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

Submitted by:	Lee Alexander, University of New Hampshire (Chair, HGMIO)
Executive Summary:	This report summarizes the activities of HGMIO during the period of November 2007 – October 2008.
Actions to be taken	Note the current activities of HGMIO; Reaffirm the need to establish a MIO Register for S-57 → S-100 related data; Agree that HGMIO can be retired as an IHO Working Group.
Related Documents:	IHO S-57, IHO S-52, and S-100
Related Projects:	n/a

Chair: Dr. Lee Alexander, University of New Hampshire
Vice-Chair: Cameron McLeay, CARIS
Secretary: Michel Huet, IHB

Annual Meeting: HGMIO 6, 25-26 September 2008, Bath, UK

Introduction

Marine Information Overlays (MIOs) consist of chart- and navigation-related information that supplement the minimum information required by ECDIS. As it pertains 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/protected areas. The supplemental information is primarily 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.

Current MIO Standards Development

Development Procedures
Recommended Procedures for the Development MIOs (Edition 1.1, 24 May 2007) provide guidance on:
- How a "competent organization" should identify MIO-related requirements.
- Information content for a MIO category.
- Development of new S-57 objects and attributes.
- Appropriate colours and symbols, based on IHO S-52.
- Test and evaluation.
- Production/dissemination of MIO data.
- Potential regulatory requirements on proper use.
The overall framework for achieving internationally-accepted MIO specifications includes:
- Alignment with IHO S-57 Edition 3.1/3.1.1, where applicable.
- Publication of a General Content Specification for MIOs
- Development of a harmonized MIO Encoding Guide.
- Establishment of a central register for MIO object classes, attributes, and attribute values.
- Use of the Open ECDIS Forum (www.openecdis.org) as a means for communication and publication.
- Alignment with IHO S-100.

General Content Specification
A *General Content Specification for MIOs* (Edition 1.0, 24 May 2007) was approved at IHO CHRIS19 in November 2007. Most companies who provide S-57 data production tools (e.g., CARIS*, ESRI, Jeppesen Marine - C-Map/DeKar* and *SevenCs)* are using the *General Content Specification*.

Encoding Guide

Similar to what was developed by the Inland ENC Harmonization Group (IEHG) related to the production of Inland ENCs, a "MIO Encoding Guide" will provide detailed guidance on what is required to produce a specific type of MIO in a consistent and uniform manner -- anywhere in the world. An additional benefit is that it is a "living document" that can accommodate change.

Since current ECDIS equipment are required to use ENC data conforming to the S-57 ENC Product Specification, MIOs will continue to be produced based S-57 3.1/3.1.1. However, following the adoption of the new *IHO Geospatial Standard for Hydrographic Data* (S-100), -- and any future ENC Product Specification based on S-100, a determination will be made on how to produce MIOs suitable for use with both S-57 and S-100 based ENCs.

MIO Register

At present, the Open ECDIS Forum (OEF) is used for MIO development associated with:
- MIO related documentation/standards
- new S-57 objects, attributes, and attribute values
- individual product specifications
- portrayal/display of MIO information

As recorded in Section 8.1 of the CHRIS 19 Minutes:

The Committee agreed the need to establish an MIO Register for MIO S-57-based objects/attributes, product specifications, and portrayal. MIOs will be included in the IHO Geospatial Information Infrastructure (GII).

However, this has not occurred. Instead, as currently implemented on the IHO Hydrographic Registry site (http: 195.217.61.120/iho_registry/), there is an "OEF" rather than a "MIO" Register. This "OEF" Register contains a wide variety of S-57 objects/attributes – some that no longer relevant and others that are related to MIOs .

As explained in the *Report of the Activities of the OEF* (CHRIS20-05.2), there exists some uncertainty regarding the fate of these "orphan" S-57 objects/attributes. Since there is no OEF Register Manager or OEF Control Body, it is not clear who has "ownership", nor how a determination can be made regarding their usefulness. Potentially, some (but not all) could be transferred to the other established registers (e.g., Hydro, Ice, IENC, NPub). However, others are MIO-related. In addition, new MIO-related objects/attributes are under development (e.g., RIOs and Emergency Management Layers).

For both for S-57 and S-100 data related to MIOs, there is a need for a MIO Register to be established under the new IHO Registry.

