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SatNavNews

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The *SatNav News* is produced by the Navigation Services AJW-91 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).

“Iono Robustness” Upgrade to Increase WAAS Reliability

In the month of October 2011, WAAS will begin a series of upgrades to increase the reliability of the system. One of these upgrades, known as ‘Iono Robustness’, will increase the availability of the WAAS LPV service during the upcoming solar maximum. The solar maximum refers to the peak of the 11 year solar cycle which is expected to occur in 2013. During solar maximum, the number of sun spots increases, greatly increasing the likelihood of solar flares. These flares tend to disturb satellite signals passing through the earth’s atmosphere, specifically the ionosphere. Such events are referred to as a solar storm (also known as an ‘iono storm’).

To ensure safety for users, the WAAS provides information about the ionosphere. The information is provided via a parameter called the Grid Ionospheric Vertical Error (GIVE). The GIVE parameter makes sure WAAS receivers properly account for the ionosphere when calculating a position. If the ionosphere is ‘quiet’ (i.e. no iono storm) then the value of the GIVE parameter is small. But during an iono storm the GIVE value becomes larger. The GIVE parameter is one

of the parameters used by a WAAS certified avionics receiver to support the LPV service. Larger GIVE values means that the LPV service from WAAS will be less available for use. The ‘Iono Robustness’ upgrade of WAAS optimizes the GIVE algorithm with the goal of increasing LPV service from WAAS during an iono storm, while not compromising safety.

The two figures show how WAAS reacted to a recent iono storm.

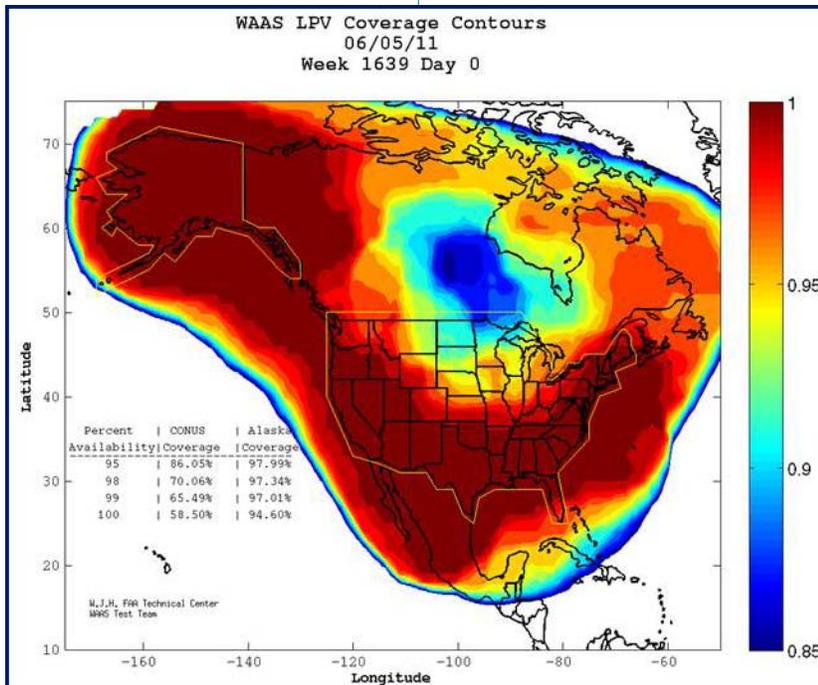


Figure 1: WAAS LPV Coverage without improved GIVE algorithm

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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 Scott Speed at scott_ctr.speed@faa.gov

