National Oceanic and Atmospheric Administration
NOS
Nautical Charting System
6501
Operational Analysis
2007

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Executive Summary

The Nautical Charting System (NCS), managed by the NOAA Office of Coast Survey, underpins production and distribution of NOAA's nautical charts. The NCS is a collection of 18 servers, 68 COTS and in-house developed programs, procedures, policies, four FTE's and six contractors. Under NOAA IT's naming convention the NCS is also known as the NOAA 6501 system. The NCS is the tool used by the Nautical Charting Program (NCP) to generate chart products. The NCP includes the NCS, and the elements of the Office of Coast Survey which directly produce nautical chart products. Currently, the NCS consists of two production lines to deliver raster/paper nautical charts and Electronic Navigational Charts (ENCs). The foundations of the NCS where laid in the

early 1990's. The primary output of that system design was raster/lithographic nautical charts. Due to changes in technology, mandated requirements, and customer requirements an additional product line was created for ENCs. The production lines for both raster/lithographic and ENCs are separate and distinct. The Nautical Chart System II (NCS II) is an effort to integrate COTS software into the NCS. The goal of the integration effort is to create is for a single production system which generates both raster/lithographic and ENC products. Both the NCS and the NCS II investments are reported in the NCS OMB 300 and the production metrics of the NCP are referenced as performance measures.

The data contained within the nautical charts, in both electronic and paper form, are the basis for safe, efficient and environmentally sound navigation in U.S. waters. This operational analysis (OA) is an annual, in-depth review of the NCP's performance based on the following:

- Customer Results
- Strategic and Business Results
- Financial Performance
- Innovation

This report focuses on the operational state of the program as of September 30, 2007, and is based on guidance developed by the Department of Commerce. The NCS directly facilitates NOAA's Strategic Goal to "Support the nation's commerce with information for safe, efficient, and environmentally sound transportation." The current program meets requirements within established cost, schedule and performance parameters.

2007 Achievements

The NCS's primary achievement was its availability, functionality and efficiency which allowed the NCP to meet the chart product production goals listed in the Marine Chart Division's (MCD) FY07 Annual Operating Plan (AOP). Chart Product production numbers are listed in Table 2.

During FY07 the reduction in the working inventory of reviewed source for ENC products was a priority. In FY06 the NCP did not achieve continual maintenance for source applications for the ENC product line. As of October 2, 2006 the working inventory of reviewed source was 9,669 source applications. To reduce the working inventory the NCP tasked six additional review cartographers to the ENC production. Working inventory was reduced by 52% during FY07 to 4,299 source applications. This reduction is dramatic considering that 9,656 applications were received during the year. The total number of source applications reviewed in FY07 was 13,935. This reduction was achieved by recalling charts from the contractors for review and posting 350 new editions.

Strides were made with the NCS II integration effort during FY07. Functional testing of the COTS software was conducted. The NCS II team worked to ensure that the requirements documented in the baseline were met and several draft documents on workflow, interfaces and system architecture were delivered.

1.0 Customer Results

The NCP is meeting customer needs by providing information for safe, efficient and environmentally sound marine transportation for our Nation's commerce via our nautical charts and related products. Up to date, accurate, and internationally standardized navigational products are provided to our customer by a wide variety of means. The value of this program in terms of reduced shipping costs, avoided environmental disasters and lives saved mandates a continued need for this investment. "The Marine Transportation System (MTS) provides *economic valu*e by affording efficient, effective, and dependable all-weather transportation for the movement of people and goods. Waterborne cargo alone contributes more than $742 billion to U.S. gross domestic product and creates employment for more than 13 million citizens.[1]" Hauke-Powell (2007) states that the value of NOAA nautical charts "contribute to these values generated by ships and boats because they are a component of the physical systems that make it possible to generate value.[2]"

The qualitative value of the NCP can be understood by examining the impact of an accident and the number of critical corrections applied to the nautical chart suite. Athos 1 is an object lesson in the economic and environmental costs of an uncharted obstruction. On November 26, 2004 the single-hull tanker Athos 1 struck undetected submerged objects, ripping its hull open. An estimated 265,000 gallons of oil spilled from the vessel into the Delaware River, affecting 115 miles of shoreline.[3] Waterfowl were killed, fishing, shell fishing, boating and hunting were impacted, two nuclear power plants were temporarily shut down, and the Port of Philadelphia was shut down to commercial traffic for three days. The cleanup costs for this accident exceeded $150 million.

In FY07 the NCP applied 1,084 critical corrections to its ENCs and 2,468 critical corrections to its raster nautical charts. A critical correction is defined as information on hazards to navigation or other information considered essential for providing safe navigation, such as channel conditions, bridge and cable clearances and regulatory changes. The mariner benefited in FY07 by having thousands of critical corrections applied to the NCP chart products. This information was used by the mariners to avoid incidents like that of Athos 1.

Figure 1 describes the logic model employed by the program to determine its outputs and outcomes. The program provides all required outputs and continues to reach the required customer focused outcomes.

