

REPORT 1165*

TRANSMISSION OF DIGITAL DATA FOR THE UPDATING OF
ELECTRONIC CHART DISPLAY SYSTEMS (ECDIS)

(Question 98/8)

(1990)

Introduction

Question 98/8 addresses the updating of electronic charts by the transmission of digital data. In this connection, the Maritime Safety Committee of IMO transmitted a letter to the Director of the CCIR asking that a study of the most appropriate system and data medium to be used, involving satellite and terrestrial methods of transmission. The notes and relevant provisional standards of IMO are contained in Annex I to this Report.

In addition, Interim Working Party 8/14, prepared comments on the satellite-related aspects of data transmission for the purpose of updating ECDIS, and further suggested that the terrestrial modes of transmission should be studied by Study Group 8.

1. Current Updating Practices

Traditional services provided by a National Hydrographic Authority or Hydrographic Office (HO) include a routine system for the update of all conventional charts on sale or regularly supplied to users. Certain chart producing nations support global portfolios, while other administrations produce charts covering only their area of interest and responsibility.

Updates, or chart corrections, are generically referred to as "Notices to Mariners" (NTM). Notices produced by administrations are collated on a periodic basis and distributed to mariners by mail. Each NTM publication contains clear, concise instructions to the mariner for the correction of his copy of the chart. The position of each correction must be plotted, and the chart annotated with the update information. In areas of extensive change, graphic blocks or patches called chartlets are printed in the weekly NTM. Chartlets are cut out by the mariner and physically affixed to the chart.

In addition to the conventional printed paper NTM published by HO's, certain supplementary services, such as the Navigation Information Network (NAVINFONET) operated by the US Defense Mapping Agency, provide access via telex or modem and telephone line to the textual data used to print the NTM (chartlet graphics are not available). These digital files can be viewed as text on a computer or printed out by the mariner. They are, therefore, equivalent to, but more timely and convenient than, the conventional means of receiving chart correction information by mail. The NAVINFONET can also be accessed by ships at sea using INMARSAT Standard A.

* The Director CCIR is requested to bring this Report to the attention of IMO, IHO and IEC.

2. Other Navigation or Safety Update Information

More time critical, and frequently more transient, chart update information is broadcast to mariners as Radio Navigational Warnings. The mariner is expected to take note of these warnings and review them when he is approaching their geographic area of application. Radio Navigation Warnings along with meteorological broadcasts and search and rescue information, along with other safety information, are known collectively as Maritime Safety Information.

Responsibility for the broadcast of Radio Navigational Warnings beyond coastal areas is shared by 16 designated regional area coordinators. These area coordinators are the foundation of the IMO/IHO World Wide Navigational Warning Service (WWNWS). The purpose of this cooperative effort is to collect, exchange and collate navigational safety information; and to broadcast messages to ships at sea.

Three types of Radio Navigation Warnings have been established, each designed to serve the needs of the mariner in a particular location by exploiting the characteristics of the radio networks he will be using. They are:

- a. The NAVAREA Warning Service which broadcasts warnings concerning routing and passage along major shipping lanes via radio telegraphy over HF circuits worldwide.
- b. Coastal Warnings which have traditionally been broadcast using voice communications, both MF/HF and VHF. These warnings give short term notice of generally transient hazards, such as lights temporarily unlit, and are of interest only in a limited area.
- c. Local Warnings which may be issued by local Authorities or local Coastguards over VHF voice circuits only in the national language.

3. Updating in the Electronic Navigational Chart (ENC) Environment

The Maritime Safety Committee of the IMO has approved Provisional Performance Standards for Electronic Chart Display Systems (ECDIS). The transition from paper to computer driven display systems offers new advantages for the more accurate and timely update of nautical chart information. In addition, it offers the opportunity to integrate many types of geographical information which are necessary to the safety of the mariner. In the ultimate application, these would include meteorological forecasts, ice reports and oceanographic data, search and rescue information, as well as navigation warnings and NTM corrections: in short, all subject areas of Maritime Safety Information.

Within the ECDIS, updates to the HO produced ENC data must be handled differently from the update of more transient navigation warnings and safety information. Once the ENC data is entered in the ECDIS, HO produced digital NTM data should be received and processed automatically to correct the digital chart files used to generate electronic chart displays. The result of this update should have the same affect as manually registering permanent NTM corrections on a paper chart.

A rough estimation of the data volume for HO produced digital NTM data files was carried out based on an evaluation of the paper NTM corrections published by the Hydrographic Institute of the Federal Republic of Germany (DHI). The DHI estimate was confirmed by a similar evaluation performed by the Defense Mapping Agency in the USA. Only the needs of larger vessels were considered (draft of five meters or greater). The weekly volume for a broadcast data transmission to provide correction information for a global portfolio of charts should range from 135 kbyte to 270 kbyte. The 135 kbyte figure represents a realistic estimate of the average weekly data transmission volume, and 270 kbyte represents a high end or worst case estimate.

