

A new aid to navigation marking system for the 21st century?

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The International Association of Aids to Navigation and Lighthouse Authorities (IALA) held its quadrennial conference in Shanghai in May 2006. The conference's theme was 'Aids to Navigation in a digital world' and consequently there was considerable focus on the fact that marine navigation has changed significantly over recent years and will continue to change as digital technology continues to make inroads into navigation systems and equipment.

The Australian Maritime Safety Authority (AMSA) presented a paper at the conference, which asked the question: "does the IALA Maritime Buoyage System meet the needs of the modern-day mariner?"

The current Maritime Buoyage System

In the 1970s IALA pioneered efforts to harmonise the various buoyage systems then in use around the world and the result was the current 'IALA Maritime Buoyage System' (MBS). The MBS has since provided a high degree of certainty for mariners and so has helped to underpin safety of navigation.

The maritime industry has changed markedly in recent decades. Ships are bigger and faster, there are quicker turnarounds, and

advances in technology and the recognition of human factors are impacting modern systems design. Now, more than ever, there is need for a navigation marking system that is intuitive and unambiguous. AMSA has urged IALA to review the buoyage system to ensure that it continues to facilitate safe and efficient maritime seaborne transportation.

In conducting such a review a key consideration is the need to reduce the 'multiple level interpretative thinking processes' required when using the current MBS. The MBS has been in place for over 25 years and when it was introduced the practice of navigation involved only a limited use of electronic aids such as Radar and Decca. Consequently, buoys and other fixed aids provided a primary means of spatial awareness, including the determination of location and tracks to be followed.

Today, a very different situation prevails in ports, their approaches and on coastal shipping routes. Electronic navigation plays an ever-increasing role within and external to the bridge. This has radically changed the way in which navigation is carried out. Further, roadstead traffic management regimes provide varying levels of external support in the form of Vessel Traffic Services (VTS).

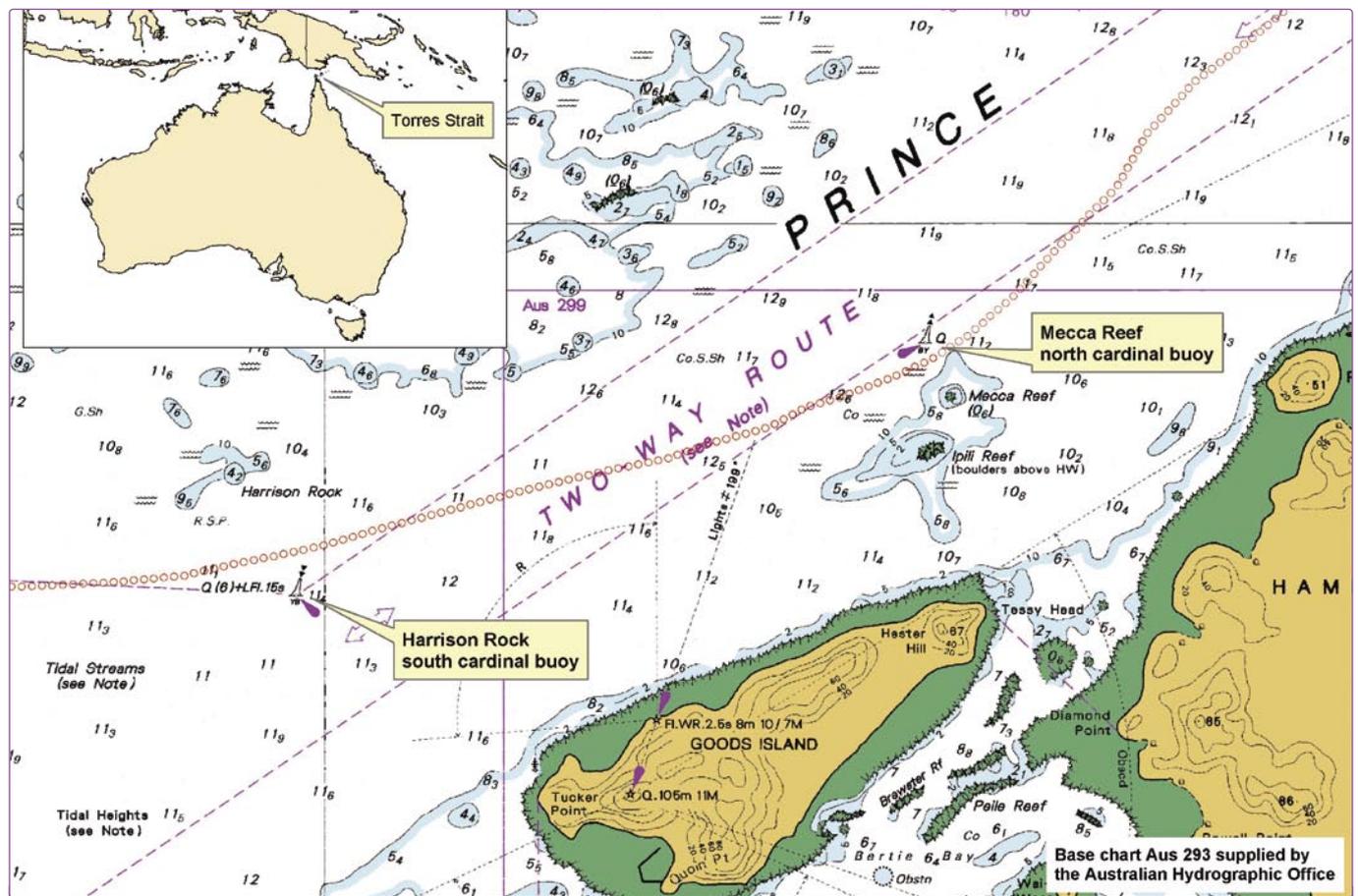


Figure 1. Track of Ever Hope.

