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THE INLAND ECDIS STANDARD OF THE CCNR

(Claudia Oberheim, WSVB, Germany)

I. Introduction

Reflections and experiments have been made in several countries of the European Union (EU) to use telematics for the support of inland navigation. This aim was especially pursued in the scope of the EU research and development project INDRIS. A pilot project on the Rhine river was started in Germany in 1998 under the name of ARGO. In ARGO and INDRIS, the radar image on the display in the skippers' wheelhouse were underlayed by an electronic chart. This is an approach to higher safety and more efficiency of inland navigation.

It turned out in the discussions that only an internationally agreed proceeding could be successful, because a skipper can not be expected to employ different equipment in each country. This was the reason why ECDIS came into view also for the inland navigation. The idea was to adopt ECDIS for inland navigation and to supply some distinct inland features, but not to change the original ECDIS standard. In this way, it is possible to have compatibility between the original - Maritime - ECDIS and Inland ECDIS. This is important for the estuaries of the rivers, where sea vessels as well as inland vessels navigate.

The European Union appointed an Inland ECDIS Expert Group in 1998 with the development of an Inland ECDIS Standard. The experiences of ARGO and INDRIS were the bases for the new standard. SevenCs GmbH, Hamburg, as a provider of maritime ECDIS software has been highly involved in Inland ECDIS. A close connection has also been held to the Federal Maritime and Hydrographic Agency (BSH) in Hamburg. The Expert Group submitted its first proposal on 1st January 1999 that was also mailed to the IHO.

In the year 2000, the Central Commission for the Navigation on the Rhine (CCNR) in Strasbourg installed an Ad-hoc Working Group for Inland ECDIS with the order to draft the Inland ECDIS Standard of the CCNR. The Ad-hoc Working Group started with the results of the Expert Group as input for their further work. On 31st Mai 2001, the CCNR introduced Inland ECDIS for the Rhine by a formal decision (**appendix**).

II. Structure of the standard and compatibility to Maritime ECDIS

The Inland ECDIS standard has 5 sections corresponding to the maritime ECDIS Standard:

2. Performance Standard (according to IMO-A.817(19))

3. Data Standard (extensions to IHO-S57)

4. Presentation Standard (extensions to IHO-S52)

5. Operational and Performance Requirements, Methods of Testing and required Test Results (according to IEC-1174)

6. Glossary of Terms

A comparison of the different structures of the standards for (Maritime) ECDIS and Inland ECDIS is given in **appendix 2**.

Inland ECDIS is compatible to Maritime ECDIS that means:

(a)   inland vessels sailing in maritime waters with inland ECDIS equipment get all maritime ENC information

(b)   sea vessels sailing in inland waters with maritime ECDIS equipment get all information that is equal to marine information (e.g. river bank), but they do not get the additional inland information (e.g. inland notice marks).

III. Operating Modes of Inland ECDIS

Inland ECDIS can be used in *navigation mode* or in *information mode*.

1. *Navigation mode* means the use of inland ECDIS <u>with</u> traffic information by radar or AIS overlay

2. *Information mode* means the use of Inland ECDIS <u>without</u> traffic information by radar or AIS overlay. For an inland ECDIS application, designed for information mode only, the requirements of navigation mode are to be understood as recommendations.

IV. Extensions to the IHO-S-57 Standard

In order to represent data necessary for inland waterway traffic in a S-57 conforming application, the S-57 object catalogue has been extended by the required object classes, attributes and values. Such extension terms of 'user defined objects' are allowed in the S-57 standard and there are several means to incorporate them.

Basis for the extensions was the S-57 Standard, Edition 3.0. They were made as follows:

The extension of existing S-57 object classes with new attributes, and the extension of S-57 attributes with new values are not allowed. Therefore, the S-57 object classes and attributes which were extended, according to the requirements of Inland ECDIS, were copied at first. Object classes were copied with their complete set of attributes, and attributes were copied with their complete list of attribute values. All new object classes and attributes have the same name as their sources, but their names are written in <u>small case letters</u>.

Reasons for *copied object classes (19)*:

-   An existing object class gets a new attribute, e.g. the object "canal bank" gets the new attribute "category of bank"

-   An existing object class gets a copied attribute with new values, e.g. the attribute "category of anchorage area" of the object "anchorage area" gets the new values 10 –12

-   An existing object class shall be symbolised in another way, e.g. top marks.

Reason for *new object classes (16)*:

-   A real world object can not be transferred into the S-57 world.

Reason for *copied attributes (10)*:

-   A new value is needed for an existing attribute.

Reason for *new attributes (29)*:

-   A new attribute with new values is needed.

The integer codes for the copied and new object classes and attributes have to be registered at the "Open-ECDIS-Forum".

V. Extensions to the IHO-S52 Standard

New symbols are created as follows:

-   20 raster point symbols in general
-   26 raster point symbols for navigational aids
-   24 raster point symbols for harbour facilities and terminals
-   103 raster symbols for the "information window on notice marks"
-   8 vector point symbols.

In order to display the new symbols, the lookup tables were extended.

