during the critical period before the incident. Further, the master's challenge to the pilot as the ship closed on the buoy was too late.

Bridge resource management techniques were not effectively followed by the ship's bridge team. They did not have the same mental model of the course alteration as the pilot and they did not actively monitor the pilot's execution of the alteration.

The ship's voyage plan contained only basic passage information and its bridge team did not know or fully understand the pilot's planned operational parameters and limits, including wheel over points and safety margins.

Safety message

Safe and efficient pilotage requires the active and continual participation of everyone involved. Pilots and ship's bridge teams, in particular, need to use the range of available resources and bridge resource management techniques to navigate/conduct the ship. This method significantly increases the opportunity of capturing and managing any errors that may occur.

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The occurrence

On the evening of 14 March 2016, the 225 m bulk carrier, *Navios Northern Star* (Figure 1) sailed from Gove (Northern Territory) bound for Gladstone (Queensland) via the Torres Strait. The ship was nearly fully laden with a cargo of bauxite and would transit the Torres Strait at the maximum permitted draught of 12.2 m. After transiting the Prince of Wales Channel (PoWC) in the Torres Strait, the deep draught ship would turn south and sail through the Inner Route of the Great Barrier Reef (GBR) to its destination.

Figure 1: *Navios Northern Star*



Source: ATSB

At 1800¹ on 15 March, the ship started its approach to the Booby Island pilot boarding ground (Figure 2) to board a coastal pilot (pilot) for its GBR transit. The master took over the conduct² (con) of the ship and the chief mate, the officer of the watch (OOW) remained on the navigation bridge (bridge) to assist the master. The ship was in hand steering with a seaman at the wheel.

At 1940, the pilot and a trainee pilot (trainee) boarded *Navios Northern Star* near the Booby Island pilot boarding ground. The third mate escorted them up to the bridge, where the pilot started the master-pilot information exchange (MPX) with the master. After asking about the status of the ship's anchors, the pilot took over the con and reported to REEFVTS,³ the coastal vessel traffic service. He then configured the s-band⁴ radar display for the transit of Varzin Passage (Figure 2).

The pilot then focused on the transit of Varzin Passage while the trainee completed the remaining items of the MPX with the master. The MPX included information for calling the pilot when the ship was 7 cables⁵ from each course alteration position (waypoint) and the pilot's plan for the deep draught transit as per the Under Keel Clearance Management (UKCM)⁶ system.

Navios Northern Star proceeded through Varzin Passage at about 8 knots⁷ as planned to maintain the required under keel clearance (UKC). The ship's UKC and the electronic navigational chart (ENC) were continuously displayed on the pilot's portable pilotage unit (PPU) that had been set up near the bridge front windows on the port side.

¹ All further times referred to in this report are local time Queensland, Coordinated Universal Time (UTC) + 10 hours.

² Conduct of the ship's passage determines the outcome by controlling (con) how the outcome is achieved.

³ Great Barrier Reef and Torres Strait Vessel Traffic Service (REEFVTS).

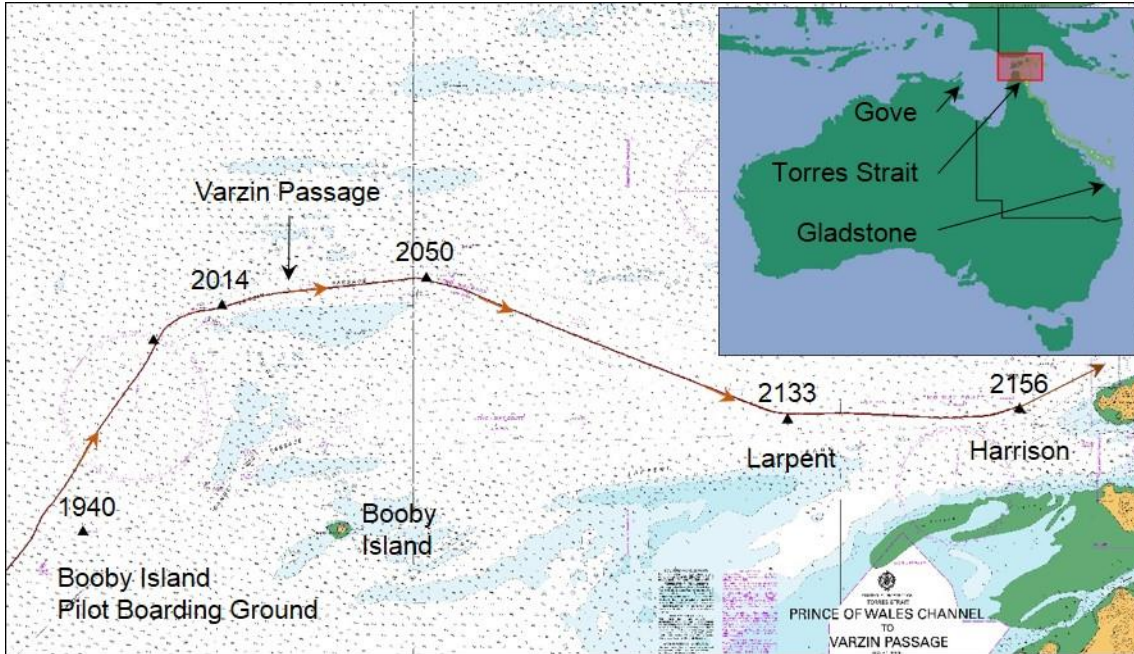
⁴ The s-band radar (3 GHz frequency and 10 cm wavelength) provides high detection of small targets at all ranges and is used as the anti-collision radar.

⁵ One cable equals one tenth of a nautical mile or 185.2 m.

⁶ The UKCM system is provided by the Australian Safety Maritime Authority and is a web based system for enhancing safety of large vessels whose keel is close to the seabed in the shallow Torres Strait region.

⁷ One knot, or one nautical mile per hour equals 1.852 kilometres per hour.

Figure 2: Section of ENC Aus 296 showing *Navios Northern Star's* actual track



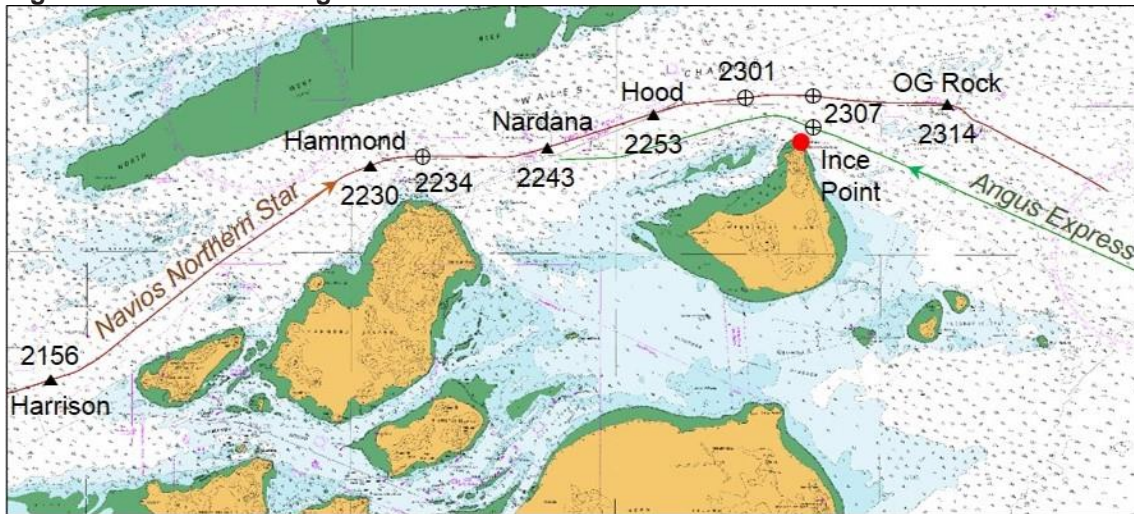
Source: Australian Hydrographic Service (annotated by ATSB)

At 2000, the third mate took over the watch from the chief mate after reading the information form provided by the pilot during the MPX. He started plotting *Navios Northern Star's* position on the ship's paper navigational chart (chart) at 5-minute intervals. He also followed the pilot's standing instruction by informing him when the ship was 7 cables from the next waypoint.

At 2133, the ship approached Larpent waypoint and the pilot instructed the seaman to steer a heading⁸ of 088° towards the Harrison waypoint. Shortly thereafter, he asked for the ship's speed to be increased to 10 knots as planned.

Shortly after 2156, the ship entered the PoWC and was turned onto a north-easterly course. The transit through the channel (Figure 3) continued as intended by the pilot, with him conning the ship and the other bridge team members attending other tasks.

