

**19th CHRIS MEETING
Rotterdam, Netherlands, 5-9 November 2007**

**Electronic Chart Status (ENCs, RNCs, IENCs) in the USA
USA (NOAA)**

1. Electronic Navigational Charts (ENCs)

USA (NOAA) produces 609 of its suite of approximately 1,000 nautical charts as official ENCs. Monthly electronic updates are also produced. These ENCs cover 90% of the 175 top commercial shipping ports in the USA. The resulting ENCs and updates are distributed for free over the Internet at:

<http://nauticalcharts.noaa.gov/mcd/enc/index.htm>, and through a network of 8 certified distributors (<http://nauticalcharts.noaa.gov/mcd/enc/certdist.htm>). Over the 12 month period July 2006 to June 2007, NOAA distributed 22.4 million base cells, reissues, and updates. The certified distributors distributed an unknown number of additional NOAA ENCs.

Work is continuing on a new production system that will make ENCs, RNCs and paper charts from a single system. The new system uses PLTS for ArcGIS – Nautical Solution from ESRI to create, manage, and publish hydrographic information. It is a database-based system as opposed to a cell-based system. USA (NOAA) expects system acceptance to be complete by July 2008. Upon acceptance NOAA will begin data migration and publication from the new system. However, due to the varying nature of paper and ENC products, it is expected that this will be a long process.

Information regarding the project can be found here:

<http://www.esri.com/news/arcnews/summer07/articles/noaa-modernizes.html>

2. Raster Navigational Charts (RNCs)

USA (NOAA) produces its entire suite of approximately 1,000 nautical charts as official RNCs in the BSB format. Weekly electronic updates are also produced. The resulting RNCs are distributed for free over the Internet at:

<http://nauticalcharts.noaa.gov/mcd/Raster/Index.htm>, and through a network of 66 certified distributors (<http://nauticalcharts.noaa.gov/mcd/Raster/distributor.htm>).

Far more RNCs are distributed by the certified distributors than are downloaded from NOAA. Production, after 12 years, continues to be smooth, and public demand for the resulting RNCs is quite high.

Experimental work was conducted during 2007 on the use of the Adobe® PDF format for raster charts. This widely used format has the potential of offering a more feature-rich RNC, and of providing functionality that exists in ENCs but not in today's

RNCs. New technology developed by TerraGo Technologies, Inc. (<http://www.terragotech.com/>) permits raster images of nautical charts to be georeferenced.

Results from these experiments indicate that raster charts can be made as layers that behave like an ENC's Base Display, Standard Display, and All Data Display. Further, the ability to produce alarms and indications appears possible, including for "Areas For Which Special Conditions Exist." The ability to provide safety contours also appears possible. File sizes needed to provide these capabilities were larger than desired (10MB) and displayed slower than desired.

The Adobe® PDF format also accepts and displays vector data, including vector data with attributes. A NOAA ENC® was converted first to ESRI shape files, then to georeferenced PDF and evaluated. All objects and attributes converted correctly. However, the file size increased by a factor of 10 compared to the original ENC. The demonstrated capability of the PDF format to successfully deal with ENCs and RNCs simultaneously will be investigated further.

3. Inland Electronic Navigational Charts (IENCs)

The following table shows status of IENC availability, produced by the U.S. Army Corps of Engineers (USACE), on U.S. inland waterways. These waterways are shallow-draft (maintained for 2.7m minimum depth) and used by domestic, non-SOLAS class vessels. The current IENCs cover 68% of the inland waterway system, which support over 80% of cargo tonnage. Complete coverage of the 13,000 km system is anticipated by 2009. The resulting IENCs are distributed for free over the Internet at <https://www.tec.army.mil/charts>.

Nav Chart Books Available	River Coverage	IENCs Available	River Coverage	Equivalent Chart Books
22	13,035 km	82	9,241 km	12

Forty-two IENCs are maintained with incremental updates from Notices to Mariners and survey data. The remaining IENCs, currently maintained with annual file replacement, will also be maintained with incremental updates within the next two years. The U.S. Coast Guard is developing procedures and outfitting river tenders with chart systems to begin collecting buoy data for transfer to USACE, and publication in the IENCs.

Most initial and revised IENCs are produced by contractors using CARIS or SevenCs software, with revisions done by USACE offices and contractors. Quality assurance for all published IENCs is conducted using DKart Inspector software.