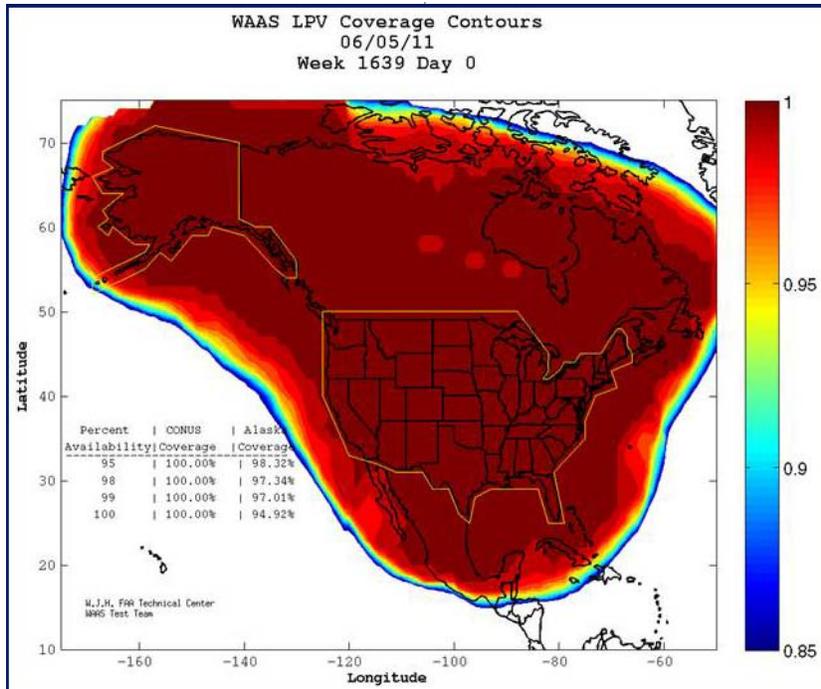


Figure 2: Test WAAS LPV Coverage with improved GIVE algorithm

Figure 1 shows the availability of WAAS on the current system during an iono storm on June 5, 2011. Figure 2 shows the availability of WAAS would have experienced using the improved GIVE algorithm software. The dark red color shows where WAAS LPV service was available 100% of the time on the indicated day. In Figure 1, WAAS LPV service was less than 100% in most of Canada and the north central portion of the United States. The improved GIVE algorithm software would have allowed WAAS to provide 100% LPV service for all of the contiguous United States and most of Canada during this solar event. Over the past few months there have been several iono storms and the performance WAAS would have experienced with the improved WAAS GIVE algorithm software has been similar to the example of June 5, as shown in the figures.

It should also be noted that during an iono storm, WAAS does not shutdown. Instead, the value of the GIVE parameter is increased to ensure safety for users of the LPV service. As an iono storm subsides, the GIVE parameter value lessens and LPV service is restored.

- Bill Warner, FAA ANG-E51

Government Industry Projects Advance WAAS Goals

The WAAS Program within the Federal Aviation Administration's (FAA) Global Navigation Satellite System (GNSS) Program Office is responsible for activities that initiate, coordinate, and continuously review all WAAS-related projects for National Airspace System (NAS) implementation. The Government Industry Partnership Plan will be used to guide the development of those programs which are to be open to public participation.

The WAAS Program's developed strategy is to find user partners and obtain a formal contractual agreement with those parties; then to develop data collection plans and equip aircraft with GNSS WAAS capability; and finally to conduct flight operations which would validate the potential benefits of both WAAS avionics equipment and the operational application. The following sections describe some of the Government Industry Projects (GIPs) that are currently underway.

Associated Aircraft Group (AAG)

This vertical flight project applies the lessons learned from previous vertical flight projects to New York City low



altitude and terminal area operations. This will allow for safer and more enhanced vertical flight operations without impacting current commercial fixed wing traffic into the business jet hub at Teterboro and the three major airports: Newark, LaGuardia, and Kennedy. The primary routes for helicopters in New York transport passengers to and from the local business jet and airline airports and also between the Manhattan heliports and the eastern end of Long Island. This helicopter initiative is in cooperation with AAG, an operator of charter and fractional share helicopters, based in Wappingers Falls, NY.

This project is focused on application of WAAS technology to deconflict helicopter and fixed wing aircraft approaches and allow unimpeded, simultaneous, all-weather operations. The intention is that these demonstrations, once established, will be converted into public use procedures in the future.

