Looking Forward

How e-Navigation tools can improve the view.

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Pilots are always looking forward — whether through the bridge window at approaching traffic, buoys, and shoreline points of reference, or at developing technology. As to technology, there are numerous current initiatives in which pilots are actively participating or leading. In fact, pilots have long been known as technology leaders and innovators. For example, the American Pilots’ Association has a dedicated Navigation and Technology Committee, known as NAVTECH.

Even before the 1971 Bridge-to-Bridge Radiotelephone Act, pilots were bringing VHF radios to the bridge to communicate with other pilots rather than relying on the medium- and high-frequency radios in the radio room. Long before the notion of e-Navigation, portable pilot units (PPUs) came into their own in the 1980s. The Pilots’ Association for the Bay and River Delaware introduced the first PPUs, using Loran-C as the position sensor and a simplified monochromatic display indicating cross track error, cross track error rate, speed over ground, and distance to waypoint. From those days, the portable pilot units have continued to utilize newer technologies and pilots continually adapt them to best meet their needs.

Today, more than 90 percent of state-licensed and federally registered Great Lakes pilots in the U.S. use some form of PPU. Each group of pilots selects, and often adapts, the type of PPU best suited to the specific needs and demands of the group’s pilotage area. Through the NAVTECH committee, pilots can review the different options for portable pilot unit hardware and software and related technology.

Positioning, Navigation, and Timing

The need for robust positioning, navigation, and timing in the marine environment has long been the focus of many user communities, and pilotage is no exception. The pilots’ preferred method of enhancing the ubiquitous Global Positioning System (GPS) is the U.S. Coast Guard’s differential GPS (DGPS) because of its ability to provide independent GPS satellite monitoring.

There have been numerous reports of GPS anomalies showing vessels several hundred yards off position. In a narrow waterway, this could have disastrous consequences. Further, the vulnerability to interference, coupled with the dependence on GPS by so many shipboard systems, have most pilots supporting a reliable terrestrial back-up to GPS.
The IMO e-Navigation Vision

No discussion on the future of navigation would be complete without at least a brief look at the International Maritime Organization (IMO) e-Navigation effort. The current product of that nine-year project is an e-Navigation strategy implementation plan (SIP) that includes two items of specific interest to pilots:
- the standardized mode,
- the maritime service portfolio on pilotage service.

The Standardized Mode
The concept of a standardized mode for a navigation display was initially presented to IMO in 2008. Under this original version, S-mode would require navigation displays to have the ability to revert, by a single operator action, to a standardized navigation display.

When the NAVTECH committee looked at the concept, members determined that a standard starting point for settings would be valuable, but should be combined with a save/recall function through which a user could restore previous user settings. However, the currently proposed S-mode appears to go beyond the original idea of default settings and would include standardized operating features and user interfaces that manufacturers strongly resist and hence are unlikely to adopt.

S-mode supporters see it as a component of e-Navigation and have succeeded in having it, along with the pilots’ concept of default settings and save/recall function, included in the SIP as part of the larger e-Navigation program. Manufacturers, however, are already independently developing the pilots’ concept. Pilots are concerned that linking their concept with S-mode under the strategy implementation plan could interfere with, or at least delay, the full roll-out of their concept.

The Maritime Service Portfolio
Another pilot issue is the description of pilotage service within the SIP:

“Each pilotage area needs highly specialized experience and local knowledge on the part of the pilot… The Pilot’s Portable Unit (PPU) is a useful tool for safe navigation in clear and restricted visibility. Data accessible by the PPU should be made available in a structured, harmonized and reliable manner, and the interface for accessing such e-Navigation information should be standardized…”

Although others may be considered, enhanced Loran or eLoran has captured the attention of many users and potential providers. Multi-system navigation receivers that may use GPS, other satellite systems, and terrestrial systems, may also help eliminate catastrophic modes of failure and increase robust positioning, navigation, and timing. These could also play a part in PPU evolution.

eATON
The latest term to arise from the e-Navigation discussion is electronic aids to navigation, or eATON. This term was crafted, in part, to obviate the need for distinguishing the different types of Automatic Identification System (AIS) aids to navigation (ATON). In the context of AIS ATON, a virtual aid to navigation results from a transmitted AIS message that portrays an aid on an electronic chart where no physical aid exists. A synthetic aid is an AIS message transmitted from a location different from an aid, to mark the position of that physical aid. A “real” AIS ATON is transmitted from an AIS unit affixed to a physical aid marking its position.

Coastal and harbor navigation in pilotage waters has been characterized by those who understand it best as a tactical form of visual navigation augmented by electronic navigation. How do pilots view these electronic cues known as AIS ATONs? As pilots’ tactics first involve visual cues, the view out the bridge window and sight of traditional aids to navigation are of the greatest utility. Synthetic and real AIS ATON can serve to augment the pilot’s view of a situation.

Virtual ATON has been met by many within the maritime sector with some trepidation, but using this technology in extenuating circumstances can be understood. One reasonable use of virtual AIS ATON, for example, would be if a buoy is no longer on station, having broken free from its mooring due to ice or severe currents. Another potential use might be to mark a temporary hazard in an area where placing a physical aid would be challenging. Pilots, however, will continue to voice concerns with any plans for the widespread replacement of traditional aids with eATON.
While VTS personnel provide recommendations on occasion (usually in restricted waters), seldom do they direct navigation.

More recently in Europe, the VTSs include “traffic control centers.” It does not take a great stretch of the imagination, particularly given the preponderance of European vessel traffic services in close proximity to each other, to envision the VTS using route exchange to direct ship movements within and between VTS areas on a large-scale basis. If this route exchange vision is taken beyond VTS areas or territorial seas, it becomes sea traffic management. Widespread ship directing beyond vessel traffic service areas does not likely comport with U.S. domestic law, however, and, if attempted in international waters, would appear to fall outside of freedom of the seas and the right of navigation.

The pilot perspective on all this is that the safest route in pilotage waters is the one determined using all means available to the master or pilot, including the one not routinely available with route exchange—the view out the window.

Window, Radar, ECDIS
Pilotage is a tactical form of visual navigation augmented by electronic navigation. So, the pilot uses the tools in that order: first the window, then radar, then electronic chart display and information system (ECDIS).

Adding to what the pilot knows and sees, the radar is an electronic bird’s eye view of the route ahead. Finally, the ECDIS is a depiction of the waterway, perhaps with the additional information of eATON and maritime safety information. But reliance on the depiction first, rather than the reality out the window, inverts the tactics; so training in e-Navigation is critical.

About the author:
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Route Exchange, Sea Traffic Management
There are a number of e-Navigation test beds, particularly in Europe, that have included in their scope the notion of tactical route exchange. It is benignly referred to as a service that allows mariners to electronically communicate their intended routes to each other and vessel traffic service (VTS) centers. But this notion also has VTS centers assigning the most efficient or safest route to a vessel.

In the U.S., vessel traffic services provide information to the ship from which the operators can determine a safe and efficient route. The typical U.S. VTS paradigm is:

• inform/advise,
• recommend,
• direct.