Figure 3: Section of navigational chart Aus 293 Prince of Wales Channel



Source: Australian Hydrographic Service (annotated by ATSB)

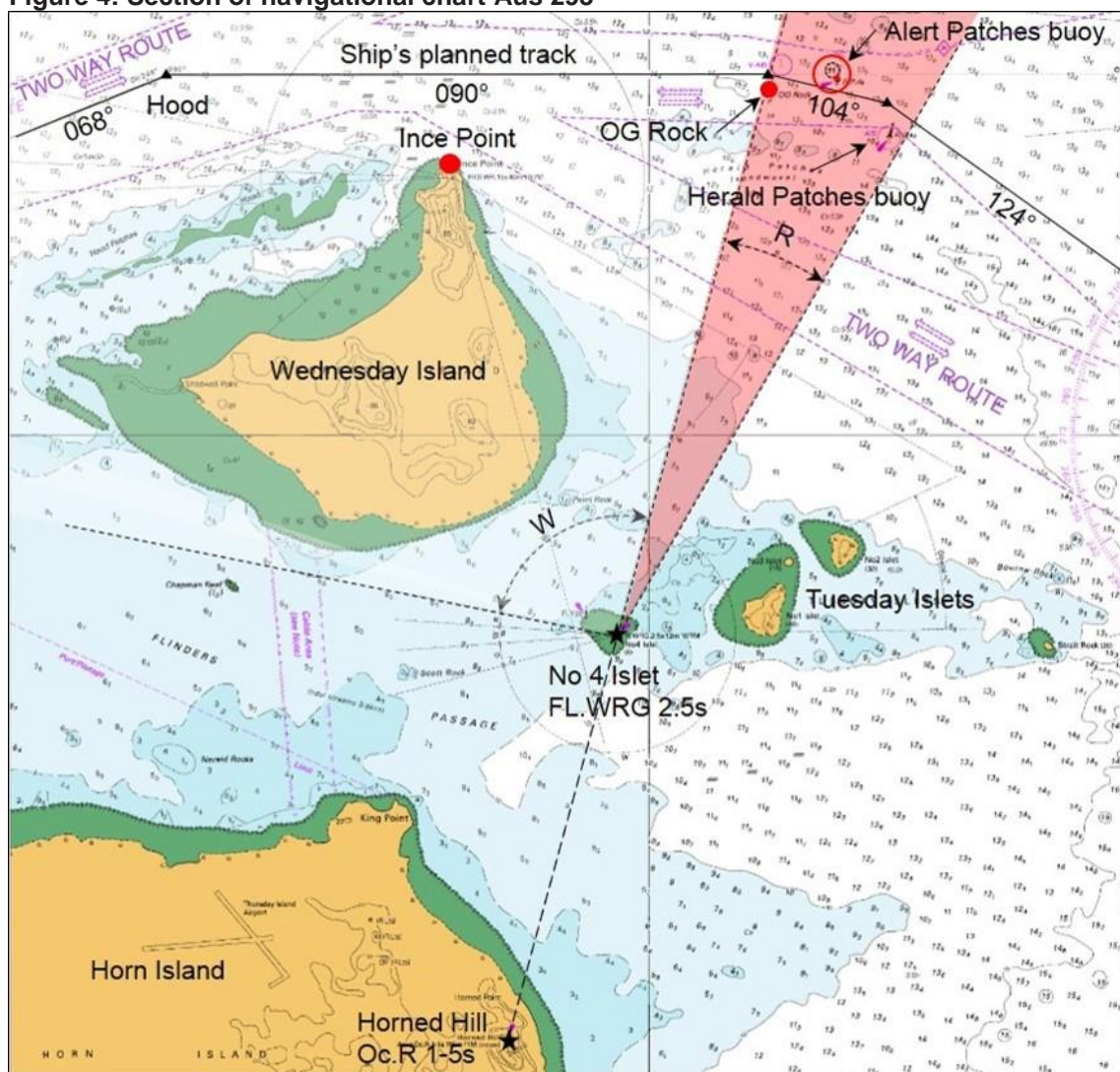
⁸ All ship's headings in this report are in degrees by gyro compass with negligible error.

At 2234, *Navios Northern Star's* pilot contacted *Angus Express*, a west-bound livestock carrier in the two-way route⁹ south of Herald Patches by VHF radio. *Angus Express's* pilot informed him that his ship would keep close to Ince Point so that the ships could pass 'green to green' (pass each other on their starboard side). *Navios Northern Star's* pilot agreed and stated he would keep north of track as he wanted to keep north of OG Rock.¹⁰

At 2243, when the ship was 7 cables from Nardana waypoint, the pilot used 10° of starboard rudder to bring the ship onto a heading of 068°. At about 2250, the pilot and trainee discussed the characteristics of the lights on the buoys in the channel, and the course alteration at OG Rock.

At about 2251, as the pilot and trainee continued their conversation, the third mate gave the pilot 7 cables notice to the next waypoint, Hood. The trainee then stated that when the Horned Hill light was in transit with Islet No 4 (Figure 4), the ship should be turning. The pilot agreed as the ship would then be in the red sector of Islet No 4.

Figure 4: Section of navigational chart Aus 293



Source: Australian Hydrographic Service (annotated by ATSB)

⁹ The two-way route is a routing measure indicating the best and safest route for all vessels having regard to charted depths and dangers.

¹⁰ On 3 March 1970, the oil tanker *Oceanic Grandeur* struck an uncharted rock while transiting the Torres Strait with a coastal pilot on board. The ship was carrying a cargo of 55,000 t of crude oil and over half of its cargo tanks ruptured resulting in significant pollution. The rock was subsequently named OG Rock after the ship's abbreviated name.

At 2253, the pilot ordered ‘starboard 10’ and then ‘ease to 5’ and ‘steer 085°’. The conversation between the pilots continued and included some social topics, and at 2259, the pilot ordered 082° to be steered. The wind was from the north-west at force¹¹ 5 (17 to 21 knots) throughout the transit.

At 2301, the ship was 2 cables north of track and the pilot ordered a succession of heading alterations to bring the ship onto a heading of 090°. The master then queried the pilot regarding the ship to starboard (*Angus Express*). The pilot advised it was a 6 m draught ship and would go through the two-way route south of Herald Patches.

The conversation on the bridge resumed in a social vein and at 2305, the pilot ordered a heading of 095°. At 2307, *Navios Northern Star* and *Angus Express* passed green to green, 0.5 miles apart. The ship’s speed was then increased to full ahead. The pilot and trainee then talked about the ship being north of the planned track and how it would make it easier to clear OG Rock.

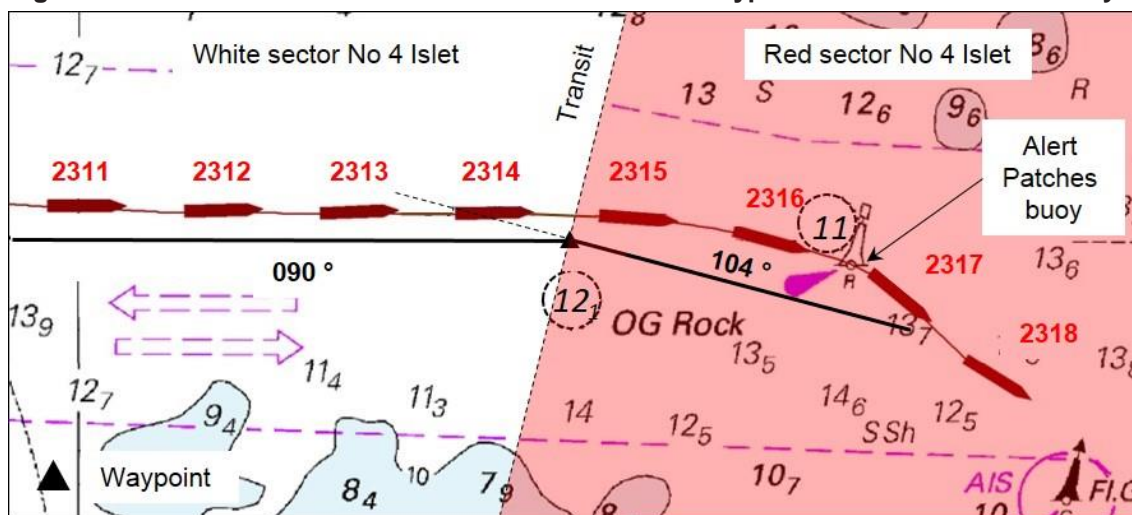
At about 2308, the pilot ordered a heading of 090° and asked the master where the pilot cabins were. The master informed him they were aft of the bridge.

At 2310, when the pilot asked the third mate if the next course was 104°, he got no response. The master told the third mate to concentrate and confirm the course. After confirming the course, the third mate plotted the ship’s position. The ship was 1.5 cables north of the charted track. Shortly after, the pilot asked if the cabin phones were operational but neither the master nor third mate could confirm this. The master then left the bridge to check if the phones worked.

At 2311, the pilot ordered a heading of 088°. He was positioned by the s-band radar, near the ship’s centreline and was using the radar to determine the distance to Alert Patches buoy. Shortly after, the master returned to the bridge and advised the pilot that the phones were working.

At about 2312, the third mate advised 7 cables to go to waypoint north of OG Rock (OG Rock waypoint) and the pilot acknowledged the information (Figure 5). The tidal stream at that time was about 1.2 knots x 098° and the wind was from the north-west at force 5 (17 to 21 knots). The ships speed was now steady about 12.5 knots.

Figure 5: *Navios Northern Star*’s track to the OG Rock waypoint and Alert Patches buoy



Source: *Navios Northern Star*’s VDR ((annotated by ATSB)

Shortly before 2314, the pilot asked the trainee ‘how’s the light going’ (No 4 Islet). The trainee replied, ‘still open’ and 9 seconds later, he informed the pilot ‘this is the place, going red’.