Bell Helicopter

A vertical flight project was initiated by the WAAS Program in coordination with Bell Helicopter and the University of Oklahoma. This project focused on the collection of flight technical data which forms the basis for the creation of Public-Use criteria for helicopter WAAS LPV approaches. Up to now



only "Special" procedures have been available for helicopters. These are typically created for individual operators and are not available for use by the public. To facilitate this project Bell Helicopter obtained a Supplemental Type Certificate (STC) for their newly developed B-429 helicopter. The University of Oklahoma developed portable data collection equipment that was carried onboard the aircraft during tests. The FAA developed demonstration WAAS-based infrastructure in airspace utilized by an operator of the Bell 429 in the Des Moines, Iowa metropolitan area. WAAS LPV approaches to area medical centers were developed using Point In Space designs. This project has been successfully completed. The public-use criteria document has been delivered to the appropriate FAA offices and is currently in the review and release process.

CareFlite

A project was developed with CareFlite, an aeromedical helicopter operator in the Dallas, Fort Worth, Texas area. CareFlite, which flies the AgustaWestland A-109E helicopter, is a major operator for medical transport. Aeromedical helicopters transporting patients from outlying areas near the Dallas, Fort Worth Airport (DFW) are faced with transiting the busy and complex airspace surrounding DFW. During inclement weather air traffic controllers routed helicopters operating under Instrument Flight Rules (IFR) away from DFW, causing increased flight time to the medical center helipads and potential flight hazards for arriving and departing airline traffic. Under this project, a WAAS-based demonstration infrastructure was developed first placing new helicopter LPV Point In Space approaches to five



trauma centers and then creating a connecting, non-interfering route system encircling DFW. This system allows helicopters to file IFR flight plans to the route system from exterior pick up points then to proceed to the trauma centers helipads, thus eliminating potential conflicts with airline traffic and allowing air traffic controllers the ability to provide immediate clearances, thereby minimizing flight time from any location to the site of medical units. This demonstration project has had all infrastructure developed, tested, and approved. Flights are underway daily, gathering the data necessary to prove the system's functionality.

Cape Air

A project with Cape Air is utilizing a fleet of reciprocating twin engine propeller driven aircraft. Currently there are 25 WAAS equipped aircraft. As a result of the preliminary results



of this project Cape Air's CEO has committed to equip all 65 of their aircraft with WAAS avionics. This project has been developed to assess the benefits of WAAS-based infrastructure on a small airplane airline operation. Based in New England, Cape Air has been flying their regular routes with a new focus on WAAS LPV approaches. Results to date have shown a significant reduction in diversions from destination airports due to weather as compared to legacy approach systems. Accompanying cost savings have been significant enough to justify the planned investment to equip all aircraft in the fleet with WAAS avionics.

A further demonstration has been developed to investigate the value of WAAS in wake turbulence approach procedures (see article on page 6).

NetJets

Focusing on business jet aircraft operations, a developmental demonstration effort is being conducted in the mountainous region of the NAS at Aspen, Colorado and Jackson Hole, Wyoming. These procedural demonstrations for NetJets will be implementing RF (radius to fix) turn applications into WAAS LPV approach to increase the service arrival availability at those airports. The intent is to demonstrate increased service and showcase this new capability to other operators, thus demonstrating WAAS equipage benefits. Routes, approach and departure procedures are being developed to demonstrate the unique new capabilities provided by NextGen. More precise routes will permit relocation of flight paths to areas outside National Park boundaries and away from sensitive locations. New WAAS-based arrival and departure procedures will provide the ability to safely accommodate increased air traffic at very challenging mountain airports.

The NetJets project is also developing demonstration infrastructure in the heavily trafficked corridor between New York and Florida by creating an en route structure for expedited high altitude- high speed operations that would terminate in the New York airspace with arrivals into and departures out of Teterboro Airport (TEB). This high altitude route would emanate from the Ormond Beach, Florida region, offshore along the Eastern Seaboard, over Long Island transitioning to an entry point on the northern side of the New York Metro Airspace. This route would then be able to support independent operations (exclusive of Newark, Kennedy, and LaGuardia) into Teterboro, Morristown, and Westchester airports

Teterboro Terminal Operations will be served by establishing a separate transition corridor from this route to segregate WAAS equipped business-jet traffic from the main arrival streams. That will reduce some of the current congestion on



those routes that often have back-ups as far west as Chicago, IL, and as far south as Charlotte, NC. The intended objectives are to reduce commercial air traffic congestion, reduce current ground delays, and provide for de-confliction of air traffic operations between Teterboro and Newark (EWR) Airports. The FY12 demonstration project will allow for the test flights and data collection to conduct traffic modeling and simulation tasks with the New York air traffic control personnel.