VI. New functions in

In order to cope with the special conditions of inland waterways, new functions were developed, e.g.:

- a kernel functionality for the representation of aids to navigation (buoys, notice marks) and texts in a window of the ECDIS display (**fig. 1**)

- development of a kernel function for the display of depths contours under the actual water level and for the display of the individual navigable strip depending on the selected draught of the vessel and the water level at the main gauge **(fig.2)**

- overlaying of the ENC with the radar picture by radar map matching (**fig. 3**).

VII. Applications and Inland ENCs

Two applications for Inland ECDIS were developed:

- the ARGO Viewer by SevenCs GmbH for the information mode

- the Radarpilot 720° by Innovative Navigation GmbH for navigation mode (using the SevenCs Kernel) with radar map matching.

Inland ENCs were produced in Germany and the Netherlands for the whole Rhine, and in Germany and Austria for parts of the Danube. Further ENC production is now in progress.

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The authors:

Dipl.-Ing. Christian Krajewski,
Dipl.-Ing. Claudia Oberheim
Projektgruppe Telematik Binnenschifffahrt
Wasser- und Schifffahrtsdirektion Südwest
Brucknerstr. 2, 55127 Mainz
Telefon: +49 (0)6131 979 0
Telefax: +49 (0)6131 979 155
E-Mail: c.krajewski@wsd-sw.wsv.de
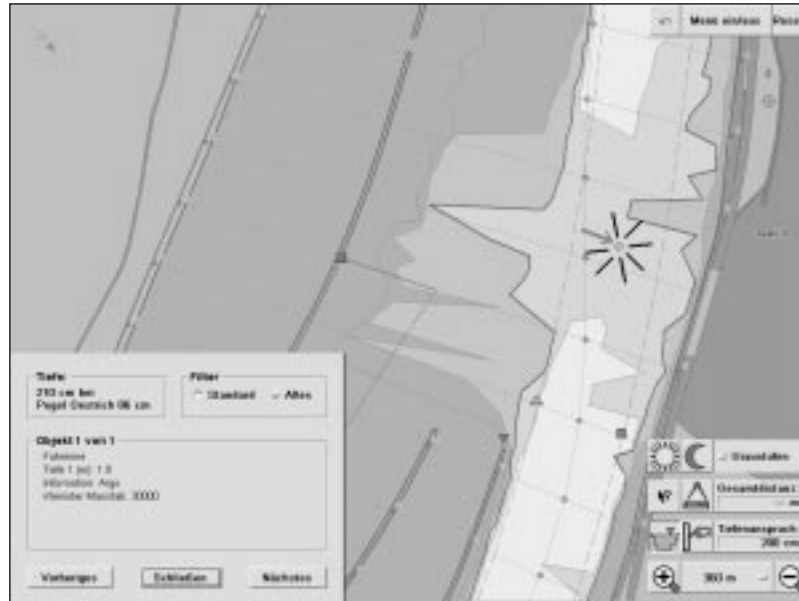   c.oberheim@wsd-sw.wsv.de
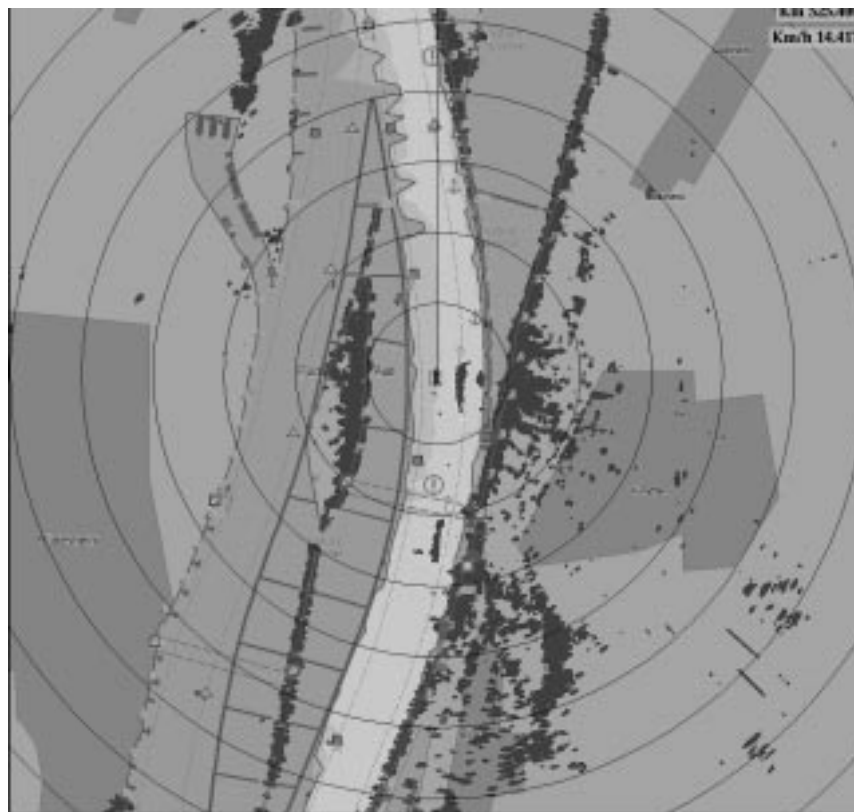
Fig. 1

Fig. 2

Fig. 3

PROTOCOL 16

Standard
ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM FOR INLAND NAVIGATION
(Inland ECDIS Standard)

Resolution

1. New information and communication systems for use on board inland waterway vessels are increasingly being developed in the area of telematics. Electronic inland waterway charts in which a radar display and an electronic map display are overlaid on a monitor have already been successfully tested in the German ARGO project and in the European INDRIS research and development project. Such systems are already being offered on the market.

