Note

A Survey of Mariners' Opinions on Using Electronic Charts

Igor Karnicnik, M.Sc., Geodetic Institute of Slovenia, Slovenia.

A new component of modern shipborne navigation equipment is the Electronic Chart. Whether it is an Electronic Chart Display and Information System (ECDIS) or an Electronic Chart System (ECS), mariners can now steer their ship more safely and with greater efficiency than relying on paper nautical charts. This paper presents the responses to a survey wherein mariners were asked their opinions and views about the use of electronic charts.

Introduction

Navigational charts are important navigational aids on the ship's bridge. The demands of modern navigation are such that it is hard to imagine safe navigation through complex waters with dense traffic without electronic aids to navigation or integrated bridge systems. When using paper charts, a navigator must mentally process many different sources of information in order to decide where and how to sail.

Electronic chart systems and electronic charts are connected to a number of ship's sensors. They process this information and automatically display it on a computer screen for the navigator to use. However, an electronic chart system depends on the ability of the mariner to use it as a navigational aid.

Questionnaire Administration

The purpose of the study was, to collect the views and opinions from actual users of electronic charts - mariners.

The target study group was navigational officers on the bridge rather than the hydrographers or others who may deal with electronic charts (e.g., ECDIS/ECS manufacturers and ENC producers).

The questionnaire contained fourteen questions, and requested basic information about the age, type and size of a ship. Most questions were 'multiple-choice', although some questions requested the respondent's opinions. Two particularly important questions asked mariners their opinion about the advantages and disadvantages of electronic charts. Most questions were related to ECDIS and the use of Electronic Navigational Chart (ENC) data. Other questions dealt with the use of Raster Navigational Charts (RNC).

The survey questionnaire was distributed via e-mail. Some of the questionnaires were also sent (with the help of the Slovenian Maritime Directorate) to the ships in the Port of Koper, Slovenia. All together, 351 questionnaires were sent to various shipping companies, hydrographic offices and ECDIS manufacturers.

Results

Of 351 questionnaires sent, only 87 questionnaires were returned (25%). This relatively low response was due in part to a short time period available to conduct the survey (March - April 2005). The majority of responses were from tanker vessels, followed by container ships and RO/RO ships (Figure 1). Although 22% of the responses were from hydrographic research vessels, there were none from ferries or cruise liners.

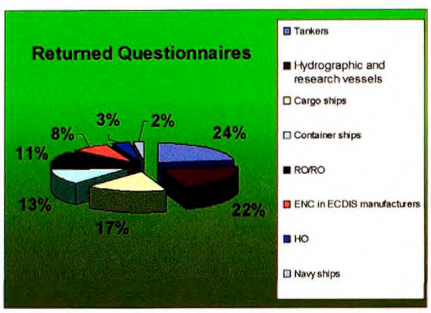

Figure 1. Returned questionnaires by type of a ship.

An important objective was to investigate the use of ECDIS and ENC data on board ships. Based on the results obtained, only 34% use ENCs (Figure 2). However, it should be noted that 49% responded that they are not using electronic charts at all.

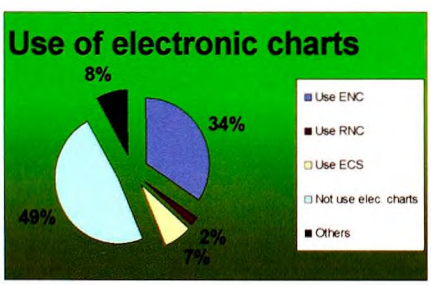

Figure 2. Use of electronic charts by type of a chart.

Analysis

Analysis of responses focused on six main topics:

- What type of electronic chart is used?
- Opinion about availability of ENCs.
- Opinion about use of RNCs.
- Familiarity with the difference between ENC and RNC.
- Advantages and disadvantages of ECDIS and ENC by user's opinion.
- General satisfaction and possible problems related to the use of ECDIS.

Unfortunately, one third of the returned questionnaires were not completed. The reason for this is unknown. Possibly the users were not familiar with the subject, or they did not use electronic charts, or had little time or interest.

ENC coverage

The availability of ENCs for ECDIS appears to be one of the most important restraints towards broader use of ECDIS. Of the answers received, 46% were satisfied with the number of ENC available on the market (Figure 3). However, 36% of the completed questionnaires did not respond to the question.

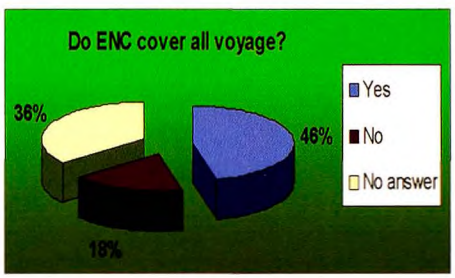

Figure 3. Availability of ENCs.