- Scott Speed, FAA AJW-9131/NAVTAC

FAA Conducts Long Island Helicopter Test Flights

On September 12th and 13th, 2011, the FAA Flight Test Group conducted demonstration helicopter flights of the recently designed Long Island South Shore Helicopter Route, as well as Manhattan heliport approaches, cross-island transition routes joining flights from Long Island Sound to the South Shore route, and other eastern Long Island approaches. Intended to validate the routes and approaches for final approval and use under FAA Air Traffic Control (ATC) direction, this demonstration and data collection effort utilized the combined resources of the FAA's WAAS Program Office and the FAA's Test and Evaluation Group for the Wide Area Augmentation System (WAAS).

The FAA's William J. Hughes Technical Center's Navigation Performance Team and Flight Program Team flew the demonstration in a Sikorsky S-76A, a twin-engine, single main rotor helicopter, equipped with a Universal Avionics System UNS-1FW Flight Management System that interfaces with a Rockwell Collins multi-mode receiver (MMR).



The South Shore Helicopter Route channels helicopter traffic over the water along the southern shore of Long Island, thus greatly reducing noise in residential neighborhoods. When used by helicopter operators, this route and the cross-island routes will reduce instances of flying low under the cloud cover during overcast weather to maintain visual contact with surface landmarks. This practice of navigating by Visual Flight Rules (VFR) during inclement weather greatly increases aircraft noise in residential neighborhoods. WAAS equipped avionics provides accurate Instrument Flight Rules (IFR) navigation even in poor visibility, thus eliminating the need to fly low enough to see landmarks on the ground.

The South Shore Helicopter Route grew out of the New York Helicopter Project, a combined effort of the FAA and the Associated Aircraft Group (AAG). The focus of this project is to develop segregated vertical flight VFR and IFR routes, approaches, departures, and missed approach structures to facilitate vertical flight operations independent from commercial fixed wing operations. The South Shore Helicopter Route, for example, does not conflict with fixed-wing aircraft coming in and out of JFK International Airport. This con-

cept eliminates delays caused by obtaining flight clearances for both helicopters and airliners under IFR conditions.

The results of the initial test flights conducted on September 12th and 13th will be used to verify the route locations, recommend possible modifications to the proposed routes, and to facilitate broadening the use of the routes for commercial helicopter operators.

Once the FAA approves the routes and approaches for further demonstrations, AAG will fly them as a part of its regular service. Data collected from these ongoing flights will further the approval process conducted by the FAA.

- Scott Speed, FAA AJW-9131/NAVTAC

GBAS Program Update

In April 2011, the Federal Aviation Administration (FAA) made the decision to delay Ground Based Augmentation System (GBAS) acquisition management activities due to budgetary constraints. FAA GBAS activities were transferred from FAA Navigation Services to the FAA Research & Technology Development Directorate with the technical work being done by the Engineering Development Services Navigation Team under John Warburton.



GBAS remains a component of the FAA plan to transition from a ground-based navigation and landing system to a satellite-based navigation system and is identified in the Enterprise Architecture and the Navigation Roadmap as the future navigation solution for Category (CAT) II and III precision approach and autoland operations. The strategy is to evolve the architecture developed and approved for a single frequency GBAS CAT-I service and improve this architecture to provide CAT II/III service.

Current CAT II/III planning focuses on reducing technical risk through prototyping and requirements validation. This approach is consistent with international GBAS efforts. GBAS standards for GAST-D, a service type equivalent to ILS CAT III, were baselined within an ICAO Navigation Systems Panel proposed amendment to the Annex 10 Standards and Recommended Practices (SARPS). The FAA has several activities in place to provide validation products as well as operational prototypes for cooperative testing.

