

HYDROGRAPHIC SERVICES REVIEW PANEL

A federal advisory committee, advising the NOAA Administrator

Making Precision Navigation the New Norm in Approaches and Ports

ISSUES

NOAA, specifically OCS, NGS, and CO-OPS, should develop a national program for precision navigation that presents a formal, unified approach for collecting, collating, and sharing observational and geospatial data with maritime operators. Precision navigation services support the Blue Economy by aiding safe, efficient and environmentally sound maritime operations.

Precision navigation, in marine transportation terms, is the ability of a vessel to safely and efficiently navigate and operate in close proximity to the seafloor, narrow channels, or other hazards. For large vessels entering a port - when space is tight and time is critical - mariners anticipate ocean/channel and weather conditions by using observations, forecasts, and underlying foundational data in addition to nautical charts. NOAA is defining a process of collecting and integrating data to create more accurate navigational products and tools that support the mariner's operational decision-making process.

As the world economy grows and maritime trade increases, our nation's ports, vessel operators, and maritime pilots face increasing pressures to safely navigate larger vessels within spatially constrained waterways. Vessel operators need accurate charts and information on navigational hazards, tides, currents, sea state and winds to safely maneuver vessels in narrow channels and harbors.



Megaship CMA CGM Benjamin Franklin entering the Port of Long Beach. Image Credit: Port of Long Beach.

Vessel loading and passage planning tools are based on underkeel clearance. Accurate information on environmental factors such as tides and ocean swells allows vessels and ports to increase their efficiencies as well as improve safety while optimizing physical infrastructure (e.g. dredging) investments. NOAA, through its precision navigation concept demonstration in Long Beach, California, has demonstrated significant safety and economic gains can be achieved through integrating enhanced navigational and meteorological information and by providing environmental condition forecasts to deep draft tankers sailing to the port. By providing predicted and real time tidal, current and sea state information, vessel operators can determine when the vessels will have adequate underkeel clearance to safely enter port.

NOAA has worked with the maritime industry to define a unified operational forecast model and its associated products. Establishing and funding precision navigation as an official nationwide program would allow NOAA to meet growing demand, and establish precision navigation capabilities as the new normal for safe and efficient navigation in ports and harbors.

A CASE FOR PRECISION NAVIGATION

Due to uncertainty inherent in navigational products, conservative operating tolerances are often greater than necessary out of an abundance of caution. With the introduction of more accurate information and products, these operating limitations can be tailored to accommodate smaller margins of error to promote safe navigation of vessels in constrained waterways. Based on accurate environmental information, vessels can sail with decreased underkeel tolerances maximizing their cargo shipped, leading to positive economic impacts. Applying best available technology to achieve the highest resolution possible for determining underkeel clearance measurements can allow loading a tanker an additional foot of draft, equating to 40,000 barrels of crude oil valued at an additional \$2M in trade value¹. This information can

¹ NOAA, "NOAA Port of Long Beach Precision Navigation Project," <https://www.nauticalcharts.noaa.gov/staff/ocs-biweekly/pdf/lalb-precisionnav.pdf>, May 2017.

lead to reducing the need for offshore lightering at a cost of approximately \$500K per evolution. To achieve these gains mariners need access to information on the environmental conditions for the water they are sailing to prior to arrival to ensure they can safely enter or depart the port. It will require a shift from "normal" navigation (with safety percentages added) in ports to the precision navigation paradigm, which requires an understanding of the data provided by new technology.

Providing more accurate environmental information and assessment products into the hands of mariners will require the collation and integration of disparate data sources into a robust common digital infrastructure, or database that adheres to international standards. Additionally an informative and intuitive display for the mariner on the bridge is required to ensure these products are readily available, easy to interpret and consistently employed during the operational decision-making process.

CHALLENGES

Expanding the precision navigation program will require

NOAA to:

1. Work with industry to coordinate a careful evaluation to identify and overcome current issues such as meter/foot/fathom conversion errors, datum conversions, scaling inaccuracies, slow delivery of port Electronic Navigation Chart (ENC) updates, and the transition to new horizontal and vertical datums in 2022;
2. Identify the base level of environmental parameters needed for major ports to support precision navigation and the optimal technology for dissemination;
3. Clearly quantify the limits and risks associated with precision navigation in constrained channels and ports;
4. Educate and encourage industry to use the data and associated products, driving towards a safer and more efficient maritime industry; quantify the benefits in terms of trade volumes (overcoming the potential proprietary concerns of industry); and
5. Obtain continued and stable funding to support a formal program for precision navigation in U.S. ports.

RECOMMENDATIONS FOR FEDERAL ACTION

NOAA should work with other partners and agencies to:

- Review the Long Beach precision navigation demonstration project and similar international operations with industry to develop lessons learned/best practices. Identify and apply the best available technologies to achieve the highest resolution possible to aid safe, efficient and environmentally sound maritime operations.
- Formalize a national precision navigation program to research, develop and implement: 1) the unified data infrastructure needed to support precision navigation products and services; 2) a full prototype in Long Beach; 3) an expansion of the program to other U.S. ports that account for different operational characteristics; and 4) a marketing/education strategy for precision navigation data and product users.
- Lead the ongoing coordination with the U.S. Army Corps of Engineers, ports, and contractors to ensure the organization and technology is established for rapid exchange of all data affecting navigation in U.S. ports. (It should be made clear that any dredging or construction project is not complete until the chart is updated.)
- Continue to collaborate with international hydrographic agencies, marine operators, and industry manufacturers of precision navigation and port operation systems to support international navigational standards, data management, and electronic charting and display systems.

In October 2003, Secretary of Commerce Don Evans established the Hydrographic Services Review Panel as directed by the Hydrographic Services Improvement Act of 2002, Public Law 107-372. Panel members, appointed by the NOAA Administrator, include a diverse field of experts.

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