

**NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY  
ANALYSIS AND PRODUCTION DIRECTORATE  
OFFICE OF GLOBAL NAVIGATION  
MARITIME DIVISION**

**MARITIME DIVISION TRANSFORMATION**

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**ABSTRACT**

*The Maritime Division at the National-Geospatial Intelligence Agency (NGA) is transforming and the traditional mission is being gradually broadened to encompass, fuse, and blend geospatial information with imagery. This change is predicated upon the need to provide our customer the hydrographic knowledge foundation for planning, decision-making and action. Safety issues and hydrographic foundation data will remain core functions and geospatial intelligence and expanded production of littoral data will begin to take on increased relevance. This paper will discuss the Maritime vision for transformation, history and legacy systems, and new initiatives that will move the division closer to a data centric business environment.*

**INTRODUCTION**

Transformation is ubiquitous at the National Geospatial-Intelligence Agency. Some of this transformation may be a result of technology; some occurs because of cataclysmic events such as 9/11. The Maritime Division has demonstrated resilience over its history to remain rooted in its core mission and yet make the adjustments to transforming events and technology. The purpose of this paper is to discuss the ongoing transformation, and the transformational initiatives developed by the Maritime Division. As the Division moves further into the digital realm; as the Digital Nautical Chart (DNC ®) comes of age and replaces standard paper nautical charts, new data mining initiatives become apparent. These initiatives are shaping the Maritime Division's strategy to eliminate stovepipe production systems, exploit and integrate new source and new technology, and move to a single, web accessible, hydrographic knowledge store- the Nautical Database Maintenance Environment (NDME).

The Maritime Division is transforming, and the traditional mission is being gradually broadened to encompass and fuse hydrographic geospatial information with imagery. The traditional mission has been to keep the seas safe for navigation through the timely dissemination of maritime safety information in the form of nautical charts, navigation publications, U.S. Notice to Mariners, and broadcast warnings via the Worldwide Navigational Warning Service. This broadening of mission is predicated upon the need to provide our customers the hydrographic knowledge foundation for planning, decision-

making and action. Safety issues and hydrographic foundation data will remain core functions, and geospatial intelligence<sup>1</sup> and expanded production of littoral data will begin to take on increased relevance.

## **HISTORY AND HERITAGE**

The establishment of the Maritime Division dates from Dec. 6, 1830, when the U.S. Navy established a “Depot of Charts and Instruments” to collect navigational charts, publications, and instruments. The National Imagery and Mapping Agency (NIMA) was established in October 1996. NIMA was created to accelerate the fusion of geospatial information and imagery intelligence and to meet growing customer needs for a common, digital view of the mission space. The Defense Authorization Act for Fiscal Year 2004 formally changed the name of NIMA to the National Geospatial-Intelligence Agency (NGA). This is a major step in transformation efforts and emphasizes the geospatial intelligence mission in support of national security. It recognizes the intrinsic value of geospatial intelligence to operations and decision-making.

Throughout these organizational changes, the Maritime Division has remained steadfast in fulfilling its mission to deliver maritime safety information to the U.S. Navy and civil mariners. The world’s oceans are vast and dangerous and no U.S. Naval vessel sails, into harms way, without hydrographic geospatial information supporting safety of navigation disseminated by the Maritime Division. This information supports: general/strategic planning, tactical planning, mission planning/rehearsal, amphibious assault, anti-submarine warfare, sea navigation, littoral warfare, special operations, mine warfare, search and rescue, helicopter operations, close air support, urban evacuation, mobility analysis, land navigation, ground operations, modeling and simulation, advanced deployable systems, C3I, and joint logistics over the shore.

NGA’s Maritime Division has maintained its nautical presence and emerged to play a vital role in today’s world of navigation safety information and national security needs.

