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FAA Navigation Programs AJM-32



Air and Space Museum Features WAAS Experts

2003-2013
WAAS
10
years



The entrance to the Time and Navigation exhibit at the National Air and Space Museum

On September 25, 2013, the Time and Navigation exhibit at the National Air and Space Museum on the National Mall in Washington, DC featured experts on the Wide Area

Augmentation System (WAAS) to answer questions about the benefits of WAAS and explain the workings of satellite navigation. WAAS, which increases the accuracy and

The *SatNav News* is produced by the Navigation Programs AJM-32 branch of the Federal Aviation Administration (FAA). This newsletter provides information on the Global Positioning System (GPS), the Wide Area Augmentation System (WAAS) and the Ground Based Augmentation System (GBAS).

Inside ...

- 1 Air and Space Museum Features WAAS Experts
- 3 FAA Gathering Celebrates WAAS Tenth Anniversary
- 3 WAAS Finds Old Fishing Gear in Puget Sound in Washington State
- 4 GEO 5 Lease in Place
- 5 WAAS Has Potential to Aid Unmanned Aircraft Systems (UAS) in Arctic
- 5 Less Noise for Long Island Endangered Birds
- 6 What's New on the Web
- 6 Satellite Navigation Approach Procedures Update

Tell Us Your WAAS Story

We're collecting testimonials about the benefits of Wide Area Augmentation System (WAAS) navigation from users. If you are a pilot, passenger, airport manager, airline employee, or are involved in aviation in any capacity - whether you fly fixed-wing or vertical flight aircraft - we want to hear from you! Please send your stories and contact information to [Mary Ann Davis at \[MaryAnnDavis@faa.gov\]\(mailto:MaryAnnDavis@faa.gov\)](mailto:MaryAnnDavis@faa.gov)

integrity of GPS positioning signals, is observing its Tenth Anniversary this year. The service became operational on July 10, 2003.

Roger Connor, Aviation Curator for the Time and Navigation Exhibit, demonstrated some cockpit navigation equipment at the exhibit's entrance, next to a monitor showing [The WAAS Experience](#), a video about the benefits of WAAS as described by users of the system.

Todd Walter, Ph.D., a senior research engineer in the Department of Aeronautics and Astronautics at Stanford University, and Per Enge, Professor, also in Department of Aeronautics & Astronautics at Stanford, were on hand to describe the various applications of WAAS. While originally conceived as a way to ensure reliable positioning data for aviation, WAAS has found many additional applications in agriculture, surveying, mining, maritime shipping, and everyday recreational activities such as hiking. Todd and Per each explained how WAAS is utilized by these diverse industries and groups to improve performance.

Bill Wanner, Navigation System Verification & Monitoring Branch Manager at the William J. Hughes



Eric Young, Helicopter Emergency Medical Service (HEMS) pilot



Roger Connor (right), a museum specialist, demonstrates cockpit navigation equipment



Malcolm Andrews (left), the FAA's Director of Enterprise Services, and Deborah Lawrence, Manager of Navigation Programs, visit the information station manned by Bill Wanner of the FAA's William J. Hughes Technical Center

Technical Center of the Federal Aviation Administration (FAA), manned another information station. He explained the revolutionary nature of WAAS technology and how its ground-based installations interact with geostationary satellites to make it all happen.

Eric Young, a pilot with Pegasus Flight Operations, University of Virginia Medical Center, Air Methods, was also on hand to explain how new WAAS approaches to sites in the Charlottesville, Virginia area will provide quicker HEMS response and enable more missions to be completed in overcast weather and

mountainous terrain. Pegasus is a hospital-based air and ground transport service providing care to critically ill or injured patients. Mike Webb of the FAA's Flight Standards group, working with Helicopter Instrument Criteria, was with Eric to talk about the nature of helicopter approaches and the FAA's plans to increase their number.