1.1 Customer Requirements and Costs

The products generated by the NCP serve commercial and recreational mariners, other NOAA programs and government agencies such as US Coast Guard, US Navy, National Geospatial Intelligence Agency and many other non-governmental organizations such as American Pilots Association and US Power Squadron. Ultimately, the American consumer is the beneficiary, as safe

[1] An Assessment of the U.S. Marine Transportation System, A Report to Congress, U.S. Department of Transportation, September 1999. *http://ntl.bts.gov/DOCS/report*

[2] Use and Value of Nautical Charts and Nautical Chart Data in the United States, Report produced for the Office of Coast Survey, NOAA, August 2007

[3] *The Athos 1 Oil Spill on the Delaware River*, University of Delaware Sea Grant Program, Recovered January 13, 2008 from *http://www.ocean.udel.edu/oilspill/*

maritime transportation keeps costs low by moving over 51.4% by value and 79.5% by weight of all international trade.[4]

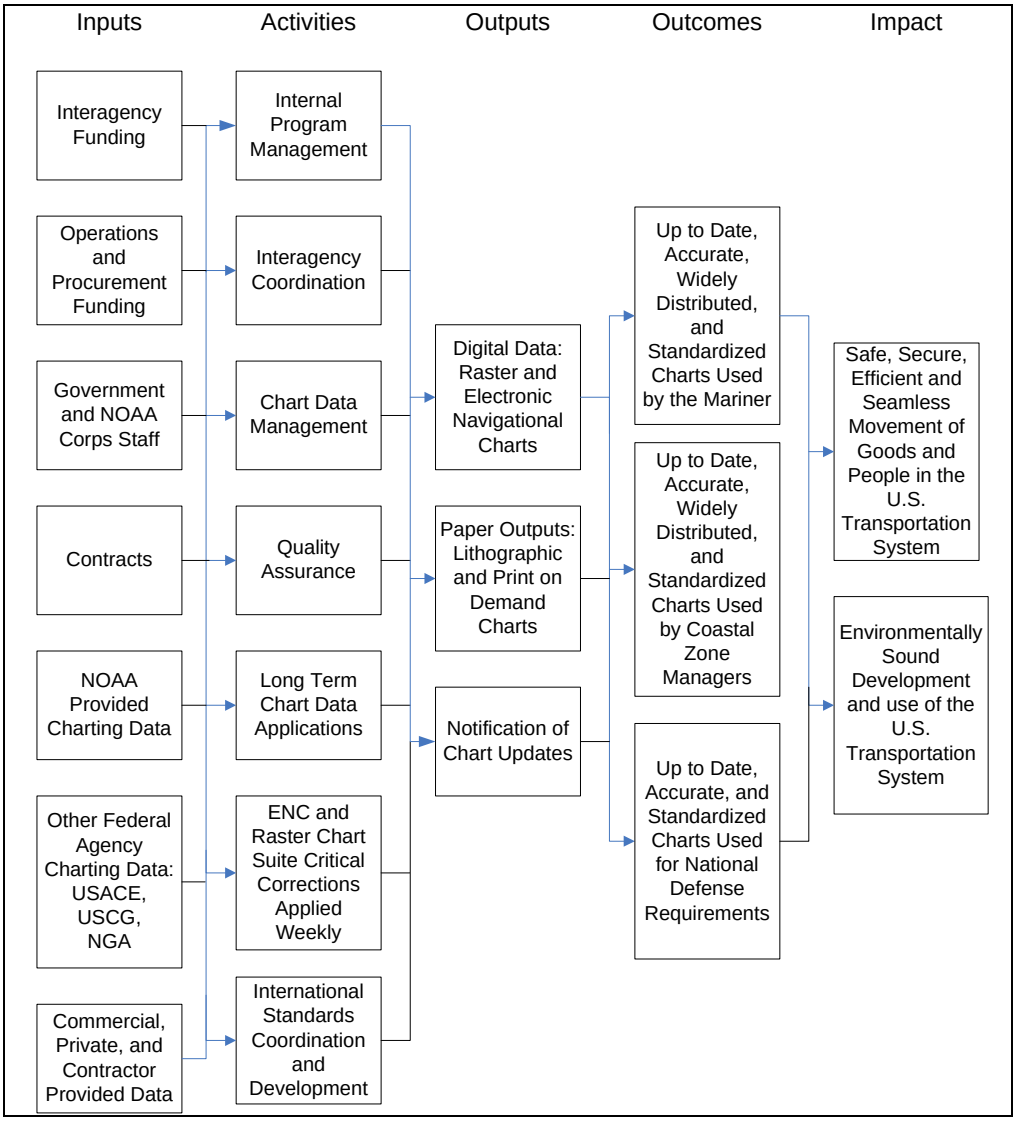


Figure 1: Nautical Charting Program Logic Model

Coastal resource managers, the scientific community, emergency planners and environmental protection authorities also have a stake in ensuring the U.S. waterways can be safely navigated without causing environmental damage. Americans benefit by having environmentally sound development of the nation's coasts.

Customers participate in funding decisions through their elected representatives through the annual appropriations process.

[4] Bureau of Transportation Statistics, Pocket Guide to Transportation 2007, Table 5-5 and 5-6. Recovered on January 13, 2008 from *http://www.bts.gov/publications/pocket_guide_to_transportation/2007/*

The Navigation Services Division (NSD) provides customer feedback to the NCP. NSD coordinates activities between multiple NOAA Line and Staff Offices in addition to other government and local organizations. Interacting closely with the maritime community and government organizations, NOAA is able to focus on resolving charting questions, educating constituents and soliciting perspective from the professional mariners and policy makers concerning NOAA's navigation products and services.

NSD has 11 Regional Navigation Managers that provides NOAA a conduit to engage and educate our nation's commercial and recreational maritime communities. They facilitate the flow of vital information, assure coordination and cooperation, and provide assistance in the use, evaluation and application of information. Regional Navigation Managers enhance navigational safety and efficiency by helping to improve products and services. Through their efforts, we help reduce the environmental and economic consequences resulting from natural or human induced emergencies.

