ECDIS use on board ship

ECDIS can provide navigators with high levels of situational awareness, which should reduce the number of collisions. However, this is not always the case. This article explores why.

Richard Bell
Loss Prevention Executive
T +44 20 7680 5635
E richard.bell@ctplc.com

Introduction

The advantages of ECDIS assisted navigation can only be realised if operators are properly trained and provided with procedures relating to its use. The requirement for generic training courses is well known in the industry, but this is not sufficient. As this article will demonstrate, operators should be trained on their own specific system and companies should develop guidelines relating to ECDIS use and settings management, to ensure the required safety outcomes.

All ECDISs work the same way... don't they?

Whilst common standards exist for ECDIS (principally embodied in MSC.232 (82) *Adoption of the revised performance standards for electronic chart display and information systems*), these standards focus on general requirements, leaving details of how the ECDIS accomplishes these requirements to the manufacturer. This has resulted in wide variations between ECDIS brands, meaning that officers trained on one model of ECDIS will not necessarily be able to safely use another model.

A good example is the way in which various ECDIS brands satisfy 11.4.15.1 of MSC.232 (82), which concerns the use of lines of position (LOPs) on ECDIS. LOPs enable the ECDIS to be used in the event of a Global Navigation Satellite System (GNSS) failure; it also allows operators to monitor the accuracy of GNSS using ranges and bearings.

Different ECDIS models use different means to generate LOPs, including:

- pre-selected reference points
- drag and drop functions
- click and assign functions.

An unfamiliar navigator may not be able to generate LOPs, making fixing impossible.

This problem extends to nearly every function on ECDIS. Different models have very different menu structures, aesthetics and terminology, meaning a user without specific training would struggle to competently navigate their ship. In recognition of the importance of this issue, port state inspectors have included checks on the knowledge of crews in their activities.

Obligations

Regulatory

The obligations regarding familiarisation training for shipowners derive from two distinct sources: the ISM Code and STCW 2010.

The ISM Code sections on familiarisation highlight the need to familiarise new staff and staff assigned to new roles with their duties, if their duties relate to safety and protection of the environment. The relevant sections are 6.3 and 6.5.

STCW 2010 I/14 1.5 states that it is the responsibility of the company to ensure that:

'seafarers, on being assigned to any of its ships, are familiarized with their specific duties and with all ship arrangements, installations, equipment, procedures and ship characteristics that are relevant to their routine or emergency duties'.

Such requirements extend to ECDIS, meaning that shipowners must make proper provisions to ensure that their officers are familiarised with the type of ECDIS they will be operating when serving on board ship.

Flag state

The approach of flag states to the issue of familiarisation varies. It is therefore important for shipowners to understand their own flag state's requirements for ECDIS familiarisation. Two flag states that have differing approaches are the UK's Maritime Coastguard Agency (MCA) and the Australian Maritime Safety Agency (AMSA). These are compared below.

UK-MCA

The MCA's policy towards familiarisation training is contained in Marine Information Note (MIN) 503 (M). This MIN 503 replaced MIN 442 and details the familiarisation training requirements for UK flagged vessels:

- The training must relate to the make and model of the equipment fitted on board the ship they are currently serving.
- It reminds owners and operators of their obligations/responsibilities for ship-specific training and the need to comply with the requirements for ship-specific training.
- MIN 503 does not make specific reference to what types of training will be accepted by the MCA to meet the requirements for familiarisation.

AMSA

The AMSA's requirements for familiarisation training are more specific and include:

- the responsibility of the master to verify that the OOWs are competent in the use of ECDIS
- the areas of training that should be included for familiarisation
- a ban of 'trickle-down training' and the definition of this term
- a definition of the instructor qualifications required to provide familiarisation training, which may also include a manufacturer's computer-based training package.

Such variations make it crucial for shipowners to be fully conversant with their flag state's requirements to ensure compliance.

Ensuring compliance

Practical tips on familiarisation training

Using the same model of ECDIS throughout a fleet will greatly simplify the issue of familiarisation training. The Nautical Institute's Industry Recommendations for ECDIS Familiarisation is a useful guide to the items that should be included in familiarisation training and can be used as a framework for bespoke onboard familiarisation procedures.

