I am pleased to present to you the 2017 NAVCEN Year in Review. As a one of a kind unit, I often tell people we are the hub of a spoke and wheel configuration, in which we are constantly interacting with Coast Guard units, headquarters offices, government agencies, maritime stakeholders and GPS users around the world. These interactions and engagements provide us with an enlightened perspective. As a result, we are in a unique position to connect and coordinate with partners to identify gaps and influence the development of new and improved information delivery methods and products.

Many of our forward-leaning goals rely on information technology advancements, but in challenging budget environments, we find ourselves looking inward and getting more creative in how we can advance and execute programs in-house or leverage existing technologies to maximize the return on investment we provide. The creation of the Vessel Information Verification Service (VIVS) is a prime example of a high-return, high-impact and high-visibility project that was developed by our dedicated employees to improve the quality of AIS static data, which in turn improves data analytics and maritime safety on the waterways. In just the first month, the tool assisted Coast Guard marine inspectors and ship operators in correcting more commercial vessel AIS errors than the entire 2016 calendar year, firmly proving its operational effectiveness.

In December, we completed the transition of the 24x7 DGPS watch and NAIS watch to support the stand up of CG Cyber Command. This internal organizational move consolidates some watch standing functions focused on the CG’s strategic cyber priorities to defend cyberspace, enable operations and protect infrastructure. Even with this recent shift in resources, we remain steadfast in our efforts to support the Coast Guard, maritime stakeholders and GPS users.

We are constantly striving for continuous improvement in the way we do business. I value your feedback and input regarding how we can better support you in the future.

Russell Holmes
Co NAVCEN
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NAVIGATION CENTER (NAVCEN) OVERVIEW

NAVCEN Mission
The Navigation Center operates services and provides information that enhances the safety, security, and efficiency of U.S. waterways and civil Global Positioning System (GPS) users. These services include:

• Publishing Notices to Mariners and the Light List
• Disseminating navigation information through 24/7 operations center and the NAVCEN website
• Managing the Integrated Aids to Navigation (ATON) Information System
• Managing electronic charting portfolios for U.S. Coast Guard (USCG) units
• Serving as the primary U.S. Government interface with GPS users (except aviation and military)
• Receiving and coordinating investigation of GPS disruption reports
• Operating the Long Range Identification and Tracking business helpdesk
• Operating the Nationwide Differential GPS System - watch shifted to CGCYBER Dec 1, 2017
• Operating the Nationwide Automatic Identification System - watch shifted to CGCYBER Dec 1, 2017

NAVCEN Vision
The Navigation Center serves as the U.S. focal point for implementation of maritime e-Navigation.¹

Organizational Structure

NAVCEN is organizationally positioned under USCG Headquarters Marine Transportation Systems Management Directorate (CG-5PW) and located as a tenant command at the Telecommunication and Information Systems Command (TISCOM) base in Alexandria, VA.

NAVCEN Personnel
• 19 Officers
• 17 Enlisted
• 19 Civilians

¹ The harmonized collection, integration, exchange, presentation, and analysis of maritime information onboard and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment (IMO document MSC 85/26/Add.1, Annex 20, paragraph 1)
2017 ACCOMPLISHMENTS/STATUS OF PROJECTS

NAVcen is committed to excellence by optimizing available resources to meet the present and future needs of the Coast Guard and maritime stakeholders. To support the Vice Commandant’s direction we undertook several initiatives in 2017. Some of these were identified in our 2016 Year in Review. Despite resource challenges, especially within the Coast Guard’s information technology infrastructure, we made significant progress on several initiatives. The status of these projects is outlined below:

Improving Automatic Identification System (AIS) Vessel Compliance

Vessel Identification Verification System (VIVS)

Following thorough analysis of several years of data, experts at NAVcen confirmed that over 50% of all vessels operating on U.S. waterways were broadcasting at least one erroneous AIS vessel characteristic (e.g. length, width, type of vessel), causing serious concern in the Marine Safety community. For example, when two vessels are transmitting the same MMSI and within close proximity of each other, vessels in the reception area will see only one of the two vessels on their AIS transponders/chart plotters, leaving one vessel invisible to mariners in the reception area, as was the case in 2016. Because of the seriousness of the situation, and with no available funding to develop a Coast Guard wide solution, a NAVcen project team creatively used existing information technology resources to develop a web-based application hosted on the Navigation Center’s website. The Vessel Identification Verification System (VIVS) is an online tool giving marine inspectors and maritime stakeholders a means of checking the fidelity of their AIS broadcasts. Using an aggressive outreach campaign, consisting of blog posts on Maritime Commons, magazine articles, and presentations to Coast Guard and maritime industry stakeholders, VIVS was formally launched in April 2017. Within 30 days of release, 164 Towing Vessels corrected their AIS discrepancies, surpassing NAVcen’s entire 2016 calendar year compliance number of 150 vessels. With its impressive operational effectiveness, the system continues to produce outstanding compliance statistics, and ultimately improves overall maritime safety in U.S. waterways.  