Specifically, the Regional Navigation Manager provides a regional focal point for advancing NOAA's marine navigation products and services. The manager acts as NOAA liaison within the maritime community that includes shipping companies, pilot associations, port users and other customers to identify and understand their needs for navigation products and services. They also further NOAA programs through outreach efforts at conferences, workshops, maritime events and coordinate with other regional NOAA personnel to support the "One NOAA" concept.

Navigation Managers also represent NOAA in local, state, and federal interagency efforts for improved marine navigation safety and services. They actively participate in regional maritime planning meetings with Coast Guard, Army Corps of Engineers, state and municipal offices to understand and support current or proposed projects. They assess potential changes projected may have on NOAA products and services and recommend updates to accommodate. They also cooperate with planners to provide project support in areas of common interest.

Navigation Managers address navigation issues and facilitates the exchange of information that is distinct to their region. They conduct special projects and provide support as directed to include responding to natural or manmade disasters, special charting requests and Coast Pilot updates.

Figure 2 reflects areas for which the Regional Navigation Managers are responsible.

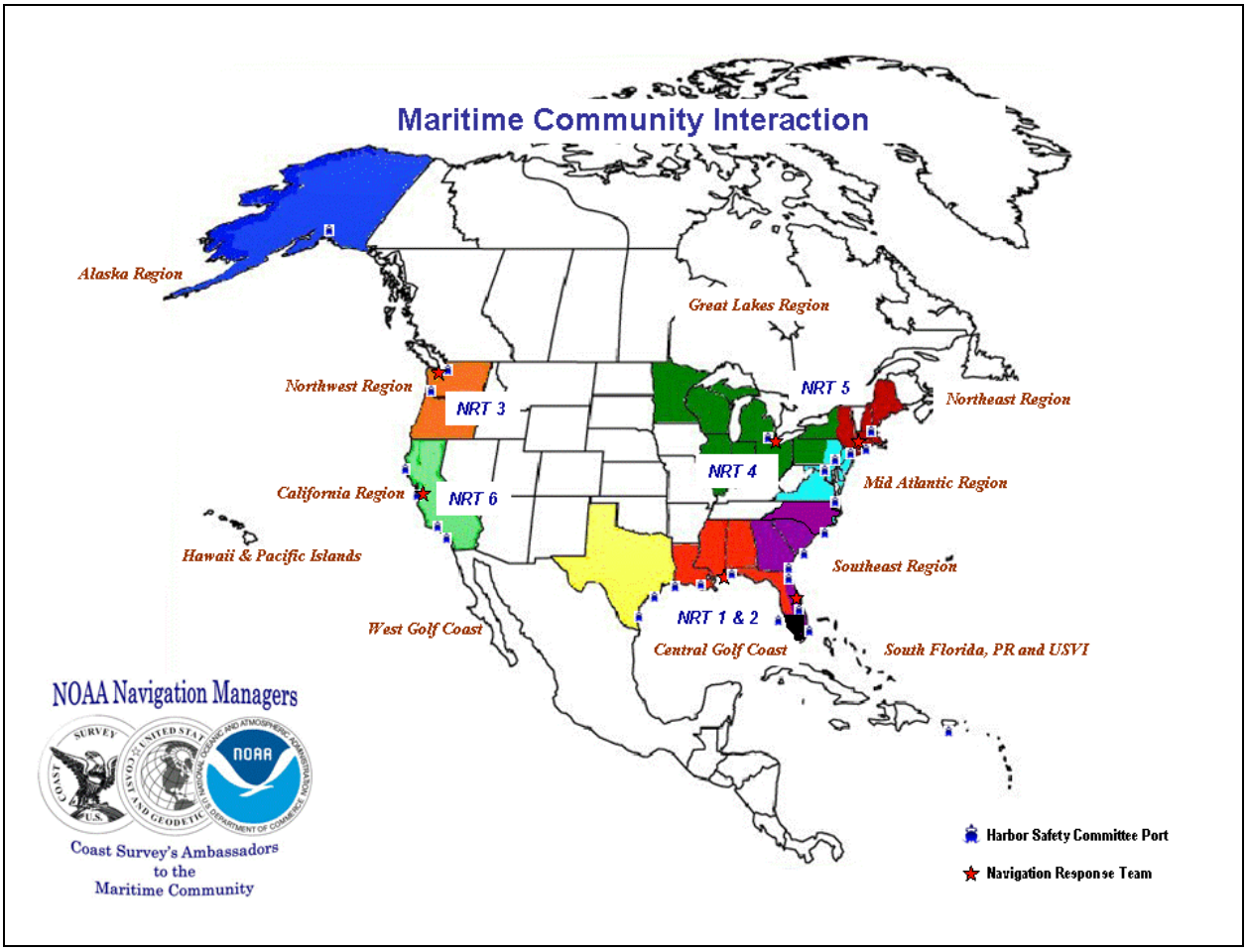


Figure 2: Regional Navigation Manager Maritime Community Interaction

Customers also provide feedback and new requirements using a web accessible chart comments, inquiry and discrepancy reporting system. Eighty percent of the comments are responded to in less than two days. The program has also long maintained relationships with trade and user organizations, such as the United States Power Squadron, American Association of Port Authorities and American Pilots Association, in order to keep abreast of user needs.