Maritime traffic incident investigation reports often include comments to the effect that mariners tend to be looking out of the bridge windows less and instead may be spending more time using electronic screen based navigational tools. There is an equally valid counter view that these new electronic 'tools of the trade' increasingly require mariners to pay attention to electronic screen displays to make sure they have the best navigation and collision avoidance information available. Regardless, there is no excuse for not visually validating information obtained by other means.

Another important issue is that 'human factors' research did not formally exist in 1975, when the current MBS was designed. Hence, the MBS was developed with little or no account taken of how people learn, think and act on information presented to them. The International Maritime Organisation (IMO) has decreed that 'human factors' are to be taken into account in all new maritime endeavours.

Two recorded navigation incidents relating to buoyage in the Australian area, along with a study of the Tricolor incident (off Dunkirk, 14 December 2002), indicate there is a problem with the cardinal marking element of the MBS. These incidents are examples that illustrate the sorts of errors that mariners can make when using cardinal buoyage.

One of the Australian examples, shown overleaf in Figure 1, illustrates the point.

In 2001 an eastbound general cargo vessel was monitored in Prince of Wales Channel by Reef Rep radar as it passed north of a south cardinal buoy and shortly thereafter south of a north cardinal buoy very narrowly avoiding grounding in both cases. This would seem to be a total misunderstanding of the intent and purpose of the cardinal mark system and indicate a fair degree of confusion on the bridge of the vessel.

Modern day considerations

AMSA has suggested that any new navigation marking system will need to take account of the following:

- A holistic approach to the safety of navigation, noting that marking regimes no longer operate in isolation
- Detailed features of a buoy (e.g. 'can' and 'cone' silhouettes and top marks) may be unnecessary if supplementary information

is provided by other systems such as Electronic Chart Display and Information System (ECDIS) and/or the Automatic Identification System (AIS)

- The use of synchronised lights, light emitting diodes (LED's) and possibly laser lighting technologies
- Compatibility of the marking system across different platforms (e.g. between buoys and fixed structures)
- The need to seamlessly integrate lighthouses into any new arrangements, particularly after landfall has been made
- Society's increasingly limited tolerance of accidents
- The need to take into account 'human factors', as consistently recommended by the IMO

An example of a futuristic development is for a floating aid to be depicted on an ECDIS display by an icon that resembles the actual object and is animated to flash with the same characteristics as the physical aid. Consideration needs to be given to colours and shapes that make sense in the 21st century, taking into account background lighting, new lighting technology and the imminent use of blue lights. At the end of the day, the message conveyed by navigation marks must be clear and unambiguous and provide an intuitive link between the real world and that portrayed on electronic navigation displays.

Current generation systems like ECDIS, AIS and the Integrated Navigation System (INS) have radically altered the way mariners navigate in coastal areas and port approaches, and there is every indication that technological advances in the 21st century will continue to offer enhancements to the safe practice of marine navigation and pilotage. Specifically, the increasingly widespread availability of ENC data, the development of the information part of ECDIS and e-navigation initiatives, will bring about further changes to the way mariners receive and process information.

Whilst contributing to the provision of visual spatial awareness, the future buoyage system needs to serve as a 'cross checking' tool. This is in contrast to its traditional role.

AMSA has suggested that IALA articulate a vision for a new MBS and that it should work collaboratively to bring the vision into reality. Now, more than ever, there is need for a marking system that is intuitive and unambiguous.

ABOUT THE AUTHOR AND THE ORGANISATION

Gary Prosser has over 25 years experience in the maritime industry, coming from a seagoing background serving on Australian ships in both the International and domestic trade. His last seagoing position was as Chief Officer of a high speed catamaran and additionally spent a number of years lecturing at the Australian Maritime College.

For a number of years Gary managed offshore supply vessel operations in Bass Strait, prior to taking up the position of General Manager P&O Polar in Hobart, managing both Antarctic and Research vessels. Gary joined AMSA in 1997 as Manager Ship Operations. In 2001 he was appointed as Manager Navigation Safety and in 2004 was appointed General Manager, Maritime Safety and Environmental Strategy.

AMSA is responsible, on behalf of the Commonwealth Government, for the regulation and safety oversight of Australia's shipping fleet and management of Australia's international maritime obligations. AMSA is funded largely through levies on the shipping industry.

AMSA's role is to enhance safety through:

- The provision, operation and maintenance of a network of marine aids to navigation
- Ensuring the seaworthiness and safe operation of Australian and foreign vessels in Australian waters
- Administering the certification of seafarers
- The provision of a maritime distress and safety communications network
- The operation of Australia's Rescue Coordination Centre and coordination of search and rescue operations for civilian aircraft and vessels in distress

And also to protect the marine environment by:

- Administering programmes to prevent and respond to the threat of ship-sourced marine pollution; and
- Managing Australia's National Plan to combat pollution of the sea by oil and other noxious and hazardous substances.

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