LP NEWS

8 JUNE 2007

Bridge technology

limitations and evidence preservation

What would an emergency situation reveal about your crew's understanding of bridge technology?

Although bridge technology has advanced in leaps and bounds in recent years, accidents are still happening and evidence that could be preserved is being lost. If properly understood, however, these technological advances can have a significant, and positive impact. Whilst, at sea, such understanding will inevitably improve safety and the efficacy of the bridge team, bridge technology also has a crucial role to play in the field of casualty investigation – should the worst ever happen.

In a world where an in-depth familiarity with bridge equipment amongst mariners is becoming increasingly desirable, it is worthwhile exploring the scope of this technology. In addition to exploring the capabilities (and limitations) of some of the latest technology, this article will also address the evidence preservation facilities contained within such equipment. In the event of an incident, the importance of knowing how evidence can and should be preserved cannot be understated. Unfortunately, it is often when something goes wrong that a lack of in-depth knowledge of the equipment in question is exposed; but by then, of course, it is far too late and the damage is done.

GPS

Although GPS is hardly a recent technological advance and will be familiar to most mariners it is as important as ever on the bridge and is a useful tool in evidence collection.

NAVSTAR GPS

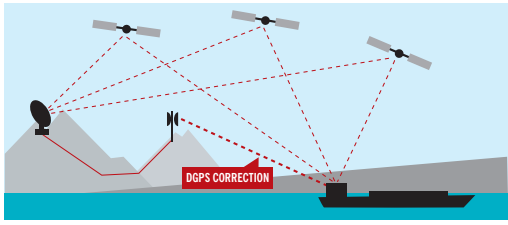
For the purposes of navigation, visual fixing, where possible, is still the best method of navigation and is to be encouraged. When visual fixing is not possible, however, a system such as the NAVSTAR GPS provides a highly accurate means of positioning a ship (95 per cent accuracy in the order of 100 metres).

GLONASS

Unlike the NAVSTAR GPS, the alternative GLONASS system is not deliberately degraded by selective availability (SA) and is, therefore, considered more accurate.

DGPS

These days, however, many vessels are now equipped with differential GPS (DGPS), which is designed to provide positions accurate to within a few feet. It should be borne in mind, though, that the mere presence of a DGPS set is no guarantee of 'pin point' positions as the system relies on the presence of a shore establishment in the area in question. The shore establishment must be able to transmit the correctional messages required to reduce the inherent errors found in normal GPS. To check whether such an establishment exists, mariners



should refer to ALRS Vol 2. If there is no station in the area, then DGPS will only provide readings with the accuracy of normal GPS and the mariner should be warned accordingly. Even with DGPS fitted, position accuracy should not be taken for granted because, to work properly, GPS must be correctly set up in the first place.

Datum

GPS positions are generally referenced to the global datum WGS 84 but can be tuned into other datums if necessary. The GPS datum in use should therefore be checked to ensure that it is consistent with the area and chart in use. On a recent casualty, for example, a ship built in the Far East was found using a Japanese datum in the Mediterranean (WGS 84), seven years after build. As a result, the GPS was providing navigational information with a near 5 cable inaccuracy, resulting in a half mile error on all the vessel's waypoints transposed from GPS onto the ship's ARPA radar. Had the ship been relying on GPS to navigate (rather than

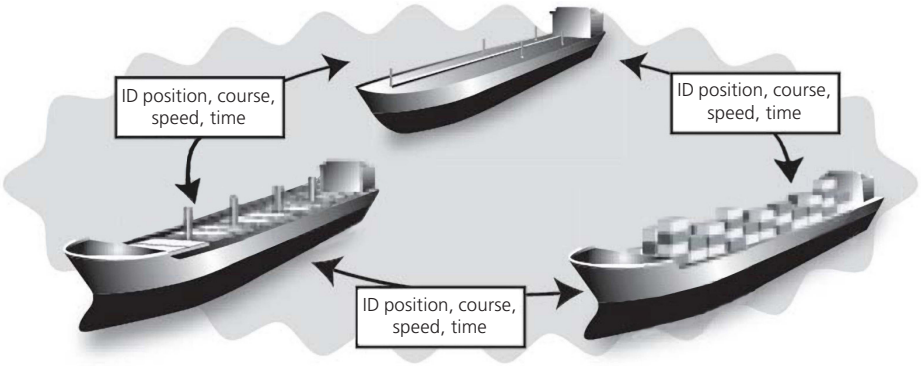
UK P&I CLUB

visual fixing) or had been using electronic charts, the inaccuracy of the positions shown on the screen would have been highly dangerous.