Tom Kramer, Manager of Airspace and Modernization for the Aircraft Owners and Pilots Association (AOPA), and Luz Beattie, one of AOPA's corporate pilots talked about how WAAS has been enthusiastically embraced by General Aviation (GA) pilots who often utilize small airfields that do not have expensive Instrument Landing System (ILS) installations to guide approaching planes.

Visitors included many FAA personnel who walked over to the museum during their lunch break to find out more about this highly beneficial and cost-effective service provided by their agency. Further information about the Time and Space Exhibit can be found at the following web address: <https://timeandnavigation.si.edu/research/waas-meet-the-expert-educational-event>

FAA Gathering Celebrates WAAS Tenth Anniversary

A gathering at the Washington, DC headquarters of the Federal Aviation Administration (FAA) at 800 Independence Avenue was held Wednesday, September 25, 2013 to celebrate the tenth anniversary of the Wide Area Augmentation System (WAAS), which was commissioned into service on July 10, 2003.

FAA employees and contractors, along with other key stakeholders and users of the WAAS service, heard a rousing keynote address by FAA Navigation Programs Manager Deborah Lawrence. Ms Lawrence talked about the development of WAAS, the growth in the number of aircraft equipped with WAAS avionics, the application of WAAS



Tom Kramer of the Aircraft Owners and Pilots Association (AOPA)

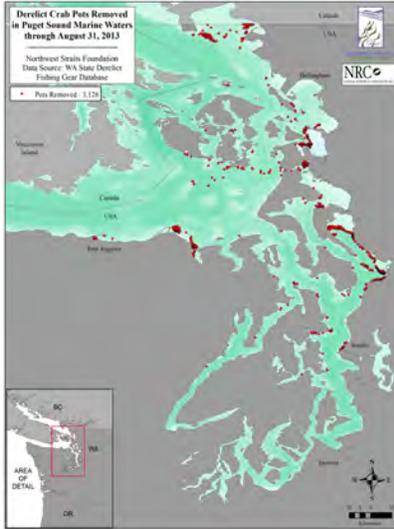
service outside of aviation by those in agriculture, mining, and maritime occupations, and the future plans for the system. Ms. Lawrence thanked all present for continuing to maintain and improve the WAAS program "for the good of the country."

Other speakers included: Malcolm Andrews, the FAA Director of Enterprise Services, which oversees the WAAS program; Jeff Christoffers, a Program Manager for the Raytheon Company, the primary contractor for WAAS; Dan Hanlon, the FAA's WAAS Program Manager when the system was commissioned in

2003; and Tom Kramer Manager of Airspace and Modernization for the Aircraft Owners and Pilots Association (AOPA), who emphasized his organization's long standing support for the WAAS program and how WAAS has benefited General Aviation pilots.

WAAS Finds Old Fishing Gear in Puget Sound in Washington State

In Washington State, the Puget Sound Derelict Fishing Gear Removal Project, managed by the Northwest Straits Marine Conservation Initiative (NWSI) has been locating and



removing derelict fishing gear since 2002. Nets (gillnets and purse seines), mostly from previous decades of heavy salmon fishing, and crab pots from both commercial and recreational Dungeness crab fisheries are what constitute the majority of gear types found to be derelict in the Puget Sound. Derelict gear targets are identified through sidescan sonar surveys and dive surveys, then are entered into the statewide derelict fishing gear database. Using GPS receivers equipped with Wide Area Augmentation System



(WAAS) circuitry, the dive team and biologist identify targets and load them into navigation software which is later used when returning to target locations. Highly trained divers using surface supplied air descend to the seafloor and manually remove the derelict gear. The gear is attached to a recovery line and retrieved by the dive removal vessel. An onboard biologist records the characteristics of the removed derelict gear item as well as all live and dead organisms found entangled.



As of August 31, 2013, the NWSI with Natural Resources Consultants, Inc (NRC) have removed 4,500 derelict fishing nets and over 3,000 crab pots, restoring more than 640 acres of critical marine habitat. Over 316,000 animals, representing more than 240 unique species, were found entangled in this gear. Species found include porpoise, sea lions, scoters, grebes, cormorants, rockfish, salmon, and Dungeness crab.