About 25 seconds later, at 2314, the pilot ordered 10° starboard rudder. The ship (that is, its bridge) was now about 2 cables from the OG Rock waypoint and 6½ cables from the Alert

¹¹ The Beaufort scale of wind force, developed in 1805 by Admiral Sir Francis Beaufort, enables sailors to estimate wind speeds through visual observations of sea states.

Patches buoy. Shortly after, the pilot ordered 5° starboard rudder and, at about the same time, he was unable to find the echo return of the buoy on the radar's display.

At 2315, the trainee informed the pilot that the ship was now in the red sector of No 4 Islet and the ship was on the transit. While trying to locate Alert Patches buoy's radar echo, the pilot acknowledged the trainee but continued to focus on the radar and regaining the echo of the buoy. The position plotted on the chart indicated that ship was about half a cable (100 m) north of the charted track.

At 2316, the master observed aloud that the Alert Patches buoy was right ahead. Hearing the master's observation, the pilot said to the third mate 'my friend, the captain, is very worried'. About 10 seconds later, the master asked how the buoy was, followed 11 seconds later with 'will we touch the buoy'. The pilot said 'no' and shortly after ordered starboard 10°, followed 16 seconds later by starboard 20° and then 'hard a starboard'.

By then the trainee had moved to the port side of the bridge and informed the pilot that he could see the buoy close to the ship's port side. The pilot immediately ordered 'midships' and then 'hard to port' to swing the ship's stern away from the Alert Patches buoy.

At 2317, the ship's hull in the area of its port quarter contacted the buoy. At 2318, the trainee confirmed that the ship had contacted the buoy. The pilot then ordered 'midships' followed by 'hard to starboard' to stop the swing. At 2319, he ordered 'midships' and for the ship to be steadied on 122°. Shortly after the ship was steadied on the new heading the pilot asked the third mate to change the steering into automatic.

At about 0051 on 16 March, the pilot reported the incident to REEFVTS.

The ship continued its passage through the Inner Route. On 17 March at 1320, the pilot and trainee disembarked off Cairns, the limit of the compulsory pilotage area.

On 19 March, *Navios Northern Star* arrived off Gladstone and anchored to wait for a berth.

Subsequent inspections/survey of the ship and the Alert Patches buoy did not indicate any significant damage to the ship or the buoy. The damage was limited to some removal of paint from the ship's side.

Context

Navios Northern Star

At the time of the incident, the 2005-built *Navios Northern Star* was registered in Malta and classed with Class NK. The ship was owned and managed by Kleimar, Belgium. The ship was trading between China and several ports in the Northern Territory and Queensland, Australia.

Navios Northern Star was fitted with navigational equipment required for a ship of its size in accordance with SOLAS.¹² The navigation equipment included paper navigational charts and publications. The two radars, an x-band¹³ and an s-band had automatic radar plotting aid (ARPA) and other target tracking functions. Both radars also had data input from the ship's automatic identification system (AIS) transceiver and global positioning system (GPS) receiver unit. The ship was also fitted with an electronic chart system (ECS).¹⁴

The ship had a multi-national crew of 20, including the master and three mates.

The master had 34 years seagoing experience and held a Ukrainian master's certificate of competency. He had sailed as master for 19 years and sailed on Kleimar-managed ships for the last 5 years. He had joined about 4 months before the incident.

The third mate had 3 years of seagoing experience and held a Ukrainian watchkeeping deck officer's certificate of competency. He had sailed as third mate for 1 month and had been with Kleimar for 3 years. It was his first time on *Navios Northern Star* and he had joined about 1 month before the incident.

The helmsman at the time of the incident was an able seaman with 3 years of seagoing experience, all of which had been on bulk carriers. He had been with Kleimar for 3 years and had joined 1 month before the incident.

Queensland coastal pilotage

Under the *Great Barrier Reef Marine Park Act (GBRMPA) 1975*, pilotage was made compulsory for areas of the GBR prescribed by safety regulations.

Consequently, Australia introduced compulsory coastal pilotage to the Inner Route, Whitsunday Islands and Hydrographers Passage. The particularly sensitive sea area (PSSA)¹⁵ was subsequently extended to include the Torres Strait. Compulsory pilotage in the Torres Strait and Great North Eastern Channel for all vessels over 70 m in length followed.

The Australian Maritime Safety Authority (AMSA) is responsible for the safety regulation of coastal pilotage, pilotage providers and pilots.

Legislation and regulations

Safety regulations for coastal pilotage are made by AMSA under the provisions of the *Navigation Act 2012*. The regulatory instrument is known as Marine Order¹⁶ 54 (Coastal pilotage) (MO54).

¹² The International Convention for the Safety of Life at Sea, 1974, as amended.

¹³ The x-band radar (9 GHz frequency and 3 cm wavelength) provides enhanced definition and good angular discrimination which can improve the accuracy of bearings and ranges used for position fixing and is generally used in pilotage waters.

¹⁴ The ECS was not an approved route monitoring system and could only be used for planning and the unit had a sign on it stating this.

¹⁵ An area of the marine environment that needs special protection through action by the International Maritime Organization (IMO) because of its significance for recognised ecological, socio-economic or scientific attributes where such attributes may be vulnerable to damage by international shipping activities.

¹⁶ Marine Orders are legal instruments made by AMSA pursuant to powers under Commonwealth legislation. They are also described as regulatory instruments or legislative regulations.

The provisions of MO54 relate to various safety aspects of pilotage, including the operations of pilotage providers and pilots, pilot licensing and the duties of pilots. Under MO54, the following are compulsory pilotage areas:

- Great North East Channel
- Hydrographers Passage
- Inner Route
- Torres Strait
- Whitsundays.

Queensland Coastal Passage Plan

In December 2011, AMSA and the coastal pilot working group developed the Industry Passage Plan (IPP). In May 2013, the IPP was updated and became the Queensland Coastal Passage Plan (QCPP), the current revision of the QCPP is July 2014. This document was produced to improve pre-pilotage communications between pilotage providers, the ships they service and the pilots conducting the pilotages.

The QCPP is the approved plan used by pilots and ship masters to prepare their voyage plans. The waypoints and courses detailed in the QCPP are to be plotted on charts and/or in electronic navigation systems before embarking the pilot.

The QCPP provides detailed guidance for:

- routes (a set of relevant waypoints) and draught restrictions
- REEFVTS
- preparations before the pilot boards
- master/pilot exchange and passage monitoring
- under keel clearance
- bridge resource management
- passage planning chartlets.

Pre-arrival information

The pilotage provider servicing *Navios Northern Star*, Australian Reef Pilots' (ARP), contacted the ship's master 7 days prior to its scheduled pilotage to provide, request and confirm information.

The pre-arrival information comprised two parts (Parts A and B).

Part A detailed ARP's advice to the master for:

- ETA management
- manning
- environmental discharges
- REEFVTS
- QCPP route.

Part B requested specific ship information and detailed the dynamic UKCM information, transit windows and the information required to complete the safe transit plan in accordance with AMSA UKC regulations.

Shipping routes

The western entry to the Torres Strait is through either Gannet Passage or Varzin Passage (the deeper of the two), leading into the Prince of Wales Channel (PoWC), the main shipping route through Torres Strait.

The maximum allowable draught through the Torres Strait is 12.2 m and all ships must maintain UKC requirements as detailed in the QCPP.

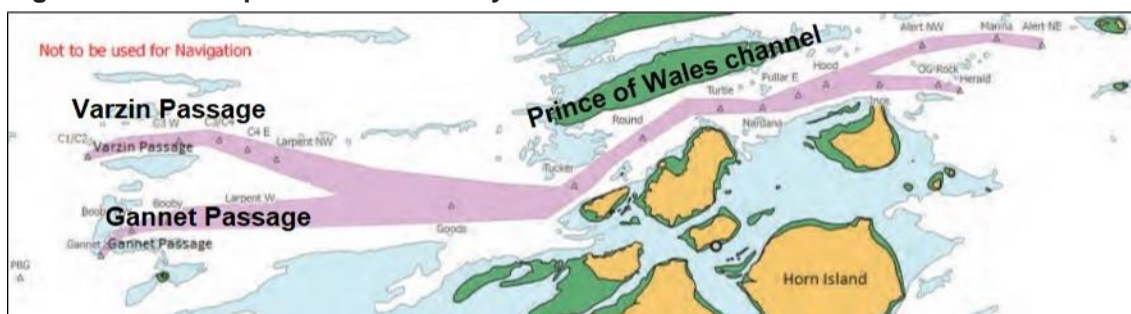
The Torres Strait is an interface between the diurnal tidal¹⁷ regime of the Indian Ocean and the semi-diurnal¹⁸ tidal regime of the Pacific Ocean. All tides are composed of both diurnal (once a day) and semi-diurnal (twice a day) components. This creates a highly variable and complex tidal regime with fast flowing tidal streams of up to 8 knots at Hammond Rock within the POWC.

Under Keel Clearance Management (UKCM) system

Since December 2011, AMSA has provided the UKCM system as an additional aid to navigation for deep draught ships transiting Torres Strait. The system is used to assist coastal pilots to plan and manage the ship's UKC.

It is an internet-based system that estimates a vessel's UKC in real time. By using a defined set of operational parameters, the UKCM system calculates tidal windows to meet AMSA's UKC requirements. The system monitors the ship's UKC margin throughout the transit. All coastal pilots transiting ships with a draught of 8 m or more, through the Prince of Wales Channel, the Varzin or Gannet Passages (Figure 6), are required to use the UKCM system.