https://www.navcen.uscg.gov/vivs
Improving AIS Historical Data Request (HDR) Cycle Times

Due to cyber security policy changes in 2016, NAVCEN stopped processing HDRs without support from Operations Systems Center (OSC) Martinsburg, WV. In 2017, to address a growing backlog of requests, with some more than nine months old, NAVCEN’s E-Tracking Branch led a multi-faceted effort to reduce the HDR process cycle times. Using the Theory of Constraints and mapping the entire process, NAVCEN worked with OSC Martinsburg to identify bottlenecks and areas for improvement. Recognizing the existing IT tools were insufficient, OSC Martinsburg added an additional server to increase capacity and processing power while also assigning more personnel to address the backlog. A Functional Requirements Document was jointly developed resulting in the use of four priority levels (vice two), with target completion dates for each category. A scoring matrix was developed to objectively determine the priority of each request and processes were developed to complete less data intensive HDRs in-house at NAVCEN, without any needed support from OSC Martinsburg in accordance with the new cyber policies. The overall effort reduced the backlog to nine (9) requests at the end of 2017 and improved maximum cycle time from six months to just a few weeks in most instances, thus vastly improving the ability to provide timely information to Coast Guard operational commanders, interagency partners and respond to public Freedom of Information Act (FOIA) requests.
U.S. Aids to Navigation Information Management System (USAIMS)

In 2017 NAVCEN’s Maritime Information Branch supported enhancements of USAIMS. The most noteworthy improvement resulted in the ability to create and maintain Virtual or electronic Aids to Navigation (eATONs). This was particularly significant during the Hurricane Season, when Coast Guard Headquarters Office of Navigation Systems (CG-NAV) was able to coordinate with USCG Districts 7 and 8 to identify critical ATONs in their respective AORs and ultimately establish virtual AIS-ATONs in advance of the storms. Those regions were able to continually broadcast for the impacted waterways, allowing them to re-open the waterways after the storms passed.

Another USAIMS change supports WLB maintenance. Over the next ten years, WLBS will be moved in and out of service for maintenance then transferred to a new Area of Responsibility in a different district. A process was developed to track cutter movements in the ATON database ensuring aid assignments are properly updated and prior cutter assignments experience no data loss. Aid information tracking (e.g., batteries, charts) and system tools (e.g., printing, attachments) were streamlined making day-to-day ATON management easier for underway ATON units ensuring Mid-Life Cutter Maintenance transfers are reflected properly in the ATON database.

Other USAIMS improvements of note included the establishment of regular transfers of ATON data to support CG-NAV/DHS Science and Technology Waterway Analysis and Waterway Harmonization effort, currently being developed through the Naval Surface Warfare Center; as well as enhancement of inventory tracking for seasonal hulls to assist in work/supply scheduling and overall property management for ATON units.
Maritime Safety Information (MSI) Modernization – CG District 5 Pilot Project

MSI provides critical information to the mariner during voyage planning and while transiting the Marine Transportation System. NAVCEN is leading an effort to modernize and standardize MSI throughout the Coast Guard, in order to meet the growing demand of today’s waterways user. A common complaint of the maritime public is that they are not always able to access the information when they need it. For example, one must wait for, and be within range of a radio broadcast of MSI, to receive some of the real-time information such as a Broadcast Notice to Mariners (BNM) or wait up to a week to read about it in the Local Notice to Mariners (LNM).

In most instances, Coast Guard provides MSI to the public two ways: voice messages intended for radio broadcast, such as (BNM) or Urgent Marine Information Broadcast (UMIB); and bulletins, intended for electronic or hard copy distribution, such as Marine Safety Information Bulletins (MSIB) and LNM. Outside of LNM’s and Light List files that are updated weekly and posted in PDF format on the NAVCEN website, information is not readily available in a central location. Some of this information is located on Homeport pages or disseminated via Captain of the Port (COTP) maintained E-mail lists, but there is no Coast Guard wide centralized or consistent delivery method. In addition, the format of current BNM messages varies between Districts, which is a barrier to machine readability. Standardizing the format of information will greatly enhance automation efforts for both the Coast Guard and the Maritime Public.