Companies should research all of the options available to ensure that they source a familiarisation training package that is right for them and acceptable to their flag state. Such options include:

- computer-based training either on DVD or the internet
- manufacturer's training course complemented by onboard familiarisation
- onboard training conducted by manufacturers
- onboard training conducted by appropriately certificated company staff (train the trainer courses).

ECDIS procedures

Companies should develop guidelines relating to ECDIS use and settings management. Without guidelines, variations in ECDIS use will occur within a fleet and it is inevitable that some of these variations will be unsafe.

Investigations of groundings involving ECDIS often involve:

- incorrect safety depth/ contour settings
- inadequate anti-grounding settings
- inadequate display settings
- incorrect chart scale being used.

Such deficiencies indicate that the operator was not competent or that the procedures for ECDIS were inadequate/poorly enforced.

ECDIS procedures should be decided by a suitably qualified mariner within a company, ie somebody fulfilling the role of a 'subject matter expert'. Methodically working through each of the functions and settings in an ECDIS manual until each is fully understood is the best way to gain subject matter expertise. This requires 'hands on' time with the appropriate model of ECDIS. When this process is complete, a full understanding of the capabilities and limitations of the selected model will have been gained. A company's subject matter expert can then develop its ECDIS procedures/policy. This policy should complement existing arrangements and ensure that a uniform standard of ECDIS navigation is maintained throughout a fleet.

ECDIS procedures should be created for different navigation stages, including:

1. pre-departure
2. pre-arrival
3. passage monitoring
4. loss of GNSS or other sensor
5. failure of an ECDIS system
6. transition from ENC to RNC.

Example ECDIS procedure: pre-departure

This procedure should ensure that when the vessel departs the berth, the ECDIS is properly set up and ready to use for navigation. The requirement to set up ECDIS equipment should be added to the existing pre-departure checklist and a second detailed list of required ECDIS settings provided. Once these settings have been applied, many of them will remain unchanged for the duration of a voyage. The ECDIS settings/features below should be considered pre-departure. This list is not exhaustive and is dependent on the model of ECDIS used.

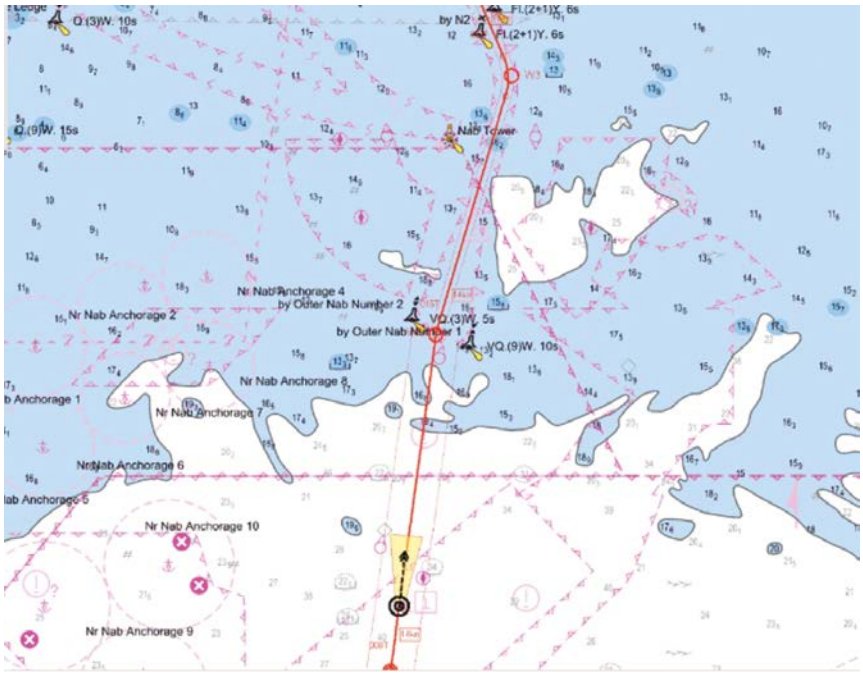
- Safety depth and contour values
- Depth shades
- Buoyage types: simplified or traditional
- Palette: night or day
- 1:1 or compilation scale to be selected
- Docking/berthing mode if applicable
- ENCs required for the voyage installed and available, and updated
- Sensor selection is correct:
  - Gyro
  - GNSS
  - Log
- Appropriate route is available and selected
- Anti-grounding function is activated:
  - Appropriate distance ahead
  - Appropriate width and angle
- Chart notes are displayed for the voyage
- Parallel indexes are displayed for the voyage
- Chart maps are displayed for the voyages
- Overlays are selected:
  - Automatic identification system
  - Radar image overlay
  - Admiralty information overlay
- Primary and secondary past track selection
- Chart display settings:
  - Pre-saved group is selected or settings as per list
- Vector length

