

**17th CHRIS Meeting
Rostock, Germany, 5-9 September 2004**

Report of IHO-IEC Harmonization Group on Marine Information Objects (HGMIO)

Submitted by:	Lee Alexander, University of New Hampshire (Chair, HGMIO)
Executive Summary:	This report summarizes the activities of HGMIO during the period of June 2004 – August 2005.
Actions to be taken	CHRIS is invited to: <ul style="list-style-type: none"> - note the report, and endorse the future plans. - approve the “Recommended Development Procedures for MIOs” (see Annex) - approve “Aids to Navigation Status” as a new Work Item for HGMIO (see Doc. CHRIS17-7B)
Related Documents:	CHRIS17-5.1B; CHRIS17-7B; IHO S-52
Related Projects:	n/a

Introduction

Marine Information Objects (MIOs) consist of chart- and navigation-related information that supplement the minimum information required by ECDIS. As it relates to the use of Electronic Navigational Chart (ENC) data, MIOs are additional, non-mandatory information not already covered by existing IMO, IHO, or IEC standards. Currently, this includes ice coverage, tide/water level, current flow, meteorological, oceanographic, and marine habitats. The supplemental information would primarily be additional S-57 objects/attributes but could also be imagery, graphics, or gridded data. In 2001, a Harmonization Group on MIOs (HGMIO) was established between IHO and IEC to recommend additional data and display specifications that may be incorporated into future editions of IHO and IEC standards. This report provides a brief update on HGMIO-related activities.

The 3rd Meeting of **HGMIO** was held 27 June 2005 at the IHB. Eight persons attended representing four member states, and included two IHB Directors. The main topics discussed at this one-day meeting were: “Recommended Procedures for MIO Development”, status/update current MIO-related efforts, and a new MIO-related project on electronic Aids-to Navigation Service Information (e-ANSI) proposed by International Association of Lighthouse Authorities (IALA). On 28 June 2005 (the day following HGMIO3), a Workshop on International Standardization of e-ANSI Information on ECDIS was held at IHB.

Current Status of MIO-related Efforts

a. Ice Coverage – Task Leader: John Falkingham (Ice Services Canada)
An *ECDIS Ice Objects Catalogue* (Version 3.0) was published by Ice Services Canada (in cooperation with the Canadian Hydrographic Service) in March 2001. These objects are registered on the Open ECDIS Forum (OEF). A presentation on this subject, including the Ice Object Catalogue, was made by John Falkingham (Canadian Ice Service) at a meeting of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology

(JCOMM) Expert Team on Sea Ice (ETSI) in April 2004 in Hamburg, Germany. As a result, ETSI has agreed, in principle, to take responsibility for the *ECDIS Ice Objects Catalogue / Registry*. ETSI Points-of-contact on this matter are John Falkingham (Canada) and Capt. Manuel Picasso (Argentinean HO). There have been informal proposals by *SevenCs* (Germany) on suitable colours and symbols for ice objects. However, they were prepared before the Ice Objects Catalogue was published and therefore need revision. Although there is some interest in conducting an Ice Information Testbed project in the Gulf of St. Lawrence/St. Lawrence River in Canada in conjunction with "Information Seaway Project", nothing has been formally proposed or scheduled.

b. Meteorological - Task Leader: Michel Huet (IHB) and Dan Pillich (*SevenCs*) *Object Classes and Attributes for Weather* (Version 1.0) were first proposed by *SevenCs* in November 1999. However, only basic colours or symbols for these objects have been developed. Liaison was established with a NATO group developing an Additional Military Layer (AML) on weather information with the aim to harmonize NATO and HGMIO developments. It is also hoped that this group and HGMIO can cooperate to develop appropriate S-57 objects/attributes and symbology for the display of weather information on ECDIS / WECDIS taking into account edition 3.3 of the IHO Presentation Library published in March 2004. Contact was also made with the World Meteorological Organization, first back in 1999 and more recently when a Working Group met during *Ocean OPS 04*, Toulouse, France, 10-15 May 04.

c. Tides/Water Levels – Interim Task Leader: Lee Alexander (USA– Univ. of NH) In 2001, *SevenCs* developed a tide-simulation model for a "tide-aware" ENC. Prototype ENC data sets were produced for two ports (Singapore and Schelde/Vlissingen (The Netherlands), the latter containing single meter contours. A simulated 10-meter tidal range was then applied, and the display modified based on time and ship's safety contour (depth). Further enhancements included the establishment of designated tidal zones within the overall area.