NAVCEN collaborated with Coast Guard District Five (D5) to develop and beta test a modernized MSI structure in an operational environment using the new delivery system recently implemented by the Coast Guard, known as GovDelivery. The project aims to consolidate numerous MSI products (e.g. BNM, MSIB, UMIB, Bridge Notices), ideally in a geographically referenced manner, machine readable and searchable by mariners in order to develop the future composition, distribution and centralization of real/near real time MSI.

In 2017, NAVCEN scoped the project with District 5 and then visited the D5 Sectors to determine the types, formats, and procedures currently used to generate and distribute MSI, in addition to the traditional delivery methods. By the end of the year, numerous District 5 BNM’s and MSIB’s were being disseminated via GovDelivery. NAVCEN tested distribution methodologies using GovDelivery for Rich Site Summary (RSS) and email feeds during normal business hours distributing D5 BNM’s and MSIB’s in electronic format.

NAVCEN also established an active feedback project to enable the user community to provide input on the usability, readability, and effectiveness of current and developmental MSI formats and services through site visits and surveys.

Based on initial test results and feedback from the maritime community, in addition to improving the traditional delivery methods, recent efforts have focused on the smart phone user. These improvements enable smart phone users to quickly determine the applicability of MSI to their voyage planning without having to open every message. Thus, significantly reducing planning time constraints and streamlining the usability for all digital users.
OCONUS GPS Interference & Disruption Reporting - Interagency Coordination

In response to tabletop exercises and a few GPS interference events outside the continental United States (OCONUS), NAVCEN partnered with other agencies to improve and expand the existing Memorandum of Agreement (https://www.gps.gov/policy/docs/2017/user-support-MOA/) and its annexes to more holistically approach GPS issues reported outside of the U.S. Homeland. The changes have improved the efficiency and effectiveness of interagency information sharing and further mitigate potential navigation and timing challenges worldwide during a GPS disruption. As part of this effort, NAVCEN also coordinated with the Maritime Administration (MARAD) and DHS’s Global Maritime Operational Threat Response Coordination Center (GMCC) to use the newly developed U.S. Maritime Security Communications with Industry (MSCI) notification system. By incorporating this system into NAVCEN’s reporting processes, U.S. Maritime Alerts and Advisories have become a standard and comprehensive means of communicating disruption events to the maritime community worldwide.

Website Developments

New developments include the publication of the Vessel Identification Verification System (VIVS), the hosting of the Towing Vessel Center of Excellence Decision Aid, and a Ports Access Route Studies section. In addition, the nautical rules of the road section was completely revamped to include the Annexes as well as printer friendly capability, which allows mariners to print the entire “rules of the road book” in 13 or 14 double-sided pages.

As a measure of transparent cyber-security, the Web Services Branch teamed with CG Cyber Command to do a first-of-its kind real-time, intensive, cyber-security penetration test on the website and its associated network, Navigation Systems Information Dissemination Network (NSIDN). This "full-immersion hacking" test, which included arduous attacks on the website network as well as the website application software, developed a baseline standard for future tests against all Coast Guard websites. The Team’s final report stated that “Overall, NAVCEN displayed a highly effective defensive posture, leveraging higher level technologies, training, and processes than all Coast Guard enterprise defenses.”

CG-NAV Ports and Waterways Safety Assessment Team

NAVCEN was instrumental in supporting and sustaining the CG-NAV Ports and Waterways Safety Assessment Team (PAWSA) by providing a lead facilitator for four workshops held in Portland, OR, Puget Sound and two in Hudson River (Poughkeepsie, NY, and Albany, NY).

By expertly managing over 40 people from diverse backgrounds and industries the NAVCEN facilitator was able to bring individuals with major differences into alignment with safety as the communal focus point by focusing on the common ground of waterway safety benefiting people, environment, and industry. The PAWSA process proved it could direct diverse perspectives towards waterway safety as the main goal. NAVCEN also provided training to an incoming CG-NAV Facilitator to ensure continuation and consistency of the program.
OPERATIONS DIVISION

Maritime Information Operations Center (MIOC)
For most of 2017, the Maritime Information Operations Center consisted of three 24/7 watches: Navigation Information Service (NIS)/Long Range Identification and Tracking (LRIT), Differential Global Positioning System (DGPS), and Nationwide Automatic Identification System (NAIS).

Navigation Information Service (NIS)
The NIS watch serves as the external interface to the public and answers any questions dealing with navigation, receives and acts upon GPS disruption reports, fields 23,000 emails annually and coordinates with subject matter experts at NAVcen, Coast Guard Headquarters, and other Coast Guard units to respond to about 1,100 inquiries per year. The NIS watch disseminates information on Global Positioning System (GPS), Differential GPS (DGPS), Automatic Identification System (AIS), Nationwide Automatic Identification System (NAIS), Long Range Identification and Tracking (LRIT), Maritime Safety, Maritime Communications, Maritime Regulations, Broadcast Notice to Mariners (BNMs) and Local Notice to Mariners (LNMs), as well as forwards any ATON discrepancy notices received from the general public to respective Districts and Sectors.