## **MISSION**

The Maritime Division is the primary organization within NGA responsible for worldwide hydrographic data. The Division incorporates all current NGA hydrographic production assets and serves as the organization responsible for all NGA hydrographic activities. The Maritime Division’s mission is to:

*Collect and analyze maritime safety and geospatial intelligence information to produce, promulgate, and provide worldwide access to standard nautical, digital and custom tailored hydrographic and bathymetric information in support of national security needs, including maritime safety.*

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<sup>1</sup> *Geospatial intelligence is the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict geographically referenced physical features and activities on the Earth in support of national security needs.*

This mission is mandated by the following U.S. Code and International Regulations:

a) Chapter V, Regulation 9, of *The International Convention for the Safety of Life at Sea, 1974*, as amended, states: "Contracting governments undertake to arrange for the collection and compilation of hydrographic data and the publication, dissemination and keeping up to date of all nautical information necessary for safe navigation." Regulation 27 states that "Nautical charts and nautical publications, such as sailing directions, lists of lights, notices to mariners, tide tables and all other nautical publications necessary for the intended voyage, shall be adequate and up-to-date."

b) Title 10-U.S. Code, section 442 (b) states: "The National Geospatial-Intelligence Agency shall improve means of navigating vessels of the Navy and the merchant marine by providing, under the authority of the Secretary of Defense, accurate and inexpensive nautical charts [which includes the U.S. Notice to Mariners and WWNWS Broadcast Warnings], sailing directions, books on navigation, and manuals of instructions for the use of all vessels of the United States and of navigators generally."

c) Federal Register, Vol. 66, No. 85 of May 2, 2001 modified 33 CFR Part 164 to enable Federal agencies to utilize electronic charting and navigation systems as an alternative to requiring paper nautical charts and publications, when the public vessel is equipped with an electronic system and backup.

## **VISION**

The Maritime Division's guiding light has been HydroVision, and it is just as relevant today as it was when conceptualized over eight years ago. Maritime Division's future will be built upon fusion of hydrographic geospatial information and imagery, creating a synergistic nautical database environment that will enable the customer to know the earth and chart the course. The NGA course for the future storage, maintenance, and distribution of NGA's nautical data has been set and is encompassed in the NGA HydroVision statement:

*To provide customers up-to-date, tailored data on demand from a single digital nautical data maintenance environment focused on aggressive data collection and near real-time information processing by regional teams that leverage the advantages of imagery, imagery intelligence, and hydrographic data sources.*

## **WORKFORCE**

The Maritime Division workforce is comprised of highly motivated Marine Analysts, Cartographers, Geospatial Analysts, Regional Analysts, Bathymetrists and Imagery Analysts that represent a unique collective blend of navigational, cartographic, geospatial and imagery exploitation expertise. The Division is slowly moving, as systems are re-capitalized, to grouping its workforce into integrated teams, as the

synergy created is beneficial to employees, NGA and the quality of the information the customer receives.

The analysis and extraction of maritime safety information from geospatial intelligence data is a core function of the Maritime Division workforce, acting as NGA's focal point for all things nautical. The Division acquires, analyzes, compiles, and disseminates maritime safety information to meet NGA's worldwide safety of navigation obligations under Title 10- U.S. Code, Federal and International laws and regulations, and DoD and NGA instructions. The Division meets these obligations by populating and updating hydrographic and bathymetric databases to support a wide variety of standard nautical, digital and mission specific datasets.

## **LEGACY PRODUCTION SYSTEMS**

There are currently six stovepipe legacy production systems in the Maritime Division: Navigation Safety System (NSS) (U.S. Notice to Mariners, web site and navigation publications); Hydrographic Source Assessment System (HYSAS) (bathymetry); Digital Capture and Finishing Environment (DCAFE) (Digital Nautical Chart, Mission Specific Data, hard copy charts, Tactical Ocean Data); COMPASS system (Navy); Worldwide Navigational Warning Service (WWNWS) (broadcast warnings); and the NGA HydroVision Production Cell (Digital Nautical Chart maintenance, Mission Specific Data and Littoral). The NSS is being re-capitalized to a windows workstation environment. This re-capitalization is the first step in our transformation to the NDME environment, moving production workstations to a common configuration, and the NSS software to an icon on the desktop. In our future work environment, all production software-GIS and imagery exploitation, will reside on the server enabling any one of our analysts to update features in DNC ®, incorporate imagery, create a Notice to Mariners or update a navigation publication from any NDME workstation.