A note on chart display settings
One of the most common complaints about ECDIS is that it does not contain the same information as a paper chart. If an ENC is missing information, it is often due to the operator's chart display settings being inadequate. When deciding on chart display settings, there are several things to consider:

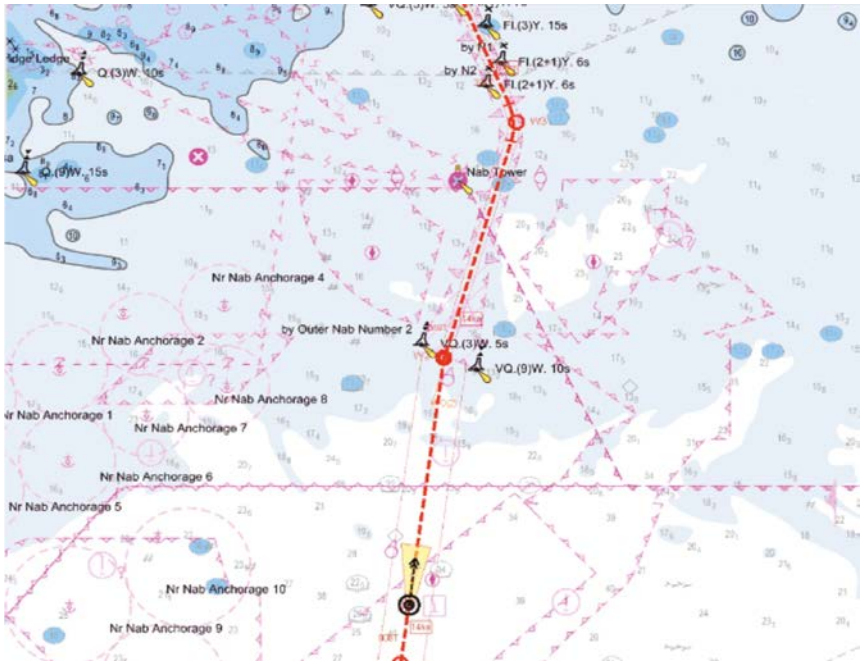
1. Always start from the standard display and add more layers.
2. Some ECDISs have the capability to save chart display settings; this means that multiple configurations can be saved for different situations.
3. A good rule of thumb is to add chart features until the ENC has a similar level of detail as a paper chart.
4. Many mariners consider an ENC displaying 'All' chart features (sometimes referred to as All Other) to be too cluttered. However, great care should be taken when deciding which chart features to omit to ensure that important information isn't left off the display.
5. Operators who use specified chart display settings will quickly learn to identify when incorrect settings have been applied and can challenge the user or correct the mistake.

Great care should be taken when deciding which chart features to omit to ensure that important information isn't left off the display.