In terms of costs, NOAA provides hardcopy nautical chart and Coast Pilot products through chart agents at costs determined by 44 USC 1307, which specifies recovering costs of printing, distribution and database management. NOAA's electronic products – the raster nautical chart, the vector Electronic Navigational Chart, the web-based Coast Pilot – are available for free on the Internet. There is no direct charge to the customer for downloadable products.

1.2 Performance Measures

The long-established measures used to assess the program's performance at the NOAA level include:

- Number of raster charts updated and published annually
- Number of Electronic Navigational Charts (ENC) built and maintained

- Weekly critical updates service
- Percentage of raster charts that have critical updates applied within one week
- Percentage of ENCs that have critical updates applied within one month

The NCP internally tracks the free Internet downloads of Raster and ENC vector charts, the number of Print on Demand (POD) and lithographic charts sold, and the number of booklet charts printed. The program also measures employee performance based on indicators such as amount of source data applied, responsiveness to customer queries and services accessibility.

In an effort to increase service to the public the NCP continues to invest in e-Government. The goals are two-fold: Speed the delivery of critical chart information to the public; and distribute that information to the widest number and types of users free of charge. In order to meet those goals the NCS distribution business model includes both direct distribution from NOAA run websites and distribution from certified value-added resellers. Measuring the total distribution digital chart products is difficult because the number of digital files distributed by certified value added resellers is difficult to track. Under the Federal Code of Regulations Certified NOAA ENC Distributors (CEDs) and Certified NOAA ENC Value Added Distributors (CEVADs) shall maintain a registry of customers receiving NOAA ENC data and shall provide that registry to NOAA on a biannual basis for internal NOAA planning and product evaluation. RNC distributors are under contract to provide file distribution information quarterly. Many distributors are not in compliance. The NCP is working to correct this. CED, CEVAD and RNC distribution metrics are not included in this OA. Currently, there are nine CEDs and CEVADs and 65 NOAA certified RNC distributors.

When examining the metrics for the distribution of digital files from NOAA run websites it is important to understand what the statistics represent. For example, in FY06 44,370,504 ENC files were distributed and in FY07 21,467,220 ENC files were distributed. An ENC file is a base cell, reissue or an update. The NCS uses the ChartServer website to distribute both ENC and RNC digital files. From ChartServer it is possible to download the entire ENC suite by selecting the all ENC zip file. That zip file contains around 1,340 ENC files and the zip file is updated every workday with the application of critical corrections. A CED or CEVAD distributor downloads this information daily in order to provide their customers with current information. Other users may also this mechanism to simplify downloading digital files. What this means is there are a lot of files being downloaded. That does not equate to 21,467,220 files being used for navigation. Further, it is difficult to understand a reduction in ENC downloads of 52%, or 22,903,284 files, from FY06 to FY07. Likely causes for this reduction include more mariners relying on CED or CEVAD distributors for their ENC files and that the public has gained familiarity with ChartServer and ENCs in FY07. This familiarity results in fewer files downloaded for testing.

With the statistics in Table 1 it is essential that the reader does not equate the number of digital files being used as equivalent to the number of lithographic or POD charts being used. More digital files are going to be downloaded because they are free, they are easy to download, and there are files updated every workday. In comparison to get a lithographic or POD chart costs about $20 per chart, and takes delivery time.

In terms of paper chart sales, both lithographic and print on demand, it is important to understand the long term trends. Sales of the conventional lithographic charts and the small craft lithographic charts have been generally declining over the past 27 years due to the availability of multiple formatted electronic charts and availability of POD charts. For clarity Graph 1 shows the last eight years of paper chart sales. Since its introduction the Print on Demand (POD) chart sales have been