These activities were presented to the EUROCONTROL Landing and Take Off Focus Group (LATO) held in September at the EUROCONTROL Experimental Center in Bretigny, France. Twenty Seven (27) participants from European nations, service providers, industry, and airlines attended the meeting. FAA activities complement those of EUROCONTROL/ Single European Sky Air Traffic Management Research (SESAR). The exchange of GBAS data, research and develop-

ment results, and documents are all essential to the global harmonization of GBAS.

LATO participants conduct GBAS related activities in one form or another. These range from concept development and research prototype activities to actual implementation. GBAS activities are driven by either individual Air Navigation Service Providers (ANSPs) national programs or SESAR. The SESAR GBAS project is divided into several work packages: GBAS CAT I operational implementation, GBAS CAT III - "airborne", and GBAS CAT II/III system development - "ground". The FAA presentations provided an overview of CAT I implementation activities in Newark and Houston, the status of the FAA GBAS CONOPS, the CAT III validation efforts, the airborne and ground prototypes, and Radio Frequency Interference (RFI) mitigation activities.

GBAS coordination and cooperation continues on a global basis through the ICAO Navigation System Panel (NSP) and the International GBAS Working Group (IGWG); on a regional basis with EUROCONTROL and SESAR through the LATO meetings; and on a national basis with FAA agreements with individual nations (Brazil, Australia, Chile, Germany, and Spain).

The next LATO meeting is planned for April 2012 at the EUROCONTROL Experimental Center in Bretigny, France. The next International GBAS Working Group is hosted by the FAA at the William J Hughes Technical Center, November 15-18, 2011.

-Dieter Guentler, FAA/AJW-9131/NAVITAC

GBAS Activities at Newark and Houston

The Federal Aviation Administration (FAA), the Port Authority of New York and New Jersey (PANYNJ), and Continental Airlines signed a Memorandum of Understanding (MOU) in

the summer of 2009 to facilitate implementation of Ground Based Augmentation System (GBAS) technology at Newark Liberty International Airport (EWR). The PANYNJ purchased and installed a Honeywell SLS 4000 GBAS at EWR. They are the sponsor of the GBAS system, responsible for operation, maintenance, and support. The FAA provides technical support and test assets. Continental is the primary customer for GBAS, and continues to seek operational experience with this new technology.

The FAA GNSS Operational Implementation Team is working with Continental, New York/New Jersey Air Traffic Control, and the FAA Engineering Development Services Group to develop, model, simulate, and flight test GBAS approaches for Newark, with much of the work being done at the FAA Technical Center. Continental Airlines already have over 30 GBAS Landing System (GLS)-capable aircraft approved for GLS operations. Straight-in GBAS approaches were developed and have been flight inspected and published but have not yet been operationally approved. The SLS-4000 was granted the first FAA GBAS Systems Design Approval (SDA) in 2009. The Newark GBAS was installed in November of that year. Operational approval was withheld due to system detection of Radio Frequency Interference (RFI) on GPS L1 and related outages. The RFI traced to illegal Personal Privacy Devices (PPDs) in vehicles traveling on the New Jersey Turnpike in very close proximity to the Newark Airport.

An FAA led working group developed several mitigation strategies including system and siting changes. The GBAS operational software was modified, minimizing the operational impact of RFI while maintaining safe operations. Siting modifications, including raising and moving GBAS antennas were planned and are being executed, with some changes being implemented on a temporary basis for data collection.



The final changes, funded by the PANYNJ, are expected early 2012. The 2009 GBAS approval will be updated based on system software modifications and safety case considerations. The new SDA covering all aspects of GBAS operations in the presence of PPD RFI is expected in the second quarter of 2012.

A second non-Federal GBAS is being installed at Houston George Bush Intercontinental Airport (IAH) with cooperation by the FAA. The system being installed was originally located at Memphis and was used as the base system for GBAS prototype testing by the FAA during the CAT I development contract. That system was subsequently upgraded to the System Design Approval (SDA) Category I baseline but never operationally approved. In order to best use this asset and the availability of Continental Airlines GBAS-equipped aircraft, a decision was made to move the system from Memphis to Houston. There it will be used for additional validation of the GBAS installation documents and to gain early operational experience with this NextGen technology.