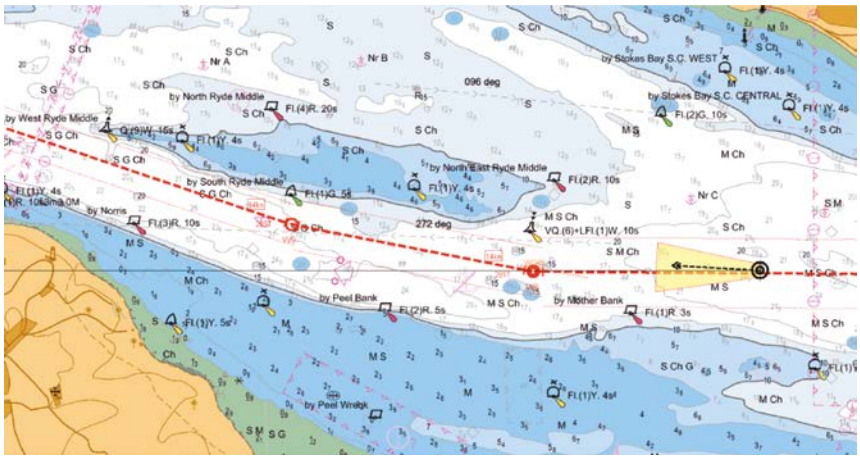
The decisions regarding ECDIS set-up and 'chart display settings' should be determined centrally, by a subject matter expert who has weighed up the implications and determined how best to ensure navigation safety. One of the strengths of ECDIS is that once the 'ideal settings' have been determined for a particular model, these settings can be employed on board all vessels operating the same model. These defined settings enable a master to identify when incorrect settings have been applied, allowing for the enforcement of standards.



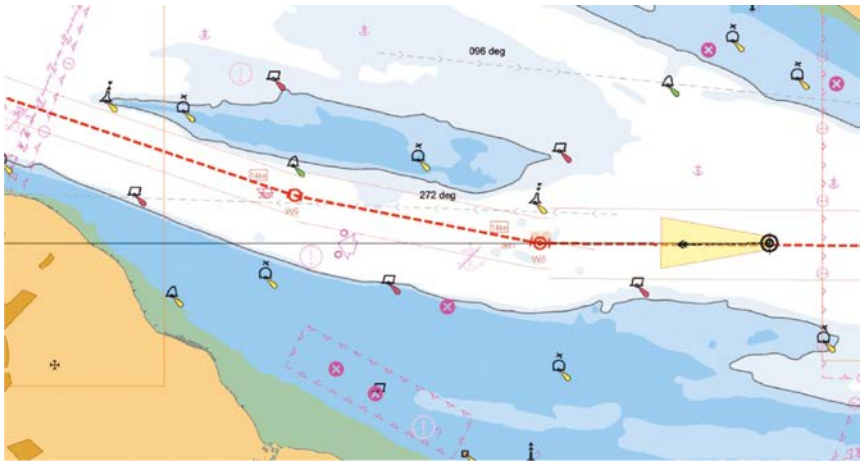
In the screen shot above, the safety contour is set at 20 metres, which is too high a value for the vessel's draft. Because of this, it is not clear to the operator where safe water is located. The vessel must also cross its safety contour during its passage, which will generate an alarm.



In this screen shot, the safety contour is set at the correct value of 10 metres. The safe water can now be easily determined and the vessel will not need to cross a safety contour.



Here, the operator of the ECDIS has prepared the ENC and selected settings to navigate safely, with enough relevant information.



The screen shot above is of 'Standard Display'. Whilst the buoys are visible and safe water can be determined, there are few geographic features, no names on the buoys and no soundings to enable monitoring of depth under the keel. Most mariners would consider this level of ENC chart features inadequate for navigation.

At the club, we have seen screen shots taken post incident which have a similar level of detail to 'Standard Display'.

Conclusion

ECDIS is now firmly established as a navigation aid within the industry, but it will only be mastered when it is fully embraced. Embracing ECDIS will enable an organisation to know its strengths and weaknesses. Organisations that base their decisions relating to ECDIS on research and sound principles will be able to get the most out of their equipment and take steps to mitigate the risks associated with its use.

The Standard Club has addressed the issue of ECDIS-related groundings in its Standard Safety Special Edition on ECDIS-assisted grounding. This is available on our website.

ECDIS images kindly supplied by Warsash Maritime Academy:

- **Steve Window, Head of Bridge Simulation WMA**
- **John Saunders, Senior Lecturer WMA**