Research is being conducted at the University of New Hampshire (USA) to develop dynamic tide and water level applications for the "Next Generation ENC". Three phases are planned. Phase 1 involves the compilation and processing of high-density bathymetric data into a digital elevation model (DEM) using a combination of *CARIS* and *SevenCs* software tools. From this DEM (called a "Navigation Surface") both S-57 3.1 ENC and gridded datasets will be produced. Phase 2 will look at various methods to incorporate vertical and time dimensions into existing ENC data. These "next generation" ENCs (i.e., capable of dealing with x,y,z and time) will be tested with existing ECDIS and ECS equipment that are currently installed onboard government and commercial vessels. Phase 3 will integrate real-time/forecast water depth information and port information services transmitted via an AIS communications broadcast into both the "Next Generation ENC" and with the "Chart-of-the-Future" (a separate, but related project). At some future date, at-sea trials are planned for the Port of Hampton Roads, Virginia.

d. Current Flow – Task Leader: [vacant] In 1997, the Canadian Hydrographic Service, Quebec Region published an *Atlas of Tidal Currents for the St. Lawrence Estuary*, from Cap de Bon-Désir to Trois-Rivières. Based on an April 2004 meeting at the Maurice-Lamontagne Institute, Mont Joli, Quebec, there is now some interest to convert some of this data into S-57 objects that could be used with existing ENC data and ECDIS systems. Ideally, this could include the development of gridded chart data models that can be used with both tide and current flow information.

e. Oceanographic – Task Leader: Max van Norden (US Naval Oceanographic Office) A Technical White Paper: *Oceanographic Object Attribution* was prepared by the U.S. Naval Oceanographic Office in June 2002. It summarized the activity and developments being undertaken in the field of oceanography that appear to be related to electronic charting.

Several new oceanography object classes and attributes were proposed. Further work that needs to be performed includes:

- 1) Recommendations on oceanographic objects that should be addressed in an ECDIS.
- 2) Determine a suitable method for handling 3-D data in a 2 -D environment.
- 3) Look at how to relate climatological and real-time data.
- 4) Assign attributes and colour tables to oceanographic objects.
- 5) Investigate how oceanographic data should be used with other data sets without introducing clutter.
- 6) Produce a sample dataset of physical oceanographic objects for testing in an ECDIS.

f. Marine Environmental Protection – Task Leader: Julia Powell (NOAA)

The Office of Coast Survey, NOAA (USA) is conducting a pilot project to convert existing coral reef, marine protected areas (MPA), and other marine habitat information into MIOs that can be used with ECDIS and ECS equipment. NOAA and the Florida Dept. of Environmental Protection produced a CD-ROM of the *Benthic Habitats of the Florida Keys*. It contains colour imagery and GIS files that describe and show the location of shallow seafloor habitats, such as coral reefs. In support of this effort, Peter Duguid (CARIS) prepared a report on how this benthic habitat mapping data (e.g., ArcView[®] shapefiles) could be converted in to S-57 feature objects using CARIS HOM ENC software tools. However, further work is needed to develop new S-57 objects classes and/or feature attributes for coral reef habitats, and for other criteria associated with regulated activities. An important outcome of the Coral Reef - MIO project will be the development of data content specifications and symbology to support new charting requirements mandated by the International Maritime Organization (IMO) and IHO for “Special Areas” and Particularly Sensitive Sea Areas (PSSAs).

g. electronic Aids to Navigation Service Information (e-ANSI) – Task Leader: Michel Huet (IHB)

The International Association of Lighthouse Authorities (IALA) set up a Working Group on Aids to Navigation Information Service (ANIS) in 2004 [Note: IALA has now re-named ANIS to “e-ANSI.”] The objective of e-ANSI is to provide real-time information to ships on the status of Aids to Navigation (AtoN) that are critical for the safety of navigation and the protection of the environment. It is planned that Automatic Identification Systems (AIS) will be used to broadcast the relevant e-ANSI information in an appropriate data format.

On 28 June 2005 (the day following HGMIO3), a Workshop on International Standardization of e-ANSI Information on ECDIS (i.e., e -ANSI as a MIO) was held at IHB on 28 June 2005. Five main topics were discussed:

- 1) What is e-ANSI (i.e., Why important; How expected to operate; How it could become a MIO, Role of AIS in data communication)
- 2) Determination of data content for e -ANSI
- 3) Define what S-57 objects and attributes are required
- 4) Need to establish an e -ANSI S-57 Object Register
- 5) Display of e-ANSI information (present/future colours and symbols)

The 4th IALA e-ANSI WG meeting was held at IHB on 29 June 2005, immediately following the Workshop. It was agreed that IALA e-ANSI WG and HGMIO would work cooperatively on the development of an e-ANSI MIO Product Specification. However, it is IALA that will deal with the implementation of e-ANSI and will address any regulatory requirements (e.g., recommend changes to IMO Performance Standards) related to the mandatory presentation of e-ANSI information.