It is also important that mariners be reminded that GPS has many other functions beyond its immediate role of providing a position to fix on a chart. For example, the input from GPS provides an essential input to other navigational systems on the bridge, such as electronic charts and automatic identification systems (AIS), discussed in further detail below. If GPS fails, or is incorrectly set up, then many other systems on the bridge will cease to function.

Finally, in the event of a casualty, GPS plays an important role. GPS will not only provide all the waypoints in use for a particular

transit but should provide, if set up correctly, a valuable track history of the ship. Such information can provide an investigator with extremely helpful data in determining a ship's movements and position prior to the casualty which may, in turn, dictate the direction of the investigation and any litigation. Even if the GPS does not have a print-out facility, photographs taken of a GPS track history screen can be superimposed onto a chart. This will then provide an accurate plot of a ship's movements in the event that VTIS, for example, is unavailable.



AIS

The automatic identification system (AIS) is a shipboard broadcast transponder system from which ships continually transmit certain data to all nearby ships and shore-side authorities on a common VHF radio. Specifically, ships transmit their identification, type, position, course, speed, navigational status and other data. AIS also automatically receives similar information from other ships with AIS and has the ability to track and monitor such vessels. AIS may also exchange data with shore-based facilities.

Regulation 19 of SOLAS Chapter V requires AIS to be fitted on board all ships of 300 gross tonnage and upwards engaged on international voyages, cargo ships of 500 gross tonnage and upwards not engaged on international voyages and all passenger ships irrespective of size. The requirement became effective for all ships by 31 December 2004.

The obvious advantage of AIS is that it can help identify nearby vessels, even if not visual (say around a bend on a river or due to poor visibility), thus making the calling up of such vessels that much easier and accurate. That said, while the use of AIS and VHF may be justified for collision avoidance purposes on rare occasions, observance of the Collision Regulations should be paramount and the Courts take a very dim view of ships colliding as a result of misunderstood VHF conversations. Mariners may wish to refer to MGN 324 (M+F) in this respect.

The information provided by AIS comes from two primary sources; GPS for information such as position, course and speed and manual data input for cargo details, drafts and ports of call. Therefore, if the GPS position data is inaccurate then the information provided by AIS will be wrong. Likewise, any error on the part of the crew inputting data will be transmitted on AIS and mariners should, therefore, be extremely wary of relying on the information provided.

The AIS is often fitted with an anti-collision facility, either in isolation or as part of its integration with other systems such as ARPA. It should not be forgotten, however, that it is a matter of international practice that CPAs should be calculated using 'speed-through-the-water' (as provided by a ship's log and used by ARPA) rather than 'over-the-ground' (as given by GPS). It is for this reason (amongst others) that AIS, as an anti-collision device, has its limitations and should not be used in isolation. In a November 2006 Admiralty Court ruling, Mr Justice Steel considered the role of AIS and opined that;

"There are dangers associated with the use of this [AIS] equipment. First there may be a temptation for its use in preference to, or even in isolation from, other navigational aids. In fact, the primary instruments for safe navigation must remain an alert and systematic visual and radar lookout. Information derived from AIS may be erroneous".

Mariners should refer to MGN 324 (M+F) and MSN 1781 (M+F) in this regard and be warned accordingly.

As with GPS, if an incident occurs, AIS is again an extremely useful tool in terms of evidence collection. Some AIS systems have a recording facility and masters should be encouraged to check their sets and use the facility if fitted. If preserved, AIS data not only provides information about your own ship's movements but also about other vessels in the area, including those who may well have witnessed the incident, even if not directly involved.

Often, AIS data is transposed onto the ARPA radar or electronic chart systems which have their own recording facilities. In such cases, it is important that, where possible, AIS data (and any other electronic information) is saved as soon as possible after an incident has occurred as it is common for most recording facilities to only save data for a pre-set period, after which the information is overwritten. If an incident occurs within a port or in coastal waters, AIS data is often recorded by VTS stations, as well as an

increasing number of independent providers who will provide quick access to the data for a fee. However, as indicated above, AIS data is only as good as the information given to it and should not be relied upon in isolation.