## **TRANSFORMATIONAL INITIATIVES**

The key to a successful Maritime Division transformation is driven by our NDME strategy and our transformational initiatives. Transformation impacts three areas intrinsic to all organizations: people, process and technology. These transformational initiatives will affect how our people will work, and what tools and technology they will use to maintain and build knowledge about the hydrographic foundation. These initiatives will affect how our customer will use our data, view our data, and access our data through the web portal. These initiatives and our NDME strategy will affect our processes and move the Division from a series of stove-pipes to a data centric environment. Lastly, implementing these initiatives will improve the quality and timeliness of our data through the integration of new tools, new processes, new source and the expansion of our data store to our customer through the Gateway.

## **DIGITAL NAUTICAL CHART (DNC ®)**

The availability of Digital Nautical Chart (DNC ®) this year, up-to-date and in continual maintenance, for U.S. Navy operational use is a significant event. DNC ® is the foundation core of our database and drives several of our initiatives. The DNC ® is NGA's product response to a validated U.S. Navy requirement to replace paper nautical charts on Navy ships and submarines with digital charts. NGA committed to Navy that all of DNC ® would be operational by the end of FY04 for combat support, situational awareness and full navigation capability. NGA completed the initial conversion of its hardcopy portfolio into Vector Product Format (VPF), and is now well along with bringing all the data up-to-date, and putting it in a state of continual maintenance. The Maritime Division is expanding its data acquisition capability, capitalizing on our long history of cooperating with domestic and foreign hydrographic offices and exploring other digital data formats. The Division has integrated contractors into the production process for both DNC ® maintenance and the production of vector database update (VDU) patches.

DNC ® is the enabler for Navy's Electronic Chart Display and Information Navigation System (ECDIS-N) for the bridge navigation module of the Navigation Sensor System Interface (NAVSSI) and other systems, including the Coast Guard's Shipboard Command and Control System. DNC ® serves as foundation data to support addition of military layers such as Tactical Ocean Data (TOD) for ship and submarine operations.

When implemented as replacement for paper nautical charts, DNC ® will provide the Navy with all essential data received to safely navigate electronically to all naval operating areas worldwide in support of Naval operations. Well over 90 % of the troops, equipment and supplies supporting Operation Iraqi Freedom arrived safely by ships using paper nautical charts and DNC ® for navigation and situational awareness.

## **DIGITAL NAUTICAL CHART VECTOR DATABASE UPDATE**

In order to meet international and Navy ECDIS-N certification requirements, it is necessary for NGA to produce and deliver updates to DNC ® and TOD CDs. NGA uses Vector Database Update (VDU), a "Bare/Streaming Patch" method to regularly supply customers with changes to DNC ® data. The "Patch" is self-installed on the ship much like updating computer virus definitions. Without an updating capability supported by a viable maintenance program, Navy cannot transition away from reliance on traditional paper chart navigation. The significant benefit of the VDU process implemented for DNC ® is that NGA and its contractors effect the updates centrally rather than having corrections applied separately by navigators on hundreds of ships. This process can also be used to update publications and Tactical Ocean Data.

