International Hydrographic Review, Monaco, LXXIII(1), March 1996

ECDIS IN RUSSIA
STATE AND DEVELOPMENT PROBLEMS

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The introduction of the Electronic Chart Display and Information System (ECDIS) as an element of a worldwide navigation system is an important landmark in the improvement of the safety of navigation. Consequently, it may be expected that in November 1995 the International Maritime Organization (IMO) Assembly will adopt (*) the ECDIS Performance Standard, the draft of which has been prepared by the IMO Subcommittee on the Safety of Navigation and subsequently submitted to the Maritime Safety Committee.

In March 1996, Edition 3.0 of the IHO Digital Data Exchange Standard S-57 (DX-90), in accordance with which Electronic Navigational Chart (ENC) data bases used in ECDIS are constructed, is planned to be released by the International Hydrographic Organization (IHO). Both the Performance Standard and the Exchange Standard are the result of labourious joint work of various IHO Committees and Working Groups, Hydrographic Services and commercial companies involved in the development of ENC production technology, aimed at improving operational characteristics of the Electronic Navigational Chart.

Development of navigational information systems, directed towards the use of the official ENC, certified by the Hydrographic Service, began in Russia about 10 years ago under the guidance of the Head Department of Navigation and Oceanography (HDNO) of the Ministry of Defence. Substantial progress in this sphere took shape during the last 3 years due to the availability of modern computer techniques and information technologies, as well as extensive work in the creation of an ENC that complies with the above standards.

As a result of the above work, sea trials of ECDIS and the ENC were carried out in March-April, 1995. These trials were conducted aboard the hydrographic vessel (HRV) SIBIRYAKOV, on passage from St. Petersburg to Portsmouth (UK). Two ECDIS developed for the HDNO by CORRECT MARINE and MORINTECH, as well as by the Central Scientific Research Institute (CSRI) ELEKTROPRIBOR, were used in the trials. Experimental ENC data sets prepared

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* Editor's note: This action has now taken place.

by the Navy Charts Division and by MORINTECH, in accordance with S-57/DX-90, Version 2.0, were used in the trials.

The ENC used in the ECDIS presented by MORINTECH and CORRECT MARINE is constructed on the basis of the universal geographic information system (GIS) DKART, designed to provide a solution for a wide range of problems in the sphere of navigation, hydrography and hydrometeorology. The geographical basis for the GIS DKART is the ENC meeting the S-57/DX-90 standard. On the termination of the development (1995), this ECDIS using this ENC will comply with the international standards.

Electronic Chart Display and Information Systems being developed for the HDNO will be available by various users and be widely employed on the vessels of the Ministry of Marine fleet and of the other agencies of Russia, as well as abroad.

A navigational Electronic Chart System (ECS) Navi-Master NS-2100S, with a large collection of simplified electronic navigational charts, which are not in conformity with the standard S-57/DX-90, was installed and used on HRV SIRIBYAKOV. TRANSAS MARINE, producer of this system, together with such companies as C-Map, Livechart, Navionics, in the course of several years, has been developing and improving these systems as well as providing them for the market. However, the ECS lacks a number of functions provided for by the HDNO requirements, therefore the position of the HDNO in this matter is unequivocal:

- only ECDIS, which is in conformity with the international standard, permits the solution of all the complex navigation problems, both from a practical and juridical point of view;

- creation and introduction of ECDIS in the fleet is problematic due to the possible future inclusion of ECS equipment as a part of a conventional one.

Interest in using ECS in preference to ECDIS may result in delays in making ENCs available. This is the result of the large amount of work required in creating a worldwide ENC database. The Hydrographic Services of Russia are interested in wide international cooperation in order to support the objective of creating a worldwide database in the S-57/DX-90 standard. In the author's opinion, cooperation of the National Hydrographic Services (NHS) should comprise the following main issues:

- Further development of the S-57/DX-90 standard;
- Revision of DX-90 format versions to achieve a unique interpretation;
- Division of the National Hydrographic Services' zones of responsibility for the development of digital data (areas of activity of the Regional Coordinating Centres ENC-RECC);
- Conceptual model of the World Wide Electronic Navigational Chart Data Base (WEND);
- Updating system for electronic navigational chart data bases;
- Automation of chart compilation;

- Principles of exchange of nautical publications, digital data, etc. and the copyright governing these exchanges.