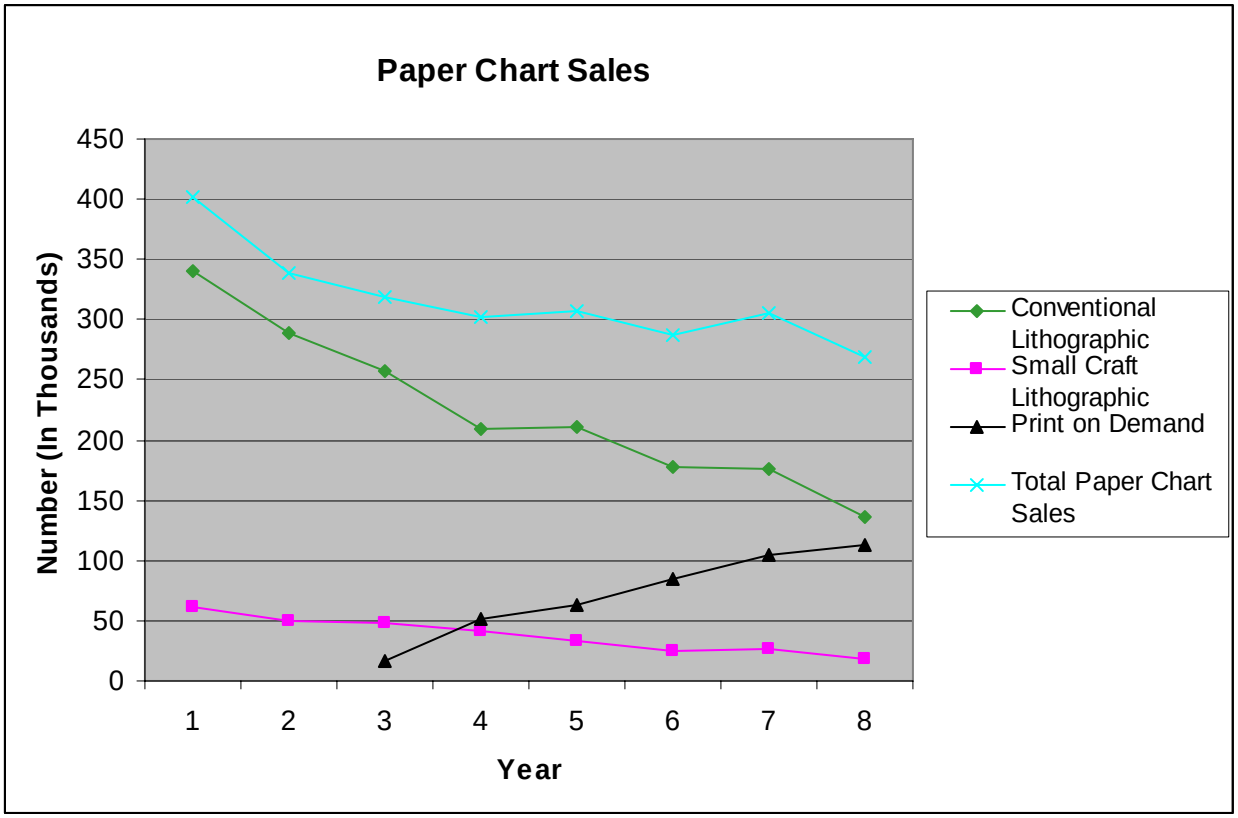
increasing on the average of 22% a year – with the exception of the first year. The popularity of the POD product is due to an innovative business model. Charts are generated on-demand and are up-to-date at the time of printing. The end result is the mariner does not have to make tedious and costly chart corrections to the conventional lithographic charts.

The measures below align with the "Customer Results Measurement Area" of the Performance Reference Model developed by the Federal Enterprise Architecture Program Management Office (FEA-PMO). Table 1 summarizes the performance measures.

Table 1: Customer Results Performance Measures

Measurement Indicators	Indicator	2006 Baseline	2007 Actual Results	Comments
Timeliness and Responsiveness	Average time to respond to chart comments, inquiry and discrepancy reporting system	2.1 Days	80% completed in less than two days	FY 2006 1323 Requests FY 2007 1345 Requests
Service Accessibility	Number of ENCs downloaded (Base Cells, Reissues and Updates)	44,370,504	21,467,220	Freely available product from http://nauticalcharts.noaa.gov
Service Accessibility	Number of RNC Downloads	2,315,743	1,891,714	Freely available product from http://nauticalcharts.noaa.gov
Service Accessibility	Print on Demand Sales	104,321	113,048	For FY2007
Service Accessibility	Lithographic Chart Sales	201,631	155,496	For FY2007 – both conventional and small craft

Graph 1: Paper Chart Sales



2.0 Strategic and Business Results

The NCP is meeting its own goals and objectives as well as those of the agency. Program management and controls are in place to ensure the program continues to meet its goals and objectives and monitor how well the NCP performs.

2.1 NCP Helps to Achieve NOAA and Commerce Strategic Goals

Nautical charting for safe navigation and homeland security is NOAA's oldest mission, with a clear legislative mandate for performing the function. The Office of Coast Survey has delivered this service since 1807, when our nation determined that its maritime and economic security depended upon safe movement of its ships. Today nautical charts bring the added benefits of promoting the efficient transport of goods to market, environmental security and homeland security. Maritime commerce enables the United States to be a leader in the global marketplace. But it is incidents like the Exxon Valdez, the 2004 Athos I strike of a submerged object in a navigation channel or the more recent Cosco Busan oil spill in San Francisco, and the disarray left behind in Gulf waterways by the 2005 hurricanes that demonstrate critical vulnerabilities in our Marine Transportation System. Accurate, timely, updated nautical charts are a fundamental defense against maritime navigation accidents and harm to life, property and the environment.

On March 10, 1983 NOAA's charting responsibility grew to 3.4 million square nautical miles when President Reagan issued Proclamation 5030 stating that the United States had sovereign rights to all natural resources within a zone extending to 200 nautical miles beyond the shoreline. This became the U.S. Exclusive Economic Zone (EEZ). As clearly stated in the Coast and Geodetic Survey Act of 1947, the agency is authorized to perform hydrographic and topographic survey activities "to provide charts and related information for the safe navigation of marine… commerce." The Hydrographic Services Improvement Acts (HSIA) of 1998/2002 reiterates this responsibility. HSIA 2002 also codifies NOAA's Homeland Security-enhancing activities with respect to electronic charts and other navigation services; the U.S. Navy and Coast Guard look to NOAA for its expertise in charting to support safe navigation.

The NCP plays a large role in NOAA's Marine Transportation System Program, which falls under the NOAA Strategic goal to "Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation." The Department of Commerce folds NOAA's navigation safety work into its Strategic Goal to "Observe, protect, and manage the earth's resources to promote environmental stewardship," with the objective of "enhancing the conservation and management of coastal and marine resources to meet America's economic, social and environmental needs."