## **DIGITAL NAUTICAL CHART VERSION 2**

The Maritime Division is working internally, and with Navy partners, to develop the next generation of DNC ® and redefine vector product format (VPF). Preliminary discussions have vectored on aspects of DNC ® that can be changed without affecting the specification

or the data requirements of the ECDIS-N. Examples include: expansion of metadata; addition of more accurate positions for navigation aids; adoption of certain harmonized data definitions with IHO. To take advantage of a *one-feature one-time* data environment with unique feature identification (which will facilitate metadata and updates), VPF must change from our primary output format to a format that can be output from the database. This is a simple yet important distinction.

Data conflation is the process of merging corresponding data elements from multiple sources into a common and consistent geospatial framework of single-object representations. Data conflation is a challenge for our analysts working with DNC ®. All DNC ® was captured from paper charts. Traditional usage of paper charts for hundreds of years has dictated overlapping data from harbor to approach to coastal and general to sailing charts. In a digital world, feature repetition creates problems for conflation, automated updates and display, storage and maintenance. As a direct result of this shortfall the Maritime Division has developed a future strategy of a *one-feature one-time* DNC ® database. A *one-feature one-time* database with unique feature ID's for each feature solves many of the problems that DNC ® in vector product format (VPF) faces today. It greatly simplifies maintenance, storage, updates and integration with other data types including aeronautical and topographic datasets.

## **DIGITAL NAVIGATION PUBLICATIONS**

The Maritime Division is transitioning the entire portfolio of nautical publications to digital-only format. The strategy is based on a three-year production cycle that was started in October 2002. As each of the 79 separate publications is scheduled for new edition production, it will be produced in a digital version and will cancel the previous hardcopy version. The hardcopy version will be maintained via Notice to Mariners until it is produced digitally. The digital nautical publications will be made available to NGA customers via CD-ROM and will be hosted on appropriate NGA websites. NGA intends to cease production of hard copy Notice to Mariners at the end of calendar year 2004. The transformation of navigation publications to an all-digital environment is nearly complete. The next step in the process will be to determine how to expand the hydrographic data chain and one-feature one-time maintenance to publications. As the Division moves towards DNC2 the navigation publication information will become integrated into that data set. This will enable the analyst to update one feature in the database and have the change ripple through the hydrographic data store.

## **BILATERAL CHARTS - HARDCOPY EXIT STRATEGY**

The Maritime Division is transforming its chart production from traditional hardcopy to all digital products. Historically, NGA and its predecessor organizations have compiled, printed and distributed hardcopy nautical charts and publications to both military and commercial customers in accord with Title 10 authorizations. With the U.S. Navy Chief of Naval Operations mandate to implement an all-digital navigation environment, the need for NGA

to produce both hardcopy and digital products is waning. It is important for NGA to begin the transition from hardcopy production as soon as practicable. In 1997, the International Hydrographic Organization (IHO) revised the Technical Resolution which had provided for “free exchange” of hydrographic data between hydrographic offices and implemented a requirement that nations execute bilateral arrangements. A proviso that allowed nations to continue existing arrangements has allowed NGA hardcopy charts to continue to be distributed worldwide, but nations are beginning to challenge the US public distribution of chart products based on their copyrighted data. NGA public sales volume has been steadily dropping with the development of commercial Electronic Chart Systems that support the non-SOLAS (Safety of Life At Sea convention) vessels. Non-SOLAS vessels represent the bulk of chart users and regulated SOLAS shipping only represents 30,000 to 40,000 ships, i.e., tankers, cruise ships, etc. These ships have increasingly been shifting to the worldwide British Admiralty folio, national folios and commercial electronic charts. The IHO transition of national chart folios is moving towards electronic charts that are in English as well as the national language, metric depth units, and WGS (World Geodetic System) 84. Under the IHO principles, nations are not to produce public products for another nation’s national waters where those national products are adequate to support international shipping. As NGA is faced with: national folios better supporting international shipping needs; commercial providers of worldwide chart products tailoring data for shipping companies; a declining market for the NGA folio- it is evident that NGA should initiate the transition from hardcopy products.