Use of RNCs

The production of RNCs has been faster and less expensive than ENCs. As a result, most shipping routes are covered by RNCs. Approximately half of the respondents prefer the use of RNCs for all their navigation or to use them when ENCs are not available (Figure 4).

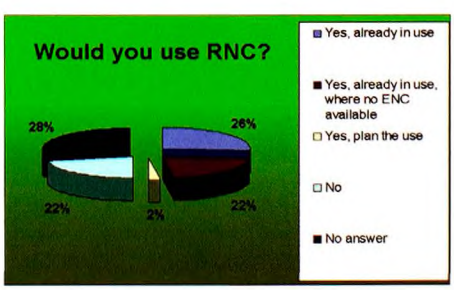

Figure 4. Users opinion about use of RNCs.

Ten percent (10%) believe that ECDIS should only use official ENCs, while 22% have the opinion that ECDIS should work in both modes (e.g., ENC and RNC). The majority consider that ECDIS should only use RNCs if ENCs are not available (Figure 5).

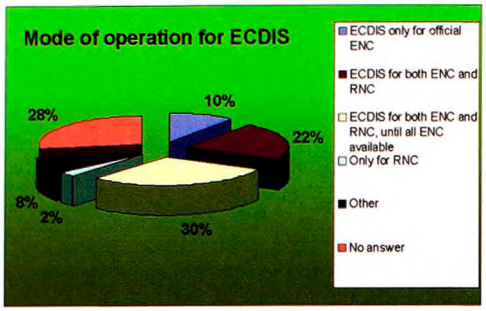

Figure 5. Users opinion about mode of operation of ECDIS.

Some commented that the use of RNCs in ECDIS or ECS already provide mariners with much more than paper charts - the most significant benefit being the display of the ship's position in real-time.

RNCs look like traditional paper charts when presented on the computer screen, whereas ENCs look very different. In this regard, 62% of those who replied to the questionnaire are familiar with the difference between ENC and RNC (Figure 6).

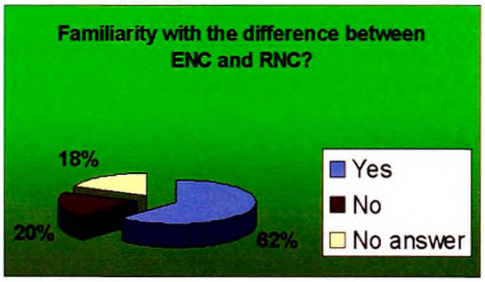

Figure 6. Users familiarity with the difference between ENC and RNC.

There was some confusion about the various acronyms used in relation to electronic charts. For instance, there is confusion concerning what is an ENC vs. a RNC, what is ECDIS vs. RDCS, and what is 'official' vs. an 'unofficial' electronic chart.

Advantages

Figure 7 presents most frequent advantages by the number of received opinions expressed by those who are using electronic charts. The number of responses received are for the same or similar answers, as provided by the users. This approach was chosen in order that the respondents could write freely and not be bound by a list of perceived advantages.

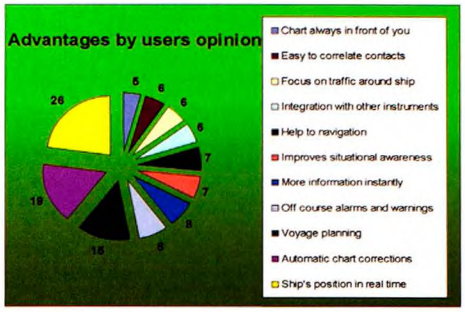

Figure 7. Number of answers received as advantages of ECDIS use.

The most welcome feature of electronic charts as opposed to paper charts is the availability to display ship's position in real-time. This is not new, but it is important to distinguish what is important for mariners during their daily work. The advantage of automatic chart corrections (although some users experienced lack of regular updates of their ENCs) and easy voyage planning were also cited as advantages.

It is interesting to note that automatic indications/alarms were not given high priority. This may be because they are not yet familiar with the function and more training is needed. Other advantages included voyage planning, integration with other instruments (e.g., radar and AIS), and improved situational awareness.

Disadvantages

There were relatively fewer opinions expressed about the disadvantages than there were for advantages (Figure 8). The price of ECDIS/ECS and the lack of ENC coverage were the most disadvantages noted. Others disadvantages included over-reliance in ECDIS and potential power failure.

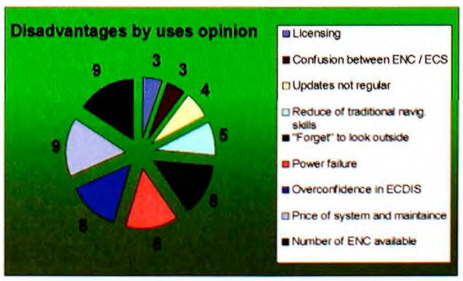

Figure 8. Number of answers received as disadvantages of ECDIS use.