Since Radio Navigational Warnings and other safety broadcast information are generally transient in nature, this update data must not be allowed to permanently change the electronic chart display. It must be processed and held separately and applied to the chart display as an overlay or in such a manner as to notify the mariner of the presence of a warning at a particular geographic location. Since mechanisms currently exist for the broadcast of warnings to be received by the mariner either in the form of text or voice transmissions, it is most likely that computer readable digital update files must be transmitted using either the same or different channels. Rough estimates made by the Defense Mapping Agency in the USA indicate a weekly data volume on the order of 50 kbyte per NAVAREA for both NAVAREA and Coastal Warnings. It is not considered feasible at the present time to address Local Warnings since they have a very limited application area and are generally broadcast only by voice in the national language.

For the foreseeable future, it will be necessary to support both conventional paper chart updating and textual and voice broadcast warnings as well as new information transfer and updating techniques that will be needed for ECDIS. To maximize the efficiency and reliability of transferring both sets of data, the textual or voice update/warning information should be sent together with computer readable digital files to update the ECDIS. Further, the ECDIS should be capable of displaying the text of update/warning information on its alphanumeric display.

4. Planned Changes Affecting the Broadcast of Warnings

The Global Maritime Distress and Safety System (GMDSS) has been developed by IMO (with ITU, IHO, WMO, INMARSAT and others) to upgrade existing worldwide distress and safety communications by the mid-1990's. The main purpose of GMDSS is to support distress alert and search and rescue operations. GMDSS also provides for urgency and safety communications and the dissemination of maritime safety information including navigation and meteorological warnings.

Under GMDSS, the present day NAVAREA radio telegraphy service will be replaced by a satellite broadcast service using INMARSAT's SafetyNET facilities. Further, NAVAREA warning traffic volume will be greatly reduced by the implementation of the NAVTEX Broadcast Service worldwide.

The NAVTEX Service broadcasts warnings in the area up to 200 miles offshore. Because most warnings pertain to coastal areas and the NAVTEX transmissions are frequent, many warnings now required to be promulgated through the NAVAREA Service will only be broadcast by NAVTEX in the future.

The NAVTEX receiver and SafetyNET facilities, included in the GMDSS carriage requirements, in accordance with the 1988 amendments to the SOLAS Convention, appear to be useful for receiving updating information promulgated by telecommunications.

5. Organizational Considerations

National Hydrographic and Telecommunications Authorities have finite resources and, as with many public sector activities, they must limit their support of nautical charts to that minimum necessary to ensure safe navigation. In the area of updating, for the conventional chart now in use, that basic support is represented by printed NTM's distributed by mail. Since manual entry of the information contained in the printed Notice would be a feasible means of providing correction information to the ECDIS, a system clearly now exists for updating the electronic chart. However, distribution by mail and manual updating do not take advantage of the potential for a more timely and more accurate correction process and reduced labor for the mariner.

Similarly, under the current IMO/IHO WWNWS and planned GMDSS implementation, the mariner is being advised in a timely manner of navigation warnings and other safety information. However, the integration and application of this data to the mariner's present location is a manual process. Clearly, the opportunity exists within the ECDIS to provide the mariner automatically with a single integrated geographically referenced source of information which affects his immediate situation.

While these benefits are noteworthy, they alone do not require the establishment of an international, free-to-user, automatic updating service sponsored by National Authorities. Despite this fact, the potential for increased accuracy inherent in automatic updating and the logic of supporting digital charts with a digital update capability warrants serious consideration. National Authorities, the CCIR, IMO, IHO, and others are working cooperatively to investigate the establishment of appropriate mechanisms for the distribution of computer readable digital NTM data and digital navigation warning and other safety information.

Annex: 1

ANNEX I

NOTES ON THE PROVISIONAL PERFORMANCE STANDARDS FOR
ELECTRONIC CHART DISPLAY SYSTEMS (ECDIS)1 Introduction

The ECDIS is evolving as a completely new type of navigational system and appears to have potential to improve the safety of navigation. ECDIS requires extensive development before it can achieve this potential and be considered as equivalent to the paper chart. The provisional performance standards and associated notes which have been approved by the Maritime Safety Committee are intended to assist in this development.

2 Reliability and availability

The safety of navigation should not be adversely effected in the case of failure of an ECDIS. Adequate back-up provisions are required. Possibilities include, for example, "Get you-home" charts, hard copy from the ENC or additional back-up equipment.

3 Operating controls and procedures

It is desirable that operating controls and procedures should be standardized. Manufacturers are invited to give this aspect consideration at an early stage.

4 Data media

Hydrographic offices and manufacturers should endeavour to agree on the data media to be used worldwide to supply ENC and update data.

5 Number of displays

Ships operating within limited trading areas may not require two displays for safe navigation. However, a second display may be used for management/operational tasks, in addition to navigation.