NGA has begun negotiating bilateral agreements that provide access to the digital print files of national compilations of English language foreign chart folios. In this way, NGA can take advantage of the compilation work of partner nations for segments of the NGA hardcopy folio and eliminate NGA hardcopy compilation for those regions. This approach will allow NGA resources to concentrate on digital products and analysis while continuing to provide the needed hardcopy coverage required by U.S. Navy. The foreign nation providing print files benefits through elimination of a competing public product. NGA can implement this procedure for segments of the NGA folio where foreign chart coverage is adequate to support U.S. Naval operations, charts are in the English language, metric units and WGS-84. These bilateral agreements require that the NGA printed “bilateral charts” be marked as DISTRIBUTION LIMITED and that NGA no longer support commercial distribution for these regions. A Hydrogram in the U.S. Notice to Mariners will be issued in advance of the withdrawal of hard copy coverage of any region. NGA will continue central Notice to Mariners support for these charts such that U.S. Navy will not have to monitor multiple foreign Notices. Eventually, as Navy transitions to digital operations, NGA will discontinue the digital to plate printing of hardcopy charts from foreign sources and transition to a print-on-demand from the Digital Nautical Chart database.

## **LITTORAL MISSION**

The Maritime Division is in the process of developing its workforce and database environment to generate the more intelligently robust digital information needed by the Joint Forces for immediate and future mission planning and operation execution in the littoral

zone. Customer requirements are driving the need to fuse and de-conflict features and attributes in the land, air, and water data environments. Dynamic forces that impact military operations along the land-sea boundary, such as tides and meteorology, must also be digitally characterized and integrated into the data model of the physical environment.

An appropriately expansive data architecture, rigorous feature definition and attribution, and resolution of numerous vertical reference systems are the issues that must be resolved to enable data interoperability and to forge disparate datasets into a single mission specific dataset (MSD) in the littoral zone. This in turn will enable 3D visualization and advanced GIS analysis of the beach study or battle space environment.

The littoral zone is defined as the area between the low and high water lines. However, in the context of MSD, a littoral dataset will extend from approximately the twenty-meter depth contour through the tidal zone to the mission objective, whether it is in close proximity to the beach or several hundred miles inland.

### **SEAFLOOR EARTH REFERENCE (SER) SYSTEM**

New sensors will soon be collecting terabytes of data daily for the shallow water and littoral regions. The Maritime Division plan is to develop a database environment capable of storing, processing, modeling, analyzing, and generating relevant and accurate data. This data will be used to produce 3D characterizations of the seafloor as it slopes upward to the littoral zone, to merge seamlessly with topographic digital elevation models and overlying feature data. Other capabilities required of this database - called the Seafloor Earth Reference (SER) System – include validation tools to eliminate redundant or erroneous data, and to flag other data that is incongruous or of questionable integrity for further analysis. This database, due to its large size, will be a working database of the NDME. SER will give the Maritime Division the capability to house and manipulate a vast data store that will provide new and more accurate sounding information for our foundation data.

### **AUTOMATED CHANGE DETECTION USING COMMERCIAL IMAGERY**

HarborView ® is a Harbor Scene Viewer built by the Harris Corporation. HarborView ® is an interactive 3-D scene visualization model that utilizes commercial satellite imagery, Digital Terrain Elevation Data and Digital Nautical Chart data. It provides the user the ability to navigate above or below the surface of the water as well as the ability to query navigational aids and view the associated DNC ® attribution data. Additionally, the HarborView ® model can be use for port familiarization/protection, safety of navigation, operational training and mission planning/rehearsal. The use of commercial imagery and vendor-provided automated processes allow analysts to employ skills and techniques in a rapid manner, augmenting traditional collection and updating methods. The HarborView ® tools enable NGA to enhance DNC ® with commercial imagery. Computer automated processes result in a deliverable that provides analysts data and

visualizations. This process has proven to be an asset in enabling the Maritime Division to exploit commercial imagery for maritime safety and force protection.