Below is the breakdown of the nearly 1,100 inquiries the NIS responded to in 2017.
Long Range Identification and Tracking (LRIT)
The satellite based LRIT system provides an enhanced level of Maritime Domain Awareness (MDA), with a real-time reporting mechanism that allows unique visibility to position reports of vessels that would otherwise be invisible and potentially a threat to the United States. LRIT is used internationally with over 100 participating countries. The U.S. LRIT boundary is 1000 nautical miles from U.S. and territories where Safety of Life at Sea (SOLAS) class vessels (300 gross tons or greater and engages in international voyages) are required to report.

The LRIT Business Help Desk (BHD) receives and responds to phone, email or web inquiries from ships, ship agents, maritime entities, data centers, International Maritime Organization (IMO), industry representatives, and other LRIT customers and stakeholders. The BHD watch monitors the frequency of vessel reporting rates and resolves issues related to shipboard position transmissions and equipment related issues (e.g., system integration/conformance testing, failures, securing of equipment, entering dry-dock, etc.) with the appropriate application service provider and/or owner/operator/captain of the vessel to ensure vessels are reporting as required. The LRIT watch currently monitors over 7000 international vessels within the area of interest, and over 830 U.S. vessels around the world.

Below is the breakdown of LRIT data.

<table>
<thead>
<tr>
<th>Type of Vessel</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. flag vessels reported</td>
<td>584</td>
</tr>
<tr>
<td>Position Reports received from U.S. vessels</td>
<td>63,120</td>
</tr>
<tr>
<td>Average number of U.S. flag Position Reports per day</td>
<td>2,079</td>
</tr>
<tr>
<td>Foreign vessels reported</td>
<td>8,298</td>
</tr>
<tr>
<td>Foreign Position Reports received</td>
<td>405,325</td>
</tr>
<tr>
<td>Average number of foreign Position Reports per day</td>
<td>13,355</td>
</tr>
<tr>
<td>U.S. vessels reported (LRIT or Satellite AIS (SAIS))</td>
<td>3,129</td>
</tr>
<tr>
<td>Foreign vessels reported (LRIT or SAIS)</td>
<td>51,973</td>
</tr>
</tbody>
</table>

All values are average per month for calendar year 2017
GPS Information Sharing, Interference Detection and Mitigation (IDM)
NIS coordinates daily with United States Air Force Space Command 2nd Space Operations Squadron to obtain and post GPS products for use by the public along with information about upcoming GPS tests. NAVCEN (civil interface for non-aviation GPS users) is part of a Triad of Operation Centers with the Federal Aviation Administration (FAA) (representing aviation) and the U.S. Air Force (representing the military), to collect GPS problem reports and lead multi-agency IDM coordination. NAVCEN coordinated with interested government agencies via email and teleconference(s) to report and address 67 reported GPS Disruptions, 3 training events and 156 GPS Test events in 2017.

Annually, NAVCEN participates in a GPS IDM Summit with the Triad of Operation Centers along with the Federal Communications Commission (FCC) Operations Center (OPCEN), DOD STRATCOM and DHS National Cybersecurity and Communications Integration Center (NCCIC) OPCEN representatives to discuss GPS Disruption Report Management. NAVCEN also participates in quarterly or semi-annual senior executive level Purposeful Interference Response Team (PIRT) Interagency Coordination Meetings to discuss IDM. As mentioned in the 2017 Accomplishments section, this year’s summit focused on Out-of-Continental United States (OCONUS) IDM reporting improvements to ensure that OPCENS respond appropriately within their sectors of influence and correctly respond to international reports as needed. Internally, NAVCEN provided GPS Disruption Reporting training across all Coast Guard Sectors and encouraged development of GPS disruption exercises through the Incident Management and Crisis Response Division’s Coast Guard-wide webinar series.
GPS Disruption Reports
NAVcen receives GPS disruption reports from maritime and civilian (non-aviation) users from around the world. These reports ranged from long-haul truckers not picking up GPS signals, cell phones with mapping errors, automobile GPS units with low signal reception, GPS based map programs taking drivers to the wrong address, and automobile built-in navigation systems freezing up. All disruption reports received by NAVcen were forwarded to the USAF GPS Operations Center (GPSOC), FCC, DHS NCCIC and FAA for input on possible disruption causes. Many of the cases in 2017 were due to a need for firmware upgrade on equipment.

