1 INTRODUCTION

This chapter will begin by explaining what an ECDIS is, including its history and development and what it does, before differentiating it from an ECS, which is a system not officially approved by the International Maritime Organisation (IMO) for navigation. The introduction will then also explain the benefits and potential disadvantages of the ECDIS and will cover the concept and importance of developing an ECDIS mindset.

Some topics introduced here are targeted to provide the reader with a quick overview to gain a better understanding of the overall context of this guide book. Nevertheless an in-depth description follows in dedicated units later on.

1.1 ECDIS – a Complex Navigation Tool

ECDIS stands for "Electronic Chart Display and Information System" and includes not only the visualisation of all paper chart information on a computer screen, but also provides a wide range of other data required for navigational purposes. ECDIS is a highly complex and sophisticated system, which besides the navigational functions includes components of a computer-based information system delivering a real-time display of the navigator's own vessel located with reference to the surrounding sea area.

In the Performance Standards for ECDIS (MSC 232(82)) the following definition is given:

3.1 Electronic Chart Display and Information System (ECDIS) means a navigation information system which with adequate back-up arrangements can be accepted as complying with the up-to-date chart required by regulations V/19 and V/27 of the 1974 SOLAS Convention, as amended, by displaying selected information from a system electronic navigational chart (SENC) with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and if required display additional navigation-related information.

In total, the system includes hardware, application ECDIS software, sensor input interfacing, electronic chart data, rules for presentation and display, status and parameters of alarms and indications, etc. ECDIS provides a real-time display of crucial information with supporting information that may be easily accessed and interpreted in a logical manner. All these items are accessible through an appropriate man-machine interface. Ultimately, the key to the comprehensive ECDIS benefits lies in the electronic object orientated chart data-base and the integration of relevant sensor data.

Although still under development, ECDIS has the capability to include or directly link information from sources such as Tide Tables, List of Lights, Sailing Directions, Radio Information or others in electronic format. Additional optimising applications are optionally available e.g. Weather Routing Systems, Fuel Management, and others.

1.2 History and Development

Electronic navigation has been evolving for more than 25 years. In 1986, the North Sea Hydrographic Commission completed a study, where the first requirements and specifications for ECDIS were announced. During this initiation period, ECDIS was developed as a hydrographic data exchange tool between the national Hydrographic

Offices for common chart production and updating. The maritime industry, however, recognised the substantial potential of the system and the development of ECDIS was driven on by scientists in Germany, the Netherlands, Norway and Canada under IMO coordination and guidance.

Non-SOLAS vessels (yachts in particular) began using electronic navigation features in the early 80s. The commercial shipping industry started to demand safer navigation tools after a number of severe ship accidents, such as the grounding of the EXXON VALDEZ in Prince William Sound, Alaska, requiring more safety for navigation in shallow and confined waters. Interestingly, if Exxon Valdez had had ECDIS on board, at least FIVE warning alarms would have indicated that the vessel was in danger of grounding. Finally, in 1995, ECDIS was officially introduced as a possible alternative to traditional paper charts for the first time. Nowadays, the development of more and more accurate electronic positioning systems has merged with the capability for displaying an electronic chart and has led to the fully operational and approved option of paperless navigation.

Looking back, the last decade has more or less been characterised by the development of technical and training requirements for ECDIS. The most important regulations are listed in the table below.

Year	Resolution	Content
November 1995	IMO Resolution A.817(19)	ECDIS "can be accepted as complying with the up-to-date chart required by regulation V/20 of the 1974 SOLAS Convention, by…"
July 2005	Amendments to SOLAS V	Specific reference to ECDIS statement, that it "may be used to fulfil the chart carriage requirements of regulation 19"
December 2006	IMO Resolution MSC.232(82)	Adoption of the revised performance standards for ECDIS
June 2009	Amendment to SOLAS chapter V/19	Mandatory ECDIS carriage requirements
June 2010	Manila Amendments to STCW	ECDIS competence mandatory for navigational Officers and Masters as from 01/2012

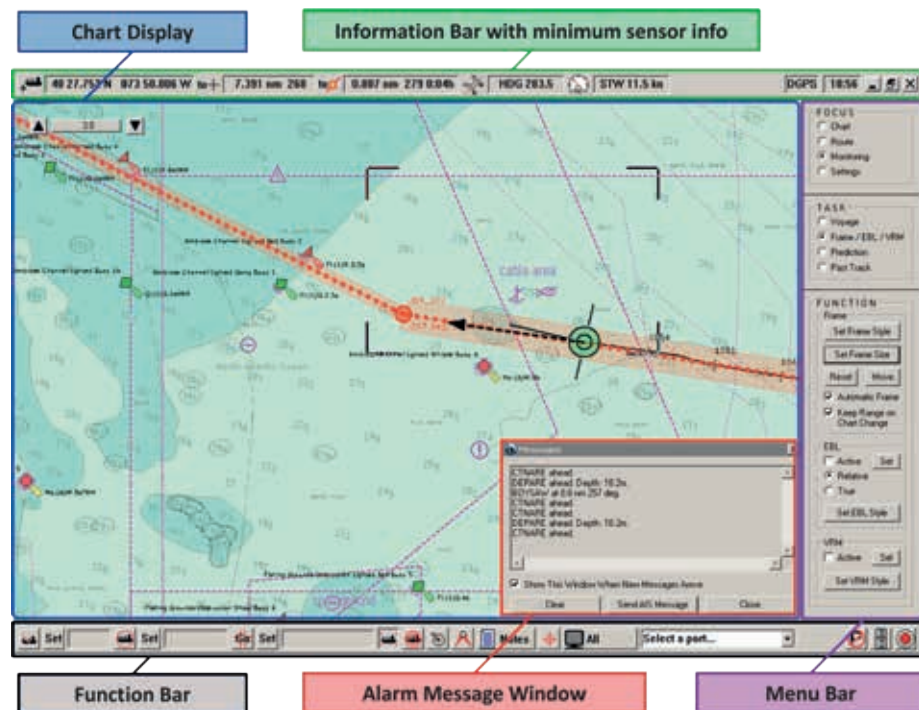TABLE 1.1: OVERVIEW OF DEVELOPMENT OF ECDIS STANDARDS