Portrayal of MIOs

Currently, most MIOs are simple points, lines, or areas. To date, HGMIO has not prescribed how MIOs should be displayed on ECDIS. Since MIOs are optional, non-mandatory information that supplement the minimum chart- and navigation-related information required for safety-of- navigation, this matter has been left to the discretion of OEMs and/or ECDIS users. However, HGMIO has recommended that the portrayal/display of MIOs be based on the colours and symbology contained in contained in printed publications.

Current Status of MIO-related Activities

a. Sea Ice Coverage

In March 2007, the World Meteorological Organization established the JCOMM Expert Team on Sea Ice (ETSI). ETSI is the recognized competent authority for sea ice information for shipborne navigation systems (e.g., ECDIS and ECS). The *Ice Objects Catalogue* (Version 4.0) is based on IHO S-57 standards, and is the basis for the Sea Ice Register that is a part of the overall IHO Registry.

A Sea Ice MIO Product Specification is being developed by *CARIS* under contract with the Canadian Ice Service (CIS). It is based on the *General Content Specification for MIOs* (ver 1.1.1). In order to generate some sample data, CIS will extract the relevant ice information out of historical ice charts and provide to CARIS in *ArcVu SHP* format. In turn, CARIS will convert to S-57 using their *CARIS S-57 Composer* software to produce a MIO test data set. Once produced (December 2008), the Sea Ice MIO test dataset will be tested in the St. Lawrence River onboard Canadian Coast Guard Icebreakers and with Portable Piloting Units (PPUs) used by the Laurentian Pilotage Authority. In conjunction with the Sea Ice MIO Testbed, CIS also plans to post daily Sea Ice coverage MIO products on the CIS web site (http://ice-glaces.ec.gc.ca/).

b. Meteorological

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 were 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. Liaison with the World Meteorological Organization has also been established. Ideally, it will be possible to develop appropriate S-57 objects/attributes and symbology for the display of weather information on ECDIS / WECDIS.

    c. Tides/Water Levels

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, Netherlands) based on one-meter depth areas. 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 continues at the University of New Hampshire to develop dynamic tide and water level applications for the "Next Generation ENC" based on the development of a MIO layer containing both discrete tidal zones and water surface model that assigns predicted/real-time "z" values (e.g., height and time) to a gridded bathymetric dataset.

    d. Current Flow

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 was interest to convert some of this data into S-57 objects that could be used with existing ENC data and ECDIS systems. Ideally, this would include the development of gridded chart data models that can be used with both tide and current flow information. In conjunction with the e-Navigation Testbed St. Lawrence River in Canada, both S-57 objects/attributes and AIS Binary Message formats are under consideration.

    e. Oceanographic

A Technical White Paper: O*ceanographic 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 oceanographic object classes and attributes were proposed. Further work that is needed includes:
    1) Recommendations on oceanographic objects that should be addressed in an ECDIS.
    2) Develop a suitable method for handling 3-D data in a 2-D environment.
    3) 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

      2) Marine Electronic Highway Project
      In the planning stage since 1994, the Marine Electronic Highway (MEH) Demonstration Project is an IMO-organized, World Bank-funded project that aims to establish a regional mechanism in the Straits of Malacca and Singapore for enhanced maritime safety and marine environment protection. The Project will be developed as a co-operative and collaborative arrangement with Indonesia, Malaysia and Singapore, in partnership with the International Hydrographic Organization, the International Association of Independent Tanker Owners and the International Chamber of Shipping. As described by IMO, the MEH Project includes the production of ENCs, establishment of shore-based AIS stations, and the development of MIOs for "Environment and Natural Resource Conservation and Management (ENRCM MIO). One of the stated project objectives of the ENRCM component is to contribute to MIO international standards development and implementation including:
        - IHO S-57 → S-100
        - AIS Binary Messages (e.g., Met/Hydro)
        - e-Navigation
      Although a Request for Proposals (RFP) was issued in February 2008, IMO has delayed the start of the ENRCM MIO Component and decided to "re-scope" the Project. However, as evidenced by discussions occurring at IMO NAV54, there is growing appreciation of the need for/value of MIOs by the maritime shipping community – particularly as it relates to e-Navigation. IHO has stated that a new/revised RFP for ENRCM MIO will be issued sometime before the end of 2008.