IMO Performance Standards for Display of Navigation-related Information

In December 2004, IMO adopted Performance Standards for the Presentation of Navigation-Related Information (MSC 19(79)). The main purpose of this Performance Standard is to: “*supplement and in case of conflict, take priority over presentation requirements of the individual performance standards...*” (Sec. 1, Purpose). To further this effort, IEC

TC80/WG13 is currently working to complete IEC 62288 which will contain the methods of testing and required test results for equipment/systems that conform to this new Performance Standard. The Chair of HGMIO has actively participated in IEC TC80/WG13. It is planned that a CDV for IEC 62288 will be completed in late 2005. Collectively, both performance standards will affect how MIO information will be a component of an overall harmonized display of navigation-related information on ECDIS and potentially, other shipboard systems.

Recommended Development Procedures for MIOs

In December 2004, a document was prepared by Michel Huet and Lee Alexander to describe the *“Recommended Procedures for the Development of MIOs” (Edition 1.0)*. The production of this document was initiated by communications between IALA and IHO regarding the necessary steps or procedures that were required to develop and implement MIOs. This document is annexed to this paper, for CHRIS endorsement, and has also been posted at: www.iho.shom.fr/committee/HGMIO.

Work Plan Submission to CHRIS

Due to the few number of HGMIO members present at HGMIO3, Chair will contact current task leaders by e-mail regarding their involvement and work progress. After receiving confirmation from task leaders, a revised Work Plan will be submitted.

Next Meeting

Depending on the progress of MIO development/implementation, a 4th HGMIO meeting is tentatively planned at NOAA Headquarters in Washington, DC in June 2006.

Action Required of CHRIS

Endorse the “Recommended Development Procedures for MIOs” (see Annex) and approve “Aids to Navigation Status” as a new Work Item for HGMIO (see Doc. CHRIS17-7B)

MARINE INFORMATION OBJECTS (MIO) *Recommended Procedures for Development*

Edition 1.0 - December 2004

1. Introduction

Marine Information Objects (MIO) consist of supplementary information to be used with an Electronic Chart Display and Information System (ECDIS) that are not Electronic Navigational Chart (ENC) objects or specified navigational elements or parameters. Supplementary means additional, non-mandatory information not already covered by existing International Maritime Organization (IMO), International Hydrographic Organization (IHO), and International Electrotechnical Commission (IEC) standards or specifications. Examples of MIOs include ice coverage, tide/water level, current flow, meteorological, oceanographic, and marine habitats. Depending on the navigation situation or task-at-hand, the provision and use of MIOs (e.g., ice coverage, weather conditions, etc.) can be crucial in terms of improving both the safety and efficiency of maritime navigation, as well as ensuring the protection of the marine environment.

As defined in the IMO Performance Standards for ECDIS, an “*Electronic Navigational Chart (ENC) means the database, standardized as to content, structure and format, issued for use with ECDIS on the authority of government authorized hydrographic offices. The ENC contains all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart (e.g. sailing directions) which may be considered necessary for safe navigation.*” In terms of being “supplementary information”, MIOs are not contained within nor are they an integral part of an ENC. Rather, MIOs are separate, supplementary information that are displayed in conjunction with the overall System ENC¹ (SENC). This is similar in concept to adding radar and AIS information to an ECDIS display and is covered in the IMO ECDIS Performance Standards, “*Radar information or other navigational information may be added to the ECDIS display. However, it should not degrade the SENC information, and should be clearly distinguishable from the SENC information.*”

The IMO Performance Standards for ECDIS require chart data to conform to IHO S-57 data standards, and that IHO colours and symbols be used to represent the System ENC (SENC) information. While the current edition of IHO S-57 (Edition 3.1) contains an ENC Product Specification, it does not specify the content or format for supplemental information (e.g., MIOs). Similarly, neither the current IHO Colours and Symbols Specifications for ECDIS (IHO S-52, Appendix 2) nor IEC Publication 61174 (*ECDIS - Operational and Performance Requirements, Method of Testing and Required Test Results*) describe how this supplemental information should be displayed.

2. HGMIO

In order to facilitate the development and implementation of MIOs, IHO and IEC agreed to establish a Harmonization Group on Marine Information Objects (HGMIO) in May 2002. HGMIO ensures the coordination of the relevant IHO and IEC bodies, and the liaison with other competent organizations interested in MIO development and implementation. Additionally, HGMIO may conduct technical exchange on MIOs with type-approval authorities, ECDIS manufacturers and ECDIS user community. It may also recommend changes to the relevant IHO and IEC standards, as a result of HGMIO work.

¹ System ENC is the data held in the ECDIS system resulting from the transformation of the ENC for appropriate use.

The current chairman of HGMIO is Dr Lee Alexander, University of New Hampshire, Durham, NH, USA (lee.alexander@unh.edu).

To date, MIO objects and attributes have been developed, based on S-57, for the following categories of MIOs:

- Ice Coverage
- Meteorological
- Oceanographic

These are currently registered on the Open ECDIS Forum (www.openecdis.org) and available for use.