Electronic charts

Electronic navigation, although still relatively new and unfamiliar to many, is becoming increasingly common and is likely to replace the paper chart in the not too distant future.

Official electronic charts come in two forms: ENCs (electronic navigational charts) or vector charts and RNCs (raster navigational charts). Unofficial commercial charts are also available and are becoming more widespread as an additional navigation tool.

ENCs (electronic navigational charts) / Vector charts

ENC charts are digitally mapped and can be customised as required by the user. If, say, a ship's draft is 8 meters, then all depths over 15 meters can be removed from the screen as they are not relevant. Another option is to remove light characteristics on the display during daylight hours. Vector charts can also be interrogated to reveal further information, such as sailing directions and are therefore considered to be 'intelligent'.

RNCs (raster navigational charts)

Raster charts are essentially a visual scan of the familiar paper chart. Positions can be continually updated with GPS or automatic position fixing by overlaying waypoints and bearing and distance lines. But, unlike ENCs, Raster charts are not considered 'intelligent' as the chart features cannot be interrogated or customised.

Replacement for paper charts?

Only ENCs, used in conjunction with an electronic chart display and information system (ECDIS), can be used in place of paper charts. Raster charts and commercial charts, even if used on an ECDIS system, cannot be considered a replacement for paper charts and mariners caught relying on them instead of the paper charts will find little sympathy with the Courts. Mariners should refer to MGN 285 (M+F) for further advice. A mariner using privately produced electronic chart data should be aware that these do not satisfy the international carriage requirements for charts; reference should be made to MGN 319 (M+F) to ensure that proper procedures for their use are being observed.

The attraction of an electronic chart system, whether vector or raster, is that it provides a clear display that gives a real time picture of a vessel's positions and navigation track. If integrated with other systems, it may also show ARPA radar and AIS tracks, providing the watch keeper with a 'one stop' screen for all the necessary information to keep the vessel safe.

However, like any system that relies on human input, errors are inevitable and should be borne in mind whenever the technology is being used. There have already, for example, been cases where depths below a ship's draft, rather than over, have been removed from the ENC, resulting in the vessel grounding. A more common danger, however, occurs when the watch keeper becomes fixated with the screen and either forgets that he should be navigating using his paper chart (in breach of SOLAS) or fails to maintain "an alert and systematic visual and radar lookout.

Like most other electronic navigation aids, electronic charts are likely to have a recording facility. In fact, it is a requirement for ships fitted with ECDIS. Clearly, any record showing a ship's movements in relation to the relevant chart will provide useful evidence, particularly if any ARPA and/or AIS data has also been captured. Masters should be reminded, however, that the records will be overwritten (at times within 12 hours) if the data is not saved. Masters would be well advised to familiarise themselves with the practicalities of data saving during quiet passage time and include the saving of data as part of their emergency response to a casualty; such knowledge will need to be second nature in the aftermath of a casualty. Often, however, the data will be saved in a format that is not readily accessible to a third party without the necessary software. Owners should check whether the information on their equipment can be readily downloaded or whether a manufacturer's technician will be needed. If a technician is required, he should be put on stand-by to attend a casualty as soon as possible after an incident to extract the necessary evidence.

A common error in this area, is for the navigator to save the entire passage plan of a voyage which may last some days, when the relevant section consists only of the last hour before the incident. While the preservation of all evidence is to be encouraged, common sense must also prevail, and a huge data file consisting of many days of voyage is likely to crash the ECDIS during playback, or prove impossible to download without the aid of a technician when, really, it should be a task within the capability of those onboard.

Voyage data recorder (VDR)

Voyage data recorders are often referred to as 'black boxes' (although they are often, in fact, bright orange) and have been a common feature on aircraft for many years. With the maritime community finally catching up, the relevant regulations are now contained in chapter V on Safety of Navigation of the International Convention for the Safety of Life at Sea, 1974 (SOLAS). VDRs are now a mandatory feature on all passenger and Ro-Ro ships and any ships of 3,000 GT and upwards constructed on or after 1 July 2002. For vessels of 20,000 GT and over, constructed before 1 July 2002, simplified or S-VDRs (less extensive and cheaper VDRs brought in to promote retro fitting) must be fitted during the first dry docking after 1 July 2006, but not later than 1 July 2009, and for vessels of 3,000 – 20,000 GT, during the first dry docking after 1 July 2007 but not later than 1 July 2010.