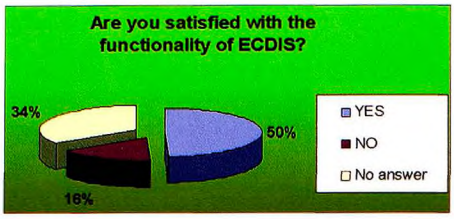

Figure 9. Users opinion about functionality of ECDIS.

Overall opinion

See figure 9. Only 16% of users are not satisfied. This may be due to some experiencing problems related to the system itself, its performance, lack of ENCs, correlation problems with GPS and other sensors. However, only two-thirds of the questionnaires were returned with this section completed.

Since ECDIS is a sophisticated navigational tool, opinions were sought on whether all ECDIS functions are necessary (Figure 10). Only 11% felt that there are functions, which are not needed. Some mentioned that the installation date of a buoy is not necessary. Others believe that the display scale function should be limited in order to prevent over-zooming. Some do not favour encryption of ENCs, and others did not see the need for different day-dusk-night settings of the screen. About 13% of the replies indicate that ECDIS is too complicated. Some consider that there are functions in the system that will never be used. In particular, this results in large menus on the right side of a screen causing less space on the screen for presenting a chart.

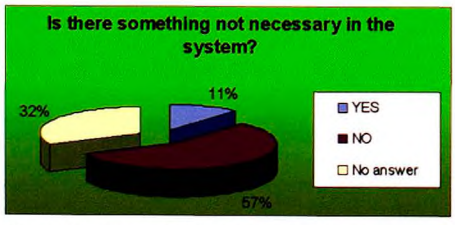

Figure 10. Users consideration about not necessary functions in ECDIS.

In spite of these criticisms most users support the system and share the opinion that it will improve the safety of navigation. In fact, some respondents are convinced that it is already improving the safety of navigation (Figure 11). On the other hand, 21% consider that the system still needs improvement. None expressed the opinion that ECDIS will not contribute to safety. Some of the comments were that

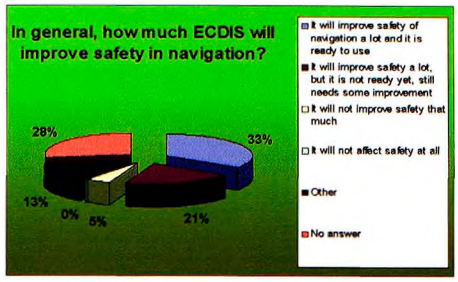

Figure 11. Users opinion on ECDIS benefit to safety on navigation.

ECDIS will improve safety, but only when properly used and with ENCs. Others stressed that the navigator is still responsible and ECDIS alone will not improve safety. ECDIS is a tool to help the navigator in making the right decision.

Summary

For the mariners surveyed in this study, most are in favour of ECDIS. The most welcome feature of electronic charts compared to paper charts is the availability to display ship's position in real-time. However, automatic indications/alarms were not given high priority. Other advantages included voyage planning, integration with other instruments (e.g., radar and AIS), and improved situational awareness.

Fewer opinions were expressed about the disadvantages than there were for advantages. The most often cited included the price of ECDIS/ECS and the lack of ENC coverage. Others disadvantages included over-reliance in ECDIS and potential power failure.

In general, a majority (50%) are in favour of the overall functionality of ECDIS. But, concerns were expressed about some functions that were not used or needed. Almost one-fourth (21%) felt that ECDIS needs some improvement.

References

- Angrisano, G., Leech, J., Bernejo, F. (1999). National Maritime Policies and Hydrographic Services, International Hydrographic Bureau, Monaco.
- Facts about charts and carriage requirements, PRIMAR-STAVANGER and IC-ENC, 2004
- Hecht, H., Berking, B., Büttgenbach, G., Jonas, M.,

Alexander, L. (2002). The Electronic Chart, GITC bv, Lemmer, The Netherlands.
- Hydrographic Dictionary, Vol. I English, 4th Edition, International Hydrographic Bureau, Monaco, 1990.
- IMO Resolution A.817(19), Performance standards for electronic chart display and information systems (ECDIS), London, UK, 1995
- IMO Document SN/Circ.270, Differences between RCDS and ECDIS, London, UK, 1999
- Tinsley, D. (1998). Everard charts new course on raster, Lloyds List, 8th May 1998.

Acknowledgement

The author wishes to thank to all who answered the questionnaire and encourage them to answer other questionnaires in the future. He also wishes to thank the Slovenian Maritime Directorate for their help to distribute the questionnaire to the ships in the Port of Koper.

Geodetic Institute of Slovenia
Jamova 2, SI-1000 Ljubljana, Slovenia
Email: igor.karnicnik@geod-is.si