Figure 6: Area of operation of UKCM system in Torres Strait



Source: AMSA Queensland Coastal Passage Plan July 2014

Australian Reef Pilots

Australian Reef Pilots is one of the two private companies that provide pilotage services in all coastal pilotage areas. *Navios Northern Star's* pilot had worked for ARP since 2007. He had held an unrestricted coastal pilot licence since 2008 and an Australian master's certificate of competency. He had been a licensed check pilot and an assessing pilot. He had 39 years of industry experience, including 17 years of sea going experience, with 2 as master.

The trainee had worked for ARP since early 2016 and held a trainee pilot license. This was his fourth time through the Torres Strait as a trainee. He held an Australian master's certificate of competency issued by the AMSA in 2004. He had 30 years of sea going experience, including 10 as master. Several of these ships transited the Torres Strait.

Master pilot exchange

Australian Reef Pilots' bridge information for bridge teams details amongst others the bridge organisation and when to call the pilot (Appendix A). The form is given to the master during the MPX and is to be available for the watchkeeping officers to reference throughout the transit. The form details the pilot (when on the bridge) must be called on the following occasions:

- if ever in doubt about the pilot's actions or intentions
- when 7 cables from the next waypoint

¹⁷ A diurnal tide is characterised by one high water (tide) and one low water (tide) per day. Typically with a diurnal tide each successive high or low tide is 24 hours and 50 minutes apart, this is the length of one lunar day.

¹⁸ A semi-diurnal tide occurs generally when there are two high waters (tides) and two low waters (tides) per day. Typically the time between each successive high or low tide is 12 hours 25 minutes (that is, half of one lunar day).

- if the ship is more than 3 cables off the charted track (cross track error)¹⁹
- when the lookout or OOW first detects another vessel.

Portable pilotage unit

All ARP pilots are issued with a portable pilotage unit (PPU). The PPU is plugged into the ship's AIS output plug and has an independent GPS unit providing its position, course and speed information. It can provide an active monitoring display allowing the observation of critical parameters for safe navigation. A PPU also provides other information such as electronic navigation charts, pilotage plans, AIS information and the UKCM system. All pilots are trained in the use of the equipment and they are to be used for all pilotages through Torres Strait.

Bridge resource management

Bridge resource management (BRM) is defined as the use and coordination of all the skills and resources (people, procedures and equipment) available to the entire bridge team to achieve the established goal of optimum safety and efficiency.²⁰ All individuals make errors, and BRM aims to minimise the occurrence and outcome of errors through the best possible use of resources.

All ship's navigators must have training, and demonstrate competence in BRM techniques.²¹ All coastal pilots must attend approved trainee pilot training courses.²² The courses are required under MO54 for pilot's to obtain and maintain their pilotage licenses.

The aim of compulsory pilotage is to reduce navigational risk in those areas. A pilot's local knowledge and practised piloting techniques are an important element in reducing risk to an acceptable level. Since a pilot is not a replacement for any of ship's bridge team members, it is necessary that the ship's bridge team works with the pilot. This can be achieved by observing good BRM practice in executing the agreed voyage plan.

Bridge resource management is a broad topic which covers many inter-related subjects, including but not limited to shared mental model, situational awareness, challenge and response and distractions. The ship's master and the pilot are responsible for taking steps to actively engage and include other members of the ship's bridge team in the pilotage. Effective BRM should result in all personnel involved in the ship's navigation having a clear understanding of, and expectations for, the pilotage.

Voyage planning

A passage plan and pilotage plan are necessary to allow the ship's bridge team and pilot to arrive at a shared understanding of what 'should' happen during the voyage. Careful planning is used to make the passage and pilotage safer, for example, by setting limits that make unsafe deviations from the plan readily apparent.

The ship is to be safely navigated in the normal range (the corridor in which a ship should navigate) and in the comfort zone of the operator conducting the ship. Outside of the comfort zone is the safety margin (distance between the corridor boundary and no-go area) and this is used when there is a reason to use it.²³ Comfort zones and safety margins can be critical when navigating in restricted areas of coastal waters, as there is limited time available to take corrective

¹⁹ The distance that a ship is to the right or left of the planned track, i.e. off-track, is displayed on many GPS units as the cross track error or XTE.

²⁰ Nijjer, R 2000 *Bridge Resource Management: The Missing Link*, Sea Australia 2000, Sydney.

²¹ International Maritime Organisation (IMO) 1978, *International Convention on Standards of Training Certification and Watchkeeping for Seafarers, 1978, as amended (STCW Code), Section A-II/1, Standards regarding the master and deck department*, IMO, London.

²² The Advanced Marine Pilots Training (AMPT) course and the BRM course are recognised by AMSA as approved trainee pilot training courses.

²³ Di Lieto A, *Bridge Resource Management*, 2015, Brisbane.

action when required. The ship's master is required to develop a berth to berth plan for its safe and efficient passage.²⁴ Detailed plans are needed to ensure appropriate margins of safety are maintained at all times.

The International Maritime Organization (IMO) provides guidelines²⁵ for voyage planning, which comprises four distinct stages:

- appraisal (when all information relevant to the voyage is considered)
- planning (when a detailed plan for the voyage from berth to berth is prepared)
- execution (of the plan, including suitable alterations to it when required by circumstances)
- monitoring (execution of the plan, including ensuring all navigators know and understand it).

Section 2.6 of the Bridge Procedures Guide,²⁶ states:

Of particular importance is the need to monitor the position of the ship approaching the wheel over position at the end of the track, and checking that the ship is safely on the new track after alteration of course.

²⁴ International Maritime Organisation (IMO), 1974, *The International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS 1974), Chapter V, regulation 34 Safe navigation and avoidance of dangerous situations*, IMO, London.

²⁵ International Maritime Organisation (IMO) 2004, *Resolution A.893(21) Guidelines for voyage planning*, IMO, London.

²⁶ International Chamber of Shipping (ICS) 2007, *Bridge Procedures Guide*, 4th edition, Marisec Publications, London.

Safety analysis

The contact event

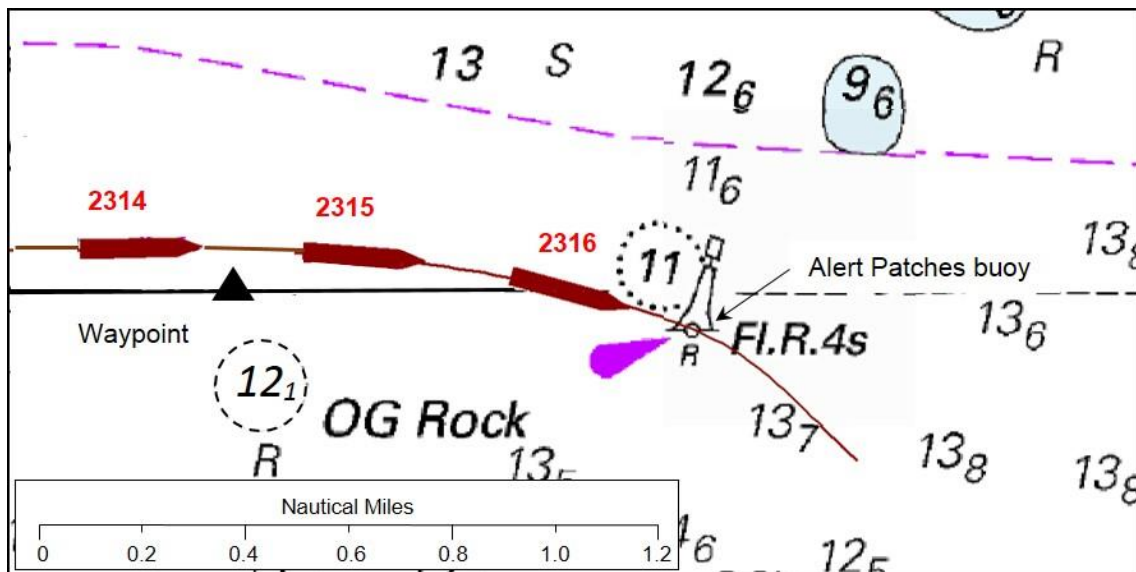
On 15 March, shortly after 2300, *Navios Northern Star* was transiting the Prince of Wales Channel, Torres Strait, on an easterly heading towards the waypoint north of OG Rock.

The pilot's usual practice was to use a distance of 7 cables from the Alert Patches buoy as a wheel over point (WoP) and the s-band radar to obtain the distance from the buoy. Shortly before 2314, the pilot asked the trainee a question regarding No 4 Islet light. This was intended to be educational as opposed to a trigger for his own WoP.

About 25 seconds later, with ship's bridge about 2 cables from the waypoint and 6½ cables from the Alert Patches buoy, the pilot started altering course. He used 10° of starboard rudder to initiate the turn and 14 seconds later, ordered 'starboard 5' (Figure 7).

However, about the same time the pilot ordered starboard 5°, he was unable to find the echo return of the buoy on the radar's display. For the next 2 minutes, he was focused on regaining it. Consequently, during those 2 minutes, the turn was not properly controlled to pass the buoy at a safe distance.