2.2 Business Results

2.2.1 Program Management and Controls

The Office of Coast Survey's NCP, like all of NOAA, collects and reports on performance measures for mapping and charting activities. Internal quarterly reports are required by the National Ocean Service office annual operating plans, along with cost, schedule, and performance data monthly. Annual and long-term performance measures are used to help manage the program and improve

program performance. The program tracks internal metrics such as time spent to compile and review data to all charts, number of charts in continual maintenance, and customer service response times. These metrics help managers gauge employee and contractor performance, identify potential production and service shortfalls early on for redress, and adjust personnel assignments based on target requirements. Contracts are handled in accordance with the Federal Acquisition Regulations, which requires reporting on goals and milestones. Based on these regular reporting requirements, the program manages performance and takes corrective action, including redirection of funding or shifting personnel, as necessary.

NOAA also actively solicits feedback and recommendations for improving products from key partners and customers. Key partner and customer information is gathered through the Regional Navigation Managers, providing feedback to the charting program and process improvement. External customers have the opportunity to provide direct feedback to the NCP via an Office of Coast Survey Website at http://ocsdata.ncd.noaa.gov/dr. The information is reviewed daily and routed to the correct responder. The external customer will receive conformation that the request has been received. Responses to requests are typically completed within two days.

In terms of international coordination and controls, the NCP output conforms to international standards: IHO S-44, and IHO S-57 for ENC; and International Standard S-61 for raster chart data. The program maintains strong ties to international partners and the organizations establishing these standards to keep abreast and influence decisions on standards.

2.2.2 Monitoring Cost, Schedule and Performance

Cost – NCP requirements are listed before the budget year and then the OCS Management team evaluates priorities. A budget and operating plan is established. Managers and contractors are held accountable for cost, schedule and performance results.

Schedule – The NCP has planned quarterly milestones. The production managers report to the OCS Management team on a production statistics on a bi-weekly basis. Quarterly reports also include production performance metrics.

For FY 2007 the NCP met its milestones.

Performance

NOAA managers are held accountable for performance beginning with senior NOAA management. The program is included in quarterly program updates on cost, schedule and performance to the NOAA Executive Panel, which oversees the NOAA planning, programming and budgeting process. The National Ocean Service Management and Budget Office require monthly reporting on budget plans versus actuals to closely track execution. Furthermore, the program reports monthly to NOAA summarizing cost, schedule and performance to ensure project targets and goals are being attained. Annual performance elements are reported in OMB's Program Assessment Rating Tool, and play a role in higher level measures reported in the Department of Commerce's Annual Performance Review documents. Program partners, such as contractors, are held accountable for performance through deliverables specified in their contracts including requirements on quality and timing associated with the deliverables.

2.3 Reviews

The NCP has implemented major program improvements stemming from recommendations made in National Research Council (NRC) studies such as *Charting a Course into the Digital Era: Guidance for NOAA's Nautical Charting Mission* (1994). Changes have been made in responding to customer requirements and in the role of advancing technologies, along with response to a growing demand for customized and digital nautical information products. The Hydrographic Services Improvements Acts of 1998/2002 provided Congress and NOAA an opportunity to evaluate NOAA's navigation programs, and authorized a Hydrographic Services Review Panel Federal Advisory Committee to advise the NOAA Administrator on issues regarding NOAA's Navigation Services, such as mapping and charting. Additional internal reviews such as Management Control Reviews and NOAA Inspector General Audits provide an objective look at program performance and processes. Virtually all recommendations of the recent audits and reviews were adopted. Socioeconomic studies have been conducted to align Program products and services with user groups and identify benefits. NSD contracts with an independent survey firm to conduct OMB approved surveys every 1.5 years of mariners and customers of navigation services on the utility of NOAA nautical charts and tide and current data. These surveys are conducted to establish customer satisfaction with the NCP's products and services as well as to track improvement.

2.4 Security

The NCS, which underpins the work of the NCP, is certified and accredited under requirements spelled out in NOA 212-13 (08/06/90), NIST 800-53a and DOC IT Security Program Policy [June 26, 2005] that are based on OMB and NIST guidance. System Security Plans, Risk Assessments, and Contingency Plans were certified and approved for NCS/NOAA6501 in July 2006. Certification and Accreditation controls for the NCS were re-tested in August of 2007. Management, operational, and technical security controls are adequate to ensure the confidentiality, integrity and availability of information.

Security of the NCS continues to increase with the hardware modernization of servers with operating systems configured to the Defense Information Systems Agency (DISA) Standards and the modernization of NCS legacy code from Microsoft Visual Basic 6 to Microsoft Visual Studios .Net 2.0.

2.5 Performance Measures

The performance measures in Table 2 show the NCP's performance with respect to Mission and Business Results. Mission and Business Results performance measures reported include "Number of ENCs maintained in Critical Corrections" and "Maintain the Raster Database of 1019 Charts with Critical Updates." The measurement category is "Transportation" with the Measurement Grouping of "Water Transportation." These subcategories are part of the Performance Reference Model developed by the FEA-PMO.

In Table 2 it is important to clarify some of the language and concepts being expressed. A "new edition raster chart" is an existing raster chart with enough new source hydro and shoreline applied that it merits being reissued and printed. A "new edition ENC" is similar. A "first edition raster chart" is a raster which covers a new area at a larger scale. This is a difficult task requiring the cartographer to compile the chart from scratch from source data. A "new ENC" is similar. To keep

raster charts in continual maintenance means that source data is analyzed and being applied within 3 weeks of receipt. This allows the NCP to extract critical correction information in a timely manner.

