MOVING TOWARDS THE PAPERLESS BRIDGE

Risk Assessment Method for ECDIS

The champions of ECDIS (Electronic Chart Display & Information Systems) correctly claim that, when properly understood, its use increases the safety of navigation. Its critics point out that it is a complex tool which, used in ignorance, can actually increase risks. This criticism is partly due to the proliferation of different chart formats and the fact that each ECDIS type interacts with the charts in a subtly different way.

The application of Risk Assessment has been used for a number of years to assist in safety procedures in various aspects of the running of a vessel. Until now, it has not been extended specifically to ECDIS and all its functions. This article deals with the key issues associated with the practical application of risk assessment. Despite the well-known benefits of electronic charts over paper charts, the maritime community has been rather slow to adopt ECDIS. There are a number of reasons for this. They fall into three basic categories:

- Production of approved charts has been extremely slow; even now many vessels cannot complete their usual trading route using only official electronic data
- Shipping companies shy away from the complexities of integrating charts from a number of different sources - bear in mind that there is no uniformity in updating frequency, permit types and so on
- There are risks associated with transition from the well-understood and robust area of paper charts (which are still an approved method of navigation) to the rapidly evolving environment of electronic charts

As many mariners are discovering, no computer package is experienced as truly intuitive by one with little or no prior knowledge of computers.

Risks and Legislation
Maritime Authorities are aware of this reticence on the part of ship-owners to migrate more quickly to electronic navigation and have attempted to make the prospect more attractive.

In 1998, the IMO Maritime Safety committee agreed to allow a dual fuel approach, whereby official Raster data could be used to plug the gaps between areas of ENC (Electronic Navigational Charts, specifically in S57 format) coverage, provided the mariner maintained an appropriate portfolio of up to date paper charts. It was left to the flag states to define what constitutes an appropriate portfolio.

Certain maritime authorities set up pilot projects to encourage local ship-owners to start using electronic charts and gave their permission for those vessels to navigate with a minimum number of paper charts. The Netherlands and UK Authorities permit both Raster charts and ENCs to replace paper. Other Authorities, particularly those in the Baltic, insist that only the use of ENCs with 2 type-approved ECDIS will result in a reduction of paper charts.

The pilot projects did not lead to greater numbers of ship-owners applying for the same dispensation and a more formalised approach was set out by the UK MCA (Maritime & Coastguard Agency) in 2001 in MGN 133. This required all ships seeking permission to operate using ECDIS or RCDS (Raster Chart Display System) without paper chart backup to formally assess the risk of electronic navigation and to submit their risk assessment for approval by the MCA. In early 2002, this was augmented by the release of MGN 194, which set out in detail the definitions of risk and the preferred method of completing such an assessment, including a list of suggested hazards to be considered.

Risk Assessment Definitions
For the purposes of this discussion, the following definitions have been used:

- Hazard: a source of navigational error with potential harm or damage to personnel, own ship, other ship or environment
- Risk: the likelihood of the hazard occurring, combined with the severity of the hazardous event
The hazards associated with the use of ECDIS fall into three categories:

- The equipment itself (both hardware and software) may suffer from potential virus infection, power outages, loss of input of sensory equipment (depth, gyro, speed etc.)
- The charts themselves are at risk from permit expiry, out-of-date charts being used, updates not applied correctly, excessive zooming (in the case of Raster charts), inability to open the next chart required (Raster charts). Most of these hazards can be mitigated or even eliminated, if bridge crew are properly trained in the use of ECDIS
- The particulars of these risks are unique to each vessel, crew and equipment, and can only be assessed on a case-by-case basis. Other factors, such as area of operation and nature of cargo, will also have a bearing on the severity of the hazard and therefore the risk

Assessment Process
This has four stages:

1. Establish the Hazards
   - This should include hazards specifically associated with operation in RCDS, and others which refer to ECDIS in general. The limitations of RCDS are well-known: it is a chart-based system (which affects look-ahead capability); it will not trigger alarms; there may be datum shifts between charts; it cannot be interrogated; it is not possible to select safety contours; orientation to â€œcourse upâ€ is often not practical.
   - Hazards associated with ECDIS failure would comprise: hardware or software failure, power failure, incorrect application of chart corrections, input failure (e.g. GPS, depth), virus infection.
   - Establish the Hazards
2. Determine the Risk
   - This should be determined by estimating both the potential severity of the hazard occurring, and then the likelihood of such an occurrence. These should be estimated separately and then combined to produce the risk factor itself. Risk assessment is a subjective process and therefore the vessel should provide documentation or other proof to back up any assumptions made regarding these estimations.
   - Take the case of virus infection. Although a virus designed to wipe clean the computer hard drive presents a critical hazard, if the procedure used on a vessel always virus checks (with up-to-date anti-virus software) all received files, and the ECDIS is not networked to the PC with Internet / e-mail access, the likelihood of the hazard occurring is extremely low.
3. Decide if the Risk is tolerable
   - Using the combination of factors described above, a risk matrix is applied and the risk is categorised at one of five levels, from trivial to intolerable. A substantial or intolerable risk would indicate that better procedures need to be implemented before any reduction in paper charts should be considered.
   - In our case of virus infection, this represents a moderate risk. It may be possible to improve procedures in order to further reduce this.
4. Controlling the risk
   - This is the opportunity to improve onboard procedures and to develop a â€œbest practiseâ€ method of operation with which all crew involved with the ECDIS are familiar. They will reduce the likelihood of the identified hazards occurring and thus the overall risk factor. This also allows for the provision of emergency procedures, should any unlikely hazard occur, to further mitigate the severity of its impact on the ship, its crew and the environment.
   - Once the procedures have been formally assessed and appropriate supporting documentation gathered, you are now in a position to present your petition for a reduction in the number of paper charts carried on board.

Practicalities
The above procedure outlines the guidelines produced by the MCA. They also recommend that the best qualified person to conduct such an assessment is someone who is familiar with the vessel, her trading pattern, onboard procedures and the ECDIS. This means, of course, the master or second officer would have to add it to the list of their duties.

There is help available. Kelvin Hughes worked closely with the MCA to interpret the guidelines and transform them into a practical service which assists the mariner complete the assessment from collation and assessment, through actions and control procedures and finally on to the presentation and application itself. Lloyds Register Fairplay have a generic Risk Assessment programme for the marine industry, and other independent consultants with knowledge in the field may be able to provide advice. Certainly, for the novice the process is a minefield.

Benefits of Risk Assessment
Conducting a risk assessment for a ship involves recognition of potential shortfalls in migrating from paper to digital navigation and helps focus attention on removing these shortfalls, therefore increasing safety (and decreasing frustration on board!).

It should also accelerate the migration to electronic navigation and thus bring forward the benefits associated with digital charts, such as easier navigation, greater accuracy, quicker correcting, and the cost savings inherent in reducing the number of paper charts required.

It is clear that there are a number of difficulties associated with starting to use electronic charts, such as relatively poor coverage of chart data, complexity of integrating charts from multiple sources, complexities of flag and port state control requirements, and the additional cost of maintaining two systems during the transition period.

A risk assessment will help to recognise and manage these risks. It should lead shipping companies to ensure that their staff receive adequate training in the functionality of their particular ECDIS, with the type of charts they have chosen to use. The use of electronic charts is set to increase and early understanding of the issues and risks will help crews prepare for this.

Formally documenting the procedures will further lead to adoption of best practise methods, simplifies the training of new crew members and makes for a simpler job for the new master who boards the vessel shortly before leaving port.

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