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Status Report on
Inland ENC Development and Standardization

Submitted by
North American – European Inland ENC Harmonization Group

Introduction

Based on the findings of the European transport R&D project *INDRIS* (Inland Navigation Demonstrator for River Information Services) and the German project *ARGO* in 2001, both the Danube and the Rhine Commissions adopted an Inland ECDIS Standard for ENC data and system requirements for the Rhine and the Danube Rivers. In 2002 the Economic Commission for Europe of the United Nations (UN ECE) adopted the Inland ECDIS Standard as a recommendation for the European inland waterway system. To date, Inland ENC data conforming to the Inland ECDIS standard have been produced for the Rhine, Main and Danube Rivers in Germany, the Austrian portion of the Danube River, the Dutch connection between Rotterdam and the German border for the Scheldt River, the Garonne river in France, and sections of the Danube river in Slovakia, Hungary, Croatia, Serbia and Montenegro and Romania. Private companies are co-operating in producing complete Inland ENC coverage for remaining European navigable waterways. In addition, ECDIS and ECS equipment manufacturers that are active on the European inland waterways have upgraded their software to use Inland ENC data.

In the USA following 1999 recommendation by the National Transportation Safety Board, the U.S. Army Corps of Engineers (USACE) initiated a program to facilitate the production and implementation of Inland ENCs on Major River and inland waterway systems in the USA. To date, 45 Inland ENC cells covering 3,200 miles on the Mississippi, Ohio, Red, and Atchafalaya Rivers, and the Black Warrior/Tombigbee system have been produced and are available for public access via the Internet (www.tec.army.mil/echarts/). In 2004, work began on five additional waterways. Similar to Europe, several North American ECDIS and ECS equipment manufacturers now offer systems capable of using Inland ENC data.

While there are some differences between the North American and European inland waterways, there are far more similarities. A North American – European Inland ENC Workshop was held in Nijmegen, The Netherlands on 30 June – 1 July 2003 in conjunction with a *COMPRIS* (Consortium Operational Management Platform River Information Services) Conference on River Information Systems (RIS). In addition to informing participants on the status of standards development and projects being conducted, a key objective was to discuss the benefits of harmonizing Inland ENC data standards between Europe and North America. As an outcome of the Workshop, this was unanimously agreed.

Framework for International Inland ENC Specifications

- IHO S-57 Edition 3.1 where applicable.
- A central register for non-IHO S-57 object classes, attributes and attribute values.
- A Base Product Specification that includes all known Inland ENC requirements.
- Regional product specifications containing items from local waterway networks not contained in the Base Product Specification.
- Use of the Open ECDIS Forum (www.openecdis.org) as a means for communication and publication.
- Align with the future edition of IHO S-57 (Edition 4).

IHO S-57

IHO S-57 Edition 3.1 contains a Product Specification for the production of "maritime" Electronic Navigational Charts (ENCs) to be used in conjunction with an IMO-compliant ECDIS. For Inland ECDIS it became evident that additional object classes, attributes and attribute values were required to meet real-world inland navigation requirements. The European Inland ECDIS Expert Group developed a regional product specification based on IHO S-57, Edition 3.1. The Central Commission adopted it in 2002 for Navigation on The Rhine (CCNR), Danube Commission (DC), the Economic Commission for Europe Of the United Nations (UN-ECE), and the Permanent International Association of Navigation Congresses (PIANC). In parallel, U.S. Army Corps of Engineers (USACE) also adopted in 2002 an Inland ENC Content Specification based closely on the IHO S-57 Edition 3.1 ENC Product Specification. The USACE Inland ENC (IENC) Content Specification has recently evolved to become an *IENC Chart No. 1 and Encoding Guide.*

Central Register

In conjunction with the next edition of IHO S-57, a central register is planned that will include both IHO and non-IHO extensions. The register will based on ISO TC211 standards, and is planned to be operational when S-57 Edition 4.0 is published (planned for 2006). In the interim, the *Open ECDIS Forum* (http://www.openecdis.org/) currently serves as a central register for S-57 Edition 3.1 extensions.

"Core → Base" Product Specification

There were two different approaches that Europe and North America took towards initially developing Inland ENC standards. The European Inland ECDIS standard contains additional and/or modified objects/attributes (i.e., extensions), while the North America approach was to refrain from extending IHO features, but to produce a regional (i.e., USACE) content specification and encoding guide.

For harmonization, it was agreed that "Core" Product Specification for Inland ENC be developed that would be suitable for basic inland navigation requirements in Europe and North America. However, the term "Core" was confusing. In the USA, the word "Core" is pronounced the same as the term "Corps." Therefore, it was agreed that the term "Core" be changed to "Base". It was decided that the somewhat limited "core" (now base) product specification should be expanded to accommodate all known requirements of both Europe and North America. It was also agreed that the International Inland ENC Specification should include those IHO features that are relevant for Inland ENCs, as well as the real-world features that are needed for Inland ENCs (i.e., not contained in the "maritime" ENC Product Specification). It is intended that the Base Product Specification will be suitable for all regions of the world[1].

In conjunction with what is decided for IHO S-57 Edition 4 and its alignment with the ISO TC211 standards, it is expected that the Inland ENC Product Specification will become a separate Application Schema. In the interim, future extensions to the BPS and regional product specifications will be registered with OEF.

Regional Product Specifications

Some S-57 Object Classes, attributes, attribute values and encoding rules are specific to a local waterway network to such an extent that inclusion within the Base Product Specification would be impractical. Such features would be described as part of a regional product specification. A complete product specification for International Inland ENC production is therefore comprised of both the Base and, likely, a Regional Product Specification (i.e., Base + Regional = International).

Guidelines for Inland ENC specifications

a) Existing and new S-57 objects:

[1] Presently there are private initiatives to use ECDIS on major South American rivers. Also, China and Hong Kong have expressed interest in the developments of Inland ECDIS.

- Wherever possible, use existing object classes, attributes and attribute values from the current IHO S-57 ENC Product Specification, Edition 3.1.

- For additional object classes, attributes or attribute values that are not already described in the IHO S-57 Object Catalogue, first check the central registry for Inland ENC features.

- If the required object classes, attributes or attribute values are not described in the central registry, then new object classes, attributes or attribute values can be drafted and put forward to the IEHG for inclusion in the International Inland ENC set.

b) Creating new object classes, attributes or attribute values:

- An object class definition should be complete, covering all aspects of a real-world entity.

- An object class should represent an easily comprehendible concept. It is better to make two separate object classes if the definition of one object class is too lengthy and confusing.

- Each attribute should only exist once in an object class definition and should only contain one attribute value. The only exceptions to this rule are attributes of the type 'List'. These attributes should contain a composite string that can be broken down into a number of discrete values.

- The value of one attribute should not influence the value of other attributes, thus avoiding hierarchical dependencies within the attribute list of an object class.

c. Encoding rules

For all object classes, attributes, and attribute values, encoding rules should:

- Explain the basis for its creation.
- Describe its relationship to the real-world entity.
- Provide criteria for its proper use.
- Provide specific encoding examples for practical guidance.

Harmonization Group

The North American – European Inland ENC Harmonization Group (IEHG) is comprised of representatives from government, industry and academia. IEHG meets once per year, the most recent being 22-24 September 2004 in St. Louis, Missouri, USA. However, most of the work is accomplished via e-mail correspondence and the *Open ECDIS Forum*.

Four key persons involved in the IEHG include:

Co-Chairman

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