## **MARITIME ENTERPRISE PRINT ON DEMAND SYSTEM (ePODS)**

The Maritime Division's transformation to an all-digital data centric business environment has not been without challenges; one of the more vexing issues is how to provide both digital and hard copy data to our customers. In order to lessen the strain, the Maritime Division has developed the ePODS initiative.

First a little background....

The worldwide database of Digital Nautical Chart (DNC ®) in vector product format (VPF) is nearly ready for operational use by U.S. Navy; by the end of FY 04 the entire digital portfolio will be in a continuous maintenance phase and up-to-date. The current DNC ® was largely created from paper charts. The first generation onboard Navy Electronic Chart Display Systems (ECDIS-N) could not effectively generate 'on the fly' DNC ®, so the paper chart display paradigm of harbor, approach, coastal and general schemas migrated to the DNC ®. One of the quirks of the hydrographic paper paradigm is overlap (necessary for usage) and the attending multiple representation of a single feature. This single feature can potentially display on the individual harbor, approach, coastal and general charts. Often this single feature can have multiple positions because of scale, representation (or cartographic license) or inaccuracies of the chart. There are no automated generalization algorithms used in the derivation of the approach from the harbor data, the approach data to the coastal, and coastal data to the general library. Data overlap and feature repetition when applied to the Digital Nautical Chart obscure the advantages of digital data- for both the customer and data provider. Maintaining a single feature up to four times by a data provider is counterproductive. Source data is growing exponentially. We are rapidly reaching a glut of information source and require new technology coupled with a better process.

The Maritime Division believes that the solution to the challenge of supporting a hydrographic digital and hard copy world lies with the ePODS initiative. The premise of the ePODS initiative is simple- all products derive from the digital database. The implementation of the ePODS initiative will begin the migration of the Division to a Nautical Database Maintenance Environment (NDME). The ePODs initiative will enable customers to access the Digital Nautical Chart database from secure Internet and automatically generate mission specific datasets or hard copy charts. In order to solve some of the issues and create a more digital-friendly data environment, Maritime Division has developed a geo-sectioning strategy for the ePODS initiative. Geo-sectioning is a data replacement process. In its simplest form geo-sectioning inserts, over the same geographic area, a segment of a larger scale data set into a smaller scale dataset. One of the advantages is that the larger scale dataset is hypothetically imbued with more accurate data; albeit only over a segment of the dataset: this assumes that the larger scale data was compiled from more accurate source. The maintenance efficiencies achieved by geo-sectioning the data are dramatic. A feature that requires updating needs only to be fixed once at its largest scale versus the traditional two, three or four times.

At this time, there is no simple way to achieve one feature–one time in current data and database formats without the geo-sectioning process. Feature generalization tools in GIS applications are in their infancy. We have to work more efficiently and effectively. Reducing the amount of maintenance to be done reduces costs, which in-turn, frees up our analysts and contracting partners to assure quicker turnarounds and better quality data. The shortfalls of geo-sectioning are highlighted in the Electronic Chart Display (ECDIS-N), the primary viewing tool on board U.S. Navy vessels. If NGA were to geo-section current DNC ® data a navigator using an ECDIS on a smaller scale dataset, such as a coastal library, would be able to see a harbor library in the offing. The more dense data from the harbor library, injected into a smaller space on the coastal library through the geo-sectioning process, would appear overly dense (potentially useful aid to navigations could be obscured). Thinning data can solve this problem, and can be accomplished to a large extent through the use of the IHO developed SCAMIN (scale minimum) attribute. SCAMIN is a “poor man’s” generalization tool. This attribute is implemented in ENC (Electronic Navigation Chart) S 57. The SCAMIN of a feature determines the display scale below which the object must no longer be displayed. Its main purpose is to reduce clutter, to prioritize the display of objects and to improve display speed. If SCAMIN attribution is missing, the feature must be displayed at all scales. We are also investigating the use of scale banding. Additionally, DNC ® must accommodate the use of a unique feature ID. Every feature in the database will be assigned a unique feature ID that will reside with that feature forever. The creation of a unique feature ID for all of DNC ® data will facilitate database design, data maintenance and data retrieval.