GPS Disruption Report Statistics
Below is the breakdown for the 67 disruption reports received by NAVcen in 2017.

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Equipment</td>
<td>47</td>
</tr>
<tr>
<td>Mapping Issue</td>
<td>10</td>
</tr>
<tr>
<td>ICD Violation</td>
<td>2</td>
</tr>
<tr>
<td>Unintentional Interference</td>
<td>4</td>
</tr>
<tr>
<td>Unknown Interference</td>
<td>2</td>
</tr>
<tr>
<td>GPS Testing</td>
<td>2</td>
</tr>
</tbody>
</table>

GPS Test Coordination
GPS testing, through US STRATEGIC COMMAND, is coordinated with the USCG Districts to ensure any testing does not cause undue risk to Coast Guard operations, maritime and civil GPS reliant users. In 2017, NAVcen coordinated 156 GPS Test events. A Broadcast Notice to Mariners (BNM) is published when GPS testing events are forecasted to disrupt GPS in maritime areas.
Nationwide Automatic Identification System (NAIS)
NAVCEN maintained a 24/7 NAIS watch to support system users and monitor 73 live feeds to USCG commands and other government agencies and authorized partners. AIS is a Very High Frequency radio system used between vessels for collision avoidance. NAIS is the USCG system that receives AIS data to maintain Maritime Domain Awareness and Environmental Stewardship. User notifications to affected Sectors and Districts are issued when the system is not operating properly.

The NAIS watch works closely with the e-Tracking branch who manages creation of live feeds and works closely with CG NAIS Product Line and Command, Control, and Communications Engineering Center (C3CEN) to ensure watch tools are kept up to date and provide an accurate record keeping mechanism for NAIS site outages and related events.

The following are the primary NAIS statistics for 2017:
- 300 user notifications issued
- 149 CG FIXIT tickets opened by NAIS Watch
- 16 Casualty Reports (CASREPS) issued

NAIS Site Availability Requirement is >96%. For 2017, the average site availability was 99.45%.

Starting in July 2017, NAVCEN began shifting operational control (OPCON) of the NAIS watch to Coast Guard Cyber Command. Once the CGCyber Phase II Organizational Modification Request (OMR) was approved in November, NAVCEN began shifting administrative control (ADCON) and completed the transfer on December 1st, 2017.

Nationwide Differential GPS (NDGPS)
NAVCEN maintained a 24/7 watch to monitor DGPS sites throughout the U.S. and coordinate maintenance and unplanned down time with Command, Control and Communications Engineering Center (C3CEN), local Electronic System Support Detachments (ESDs), Department of Transportation (DOT) and US Army Corps of Engineers (USACE) contractors. DGPS is an augmentation system comparing received GPS signals to a surveyed reference point to provide corrections and in turn provide for a more accurate GPS position, typically with sub-meter accuracy. DGPS site integrity monitors recognize an unhealthy satellite before the U.S. Air Force sets a satellite to unusable; this integrity monitor has a 10 second time-to-alarm. In 2016, all 28 DOT sites and some CG DGPS sites were shut down. In 2017, NDGPS coverage maps were updated after all seven USACE DGPS sites were shut down and the Aransas Pass DGPS site was declared irreparable due to hurricane damage.

For 2017, 487 Broadcast Notice to Mariners were issued for DGPS outages.

Starting in July 2017, NAVCEN began shifting OPCON of the DGPS watch to Coast Guard Cyber Command. Once the CGCyber Phase II OMR was approved in November, NAVCEN began shifting ADCON and completed the transfer on December 1st, 2017.

Team members also conducted a Wide Area Augmentation System (WAAS) assessment showing the availability of WAAS (an alternate GPS augmentation) in the vicinity of New York Harbor, along the Hudson River and in Northern New England.
Navigation Center Website (https://www.navcen.uscg.gov)

In 2017, the Navigation Center website was again one of the most popular Coast Guard websites and is the central element that connects all operational mission support efforts at NAVCEN. Approximately 5,700 visitors per day logged 2.1 million page views throughout the year. 40% of the page views were from smart phones and tablet-type devices. The most popular products or sections were the Local Notice to Mariners (LMNs) (and the chart corrections contained therein), maritime telecommunications, nautical rules of the road, and many GPS-related products and information tools including GPS almanacs used for accuracy prediction by many commercial entities. There are approximately 200,000 page views monthly to the NAVCEN website and more than 38,000 List Server subscribers for GPS status, GPS advisories, and LMNs. Other sections and products, such as the Automatic Identification System section (which contains the mariner’s authoritative AIS Guide to correctly setting AIS receivers), and the International Ice Patrol’s ice prediction charts were important to worldwide navigation safety. While the majority of the users were located in the United States, thousands of people used the website from places such as the Philippines, Canada, the United Kingdom, India, and Japan, indicating the worldwide importance of the website.
ENGINEERING DIVISION

E-Tracking Branch
The E-Tracking Branch provides two core services to internal and external stakeholders, Data Distribution and AIS Compliance. In 2017, the majority of E-Tracking’s efforts focused on three areas of improvement; streamlining Blue Force Tracking (BFT) processes; reducing NAIS static errors; and developing tools that benefit the greater Coast Guard Nationwide AIS (NAIS) and maritime stakeholders.