In FY07 there was a reallocation of fixed resources to meet changing NCP priorities. The reduction of reviewed ENC source was a priority and was staffing the NCS II integration effort. The FY07 Annual Operating Plan was written with these changes in mind, with planned increased production in some areas while production in others would be reduced.

Reviewers from the raster teams were reallocated to ENC production. As source was reviewed on ENC products new edition ENCs were released resulting in 350 cells for FY07 as compared to 215 for FY06. This was a significant success for the year. The end goal is to place ENC cells into continual maintenance for source applications.

In the FY07 Annual Operating Plan it was determined that shifting resources would decrease the number of new edition raster charts produced to 200. The actual result of 209 beat the expectation. Similarly it was expected that 20 new ENCs would be built. The actual result was 21.

Table 2: Business Results Performance Measures

Measurement Area	Indicator	2006 Baseline	2007 Actual Result	Comments
Mission and Business Results	Number of new edition raster charts produced	263	209	Goal to produce 200 for FY 2007
	Number of new edition ENCs produced	215	350	Updating 350 ENC editions for source reduced the ENC backlog by 52%. A reduction of 33% was targeted.
	Number of first edition raster charts built	2	1	First edition raster charts are only built to meet new requirements
	Number of new ENCs built	72	21	Goal to produce 20 new ENCs for FY 2007.
	Maintain the raster DB of 1,019 charts with critical updates	99%	99%	Percent of critical updates applied to raster charts within one week of publication
	Maintain the ENC DB of 601 charts in with critical updates	97%	97%	Percent of critical updates applied to ENCs within one month of publication
	Percent of raster charts kept in continual maintenance for source applications	95%	95%	

3.0 Financial Performance

3.1 Current Performance vs. Baseline

The Nautical Chart Program follows prescribed Department of Commerce-wide financial management and accounting policies, procedures, and controls. Planning and spending is done via Annual Operating Plans, and routine financial and performance execution reports. Budgets are planned, executed and tracked on a monthly basis with variances identified, justified and mitigated. Advance Acquisition Plans are developed annually that identify all procurement actions submitted during the year to the NOAA Acquisitions and Grants Office to ensure close coordination and tracking of procurement actions. Spending is tracked within the NOAA financial system (CAMS/CBS) and is evaluated quarterly by Navigation Services financial management officers. Program managers perform quarterly reconciliation (comparing internal tracking against CBS) and must satisfactorily justify any significant variances from plan. Furthermore, NOAA has begun to implement recommendations resulting from a multi-year Business Process Reengineering study intended to improve the management and delivery of financial and administrative services. The study team examined NOAA's financial management practices across eight functional areas (Acquisitions; Budget; Finance; Grants; IT; Workforce Management; Facilities and Logistics; and Environmental Compliance, Health and Safety). The team then researched relevant best practices that could be applied to improve NOAA's budget and financial systems. Improved financial management procedures, processes, systems, and training developed through the Business Process Reengineering implementation are being adopted by the program.

3.2 Performance Measures

The program's planned versus actual expenditures are reviewed monthly, quarterly and annually via reports presented to National Ocean Service management and Budget, NOAA Budget and the NOAA Deputy Undersecretary.

3.3 Cost Benefit Analysis

The program's FY07 budget request included funds to support a cost benefit analysis; the request was not fully funded. The FY08 President's Budget also supported a cost benefit analysis, but the 2008 Omnibus Appropriation came in below the full request. Recognizing the need for such analysis, the program is currently assessing how it can pursue this effort with available resources in 2008.

3.4 Financial Performance Review

Financial performance is typically subjected to a periodic review for reasonableness and cost efficiency. Monthly budget reviews are held with the program manager, CORs and contract managers to ensure contracts are within cost and on schedule. Monthly reports from contractors are required to ensure the Government has the information it needs to evaluate cost performance. A detailed review of work and priorities is undertaken if cost is significantly above baselined values. Also, any necessary corrective actions are also identified and implemented.

4.0 Innovation to Meet Future Customer Needs

The following projects were implemented in FY2006/2007are being implemented in FY2008 to address future challenges, better meet customer needs, make better use of technology, and lower operating costs.

4.1 Number and Types of Users

NCP users include commercial and recreational mariners, other NOAA programs and government agencies such as US Coast Guard, US Navy, National Geospatial Intelligence Agency and many other non-governmental organizations such as American Pilots Association and US Power Squadron. Over the past five years there has been an increase in nontraditional users, such as scientists, coastal zone planners, and environmental protection authorities. These individuals are accessing NCS data for non-navigational purposes.

Project to Address Challenge: *Make up-to-date NCS data easily accessible to developers for reliable redistribution of chart products and services.*

The suite of NCP products is being continuously updated weekly with critical corrections and then made publically available. To better support developers from industry and other government agencies in accessing this continuously changing information, the NCS will provide direct access to database information and the nautical chart product suite. This will allow external entities to create their own interfaces or develop programs to simplify their access to the data. By providing reliable direct access to products, the NCS will be able to meet the needs of customers whose requirements are beyond that of the general user.

A rudimentary example of a developer linking directly back to NCS products is seen at http://www.mdnautical.com/ogchartview-pacificcoast.htm. This website demonstrates a developer linking directly back to the Online Chart Viewer. The limitation with this website is that when there are changes to the chart suite the site must be reprogrammed. By providing direct access to database information and the nautical chart suite, the developer can automate the website so that it is dynamically serving current information. Giving programmers NCS chart suite information in an automated way will prevent misinformation from being distributed to the public by third parties. NCS chart products are routinely added, deleted or modified from the suite. By providing links directly back to the NOAA website for current chart products, old chart products are not archived and shared by third parties.