Following the creation of the data base, ENC display systems, automated survey on a worldwide basis, the development of the universal information technology should be considered, comprising the whole process of the national digital hydrographic data base formation: acquisition, processing, digitization inclusion into data base, subsequent production in electronic or paper form, updating, etc.

Informational exchange may be initiated between the national developers of ENC production technology and companies operating under the aegis of the National Hydrographic Services with the aim of developing a unique interpretation of the S-57/DX-90 standard. The progress achieved is characterized by the fact that in the course of trials aboard HRV SIBIRYAKOV, the input of information of DX-90 format received from the UK Hydrographic Service on the basis of mutual exchange, was carried out. While performing the input the data were undergoing verification conversion on the monitor screen with the possibility of full operational work equally with the national data. A similar operation was successfully carried out with the Russian data base by the English specialists during the visit to Portsmouth of the HDNO delegation.

It should be borne in mind that in most cases the national charts are the source of digital compilations, and without strict methods of coding, the probability of producing ambiguous digital data is high. At present, quite a number of digital databases cover the subject area under review, and all of them, according to their creators, comply with S-57 standard but none are identical. They mainly differ in the methods by which real world objects are coded. Objects in the same location were found to be differently described and coded. This happens because different cartographic sources have diverse symbols, textual information and therefore results in the coders making different interpretations when coding real objects.

It is hoped that the majority of ambiguities resulting from the present S-57/ DX-90 standard will be removed following the adoption of edition 3.0. A serious problem requiring cooperation is the necessity to develop methods and programme systems of certification to cover ENC production technologies, ENCs themselves and directly ECDIS.

As for the division of zones of responsibility, the Russian Hydrographic Service supports the opinion that these zones of responsibility should be determined by the Regional Hydrographic Commissions or should be chosen independently by the National Hydrographic Service.

In contrast to the proposed organisation prepared by the WEND Committee, the author believes that the regional data base should be designed in such a way that the data from different Hydrographic Offices are combined independently and that any shipowner has the right to acquire such data that satisfies his needs. In addition, it is our opinion that the National Hydrographic Service should supply the RENC with the complete final product.

The development and introduction of an updating system for electronic navigation chart databases is a difficult scientific problem that requires further research. Methods of transmitting information to vessels to update ENC data bases will be the result of the experiments carried out by the Head Department of Navigation and Oceanography.

In our opinion, the automation of chart compilation should be based on integrated processing of data for various applications. This will provide data for paper chart production as well as making the availability of such system an indispensable condition of automation.

The system should perform the following main functions:

- creation and storing of Digital Cartographic Information Data Bases (DCIDB),
- updating and distribution of information from DCIDB to users, particularly to those who carry out chart compilation.

The central element of the integrated system is a set of DCIDB specially organized.

The problem of copyright is essential in the sphere under review.

The copyright for nautical publications (nautical charts and guides to navigation) was regulated before the XIVth International Hydrographic Conference (1992) by the Technical Resolutions TR A 1.18, and A 3.4 according to which the Hydrographic Services were unequivocally granted the right of free use of each other nautical publications to create their own charts and guides to navigation (but not for facsimile reprints). Following consideration of the copyright issues at the XIVth Conference, a Working Group, under the chairmanship of the President of the IHB, resulted in adoption of the new texts of TR A 1.18, A 3.4 and of the new Technical Resolution TR A 3.10. The principle of free use of nautical publications by the Hydrographic Services, with the aim of ensuring safety of navigation has been somewhat narrowed as a result. We are of the opinion that considering the safety of navigation, all charts produced by national HOs should make their data freely available, if only on the basis of bilateral agreements.

The Russian Hydrographic Service supports close international cooperation in solving the many complex problems that must be resolved as we enter the electronic cartography era.