Figure 7: Rudder angles and distances before contact with Alert Patches buoy



Time	Starboard rudder angle°	Rate of Turn °/min	Distance to Waypoint (miles)		Distance to Alert Patches (miles)	
			Bridge	Bow	Bridge	Bow
23:14:38	10	0.0	0.22	0.12	0.66	0.56
23:14:52	5	0.0	0.18	0.08	0.62	0.52
23:15:30	5	2.3	0.07		0.50	0.40
23:16:00	5	5.2			0.38	0.28
23:16:30	5	8.2			0.28	0.18
23:16:56	10	10.0			0.18	0.08

Source: *Navios Northern Star's* voyage data recorder

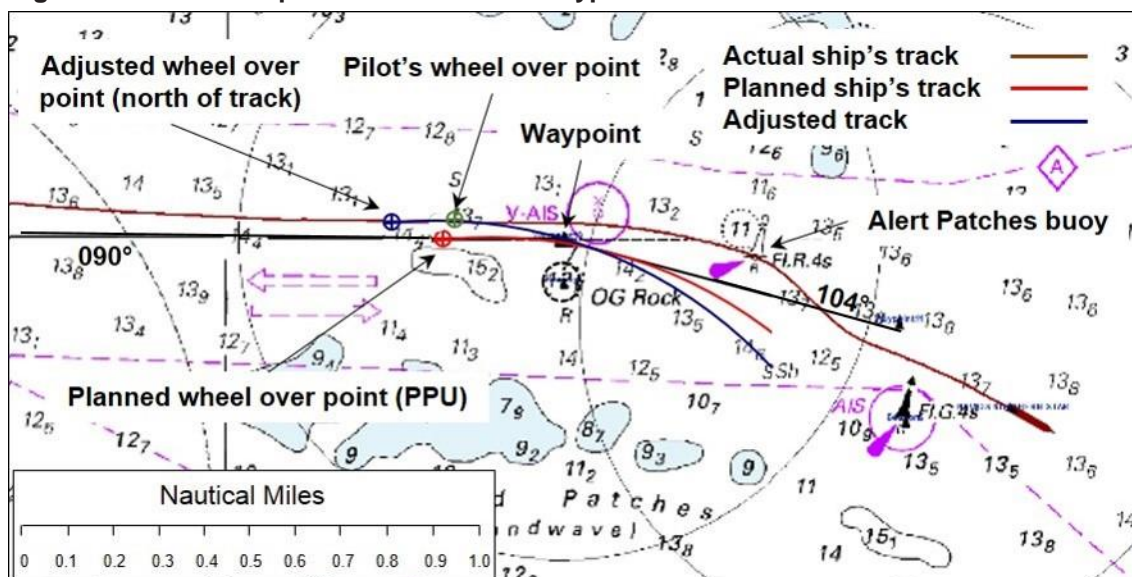
Shortly before 2317, when the ship's bow was 1 cable from the buoy, the ship's master asked the pilot if the ship would 'touch the buoy'. The pilot then ordered starboard 10°, 20° and then hard starboard in quick succession. However, this action was too late to allow the ship to swing clear of the buoy and at 2317, its port quarter contacted the Alert Patches buoy.

Bridge resource management

Execution of the course alteration at OG Rock

The course alteration at the OG Rock waypoint was from 090° to 104°, a 14° course alteration. With the ship's planned speed at 12.2 knots, the pilot's PPU had a default 1 mile radius of turn²⁷ used to calculate the WoP with a required 11.7°/min rate of turn (RoT). This WoP (Figure 8) in the PPU was about 2½ cables from the OG Rock waypoint (7 cables from the Alert Patches buoy).

Figure 8: Wheel over point from OG Rock waypoint



Source: ATSB

There were various cues and monitoring tools available to the pilot to use for the course alteration, including:

- electronic bearing lines (EBL)²⁸ between the Alert Patches buoy and Herald Patches buoy
- the radar's variable range markers (VRM)²⁹ to determine the distance from the Alert Patches buoy
- parallel indexes (PI)³⁰ set up on Ince Point and Tuesday Islets
- visual transit of No 4 Islet and the changing light sectors
- visual reference of the forward masthead light on the foremast between the buoys
- the intended track, WoPs and rate of turn displayed in real time on the PPU
- distance to waypoint displayed on the ship's radar (the ship's track could not be displayed)

The pilot's usual practice was to use a radar to determine the distance of 7 cables from the buoy as his cue to start altering. However, from his position behind the s-band radar, the pilot could not sight his PPU nor did he use any other cue to alter or monitor the course alteration.

²⁷ A constant radius turn uses a lesser drift angle and hence a lesser loss of speed. It permits full control of the ship's position during the turn and at the end of the turn, the new course can be steadied with lesser rudder angle.

²⁸ Electronic bearing lines measure the bearing of any point object within the display area to any other point.

²⁹ Variable range markers measure the range between two points on the radar display.

³⁰ Running of a parallel index line provides real time information on the ship's lateral position relative to the planned track.

On March 15, as the ship approached the waypoint north of OG Rock, it was north of the charted track, hence the WoP was further west. For the same turn radius and rate of turn, the adjusted WoP was 3½ cables from the waypoint or 8 cables from the buoy. However, it was not until the ship was 6½ cables from the buoy that the pilot gave the first helm order. Additionally, with the ship’s actual speed of 12.5 knots, a RoT of 11.9°/min was required but not achieved throughout the turn (Figure 7).

Had the pilot altered course at the adjusted wheel over point, or maintained the initial starboard rudder angle at the planned wheel over point, or applied more rudder (increasing the rate of turn), the ship would not have collided with the buoy.

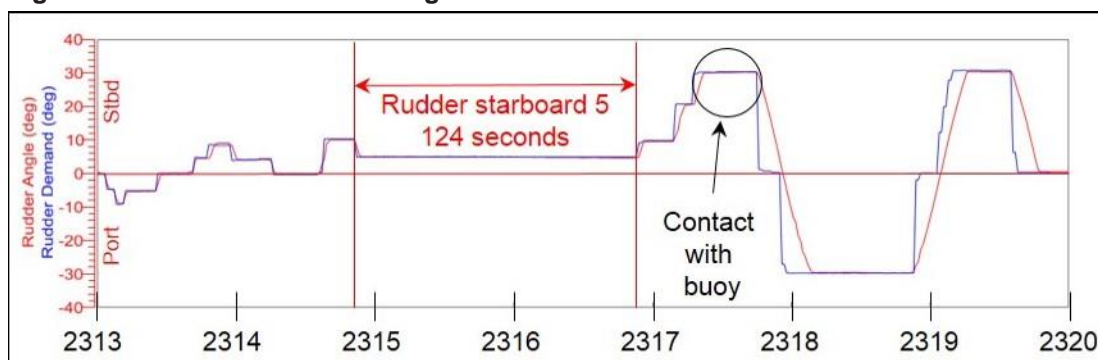
Distractions

Interruptions or distractions during the completion of a task increase the likelihood of error. When one of the competing tasks is strong enough to interfere with or divert attention away from the original focus of attention, the individual becomes distracted.

Distractions can be related to the task or from some external, unrelated source or event. An individual, or team, can also become completely focused (fixated) with one event or task and therefore distracted from the overall objective. This task fixation can be interrupted by internal or external cues and attention can then be returned to the primary task.

As the ship approached the OG Rock waypoint, the pilot was using the s-band radar to determine the distance from Alert Patches buoy. His usual practice was to use a 7 cable distance from the buoy as his WOP. About the same time he ordered starboard 5° for the course alteration, he was unable to find the echo return on the radar’s display. The pilot became fixated on regaining the lost echo. For the next 2 minutes (Figure 9) the rudder angle remained at starboard 5°.

Figure 9: Rudder demand and angle from 2313 to 2320



Source: ATSB

The pilot did not monitor the ship’s progress by any of the multiple cues or monitoring tools that were available and he was unaware that the ship was not swinging fast enough to safely make the turn.

At 2316¾, the master eventually interrupted the pilot’s focus and his attention was brought back to the task of navigating the ship, but by then it was too late.

Shared mental model

Each individual member of a group performing a common task will develop a mental model of what they think will occur during the task being completed. Each person’s mental model is based upon the information available to them at the time. Ensuring that each member involved in a pilotage (pilot and ship’s bridge team) shares the same mental model of the voyage (passage and pilotage plan) is central to effective BRM.

Shared mental models serve three critical purposes: they help people to describe, explain and predict events in a common environment. A pilot and ship’s bridge team which must adapt quickly to changing tasks might draw on shared or common mental models for those tasks. In order to

adapt effectively, they must be able to predict what the operator conducting the ship is going to do, and what they are going to need, to be able to do it.

At the start of the pilotage, the pilot and trainee conducted the MPX with the ship's master and they discussed how the ship manoeuvred. At that time the pilots and ship's bridge team shared a common mental model of how the pilotage would progress. The ship would follow the QCPP route within a 0.3 mile cross track error (XTE) and the OOW would give the pilot 7 cables notice before each waypoint. The OOW stated that after he gave 7 cables' notice, 'he expected that the pilot would alter course and it would just happen'.

However, as the ship progressed, the ship's bridge team did not seek clarification nor question the pilot regarding further details of the pilotage plan or his subsequent actions. These included deviations from the planned track such as navigating north to pass *Angus Express* and to alter course at OG Rock. Further, there was little communication about the WoPs and the parameters and limits the pilot had set in the PPU and used throughout the transit.