Precision is important in ensuring safe and effective dive operations for derelict fishing gear removals in the Puget Sound. Several steps are included in the process from target identification to target removal. Initial recording of accurate target coordinates by the survey team is essential in ensuring that the dive removal team will be able to locate the target in the future. Equally as important is the ability of the dive team to navigate the vessel and eventually the diver to the derelict gear target for removal. Variables in sea conditions, underwater visibility, tidal currents, water depth, and weather all play a factor in these operations and can affect the ease in which a target is found. Using GPS augmented by WAAS provides a high level of precision in both target identification and retrieval at a low cost, helping minimize the challenges posed by the variables encountered in the marine environment.

- Kyle Antonelis, Project Manager/Fishery Analyst, Natural Resources Consultants, Inc

GEO 5 Lease in Place

Based on a proposal from the Raytheon Company of Fullerton, California, offering the SatMex 9 satellite as the Wide Area Augmentation System (WAAS) Geostationary Earth Orbit 5 (GEO 5), the WAAS Program Office has issued Raytheon the Authorization to Proceed with Phase 1 of the contract on July 11, 2013. SatMex 9 has an anticipated in-orbit date of August 2016, with operational integration into WAAS to be completed in September 2017. The 10-year lease will begin once the satellite is integrated into WAAS.

The Post Contract Award Meeting with Raytheon was conducted on August 6th and 7th of 2013. The first Technical Exchange Meeting and the Integrated Baseline Review will be conducted during the week of October 14, 2013.

The WAAS Program uses a hosted payload on a commercial satellite. The FAA has conducted a study to compare the costs for leasing a hosted payload versus buying and operating an entire satellite, and determined the use of a leased service was more cost-effective.

- Scott Speed, FAA AJM-321/NAVTAC

WAAS Has Potential to Aid Unmanned Aircraft Systems (UAS) in Arctic

When Congress passed the FAA Modernization and Reform Act of 2012, it directed the FAA to "develop a plan and initiate a process" to designate permanent areas in the Arctic where small unmanned aircraft systems (sUAS) may operate 24 hours per day for research and commercial purposes. In August, 2013 the FAA issued "restricted category type certificates" to a pair of sUAS devices. The action "will lead to the first approved commercial UAS operations," the FAA said.

The newly certified UAS include the ScanEagle X200 from Insitu Inc., a Bingen, Washington, subsidiary of The Boeing Co., and the Puma AE from AeroVironment Inc., headquartered in Monrovia, California.

"A major energy company plans to fly the ScanEagle off the Alaska coast in international waters starting in August," the FAA said. "Plans for the initial ship-launched flights include surveys of ocean ice floes and migrating whales in Arctic oil exploration areas. The Puma is expected to support emergency response crews for oil spill monitoring and wildlife surveillance over the Beaufort Sea."

Issuing the certificates is an important step toward the FAA's goal of integrating UAS into the nation's airspace. These flights will also meet requirements in the FAA Modernization and Reform Act of 2012 that define Arctic operational areas and include a mandate to increase Arctic UAS commercial operations.

The FAA announcement takes the first steps in what is expected to be high utilization of UAS in the Arctic with benefits for:

- Scientific research
- Search and Rescue (SAR)
- Environmental analysis
- Fisheries
- Marine mammal observers
- Oil and gas leaseholders
- Maritime route planners
- Other uses as technologies and performance characteristics become better understood and integrated into UAS operations

The expansion in the use of unmanned aircraft is also expected to involve the utilization of a Space Based

Augmentation System (SBAS). The American SBAS is called the Wide Area Augmentation System (WAAS). In Alaska, using WAAS for UAS has many performance enhancing benefits over GPS. These benefits include:

- Better accuracy and performance which will greatly improve future Sense and Avoid applications for UAS
- Provides greater service volume coverage over the Northern Hemisphere with WAAS, and other SBAS, such as EGNOS, SDCM, MSAS, and GAGAN. International cooperation will work out any interoperability issues
- WAAS is required to fly all T routes whether inside or outside of surveillance radar coverage (May only operate on GNSS (GPS) Routes with GPS TSO-C129 (as revised) or TSO-C196 (as revised) equipment while the aircraft remains in Air Traffic Control (ATC) radar surveillance or with GPS/WAAS which does not require ATC radar surveillance)

- Scott Speed, FAA AJM-321/NAVTAC

Less Noise for Long Island Endangered Birds

The Piping Plover (*Charadrius melodus*) is a small sand-colored, sparrow-sized shorebird that nests and feeds along coastal sand and gravel beaches in North America. With a population that has dwindled to around 6,000, the bird is an endangered species and the protection of its habitat is a top priority for federal, state, and local environmental agencies.

A Localizer Performance with Vertical guidance (LPV) depiction, voluntarily flown using Visual Flight Rules (VFR) only, into the Southampton Heliport in Southampton, New York enables pilots to avoid disturbing the Piping Plover nesting grounds off Shinnecock Bay along the south shore of Long Island. The VFR LPV depiction curves over



The Puma AE small Unmanned Aircraft System (sUAS)



the Bay, rather than flying overland, thus minimizing noise and turbulence. The depiction also minimizes noise for local residents.

The Eastern Region Helicopter Council, an organization of helicopter operators in the area, has advised its membership of the new depiction and many have voluntarily adopted it, causing a much quieter summer for residents of the Hamptons, whether human or avian.

- Scott Speed, FAA AJM-321/NAVTAC

What's New on the Web!

Where can you find FAA Satellite Navigation Program information in between editions of the SATNAV News? Please visit our website - <http://gps.faa.gov>. Recently, we have added a new WAAS status briefing under the Satellite Navigation Library section; added the latest WAAS Quarterly Status Report; and posted

updated numbers on WAAS approach procedure development. Also, on our website, you can find information about how GPS, WAAS, and Ground Based Augmentation System (GBAS) work; an archive of past SATNAV News editions; and fact sheets. We are always looking for ways to improve the website and love your suggestions, so please feel free to send them to MaryAnn.CTR.Davis@faa.gov. In the meantime, we are working on major updates to many of the existing pages. More on that in the next SATNAV News!

Satellite Navigation Approach Procedures Update

The Satellite-based Approach Procedures table reflects the continuing growth of all types of satellite navigation approach procedures. For comparison purposes, we also include a table noting the recent inventory of Instrument Approach Procedures Based on Conventional NAVAIDs.

More detailed information about satellite based instrument approach procedures, please visit our GPS/WAAS Approach Procedures page at http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/approaches/index.cfm

- Mary Ann Davis, FAA AJM-321/NAVTAC

Instrument Approach Procedures (IAPs) Based on Conventional NAVAIDS	
ILS	1,283
ILS (CAT II)	156
ILS (CAT III)	117
NDB	802
VOR	1,291
VOR / DME	949
<small>(Data as of June 27, 2013)</small>	

More information is available at https://www.faa.gov/air_traffic/flight_info/aeronav/procedures/ifp_inventory_summary/

Satellite-based Approach Procedures (by Procedure Type)			
	Procedures (Part 139 Airports)	Procedures (Non-Part 139 Airports)	Total Number of Procedures
LNAV Procedures	1,765	4,034	5,799
LNAV/VNAV Procedures	1,338	1,884	3,222
LPV Procedures (LPV w/200' HAT)	1,338	2,002	3,341 (844)
LP Procedures	76	442	518
GLS Procedures	11	0	11
GPS Stand-Alone Procedures	10	99	109
<small>Note: Number of GPS Stand-Alone will continue to decrease as they are replaced by RNAV procedures (Data as of November 14, 2013)</small>			