To restate: the concept behind ePODS is simple- the implementation is challenging. The first step is to start the building of a *one-feature- one- time* database. This database would represent the Maritime Division future Nautical Database Maintenance Environment, all analysts and contracting partners could potentially work from this database. We would start by populating the database with DNC ® feature and attribute information. Over the long term this concept could have far reaching effects on how data is maintained as the process envisioned would enable the update of any dataset that a particular feature appears on. For example: an analyst updates a light feature in the database. This feature may be on several DNC ® libraries, hard copy charts and attending navigation publications (light list). The very act of updating the database one time potentially could have repercussions all along the hydrographic data chain: updating all instances of the feature and metadata. The second step of ePODS development is to system engineer an architecture that posits the database as the centerpiece supported by COTS GIS tools and a server, and then adds a GUI that enables our customer to access the data from the secure Internet through the portal. This capability enables the customer to bring mission specific data or hardcopy charts to their desktop for viewing or printing in PDF format. The ePODS initiative starts the Maritime Division down the road towards an all-digital environment, while providing our customer easy access to our data holdings.

## CONCLUSION

The Nautical Database Maintenance Environment (NDME), realized through transformation and integration of the stove-piped systems, establishes a single hydrographic and bathymetric production and data sharing, fusion-based geospatial intelligence system for NGA.

The NDME will be the initiation of a new era within the Maritime Division and NGA- an era that culminates in the transformation of process, expanded functionality and customer utility. The NDME will coalesce all hydrographic analysis, maintenance, and production into one environment devoid of stovepipes- one database of features continually updated and made available to customers through web portals, when and where needed, in an open-standard format that facilitates integration of hydrographic information with NGA's topographic, aeronautical and intelligence information. The NDME will create the ubiquitous hydrographic knowledge base and foundation for the Common Operating Picture (COP).

Once the hydrographic foundation database is established and the portal developed (see Maritime ePODS initiative) the analysts in our not too distant future will work with the contractor maintained database, value-adding geospatial and imagery information- creating knowledge. The NDME will serve as the foundation for the hydrographic geospatial knowledge base, the data behind the portal, with links to the layered model of the Earth with options to see, on demand, a specific area of interest integrated with imagery. Intelligence would filter into the model to show at a glance the current state of the area of interest, while also allowing trend analysis and projection of future conditions.

The Marine Analysts will engage in front end processing of source and make time critical updates to the NDME. The traditional role of Marine Analysts will change over time from feature maintenance to hydrographic assessment and analysis. The analysts will focus on tailoring the hydrographic geospatial dimension with imagery as well as providing hydrographic issue analysis based on regional expertise. Technology, tools and contractor resources will go a long way towards freeing up our analysts to focus on building knowledge about the hydrographic foundation data.

The NDME will facilitate integrated teams of multi-skilled work groups, providing the COTS and GOTS tools to exploit and fuse geospatial and imagery data, updating all data holdings in parallel as opposed to current sequential processes. The NDME establishes the virtual database as the centerpiece of marine data analysis. The end state for the Maritime Division establishes a solid hydrographic foundation data store that can, through the portal, support the Common Operating Picture and afford our customers easy access to all data holdings. The end state for the Maritime Division is the proliferation of HydroVision across the enterprise from the analyst at the workstation, across NGA and through the gateway to the customer. Though change, technology and events often conspire to make forecasting difficult, it can be said with a level of certainty the NDME strategy defines the Maritime Division's course to the future. As the Maritime Division leans forward through its transformation initiatives a common motivating force runs through the organization that unifies our mission, people and customers - maritime safety and national security.

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