Heat Maps are best used to display large-scale traffic patterns. CG Units use heat maps for a number of purposes, such as viewing historical trends by vessel type and for marine planning. Heat maps can be filtered using varying parameters to identify specific information. Heat Maps are graphical representations of data, in which individual values (i.e. Vessel Position Reports) within a defined area are represented as colors. Typically, the color increases in intensity (heat from blue through red) as the data density increases. In most cases with NAIS Data, the density value equals the number of vessel position reports within a defined cell (number of pixels). The colors are assigned values based on the number of reports (ex. Blue = 0-50; Red = 100-150, etc.). As report numbers change, colors change according to assigned ranges and grow hotter or cooler. Given that heat maps measure the density of a single value (i.e. number of reports), vessel specific data such as name, MMSI, Lat/Long, are not viewable on heat maps.

AIS Data Distribution - NAIS Live Data Feeds
In 2017 NAIS maintained 73 ‘live’ or ‘streaming’ data feeds offering government partners and USCG Programs, Vessel Traffic Services (VTS), port partners and other stakeholders near real time AIS data fed directly from NAIS production servers located at CG OSC Martinsburg, WV. NAVCEN, C3CEN, and OSC Martinsburg work together to establish data feed permissions, configuration and data management requirements to:

- Monitor for anomalous or missing data, analyze and report system status and failures
- Provide NAIS architecture performance monitoring, system health and development of operational parameters and criteria
- Notify customers of data feed expiration and assist with data feed renewals or terminations
AIS Data Distribution - NAIS Historical Data Requests (HDRs):
Customers submit HDRs to re-create events, view trends and norms, and inform marine spatial planning. The E-Tracking Branch works with the OSC staff to provide customers with various file formats. Comma Separated Values (CSV) files are useful to a variety of applications and permits the customer to extract meaningful information from NAIS data. Other common formats include standard graphics, animated re-creations of vessel movement (KML timed), and heat maps (density plots). In 2017, NAVCEN processed 239 HDRs in the following categories:

- 83 Marine Casualty
- 19 Litigation
- 8 Freedom of Information Act (FOIA)
- 129 Analysis/Research

In October 2017, NAVCEN designed and launched a short customer survey to better understand how our HDRs are being used, and how we can better support our clients. The survey was approved by the CG Institutional Review Board and has been distributed to over 396 customers. To date, survey responses confirmed HDRs helped the federal government save over 2,560 man-hours and recoup $305M in litigation and damage claims, which is 94% of the Coast Guard’s initial system cost of $325M.
Position, Navigation and Timing (PNT)

In 1986, the Civil GPS User Interface Committee (CGSIC) was organized and in 1989, GPS became a dual use (military/civilian) system. Commanding Officer NAVCEN serves as the Deputy Chair under the direction of the DOT Chair, and a NAVCEN staff member serves as Executive Secretariat and liaison for global civil GPS users.

Civil GPS Services Interface Committee (CGSIC)

NAVCEN hosted the 57th meeting of the CGSIC in coordination with the Institute of Navigation (ION) at the ION Global Navigation Satellite Systems (GNSS) conference. The CGSIC meeting was a two-day event attended by about 200 representatives from GPS industry, scientific organizations, universities, and GNSS providers from around the globe. In addition to meetings of four subcommittees, the Keynote Address for the event was provided by Dr. Keith Conner, Senior Engineer, Science and Technology First Responders Group, U.S. Department of Homeland Security. He spoke of resilience as the ability to prepare and adapt to changing conditions and withstand and recover rapidly from disruptions, deliberate attacks, accidents or naturally occurring events. Presentations given during the meeting are part of the permanent record at www.GPS.gov.