4.2 Nautical Charting System II (NCS II)

After data is ingested in the current nautical chart system NCS, the processing splits into two separate production systems to support two different yet similar products: ENCs and raster/paper nautical charts, as illustrated in Figure 3.

At a conceptual level the information contained within each product is identical as is their purpose. The difference is that one product – the raster/paper, is basically a cartographic representation using symbols that have no underlying intelligence and are interpreted by the user. This product is used as a print on demand chart, a lithographic chart or a raster chart (digital file for use on an electronic charting system).

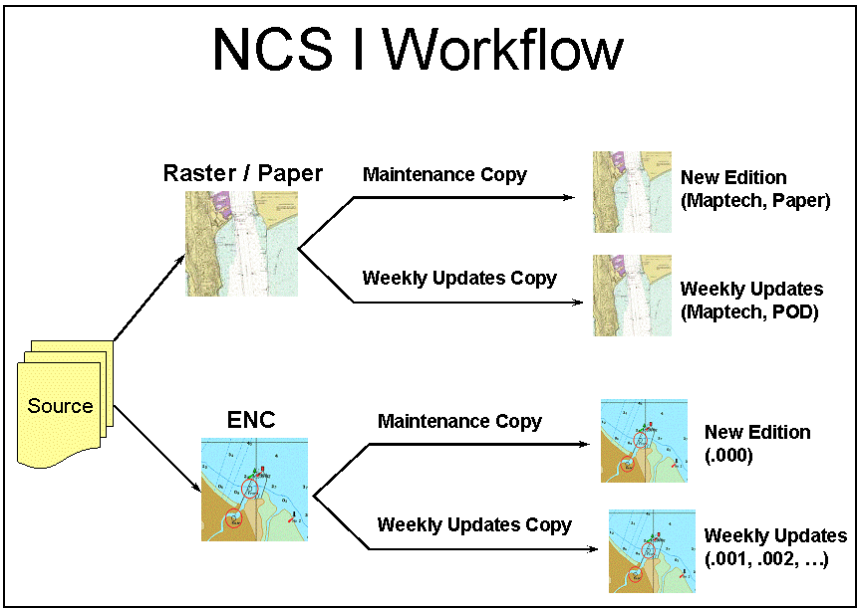


Figure 3: NCS I Workflow

The other end product is entirely vector. Every point, line or area object is attributed by the cartographer. It is assigned to be a buoy, a sounding, a land contour or a depth area, or some other feature according to the S-57 convention. These objects are gathered together over a region and make up an ENC. Vector data allows NOAA to build more information and far more accuracy into the nautical chart that the mariner now wants to view onscreen. Greater accuracy is particularly important, as mariners increasingly rely on GPS positioning to navigate, and the charting products they use must reflect the same level of accuracy as GPS.

Having two separate data pipelines is inefficient. It is anticipated in FY 2009 the new system will be integrated and have completed system acceptance. After acceptance, the NCSII will undergo a phased transition into production, and will allow the generation of raster/lithographic products from S-57 data. This integration will unify the data pipelines.

Project to Address Challenge: *Unify both raster/paper and ENC production pipelines*

The Office of Coast Survey (OCS) has worked for several years to leverage technology to improve efficiencies in the nautical chart production process (reference OMB300: 006-48-01-15-01-3401-00). In the first quarter of FY2005, the OCS Marine Chart Division (MCD) embarked upon a five year contract with ManTech MBI Inc. (MBI) to acquire a new single production line system that integrates the ENC production line and the raster production line into a vector database where multiple products can be extracted. This contract is broken into five separate phases:

Phase 1: Requirements Analysis (Completed: May 2005)
Phase 2: Trade Study and System Test (Completed: December 2005)
Phase 3: System Selection (Completed: January 2007)
Phase 4: System Integration (Acceptance: January 2009)
Phase 5: System Migration (Begins: February 2009)

Currently, the project is in the integration phase. This phase includes functional testing of the solution. Ensuring that the requirements baseline documented in phase one is met, developing workflow modules, and tying in legacy database systems to the new system. Due to the nature of the COTS development cycle, the deliverance of full capability by the vendor is not expected until August 2008. Therefore, system acceptance will occur March 2009.

4.3 Funding Levels

The NCP budget has essentially been flat since 2004, when it received a $1M increase for Electronic Navigation Charts. Though President's Budgets since that time have annually requested $2M additional to bring the total ENC effort to $6.35M, the program has held constant at $16,182,887 (before rescissions and overhead – $15,773,079 after). The level of effort these funds procure is slowly declining, as inflationary costs increase. This decline has an impact on the program's ability to maintain the raster and vector production systems, as well as the development of the single production system. The FY2008 Omnibus Appropriation also failed to adequately fund ENCs, but the FY2009 President's Request will continue to seek sufficient funds for the program.

Project to Address Challenge: *NCSII to increase chart creation efficiencies*

The adoption, integration and migration to the NCSII are anticipated to take three-to-four years. During this time the NCS will support three data pipelines. System efficiencies are anticipated to decrease during the transition period. Factors for the decrease include retraining of existing personnel, system documentation, determining and eliminating errors in the new data pipeline, populating a hydrographic product database, and development of new processes and techniques. Once migration is complete there will be an estimated 20% increase in the efficiency of chart production over the pre-transition period.