Hence, as the ship approached the waypoint at OG Rock, north of track, the pilot and ship's bridge team did not share the same mental model.

Situational awareness

Situational awareness for a group performing a common task is closely associated with the concept of shared mental model. In relation to a ship's voyage, it includes knowing what has recently happened (perception), what is happening (comprehension) and, based on where the ship is, what is about to happen (projection).

Careful observation and understanding of the situation around you should achieve one of two things: it should reinforce your understanding and confidence in the mental model of the voyage, or it should highlight a misunderstanding or an error and trigger actions to clarify or correct the situation.

Situational awareness is dependent on working memory and is, therefore, affected by distraction, interruption and stimulus overload. Collective situational awareness can be enhanced by:

- monitoring the progress of the agreed plan
- communicating with each other about the situation to share individual awareness and discuss differences
- anticipating next conditions
- checking one another.

On board *Navios Northern Star* there were many resources available in addition to the pilot and ship's bridge team to assist in establishing and maintaining situational awareness. These included the ship's electronic navigational equipment such as the radars, GPS and the pilot's PPU which could be used to gather or verify information. However, these resources were not routinely used to monitor or predict the ship's position.

The third mate plotted the ship's position on the chart. However, because of the inherent delay in completing the plot, this was not real time monitoring but more of a record of the ship's past position. Further, neither he nor the ship's master were actively monitoring or engaged in the pilotage or the course alterations. On approach to the OG Rock waypoint (Figure 10), after the third mate gave the pilot 7 cables notice, the ship's bridge team expected the pilot would alter the ship's course.

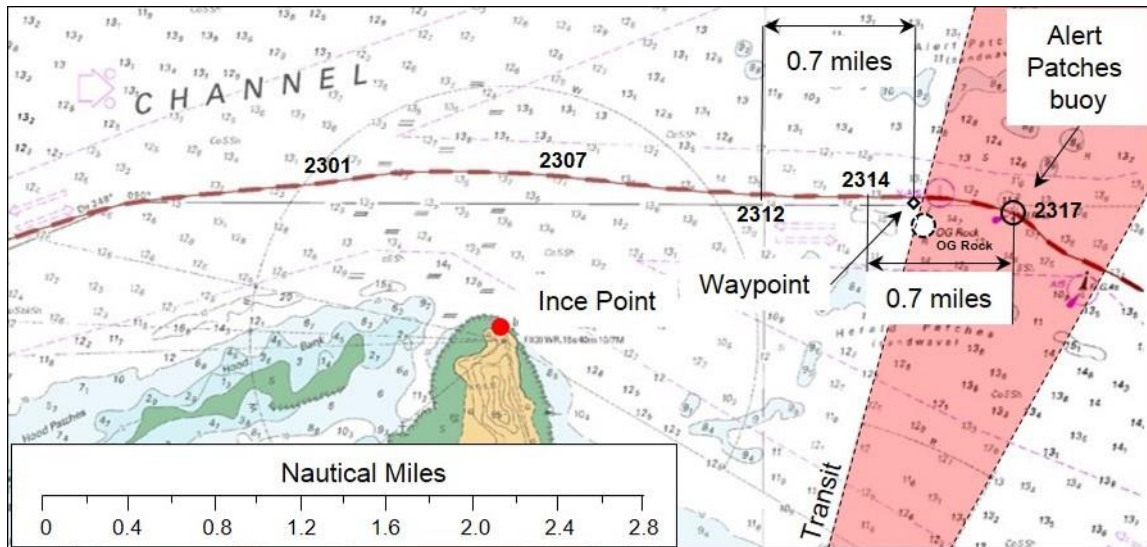
The trainee had expected the ship to be turning when Horned Hill light came into transit with No 4 Islet, just before it was in the red sector. However, the ship's RoT had only just started to increase from 0.0°/min to 2.3°/min.

When interviewed, the pilot stated that 'if you wait for the light to change (light sector on No 4 Islet white to red), there is only 4 cables to Alert Patches buoy - pilots do alter when the light goes pinky, but I use 7 cables from Alert Patches buoy'. The only cue he used for altering course was

the distance from the Alert Patches buoy as his WoP. However, this distance did not allow for any XTE, hence, altering course earlier if north of track or applying more rudder.

Further, the pilot did not inform the ship's bridge team, nor the trainee, about not using light sectors or when on a transit at OG Rock nor his plan for altering course. Therefore, the ship's bridge team and the trainee's expectations were different to the pilot's intentions in that situation. As the ship progressed, their comprehension of the situation did not trigger any actions for clarification or correction of the situation.

Figure 10 – Navigational chart Aus 293 showing *Navios Northern Star's* track to OG Rock



Source: Australian Hydrographic Service (annotated by ATSB)

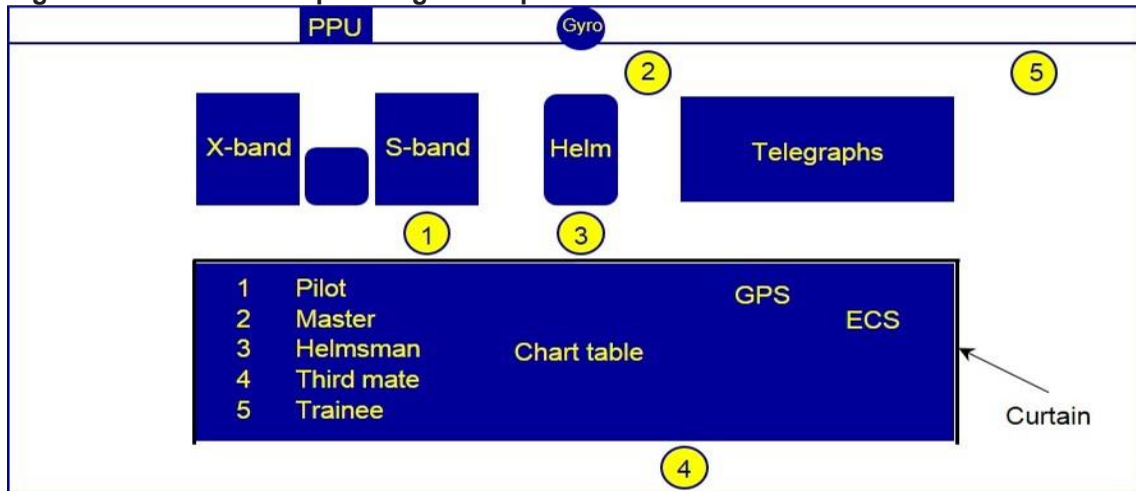
Monitoring the ship's progress

Monitoring of the voyage required observation of the pre-determined navigational parameters. Observation of the decisions made and actions taken would determine if the desired results were within comfort zones and safety margins. Importantly, to know where the ship will be.

The QCPP includes specific guidance for the OOW to follow when voyage monitoring.

The OOW is expected to apply appropriate navigational techniques and principles including placing fixes on the chart, using parallel indexing and clearing indexing³¹ on radars, and monitoring electronic systems for alarms and warnings.

Figure 11: Pilots and ship's bridge team positions between 2312 and 2316



Source: ATSB

³¹ Clearing index lines run from conspicuous marks can indicate when the ship is entering pre-determined no-go areas.

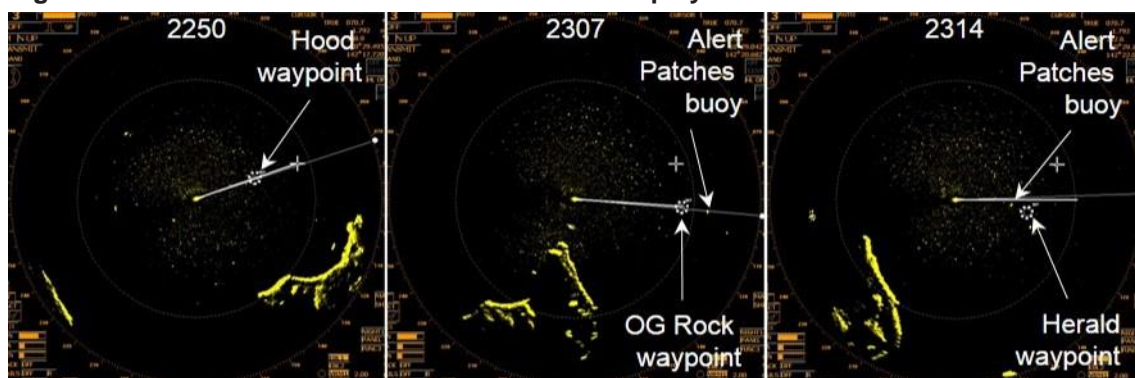
At the chart table (Figure 11), the ship's OOW plotted the ship's position every 5 minutes on the chart. He primarily used the ship's GPS and, on several occasions, radar ranges and bearings.

The GPS unit also indicated the bearing and distance to the next waypoint along with the XTE. The OOW used this information to advise the pilot when the ship was 7 cables from each waypoint. However, this was the limit of his real time route monitoring.

As it was night, curtains were drawn around the chart table to prevent backlight from the table lights affecting the pilot's and helmsman's night vision. Hence, when at the chart table, the OOW's night vision was affected. Further, he could not look out the bridge windows, sight the radars or PPU, nor monitor the rudder angle indicator.