CGSIC International Engagement

NAVCEN participated in meetings of the International Committee on GNSS (ICG) as the CGSIC Deputy Chair and Secretariat, the U.S. lead for Working Group C (Information Dissemination and Capacity Building), and as Co-Chair of the Working Group S Interference Detection and Mitigation (IDM) Task Force. Related to the ICG, NAVCEN:

- Attended the 12th UN International Committee on GNSS (ICG-12) to foster interoperability, compatibility and transparency between existing and GNSS in Kyoto, Japan. NAVCEN promoted the publication of GNSS testing event dates and locations to educate GNSS providers on the processes the United States uses to publish GPS testing to inform users of planned GPS tests and to aid the quick resolution of interference reports. Prior to ICG-12, NAVCEN participated in several ICG planning and intersessional meetings hosted by the United Nations Office for Outer Space Affairs in Vienna, Austria and numerous Department of State (DOS) interagency planning meetings to coordinate U.S. delegation work in preparation for the ICG Plenary meeting.
- Developed the agenda and Co-Chaired the 6th ICG IDM Workshop in Baška, Croatia as part of the Royal Institute of Navigation’s Baška GNSS Conference.
- Provided a briefing on the proliferation and illegal use of GPS jammers around the world to the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space at the Vienna International Center in Vienna, Austria.

As a result of NAVCEN’s international work, the U.S. Department of State endorsed NAVCEN as the model of a successful Global Navigation Satellite Systems (GNSS) user interface. This endorsement was recognized by the ICG, which promotes voluntary cooperation on matters of mutual interest amongst existing and emerging navigation satellite systems.
As part of the U.S. government’s GPS international outreach strategy, NAVCEN coordinated a CGSIC presentation to the Munich Satellite Navigation Summit that included speakers from Department of State, Department of Transportation, Department of Homeland Security, the Federal Aviation Administration, and National Space-Based PNT Coordination Office.

NAVCEN also provided a webinar presentation for GPS World Magazine on U.S. government efforts related to interference, detection and mitigation and the laws in place to prevent proliferation and illegal operation of small GNSS jammers.

**GPS Civil Interface**

To meet the responsibility of providing GPS information publicly, NAVCEN members participated in a variety of GPS program meetings including the GPS Constellation Sustainment Assessment Team (CSAT), Civil GPS Program Management Review, the National PNT Engineering Forum and the Department of State GPS International Working Group as well as formal GNSS bilateral talks with the European Union, Japan and Canada.

NAVCEN reviewed pending changes to documents, participated in discussions with partners, and provided input on revisions to documents affecting NAVCEN operations and GPS support to civil users. In 2017 NAVCEN reviewed and provided feedback on 35 Request for Change (RFC) documents and attended related teleconferences affecting various Interface Control Documents. These activities will ensure the timely transfer of unclassified GPS information products from the control segment to NAVCEN for distribution to civil GPS users through email and on the NAVCEN website. NAVCEN is also an active member of the External Interfaces Working Group responsible for building the transition plan and supporting documentation for the GPS Next Generation Operational Control Segment (OCX), and supports the GPS Contingency Operations (COps) program that will implement changes to the current ground control system (AEP) to support the operation of GPS III satellites within the constellation in advance of the transition to OCX.

In 2017, NAVCEN hosted visits by the U.S. Air Force Directorate and members of the Department of Homeland Security PNT Project Management Office to provide an overview about NAVCEN missions.

**Differential GPS**

NAVcen members provided support to CG-NAV with regard to system management of DGPS. Efforts included continuing the DPGS dialogue with various user groups, including maritime pilots and vessel operators; assessing the availability and accuracy of other differential GPS augmentation systems, such as the Federal Aviation Administration’s Wide Area Augmentation System in New York Harbor, along the Hudson River, and along the Northern New England coastline; and, drafting updated coverage maps with the drawdown of DGPS in the Western Rivers. Even though the DGPS 24/7 operational watch was transitioned to CGCYBER in 2017, NAVCEN will continue to post Differential Global Positioning System (DGPS) operational information, manage DGPS Operational Orders and DGPS real property.
Maritime Information Branch

U.S. Aids to Navigation Information Management System (USAIMS)
USAIMS and the legacy system, Integrated Aids to Navigation Information System (Legacy IATONIS), are the applications used as the official electronic record of all USCG and Private Aids to Navigation. Legacy IATONIS produces the weekly and annual Light List which mariners are able to download from the NAVCEN website. USCG District offices use Legacy IATONIS to create a weekly Local Notice to Mariners also available to download from the NAVCEN website. ATON units use USAIMS to perform on-scene aid information management. Plans are to migrate functionality from Legacy IATONIS to USAIMS to create one integrated application for all ATON activities.

Continuing in 2017, as in 2016, enhancements to USAIMS were limited due to implementation of higher priority CYBER requirements for all USCG systems. For USAIMS, OSC focused on minor changes and bug fixes; long term improvements could not be accommodated. The limited progress still resulted in several small system improvements (see Accomplishments/Status of Projects section).