2. The electronic chart, display and information system (ECDIS) that has been internationally established in ocean shipping, with the S-57 and S-52 standards of the International Hydrographic Organisation (IHO) contained therein, offers a technically matured system which can also be used in inland shipping with appropriate additions, thus ensuring compatibility between ocean and inland shipping.

3. Within the scope of the Concerted Action on Inland Navigation of the European Union, an international expert group was commissioned to elaborate an Inland ECDIS Standard especially for inland navigation.

   This standard consists of the following sections:

Section 1:	Performance standard;
Section 2:	Data standard;
Section 3:	Presentation standard;
Section 4:	Operational and performance requirements, methods of testing and required test results;
Section 5:	Glossary of expressions used.

4. By use of the inland ECDIS standard, a standard basis will be created for the use of electronic inland navigation charts on board inland waterway vessels on European inland waterways.

Decision

The central commission,

   with the aim of fostering, as early on as possible, the use of modern information systems on board inland waterway vessels and, in particular, the use of electronic inland navigation charts,

   in the knowledge that standardisation of the basis for these information and chart systems is necessary so as to be able to take recourse to uniform standards, and to take into account safety criteria, in the event of later applications of these information systems for navigation purposes,

   adopts the contents of the Inland ECDIS Standard, which is enclosed as an appendix to this resolution in German, French, Dutch and English; in the event of a lack of clarity in relation to definitions or meanings of wording in the standard, the version in English shall be decisive,

   commissions the joint police and investigation committee to update the standard and, particularly on the grounds of technical progress, to adopt necessary changes under its own responsibility; to this end, the Inland ECDIS Working Group shall elaborate suggestions in collaboration with the existing European Inland ECDIS Expert Group,

commissions the joint police and investigation committee to have the amendments of existing regulations that become necessary, for example in relation to the minimum requirements and test conditions for navigation radar systems and for rate of turn indicators in Rhine shipping, RheinSchPV, RheinSchUO, RadarPatV, for the use of electronic inland navigation charts for the control of inland waterway vessels in combination with radar, elaborated by the Inland ECDIS Working Group.

(Maritime) ECDIS

IMO A.817(19) Perfomance Standards for ECDIS, November 1995
    Appendix 1: Reference Documents
    Appendix 2: SENC Information
    Appendix 3: Navigational Elements and Parameters
    Appendix 4: Areas for which special conditions exist
    Appendix 5: Alarms and Indicators

IHO S-57: Transfer Standard for Digital Hydrographic Data, Edition 3.0, November 1996

    Part 1: General Introduction
    Part 2: Theoretical Data Model
    Part 3: Data Structure

    Appendix A: IHO Object catalogue
        Introduction
        Chapter 1: Object Classes
        Chapter 2: Attributes

        Annex A: IHO Codes for Producing Agencies
        Annex B: Cross Reference

    Appendix B: Product specifications
        Appendix B.1: ENC Product Specification
            Annex A: Use of The Object Catalogue for ENC
            Annex B: Example of CRC Coding
        Appendix B.2: Data Dictionary Product Specification

IHO S-52 Specification for Chart Content and Display Aspects of ECDIS, Edition 5, December 1996

    Appendix 1: Guidance on Updating the ENC
        Annex A. Definication and Acronyms
        Annex B: Current Updating Practice for Paper Charts
        Annex C: Estimate of Data Volume

    Appendix 2: Colour & Symbol Specifications for ECDIS
        Annex A: IHO ECDIS Presentation Library
            Part I: Use of the Presentation Libary
            Part II: Mariners Navigation Objects
            Part III: Supplementary Features
        Annex B: Calibration of Colour CRTs
        Annex C: Maintaining the Calibration of Colour CRTs
    Appendix 3: Glossary of ECDIS-Related Terms

IEC 1174: ECDIS - Operational and Performance Requirements,
    Methods of Testing and Reqired Test Results, December 1996

Inland ECDIS (Edition 1.0, 31.05.2001)

Section 1: Performance Standard

Section 2: Data Standard

    Appendix A: Object Catalogue
        1: Introduction
        2 - 4: Object Classes
        5 - 6 : Object Attributes

        Annex A: Codes for Producers and

    Appendix B: Product Specification

        Annex A: Use of the Object Catalo

Section 3: Presentation Standard

    Appendix A: Presentation Library

Section 4:   Operational and Performance Requirement
    Methods of Testing and Required Test Res

    Appendix A: Software Quality Assurance
    Appendix B: System Configurations

Section 5:   Glossary of Terms