Introduction to the 3rd Edition

For centuries, nautical charting underwent relatively small evolutionary improvements. The revolution began in the mid-1980s when the computer age opened the door for radically new ways to present and use geo-referenced navigational information. The Electronic Chart was conceived in joint action of navigators and hydrographers, and started to change the way mariners can navigate at sea. It is remarkable that the early concepts for an "Electronic Chart Display and Information System" that were originally established by a small group of experts are still valid. The underlying technology, however, has since greatly improved. From a rather exotic and experimental object of technical research, electronic chart systems have matured to a "natural" component of navigation equipment onboard modern vessels. During the past 25 years, hydrographic offices, chart suppliers and mariners have adopted new attitudes and procedures in regard to the electronic navigation. This evolution led first into IMO's acceptance of ECDIS to replace the paper chart as "official nautical chart", and more recently to IMO's adoption of carriage requirement for ECDIS. In other words, beginning in 2012, vessels must carry ECDIS and navigators must be able to properly use ECDIS. This will be a phase-in approach for selected types of vessels and covers almost all types of SOLAS vessels by 2018.

From the very beginning of ECDIS development, putting a computer-based equipment on board raised two different types of reactions by the maritime community. Some were wary of this new equipment and reluctant to trust such a complex electronic system. Others tended to over-reliant believing that this computerized equipment would be infallible or capable of making decisions. The latter attitude has become more frequent. Either attitude reflects a certain lack of understanding of the capabilities and limitations of ECDIS. The purpose of this textbook, therefore, is to convey the degree of understanding which is necessary for professional and responsible use of ECDIS.

The genesis of this book dates back to the introductory phase of ECDIS. Its first issue was published in German in 1996 when the various international standards and specifications for ECDIS had been completed and were awaiting final adoption.

The continuously increasing interest in ECDIS by the global maritime community influenced the need for an international approach. The first English edition was published in 2001 and a major revision as second edition in 2006. At that stage, ECDIS was still awaiting its breakthrough in commercial shipping.

Consequently previous editions of this book concentrated on:

– explaining the basic fundamentals of electronic charts and the various types of electronic charts,
– describing the overall functions and limitations rather generically, and
– providing reference for ECDIS training.

The following years since brought about the considerable improvement in chart data coverage needed for ECDIS to warrant a mandatory carriage requirement. Therefore, this 3rd edition now focuses also on:

– practical aspects, describing in detail, inter alia, the specific use of ECDIS in terms of functions, modes, settings, alarms, etc.
– training, providing the required substance in detail according to the learning objectives and syllabus of the mandatory ECDIS training course adopted by IMO for all ECDIS operating navigators.

Structure and content of this 3rd edition has been designed to meet the specific needs of the ECDIS stakeholder community. The book is structured into five major parts which sequentially build upon one another:

Part A (Chapters 1 - 6) introduces the subject and explains the basic fundamentals that make up an ECDIS, ranging from the ECDIS architecture to the structures of electronic chart data and the methods of their display.

Part B (Chapter 7 - 13) describes the primary functions of ECDIS and its practical use. It presents a comprehensive account of the practice of ECDIS use including its potential, requirements and limitations from the point of view of a navigator. ECDIS functioning is explained based on the ECDIS fundamentals.

Part C (Chapters 14 - 15) details the means and process for providing the electronic chart data required to use ECDIS worldwide. This includes official services for ENC data provision, distribution and updating.

Part D (Chapters 16 - 18) discusses the need for and the primary objectives and contents of ECDIS training. It gives guidance on how to design training courses including simulator training. It is supported by an ECDIS Demonstration software developed by a leading ECDIS manufacturer (*Transas Marine*). The IMO ECDIS training requirements and a cross-reference between training subjects and book chapters are given in the Appendix.

Part E (Chapters 19 - 24) describes key aspects of ECDIS beyond practical use such as adequate backup arrangements, safety issue considerations, regulatory and legal implications, and some economic aspects. The book concludes with an overview of supplementary information layers and other uses of ECDIS, and with an outlook to future development.

The audience intended by the team of authors are user groups of electronic charts such as:

– maritime users (navigators, ship owners),
– ECDIS producers/developers (manufacturers, data providers, hydrographers, …),
– maritime authorities (testers, Port State Control, …),
– ECDIS trainers (teachers at maritime schools and other training institutes),
– maritime students, ECDIS trainees.

Collectively, this 3rd Edition is intended as a comprehensive textbook on ECDIS whereby each topic is systematically built upon by information covered in earlier chapters. The book can also be selectively used as handbook whereby various ECDIS-related topics are covered in a stand-alone manner. In addition, an effort has been made to cite references to international standards and requirements, or for gaining further information about a specific topic. Thus the book may be used for self-teaching or in conjunction with ECDIS training, as well as reference book. On a cautionary note, it does not replace a user manual for a specific type of ECDIS equipment.

We are very grateful to Transas Marine for providing the CD-based ECDIS demonstration software. It is a highly useful component of this reference book since it provides a meaningful demonstration of many of the important ECDIS features and functions. The CD-based ECDIS demonstration software can be operated on a personal computer. It can be used by individuals or in conjunction with ECDIS training courses.

The Hydrographic Offices of UK, Singapore, Russia, United States and Germany are thanked for kindly providing sample ENC data of their areas. When used with the ECDIS demonstration software, this provides realistic scenarios for familiarization and training purposes.

The book was reviewed and edited by Adam Kerr, former Director of the International Hydrographic Bureau. As an early driving force for the development and use of ECDIS, he was instrumental in its early development and adoption. The authors are greatly indebted to him for his insight and useful suggestions.

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