g.   electronic Aids-to-Navigation Service Information (e-ANSI)
The International Association of Lighthouse Authorities (IALA) established a Working Group on electronic Aids-to-Navigation Information Service (e-ANCI) in 2004. 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. Based on the requirements defined at the June 2005 Workshop on International Standardization of e-ANSI Information on ECDIS (i.e., e-ANSI as a MIO), new S-57objects, attributes and attribute values were developed by Michel Huet (IHB) and Lee Alexander (UNH) in May 2007. However, based on recent e-Navigation related developments by IMO and IALA, e-ANSI information will most likely be provided in AIS Binary Message Format.

h. River Information Overlays
The US Army Corps of Engineers is responsible for the production/distribution of Inland ENCs in the navigable rivers and inland waterways of the USA. In conjunction with this effort, they are producing River Information Overlays (RIOs) associated with their "Port Series", MIOs for the National Data Buoy Center on floating Aids-to-Navigation (AtoNs) and two types of Emergency Management Layers (EML). These include:
    1) Call-in points for dealing with natural/man-made disasters (e.g., flooding, hazardous spills, accidents).
    2) Location of hazardous materials.
Working with *IIC Technologies* and CARIS, an EML MIO Product Specification and Encoding Guide have been developed. The most recent version of *CARIS S-57 Composer* (v2) has implemented these MIOs.

i. Data Quality - Fitness for Use
At recent meeting of the Data Quality Working Group (DQWG) in Bath, UK (3 September 2008), a proposed Data Quality MIO was developed. A new S-57 object and associated attribute were created:
    fituse – (fitness of use)
    depcon (depth confidence)
Using the *CARIS S-57 Composer*, a prototype test dataset was created in less than 24 hours. In concept, a Data Quality MIO would be used in conjunction with ENCs and would provide supplemental information to that contained in CATZOC.

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 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). In turn, IEC Publication 62288 contains the methods of testing and required test results for equipment/systems that conform to this new IMO Performance Standard. The Draft International Standard (DIS) version of IEC 62288 was issued in August 2008. Collectively, both performance standards (IMO and IEC) will affect how MIO information will be a component of an overall harmonized display of navigation-related information on ECDIS and other shipboard systems. In addition, these performance standards will also influence the display of e-Navigation related shore-based and shipboard information.

Future of HGMIO

Since its beginning in 2001, HGMIO has reported regularly to IHO CHRIS and to IEC TC80. However, the HGMIO work program has been monitored primarily by CHRIS rather than IEC TC80. Direct IHO Member State involvement in HGMIO has been minimal, with the majority of participation by representatives of maritime safety administrations, NGIOs, and commercial providers developing specific MIOs in support of sea ice coverage, status of Aids-to-Navigation (AtoN), and Marine Protected Areas (MPAs). In July 2008, IHB contacted the Chairman of IEC TC80 concerning the future governance arrangements for HGMIO. The Chairman of IEC TC80 informed the IHB that that it is no longer a need for IEC to retain any formal involvement with HGMIO. As a result, the HGMIO is now a defacto CHRIS Working Group.

As described in CHRIS20-071B, the role of HGMIO has evolved from its original beginning. As outlined in the *"Recommended Procedures for Development",* HGMIO does not initiate the development of specifications for individual MIOs or associated applications. Instead, HGMIO responds to requests for MIO applications/ development by IHO MS, competent authorities, or international organizations (e.g., WMO and IALA). For the most part, HGMIO assists in the development of MIO specifications intended for use by the maritime sector, less so for HOs. If or when CHRIS (soon to be HSSC) has a specific requirement to develop MIO specifications, these would most likely be assigned to a suitable IHO WG, rather than HGMIO. For example, this could include SNPWG for Sailing Directions, Tidal WG for tidal or tidal stream related MIOs.

At the HGMIO 5 meeting on 25-26 September 2007, the future of HGMIO was discussed. It was agreed that it was now more appropriate for the Group to become an independent technical group. As such, HGMIO can be retired as a CHRIS Working Group. However, it will continue exist as the Harmonization Group on Marine Information Overlays (HGMIO), and will deal with both static and dynamic MIOs.

Action Required of CHRIS

1. Note the activities of HGMIO related to MIO standards development/implementation.
2. Reaffirm the need to establish a MIO Register for S-57 objects/attributes, product specifications, and portrayal.
3. Agree that HGMIO can be retired as an IHO CHRIS Working Group.

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