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Digital Nautical Chart (DNC) Report for CHRIS 2005
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1. Digital Nautical Chart (DNC) Status

NGA (National Geospatial-Intelligence Agency) completed its worldwide folio of approximately 5,000 nautical charts in DIGEST C – Vector Product Format in mid -2000 and successfully brought the entire folio into routine maintenance in September 2004. This folio satisfied the initial U.S. Navy operational requirements for worldwide navigation; however, the Maritime Division continues to expand DNC coverage according to newly added U.S. Navy requirements. About 200 charts have been added in the past year. Because funding for paper chart New Editions has been reduced, DNC provides the best support for marine navigation in that the paper products are increasingly burdened with Notice-to-Mariners corrections. NGA is working to address this issue through Bilateral Chart arrangements, described below, and development of direct printing from DNC.

2. DNC Distribution

DNC coverage of foreign waters is restricted from public distribution, principally due to foreign intellectual property rights/bilateral agreement provisions. However, U.S. waters are not restricted and NGA provides DNC gratis for GIS use from the NGA Maritime website along with the digital updates, i.e., VDU patch files. U.S. regulations have been issued to allow U.S. Federal vessels to navigate using electronic charts and publications. This same authorization applies to foreign government vessels entering U.S. waters with DNC.

3. DNC Deployment

The first U.S. Navy ship to complete all testing and crew training for ECDIS-Navy to be used for primary navigation, i.e., without hard copy navigation charts, was the cruiser USS CAPE ST GEORGE. This will soon be followed by the first “all digital” submarine, USS OKLAHOMA CITY. Now that the systems have completed testing and have approval, vessel navigation team training and final installation are the remaining steps to be taken for the remainder of the fleet to deploy with ECDIS-N. The U.S. Navy vessels are being deployed with the Northrup Grumman-Sperry Voyage Management System (VMS) and Navy projects fleet-wide use of ECDIS-N by 2009.

4. Bilateral Charts

NGA is in the quandary of being ready to shift out of lithographic chart production, but with a user community that still has requirements for hard copy charts, i.e., the U.S. Navy is only beginning its transition. For NGA to begin withdrawal from lithographic production in the near-term, requires an alternate source of hard copy charts for the U.S. Navy in English language, meters and WGS-84. NGA has begun to do so through Bilateral Chart agreements whereby a cooperating nation provides NGA with its digital print files, NGA prints only those charts needed for its government users and NGA terminates the issuance of publicly available charts for that nation’s waters. The nation thus receives the sales revenue. NGA is phasing this in at about 500 charts annually because the NGA Notices to Mariners system and NGA publications have to be realigned to the new folio in use by the U.S. Navy. NGA also is well along the way to developing e-POD (electronic-Print on Demand) using DNC as source. E-POD will make it possible for NGA to withdraw from lithographic production of charts.

5. ENC/DNC Harmonization

NGA continues to work in support of harmonization of the ENC/DNC through DGIWG (NATO Working Group) and the TSMAD (IHO Working Group), i.e., harmonization of data definitions and extension of attribution in a common way at the data level vice the product level.

6. Digital Publications

NGA has 78 publications, all of which are in digital format. At the end of 2004, NGA terminated the issuance of hard copy Notices to Mariners, which had been continuously issued without fail every week since 1869. NGA had been issuing 12,000 copies of the hard copy Notices gratis each week and this termination was a significant cost savings for NGA. NGA continues to provide Notice to Mariners gratis to the user, but only in soft copy from the NGA Maritime website. Rules for commercial replication of NGA publications are included in the header of the NGA Maritime Website. Several commercial firms have taken on publishing hard copy versions of the NGA publications and some value added markets have begun providing tailored products to vessels. NGA has implemented PDU (Publications Digital Update) using the patch technology of DNC updates to continuously maintain the NGA digital publications up to date.

7. Systems and Software Development

NGA upgraded the Navigation Watch Desk, which monitors the IMO/IHO Navigations warnings issued worldwide (120,000 to 160,000 warnings annually) a year ago and was expanded to have a backup capability. Thus, the monitoring of real-time/near real-time information for support of ECDIS-N has completed modernization. During 2005, the NGA Navigation Safety System is being re-capitalized with upgrades to SUN Micro-Systems servers and a transition from Unix code to Windows. This will eliminate the limitations on systems connectivity and allow electronic transfer of Notices information directly into DNC production and NGA connectivity with U.S. Coast Guard and NOAA for U.S. aids to navigation information. NGA also has identified funding for the Hydrographic Source Assessment System (HYSAS) to begin transition to the next generation NGA workstation, called GEOSCOU. HYSAS has already implemented FLEIDERMAUS, which will be expanded with the upcoming re-capitalization. This will improve connectivity of NGA systems and begin moving HYSAS towards a database environment. The new system also will begin the extraction S-57 bathymetric data into the database and expand capabilities for handling Law of the Sea issues.

When DNC was being developed, a Full Utility Navigation Demonstration software display system was developed in parallel to provide the U.S. Navy with a way to view the proposed display capability. For the next generation of DNC, in 2004, NGA began initial development of a capability to support and display "one-feature one-time" data, i.e., eliminate the layers of DNC (Harbor, Approach, Coastal and General) and collapse these data-layers into a variable density layer that will encompass the best feature data from these layers. This will involve utilization of the Scale Minimum (SCAMIN) attribute used by IHO. This will involve an eventual modification of GEOSYM (NGA symbols) to provide a mechanism for symbol generalization.

8. HarborView (3-D display)

NGA Maritime Division now uses imagery for change detection in port areas and from the resulting imagery, Digital Terrain Elevation Data and DNC, produces a 3-D display for U.S. Navy to use for planning and underway situational awareness. HarborView has been integrated with GPS/DGPS and has recently been modified to include high-resolution bathymetry. The first hundred of the 1,700 ports in DNC have been completed. This product is not available to the public, but can be shared through bilateral arrangements.

9. Digital Worldwide Shoreline

NGA has captured a new World Vector Shoreline (WVS) derived from rectified multi-spectral LandSat imagery. These data are being evaluated for acceptance from the contractor and have a problem of cloud masking that remains to be resolved for the product to be continuous. This shoreline eventually will be made available gratis from the NGA website and on CD/DVD media through the NOAA National Geophysical Data Center (NGDC). This will replace the current 1:250,000 WVS at a scale of about 1:50,000 to 1:100,000 scale. NGA plans to put the world shoreline product into continual maintenance and add maritime limits/boundaries for U.S. Government users. In addition, NGA collected shallow water areas of likely coral growth throughout the Caribbean Sea and currently is capturing the northeast Indian Ocean area. This is a cooperative effort with U.S. NOAA related to coral reef data and NOAA will release these data after NOAA evaluation and attribution.

10. GPS Accuracy Improvement Initiative

NGA is working with the Air Force Space Command to double the amount of observational data provided by NGA such that both military and civil users will attain about a 30% improvement in accuracy. The Legacy Accuracy Improvement Initiative is currently in testing and is scheduled for implementation in the 1st or 2nd quarters of 2006.