3. Competent Organizations

In most cases, development or regulation of MIO data standards is not an IHO responsibility. Examples of other competent organizations that may wish to develop or administer standards for MIOs include:

- International Association of Lighthouse Authorities (IALA)
- World Meteorological Organization (WMO)
- North Atlantic Treaty Organization (NATO)

In particular, such organizations would:

- a. Clarify / define the need for a particular category of MIO.
- b. Participate in the development of suitable MIO objects and attributes (if based on IHO S-57).
- c. Take responsibility for the maintenance of those S-57 objects and attributes.
- d. Participate in the development of appropriate colours and symbols for the display of those MIOs.
- e. Participate in any MIO testing and evaluation by ECDIS manufacturers, or during at-sea trials with mariners.
- f. Play an active role in the production and dissemination of MIO data.
- g. Lead any initiative aimed at regulating the use of MIOs with ECDIS (e.g., to IMO and/or IEC).

4. MIO Development Procedure

IHO S-57 has proved to be an effective means to encode chart and navigation-related information for use with ECDIS. As such, competent organizations involved in MIO development are encouraged to develop any new applications using IHO S-57 as the basis. Development should proceed as follows:

1. Define the need for a particular category of MIO. The competent organization (e.g., IALA for Aids to Navigation Status) should identify the requirement and produce a detailed description of the various elements to be considered for encoding, transfer and display in ECDIS. The International Hydrographic Bureau (IHB) may act as interface or facilitator between the competent organization and HGMIO. HGMIO would then inform its parent committees at IHO² and IEC³ of the perceived requirement and request approval to initiate a development process.
2. Develop Objects and Attributes. From the specifications received from the competent organization, HGMIO provides recommendations for the development of appropriate S-57 objects and attributes in liaison with the IHO body responsible for the maintenance of S-57⁴,

²Committee on Hydrographic Requirements for Information Systems (CHRIS)

³Technical Committee No. 80 - Maritime Navigation and Radio-communications Equipment and Systems (TC80)

⁴Transfer Standard Maintenance and Applications Development Working Group (TSMAD)

the competent organization and with ECDIS manufacturers. This may be carried out via e-mail and/or during ad hoc workshops. The new S-57 objects and attributes would initially be registered on the Open ECDIS Forum. If formally approved by the parent IHO and IEC committees, as well as the competent organization, these new MIO-related objects and attributes will become incorporated into the IHO Registry for S-57 Edition 4. Potentially, this may involve the creation of a separate register for MIOs or several registers for various MIO categories. It is expected that the competent organization that developed these new objects/attributes would also be willing to assume the responsibility for overseeing their maintenance or future refinement.

3. Develop Colours and Symbols. From the set of objects and attributes, which are developed for the relevant MIO category, HGMIO helps facilitate the development of appropriate colours and symbols. This will be done in liaison with the IHO body responsible for the maintenance of C&S specifications in S-52⁵, the competent organization, and ECDIS manufacturers. This may be carried out via e-mail or during ad hoc workshops. During this process, the existing S-52 chart colours and symbols, and those used to display the navigational elements and parameters listed in IEC 61174 or the draft IMO Performance Standards for the Presentation of Navigation-related Information on a Shipborne Navigational Display, would be taken into account. After approval by the parent IHO and IEC committees, and the competent organization, the resulting new colours and symbols would be registered on the OEF. In the same manner as for new S-57 objects and attributes, it is expected that the competent organization would be willing to take responsibility for the maintenance of these specially developed colours and symbols.
4. MIO Test and Evaluation. Before a new category of MIOs can be operated on ECDIS, there would be a suitable period of test and evaluation performed by ECDIS manufacturers or during at-sea trials with mariners. HGMIO, as required, can act as coordinator to help organize this testing / evaluation, in liaison with the competent organization, ECDIS manufacturers, and maritime user groups.
5. Production and Dissemination of MIO Data. The competent organization would be responsible for the production and dissemination / distribution of its relevant MIO data. Some examples include production and issuing of ice coverage information, weather maps, and oceanographic information affecting ships routing (current flow, wave heights, etc.). This type of service could be performed on a daily or other periodic basis via internet, digital cell phone, satellite communications, or as part of an AIS broadcast service.
6. Address Regulatory Requirements. It may be necessary that the use of MIOs on ECDIS be reflected in the relevant IMO and IEC standards. For IMO, this includes the existing Performance Standards for ECDIS and the new Performance Standards for the Presentation of Navigation-related Information on Shipborne Navigational Displays. In either case, the competent organization would lead any initiative on the matter, possibly in association with the IHO. Future editions of IEC 61174 (ECDIS) and/or the new IEC 62288 (Presentation of Navigation-related Information) may require the development of a test data set for the particular MIOs by the competent organization.

⁵Colours and Symbols Maintenance Working Group (C&SMWG)