Additionally, we continue to support ATON units and District Prevention staffs.

USAIMS – IATONIS Support Requests for 2017:
- 141 General support requests from Districts, Field Units, OSC, and USCG Headquarters
- 48 Data Query Requests

Local Notice to Mariners (LNM)
LNMs are a method to release navigation requirements and warnings when hazards exist such as a buoy that is off station, an abandoned vessel, or a chart change. LNMs are also used to broadcast safety and security zones. Each USCG District LNM is released on the Navigation Center’s website with the newest information provided on Wednesday of each week.

Public Inquiries for 2017:
- 193 on Local Notice to Mariners (LNMs), charts, chart corrections, or Light Lists
- 50 on general ATON
- 105 on navigation
- 127 on general comments or questions
- 30,461 subscribers for weekly emails regarding the LNM and critical marine information
Electronic Chart Portfolio Management

NAVCEN is the Electronic Chart Portfolio Manager for all USCG Cutters and Boat Forces. NAVCEN provides electronic charts covering U.S., Caribbean, Mesoamerican waters, and other select areas for the USCG fleet.

Electronic Charting Portfolio Management statistics for 2017:
- 306 cutters/boats (49’ and above) using Electronic Chart Display and Information System (ECDIS) and Electronic Charting System (ECS); Electronic Navigation Chart (ENC), Digital Nautical Charts (DNC), Raster Navigational Charts (RNC).
- 1184 boats (station, Maritime Security Response Team (MSRT), Aids to Navigation Team (ANT) etc.) with proprietary chart data.

Other changes in 2017:
- Transitioned department personal to shared mailbox TIS-SMB-ECHARTING@uscg.mil in order to reduce response times to customer inquiries.
- Reduced TRANSAS ECDIS licenses from 81 to 60 due to the 87’ WPB Bow to Stern maintenance program migrating the platform to CG ECDIS.

Field support statistics for 2017:
- 205 cutter chart requests
- 245 boat chart requests
- 69 technical assistance requests
- 212 ATON discrepancy reports (received directly or passed from the NIS watchstander)

Coast Guard primary small boat charting display
PATH FORWARD FOR UPCOMING YEAR

In November 2017, the Deputy Commandant for Operations and Deputy Commandant for Mission Support transferred 21 billets from the Navigation Center to CG Cyber Command (CGCYBER) to support the formation of a Network Operations Security Center. Several functions historically performed by the NAVCEN were identified for transfer to CGCYBER along with the associated billets. As a result, NAVCEN was afforded the unique opportunity to examine our remaining functions in order to better position ourselves to support the Coast Guard and the maritime public.

In addition to our daily services, in 2018 we plan to continue to make progress on the following:

- Improve Automatic Identification System (AIS) static data quality for waterway safety and data analytics. This will be done by:
  
  a. Collaborating with CG Headquarters (CG-CVC, CG-NAV-3) and several Sectors for a pilot program to conduct better AIS enforcement among the commercial vessel fleet. The pilot program utilizes VIVS and the Coast Guard’s internal vessel database (MISLE) to begin enforcement of the AIS Carriage Requirements (33 CFR 164.46) for regulated vessels. Results of the pilot will influence broad adoption through nationwide policy.

  b. Collaborating with CG Headquarters (CG-BSX, CG-NAV-3) and the Coast Guard Auxiliary to establish an outreach campaign targeting stronger AIS awareness and compliance for the recreational boating community. This campaign will likely feature VIVS and involve industry partners such as U.S. Power Squadrons and recreational (AIS-B) manufacturers.

- Explore the feasibility of expanding AIS Analysis capabilities at NAVCEN and OSC Martinsburg to continue to drive down our cycle times. We will also evaluate how we can better use the data to find relevant issues that are not obvious, and then make them obvious to our stakeholders.

- Actively participate in the newly formed Committee on Marine Transportation Systems (CMTS) AIS Data Management Task Team to improve accessibility to data, share best practices, leverage other agency’s AIS analysis capabilities and create more synergy across the whole of government.

- Refine our Marine Safety Information (MSI) modernization effort pilot project with CG District Five and possibly expand it to other districts later in the year.

- Further develop functional requirement documents to support modernizing the ATON database.

- Work with the Air Force toward creating a mechanism by which to share GPS Satellite Outage Files (SOF) with the public.

- Evolve and improve our web services and online presence. NAVCEN has already initiated contracting to vastly improve our website’s bandwidth, providing for a more stable and faster user experience. In 2018, we will continue to explore cloud-computing options, upgrade the look and feel of our website, and provide the highest levels of website security within all Coast Guard systems.