The OOW stated he frequently moved from the chart table to use the ship's x-band radar (the pilot used the s-band radar). However, in the 27 minutes before the contact (2250 to 2317), none of the radar's tools or features including EBLs, VRMs, PIs nor clearing indexes (Figure 12) were used. Further, there was no other indication the x-band radar had been used, including a reduction in range as the ship approached the OG Rock waypoint.

Figure 12: Navios Northern Star's X-band radar display from 2250 to 2314



Source: Navios Northern Star's voyage data recorder (annotated by ATSB)

Additionally, after the master had returned to the ship's bridge from checking the pilot cabin phones he assumed a position starboard of the centreline and had to establish his night vision. Also from this position he was unable to monitor any electronic navigational equipment and could only observe visually.

When interviewed, the pilot indicated that he thought the ship's bridge team were just following the ARP bridge information form by giving 7 cables notice and after that he was operating alone. The crew confirmed this, as they assumed that the pilot would execute and monitor the passage himself, and only needed input from them when he requested it, other than calling out 7 cables before a waypoint.

Hence, as the ship approached the waypoint at OG Rock, the ship's bridge team were not effectively monitoring the ship's progress.

Voyage planning

Planning of voyage routes should contain operational limits for normal, abnormal and emergency conditions for each track. The operational limits are determined by:

- a range of values that represents the normality of operations
- extreme values, which should not be exceeded unless forced to do so in cases of emergency.

All values inside the normal range make up the comfort zone and the values outside the normal range that are still within the extreme ones of an emergency situation, make up the safety margin. Further, other voyage information such as ship's speed, UKC, XTEs, PIs, WoPs, turn radii and RoTs, amongst others, should also be included in the voyage plan. The pilot's pilotage plan (incorporating the QCPP route and above information) was loaded in his PPU. The pilot had used

a 1 mile turn radius to calculate the WOPs and the ship’s rate of turn for all course alterations throughout the transit.

The track and RoT were displayed in real time on the PPU, along with the dynamic UKCM system. Further, the XTE had a default setting of 0.3 miles, but the pilot had reduced this distance in narrow areas of the transit.

Navios Northern Star’s master had received the QCPP route plan from ARP, as a list of waypoints, 7 days before the pilotage. The waypoints were input into the GPS unit and plotted on the ship’s navigational chart and the ship’s track marked.

However, other information such as WoPs, turn radii, RoT, no-go areas or PIs were not marked on the charts nor were they discussed as part of the MPX or at any other times during the pilotage. The ship’s GPS unit displayed XTE, but route information related to the voyage such as comfort zones and safety margins were not discussed (such as reducing the XTE from 0.3 miles).

Hence, the ship’s bridge team’s voyage plan only contained basic information and the operational parameters used by the pilot for his pilotage plan were not fully understood or known.

Challenge and response

Effective communication is central to bridge resource management (BRM). It is essential to prevent errors leading to undesirable outcomes. Challenge and response is a BRM technique in which a person’s perception of an event, in the execution of the plan, is confirmed or denied by asking and/or responding to questions. That is, if unsure of exactly what is occurring, a person should ask others to clarify the situation, and a response is required.

Following the MPX, the pilot advised course alterations would be started with rudder angles of 5° to 10°. However, the actual WoP distances were not discussed. The pilot stated that, if the ship’s bridge team were engaged, they should be aware of when he would alter course.

The master stated he expected the pilot would alter course once the third mate had given him the 7 cables notice from each waypoint. Table 13 shows the pilot had altered about 7 cables from the waypoint, until OG Rock.

Table 13: Distance from waypoints when the course alteration started and rudder applied

Waypoint	Next course	Distance from waypoint when alteration started	Rudder order (degrees)		Time when alteration started
			Port	Stbd	
Larpent	088°	7 cables	15		21:33:15
Harrison	055°	8 cables	10		21:56:01
Hammond	088°	5 cables		10	22:28:30
Nardana	068°	7 cables	10		22:41:00
Hood	090°	5 cables		10	22:53:18
OG Rock	104°	2 cables		10	23:14:38

Source: *Navios Northern Star’s* VDR

The third mate stated that he believed that the pilot would start altering course at 4 cables from waypoints. He assumed this, as he thought the pilot knew the turning circle of the ship. However, his assumptions were not consistent with the pilot’s helm orders throughout the pilotage.

At 2314, when the ship’s bridge was 2 cables from the waypoint at OG Rock, the pilot started altering course. It was not until the Alert Patches buoy was directly ahead and 1 cable from ship’s bow that the master murmured quietly in Ukrainian.

Hearing this, the pilot told the third mate that the master was ‘very worried’ about the Alert Patches buoy. Shortly after, the master asked the pilot ‘how the buoy was doing’ and 11 seconds later ‘will we touch the buoy’.

The pilot replied ‘no’ but did increase the rudder angle by ordering ‘starboard 10’. Sixteen seconds later, the pilot ordered ‘starboard 20’ and another 7 seconds later ‘hard starboard’.

Considering the pilot’s focus was regaining lost radar Alert Patches buoy echo, the master’s challenge as the ship closed on the buoy was too late to be effective.

Visual perception during the hours of darkness

When monitoring a ship’s progress visually, a ship’s bridge team and pilot should be aware of visual perception issues during the hours of darkness.

In the dark, vital elements of vision are impaired, including depth perception, colour recognition, and peripheral vision. As light passes through the human eye’s cornea³² it is filtered by the pupil³³ inside the eye. It is then refracted by the crystalline³⁴ and travels to the centre of the eye and arrives at the retina.³⁵ The pupil’s dimension depends on the amount of light present and dilates at night or when we are concentrating or stressed.³⁶

Depth perception is based on experience and knowledge of distance and size of objects.³⁷ Hence, if we know two objects are the same size, the smaller one will appear further away and the larger one will appear to be closer. Similarly, for lights of a similar intensity they will appear closer and dim lights will appear further away. Therefore, familiarity with the size of an object can be an effective cue for distance perception.

However, visual cues can also be misleading and human vision and perception has its limitations. The judgement of distance deteriorates in darkness. Multiple studies³⁸ have shown that people are better at estimating objects nearby than further away. People generally overestimate the distance to near targets and underestimate the distance of far objects.

Therefore, it is important to understand that a person’s visual perception during the hours of darkness is different to that during the daylight hours, as objects may appear closer than they actually are. Hence, because of the difficulty of accurate depth perception, especially at night, it is important that human abilities are always supplemented by the use of all other navigational and electronic aids.

The bridge team member’s differing depth perceptions was evident when ATSB investigators interviewed them. The pilot and trainee both stated that when navigating visually, things look closer than they are. However, on approach to waypoint at OG Rock, the pilot and trainee, who had experience and were familiar with the buoy were occupied with other tasks and only the master was observing visually. .

Had the pilot, trainee and ship’s bridge team used the range of resources available (sight, radar, PPU) they could have had an accurate appreciation of the distance from the buoy and a common understanding of the situation.

³² The cornea and crystalline are adjustable systems of lenses capable of focussing.

³³ Light intensity is adjusted by varying the diameter of the pupil with a coloured diaphragm known as an iris.

³⁴ A lens with a variable curvature that allows focus on things that are near or far away.

³⁵ Light stimulus is collected through photoreceptors cells, rods and cones on a special film, which generate electrical signals which are passed to the brain via the optic nerve.

³⁶ Di Lieto, *A Bridge Resource Management*, 2015, Hydeas, Brisbane, Australia.

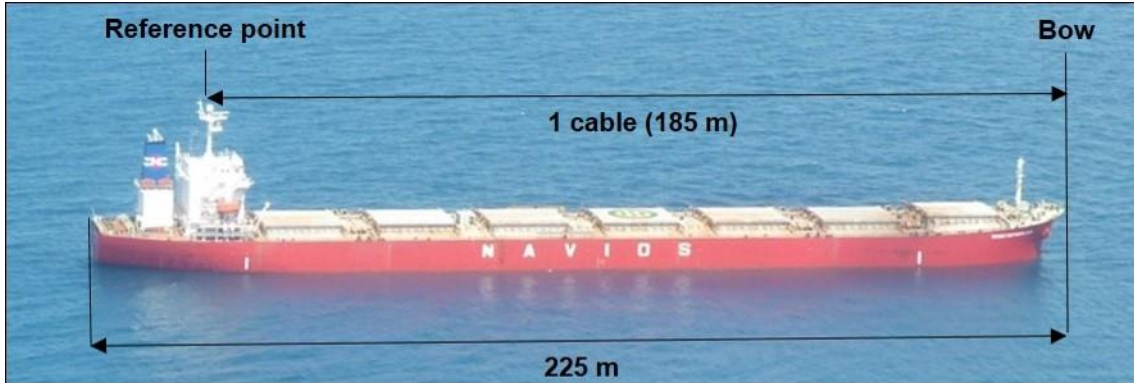
³⁷ Gibson JJ, *The Perception of the Visual World*, 1950.

³⁸ Gilinsky 1951; Higashiyama and Shimono 1994; Philbeck and Loomis 1997.

Approaching waypoints

The radar and GPS distances used during the pilotage were calculated between the ship's reference points (above the bridge) and the waypoints and objects. *Navios Northern Star's* bridge was one cable aft of its bow (Figure 14).