In line with aviation 'black boxes', VDRs are designed to record all mechanical and operational data that might be used to reconstruct a casualty. The VDR recording should include a record of the vessel's course and speed through the water, radar data, transmitted and received voice communications, depth beneath the keel and rudder orders and responses. The more sophisticated versions may also record such data as the status of weather tight and fire doors and hull stress.

The data must be stored into a protective memory capsule that has been hardened to withstand extreme fire, shock and water pressure conditions. VDRs are required to maintain a record of all data for a minimum

of 12 hours (Class often require 24 hours and many manufacturers provide a longer period), after which the information may be overwritten. To ensure a VDR continues to record events during and after an incident, it should be capable of operating from the ship's emergency source of electrical power. In the event that this fails, a VDR should, as a minimum, continue to record bridge audio from a dedicated reserve source of power for a period of 2 hours. After 2 hours, all recording should cease automatically.

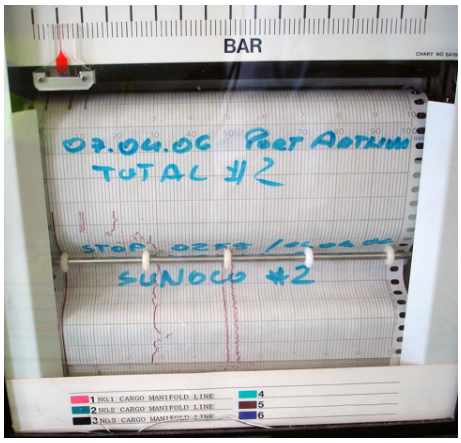
During many incidents, however, power sources will not be completely lost and the VDR will therefore continue to record events in the normal fashion (i.e. for a minimum of 12 hours before being overwritten). For the purposes of evidence collection, therefore, it is important to identify early on if a vessel is fitted with a VDR and for the information it contains to be retained or downloaded as soon as possible. Should all power be lost (for example when a vessel sinks or is lost to fire) a VDR will retain the last 12 hours (or more if set up to do so) as a final recorded medium installed in a protective capsule (floating or fixed) that should retain the data for at least 2 years.

The data supplied by VDRs need not be reserved for casualty evidence alone. The data can also be retrieved and downloaded at any time for training purposes (following a close quarters situation, for example). However, as with some electronic chart outfits, VDRs will often require a manufacturer's technician to attend and download the data. Following any casualty, therefore, it is important that the master preserves the data and a technician is brought on site to access the data as soon as possible.

With modern bridges bristling with navigational equipment it is important for crew to know which pieces of equipment feed into the VDR. For example, crew may be using the portside radar for collision avoidance on a small range, when in fact the starboard side radar is recording but it is set to a large range with no plotting data. The annual tests by technicians can be used to ensure equipment is identified and properly labelled if this has not already been done during installation of the VDR.

Course recorders, telegraph printers etc

Crew should not disregard the significance of evidence obtained from course recorders, telegraph printers and other 'mechanical'



pieces of bridge equipment. Investigators and judges alike still place great significance upon the data retrieved from these sources, and should the electronic equipment have failed, as we sometimes see, it is likely this record will still be available. Good practice dictates that this equipment is regularly checked for correct operation and synchronised.

Conclusion

Clearly, the use of electronic equipment is only going to increase and become more sophisticated with each passing year. Whilst undoubtedly a benefit to the navigator, the aids are only as good as the user's training and the input and interpretation of the information received. The Courts in the UK have, time and again, advised that there is nothing as effective as the human look-out to avoid collisions and groundings. Despite the warning, there is a growing percentage of casualties that have resulted, in whole or in part, from the watch keeper relying too much on electronic aids and not enough on the traditional methods of keeping a good look-out. Mariners should also be encouraged to understand the additional uses of the electronic devices available to them, particularly in the event of a casualty. The quiet times can usefully be employed to ensure all electronic equipment is correctly set up and that the procedures for evidence preservation during more stressful times are well understood.

Courtesy of: Faz Peermohamed & James Drummond of Ince & Co. January 2007. www.incelaw.com

For further information please contact: Loss Prevention Department, Thomas Miller P&I Ltd
Tel: +44 20 7204 2307. Fax +44 20 7283 6517. Email: lossprevention.ukclub@thomasmiller.com

UK P&I CLUB