



LP Bulletin

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Bulletin 610 - 11/08 - Use of Electronic Navigation Aids - Worldwide

The UK Maritime and Coastguard Agency (MCA) has published a detailed Marine Guidance Note (MGN 379), emphasising the need for correct use of navigational equipment by watch-keeping officers.

Accidents have occurred where the primary cause has been over-reliance on a single electronic navigational aid. Watch-keepers must always ensure that positional information is regularly cross-checked using other equipment, as well as visual aids to navigation. In other cases accidents have occurred where the watch-keeper was not fully conversant with the operation of equipment or its limitations.

The MGN addresses owners, masters, skippers, officers and crews of merchant ships and fishing vessels with the following key points:

- Be aware that each item of equipment is an aid to navigation
- Be aware of the factors which affect the accuracy of position fixing systems
- Appreciate the need to cross check position fixing information using other methods
- Recognise the importance of the correct use of navigational aids and knowledge of their limitations
- Be aware of the dangers of over-reliance on the output from, and accuracy of, a single navigational aid.

View the full text of the twelve page document on the MCA website at the following address:
<http://www.mcga.gov.uk/c4mca/mcga-mnotice.htm?textobjid=B94E7C9E5EB6C418>

The following extracts highlight some of the main points of the Marine Guidance Note:

Radar plotting aids

Collisions have frequently been caused by failure to make proper use of radar and radar plotting aids in both restricted visibility and clear weather. Common errors have been deciding to alter course on the basis of insufficient information and maintaining too high a speed, particularly when a close-quarters situation is developing. Information provided by radar and radar plotting aids in clear weather conditions can assist the watch-keeper in maintaining a proper lookout in areas of high traffic density. It is most important to remember that navigation in restricted visibility can be more demanding and great care is needed even with all the information available from the radar and radar plotting aids. Where continuous radar watchkeeping and plotting cannot be maintained even greater caution must be exercised. A "safe speed" should at all times reflect the prevailing circumstances.

Plotting

To estimate risk of collision with another vessel, the closest point of approach (CPA) must be established. Choice of appropriate avoiding action is facilitated by the knowledge of the other vessel's track using the manual or automatic plotting methods. The accuracy of the plot, however obtained, depends upon accurate measurement of own ship's track during the plotting interval. It is important to note that an inaccurate compass heading or speed input will reduce the accuracy of true vectors when using ARPA or ATA. This is particularly important with targets on near-reciprocal courses where a slight error in own-ship's data may lead to a dangerous interpretation of the target vessel's true track. The apparent precision of digital read-outs should be treated with caution.

If two radars are fitted (mandatory for ships of 3000 GT and over) it is good practice, especially in restricted visibility or in congested waters, for one to be designated for anti-collision work, while the other is used to assist navigation. If only one of the radars is fitted with ARPA then this should be the one used for anti-collision work and the other for navigation.

Interpretation

It is essential for the operator to be aware of the radar's current performance which is best ascertained by the Performance Monitor. The echo return from a distant known target should also be checked. Be aware of the possibility that small vessels, ice floes or other floating objects such as containers may not be detected. Echoes may be obscured by sea- or rain-clutter. Correct setting of clutter controls will help but may not completely remove this possibility. When plotting larger targets on a medium range scale, the display should be periodically switched to a shorter range, and the clutter controls adjusted, to search for less distinct targets.

The observer must be aware of the arcs of blind and shadow sectors on the display caused by masts and other on-board obstructions. These sectors must be plotted on a diagram placed near the radar display. This diagram must be updated following any changes which affect the sectors.

Clear weather practice

Radar should be used to complement visual observations in clear weather to assist assessment of whether risk of collision exists or is likely to develop. Radar provides accurate determination of range enabling appropriate action to be taken in sufficient time to avoid collision, taking into account the manoeuvring capabilities of own ship. It is important that watch-keepers should regularly practice using radar and the electronic plotting system in clear weather. This allows radar observations and the resulting electronic vectors to be checked visually. It will show up any misinterpretation of the radar display or misleading appraisal of the situation, which could be dangerous in restricted visibility. By keeping themselves familiar with the process of systematic radar observations, and comparing the relationship between radar and electronically plotted information and the actual situation, watchkeepers will be able to deal rapidly and competently with the problems which may confront them in restricted visibility.

Global Navigation Satellite System (GNSS)

Serious accidents have occurred because of over-reliance on satellite positioning equipment. In one case a passenger vessel grounded in clear weather because the watch-keepers had relied totally upon the GPS output which had switched to dead reckoning (DR) mode because of a detached antenna lead which was not detected by the watch-keepers. Checking the position using other means, including visual observations, would have prevented the accident. Accidents have occurred when using a track control system linked to the GNSS. In some cases positions of aids to navigation such as buoys have been inserted as waypoints and the vessels have collided with them. The MGN covers in detail various systems including LORAN C, eLORAN, GPS, GLONASS, and GALILEO.

Datum and chart accuracy

GPS positions are referenced to the World Geodetic System 1984 Datum (WGS 84). This may not be the same as the horizontal datum of the chart in use, meaning that the position when plotted may be in error. The receiver may convert the position to other datum; however these facilities should be used with caution. In this case the observers must ensure that they are aware of the datum of the displayed position. Where the difference in datums is known, a note on the chart provides the offset to apply to positions referenced to WGS 84 for plotting on the chart, but

where this offset is not provided, the accuracy of the plotted position should be treated with caution. DGPS positions are normally referenced to WGS 84 though regional datums, corresponding to WGS 84, may be used [e.g. North American Datum 1983 (NAD 83) in the USA] and European Terrestrial Reference System 1989 (ETRS 89). Many areas of the world have not been surveyed to modern standards hence the positional accuracy of the charted detail on the paper chart, Raster chart or ENC may not be as accurate as the GNSS receiver derived position. Mariners should allow a sensible safety margin to account for any such discrepancies.

The prudent navigator should never rely totally on GNSS navigation and should regularly cross check the ship's position using other means particularly in areas where the charts are based on old surveys. Mariners must read the note on satellite-derived positions on the Admiralty charts for more information. Further information can be found in the Mariner's Handbook (NP 100) and in Annual Summary of Admiralty Notices to Mariners, No19. Volume 2 of The Admiralty List of Radio Signals published by UKHO contains full descriptions of all GNSS systems, with notes on their correct use and limitations. Also included are descriptions and examples of over-reliance on GNSS, and a full account of the problems caused by differing horizontal datums. Mariners using satellite navigation systems are strongly advised to study the information and follow the advice contained in this publication.

The accuracy and functionality of electronic aids to navigation has increased considerably in recent years. However there is still a danger that over-reliance on the output from a single item of equipment may lead to an accident. The need to cross-check the vessel's position using other means is as important today as it ever was, as is the basic requirement under Rule 5 of the International Regulations for Preventing Collisions at Sea, 1972 as amended, known as COLREGS to maintain a proper lookout. Accidents have occurred with ships equipped with the best of equipment where watch-keepers have been over-reliant on the equipment output, and disaster could have been averted by the simple expedient of maintaining a proper lookout.

Source of information: UK Maritime and Coastguard Agency (MCA)
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