Figure 14: *Navios Northern Star's* bridge to bow distance



Source: ATSB

Hence, when the third mate gave 7 cables notice to the pilot, the bow was actually 6 cables from the waypoint and was always nearer to waypoints and objects than appeared on the ship's radar. Therefore, when a ship's bridge is aft, this needs to be taken into consideration when giving ranges from electronic navigational equipment.

A distance of 1 cable is significant when navigating in close proximity to navigational aids. In this case, the planned passing distance from the buoy is less than a cable. However, at interview, the pilot, master and third mate showed little appreciation for the fact they had not allowed for radar distances being 1 cable more than the distance from the buoy.

Findings

From the evidence available, the following findings are made with respect to the contact with Alert Patches buoy by *Navios Northern Star* in the Torres Strait, Queensland, on 15 March 2016. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance.

A safety issue is an event or condition that increases safety risk and (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

Contributing factors

- *Navios Northern Star's* planned course alteration to pass Alert Patches buoy was not made in time nor was the alteration properly executed and monitored to avoid contacting the buoy.
- As the ship was approaching the course alteration position, the pilot became focused on trying to regain the Alert Patches buoy's radar echo after it was lost on the radar display that he was using.
- The pilot was using the buoy's radar distance as his primary means to carry out the course alteration, so he remained focused on regaining its lost echo for more than 2 minutes during the critical period before the incident.
- The ship's bridge team did not have the same mental model of the course alteration as the pilot and they did not actively monitor the pilot's execution of the alteration.
- The ship's voyage plan contained only basic passage information and its bridge team did not know or fully understand the pilot's planned operational parameters and limits, including wheel over points and safety margins.
- The master's challenge to the pilot as the ship closed on Alert Patches buoy was too late to be effective given the pilot's focus on regaining the buoy's radar echo.
- The use of bridge resource management (BRM) techniques was not adequately established during the master-pilot exchange and therefore, BRM was not effective during the pilotage.

Other factors that increased risk

- When approaching the Alert Patches buoy, bridge team members were not using the range of available resources (both visual and electronic means) to monitor the ship's progress. This was particularly significant in the night-time conditions as human perception of distance or depth in darkness can be unreliable and depends on a number of factors. As a consequence, they had differing perceptions of its proximity.
- The radar and GPS distances used for course alterations were being calculated from the ship's bridge, about 1 cable aft of its bow. Taking the lesser distance from the bow into account would have increased margins for error and may have prevented contact with the buoy.

General details

Occurrence details

Date and time:	15 March 2016 – 2317 hours (Local time = UTC + 10 hours)	
Occurrence category:	Serious incident	
Damage:	Minimal marking of hull paintwork, no structural damage to the ship or the buoy	
Primary occurrence type:	Contact with buoy during pilotage	
Location:	Alert Patches, Prince of Wales Channel, Torres Strait, Australia	
	Latitude: 32° 03.47' S	Longitude: 115° 43.21' E

Ship details

Name:	<i>Navios Northern Star</i>
IMO number:	9328560
Call sign:	9HA3413
Flag:	Malta
Classification society:	Nippon Kaiji Kyokai
Ship type:	Bulk Carrier
Builder:	Universal Shipbuilding Corporation, Japan
Year built:	2005
Owner(s):	Navios Maritime Holdings, Belgium
Manager:	Kleimar NV, Belgium
Gross tonnage:	39,643
Deadweight (summer):	75,395
Summer draught:	13.842 m
Length overall:	224.95 m
Moulded breadth:	32.20 m
Moulded depth:	19.15 m
Main engine(s):	Hitachi Zosen Corp B&W 6S60MC
Total power:	9797 kW, 105 rpm (MCR)
Speed:	14.5 knots

Sources and submissions

Sources of information

On 20 March 2016, investigators from the Australian Transport Safety Bureau (ATSB) attended *Navios Northern Star* after the ship had anchored in Gladstone, Queensland. The master and directly involved crewmembers were interviewed and each provided their account of the incident. Photographs of the ship and copies of relevant documents were obtained including log books, statutory certificates, reports, manuals and procedures. A copy of the data stored on the ship's voyage data recorder was taken for examination in the ATSB technical analysis laboratory.

The reef pilots on board the ship at the time were interviewed and copies of relevant information was obtained.

Further information was obtained from the Australian Maritime Safety Authority (AMSA), Australian Reef Pilots and Kleimar NV.

References

Australian Maritime Safety Authority 2009, *Marine Notice 07/2009 Bridge Resource Management (BRM) and Torres Strait Pilotage*, AMSA, Canberra. Note that this marine notice has been cancelled and may contain information which is no longer applicable.

Australian Maritime Safety Authority 2012, *Marine Order 21 (Safety of navigation and emergency procedures) 2012*, AMSA, Canberra.

Australian Maritime Safety Authority 2013, *Marine Notice 15/2013 Vessel Traffic Services – Responsibilities of Authorities*, AMSA, Canberra.

Australian Maritime Safety Authority 2014, *Marine Notice 17/2014 Sound navigational practices*, AMSA, Canberra.

Australian Maritime Safety Authority 2014, *Marine Notice 54/2014 Coastal pilotage*, AMSA, Canberra.

Australian Maritime Safety Authority 2014, *Queensland Coastal Passage Plan*, AMSA, Canberra.

Di Lieto, A 2015, *Bridge Resource Management*, Hydeas, Brisbane, Australia.

International Chamber of Shipping (ICS) 2007, *Bridge Procedures Guide*, 4th Ed, ICS, London.

International Maritime Organisation (IMO) 2004, *Resolution A.893(21) Guidelines for voyage planning*, IMO, London.

International Maritime Organisation (IMO) 2004, *Resolution A.960(23) Recommendations on training and certification and operational procedures for maritime pilots other than deep-sea pilots*, IMO, London.

International Maritime Organisation (IMO), 1974, *The International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS 1974)*, IMO, London

International Maritime Organisation (IMO), 1974, *The International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS 1974), Chapter V, regulation 19.2 Shipborne navigational equipment and systems*, IMO, London

International Maritime Organisation (IMO) 1978, *International Convention on Standards of Training Certification and Watchkeeping for Seafarers, 1978, as amended (STCW Code)*, IMO, London.

International Maritime Organisation (IMO) 1978, *International Convention on Standards of Training Certification and Watchkeeping for Seafarers, 1978, as amended (STCW Code), Section A-VIII/2, Part 2 Voyage Planning*, IMO, London.

Reason, J 2008, *The Human Contribution*, Ashgate, Farnham, England.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the Australian Maritime Safety Authority (AMSA), the Maltese Accident Investigation Board, Kleimar NV, Australian Reef Pilots, the pilots on board at the time, and *Navios Northern Star's* master and third mate.

Submissions were received from Australian Maritime Safety Authority (AMSA), the Maltese Accident Investigation Board and the pilot on board at the time. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Appendices

Appendix A – Australian Reef Pilot’s briefing form

**BRIEF INFORMATION FOR BRIDGE TEAMS
GREAT BARRIER REEF PILOTAGE**

BRIDGE ORGANISATION - The Pilot does not replace the bridge team - he becomes a part of it. The OOW remains fully responsible for ships safety in all respects. The OOW is to plot and record the ships position on the chart at intervals not exceeding 15 minute intervals and more frequently if required by the vessels voyage plan. The OOW is to always monitor the progress of the ship along the planned track. The OOW is to call the Pilot in accordance with the list below. The OOW is to ensure a proper lookout is maintained at all times.

PILOT REST - The Pilot may leave the bridge to rest on occasions. He is to be called at the PCP (**Please Call Pilot**) position as marked on the chart and also in accordance with the list below.

WASTE OIL, BALLAST and GARBAGE - No garbage, waste water or ballast water is to be discharged in the Great Barrier Reef.

PILOT INCAPACITY - If the Pilot is unable to do his duty due to sickness or accident, please call

- Reef VTS - VHF or INMARSAT C, and
- Australian Reef Pilots DPA

CALLING THE PILOT

The pilot MUST be called on the following occasions:

If the Pilot is on the bridge:

- if ever in any doubt about the Pilot's actions or intentions
- when 0.7 nm from the next waypoint
- if more than 3 cables off the charted track (cross track error)
- when the lookout or OOW first detects another vessel

If the Pilot is not on the bridge:

- where 'PCP' is indicated on the chart
- if any vessel has a CPA of less than 3 cables
- if any approaching ship is steering to pass 'green-to-green',
- if any vessel is not complying with the international collision avoidance rules
- if visibility reduces to less than 2 nm
- if approaching an area of higher shipping or fishing vessel density
- if the cross-track error exceeds 0.3 nm
- generally if required to steer more than 6 degrees off the charted course to account for set or leeway

At all times:

- in the event of any equipment defect or emergency
- if there are any intended changes to the ship's draught or machinery state
- if another vessel is reported to be damaged or in distress
- if contacted on VHF by another vessel, another pilot, or ReefVTS

If unsure about anything - CALL PILOT AT ANY TIME

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

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

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

Enquiries 1800 020 616

Notifications 1800 011 034

REPCON 1800 011 034

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Investigation

ATSB Transport Safety Report

Contact with buoy by *Navios Northern Star*
Prince of Wales Channel, Torres Strait, Australia, 15 March 2016

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