1.3 ECDIS Display

FIGURE 1.1: ECDIS DISPLAY

Most of the Electronic Chart Display and Information Systems offer the same basic functions and options. The display appearance varies in its layout depending on the manufacturer, but it must still show the minimum information required.

Basically, a large part of the screen is covered by the chart image. In addition, the minimum sensor information must be displayed continuously as text, usually in a dedicated panel, and as real-time graphic data on the chart itself. The edge areas of the screen are normally used to display and hide the menu bar and tool bars. An alert indication must also be given by the system in case of danger to navigation, which must be both visual and audible. Although not mandatory, many ECDIS are, in addition, capable of displaying Radar, ARPA and AIS information.

1.4 What is an ECS?

An ECS, or "Electronic Chart System", must not be confused with ECDIS. In general, ECS is a term for all electronic equipment that is able to display a ship's position on a chart image. The term covers a wide range of capabilities and even a smart phone can be an ECS.

The critical consideration is the adherence to all official requirements for an ECDIS (listed under chapter 2.6). If just one of the requirements is not fulfilled, the system has the status of an ECS. An ECS does not meet the mandatory chart carriage requirements set by SOLAS (more details are provided under 3.1). An ECS cannot, therefore, be used as a primary tool for navigation on SOLAS ships, meaning that navigation has to be performed on paper charts.

1.5 The Potential Benefits of ECDIS

Since ECDIS was developed, the overall safety of navigation has increased continuously. It offers many benefits to the watch keeping officer: not only does it replace the paper chart but it increases situational awareness and works as an anti-grounding tool when set up correctly. It constitutes the main component of the vessel's navigational system and the operator can participate in the navigational benefits through proper knowledge and handling of the ECDIS. The list of benefits associated with the proper use of ECDIS is given below (without claiming to be exhaustive):

Benefits of ECDIS
• Reduced workload for the navigator (charts and nautical publications updating, voyage planning, all information in "one hand")
• Navigation in real time increasing situational awareness in combination with proper lookout
• Automatic route monitoring (warnings and indications of hazards to the operator, in time arrivals)
• Automatic track control (reduces bunker costs), if ECDIS is connected to the autopilot
• Prediction of special manoeuvres (predicted path, trial manoeuvre, docking mode)
• Availability of a chart during the night without night vision loss
• Access to additional information resources

TABLE 1.2: POTENTIAL BENEFITS OF ECDIS

1.6 The Potential Disadvantages of ECDIS

The technology that produces the benefits can, inevitably, also lead to risks. An ECDIS is only as good as the operator who handles it and does not replace the navigator: good navigational skills and seamanship are still essential for safe navigation. The most common potential risks are false operation, misinterpretation of the ECDIS data and over-reliance on it.

In replacing paper charts with ECDIS, mariners who are used to navigating on paper charts, will need to critically upgrade their competence in how to use the new technology and, most importantly, how to use it in the context of best practices for good seamanship.

Potential Disadvantages of ECDIS
• Too much information on the screen may cause clutter and can be distracting • Submenus can be very complex • The size of chart displayed on the screen monitor is very much reduced compared with the paper chart • Some symbols may be misinterpreted due to unfamiliarity • Automatic plotting of position can lead to complacency concerning the vessel's position and proximity to dangers. • Confusion with ECS, unauthorised use for primary navigation

TABLE 1.3: POTENTIAL DISADVANTAGES OF ECDIS

In order to minimise the risk of misinterpretation, to reduce potential ECDIS errors and to make the most efficient use of the ECDIS on board, a professional, coordinated generic and type specific ECDIS training delivered by a certified training institute is essential.

1.7 The ECDIS Mindset

ECDIS is going to become the essential tool for the watch keeping officer. One could say it is even the most complex system on the bridge and although all type-approved versions fulfil the performance specifications, there are large differences between the different manufacturers' equipment. What the officer has to develop is an ECDIS mindset. This means the attitude towards the ECDIS equipment.

Developing an ECDIS mindset includes a sound knowledge of its limitations and possibilities, including its strengths and weaknesses. With a proper ECDIS mindset, the navigator will efficiently integrate ECDIS in the ongoing navigational process. He will also develop an improved situational awareness and will be able to more easily identify any developing faults in any system he is confronted with. A sound and well-grounded ECDIS mindset will serve watch keeping officers very well, no matter what equipment they are using.

It is to this philosophy that this book wishes to contribute in making the reader familiar with the most common features and functionalities of ECDIS. Although ECDIS elements will only be introduced in general terms in this book, the reader – once confronted with a specific make and model – will remember that a certain operating or display control must exist somewhere in the menu. He will then start to explore the new ECDIS interface more confidently and allocate the newly-found type specific control elements in a proper way to his general picture of ECDIS operability.