The Houston GBAS initiative will - like Newark - support the early implementation of GNSS technology. It also provides Continental Airlines a city pair (Newark - Houston), thus facilitating the effective planning of operations for Continental's fleet of GLS capable

aircraft. It will be possible to conduct operational demonstrations using the capabilities of GBAS in a complex airspace environment. The goal is to achieve efficiency, safety, and capacity enhancements by supporting aircraft and airspace separation in a highly-congested area. It will also provide insight into requirements for Houston initiatives concerning parallel runway operations and wake separation, leveraging multiple glidepath, offset touchdown, and linear accuracy standards, all of which are capabilities of the approved GBAS design.

The RFI issue detected at Newark will assist in the siting and installation of future GBAS equipment. In fact the FAA - Houston Airport System (HAS) project is already applying lessons learned at IAH.

A site assessment was completed that included GBAS performance and RFI data collection at multiple locations toward the interior of the airport, providing isolation from nearby roadways. A final site was selected, after it was verified using Honeywell and FAA equipment that RFI conditions were not like those at Newark. Data collection continues using FAA monitoring systems while the site preparations are being completed.

Planning for civil works, system installation, flight procedure development, flight/simulator testing with Continental Airlines has started and HAS and the FAA expects IAH GBAS to be operational by spring 2012.

The Newark and Houston projects will identify and validate GBAS benefits. The projects are designed to offer an air traffic control tool that can provide flexibility, adaptability, reliability, and environmental benefits and also provide controllers and pilots with operational experience using GBAS.

-Dieter Guenter, FAA A/JW-9131/NAVITAC

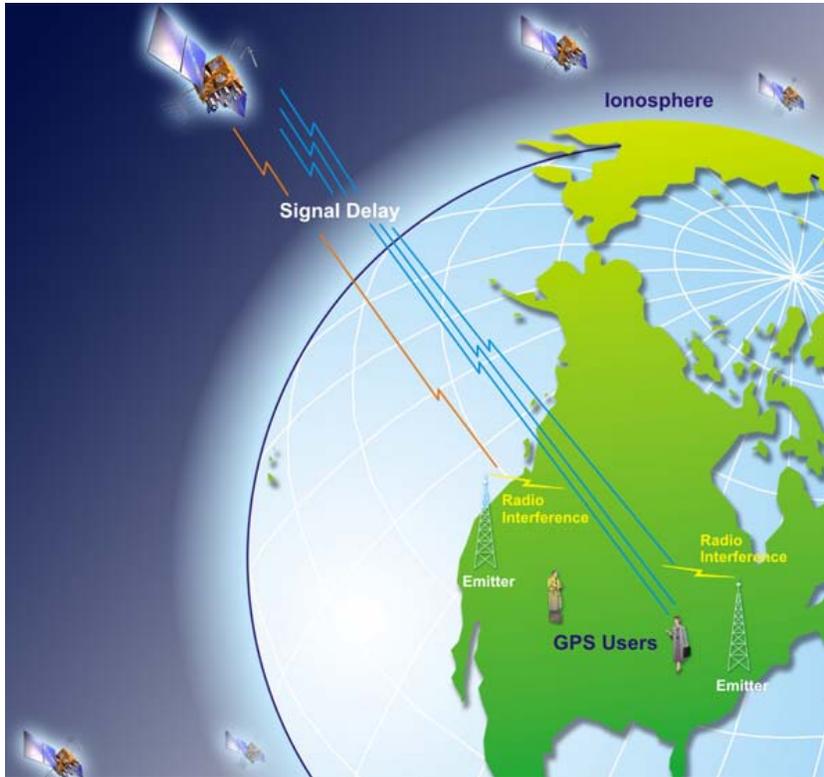
New GPS L5 Frequency Being Phased In

Augmenting the Global Positioning System (GPS), the Wide Area Augmentation System (WAAS) is

an extremely accurate navigation system developed for civil aviation. Before WAAS, the U.S. National Airspace System (NAS) did not have the potential to provide horizontal and vertical navigation for approach operations for all users at all locations. With WAAS, this capability is a reality. WAAS provides service for all classes of aircraft in all phases of flight - including en route navigation, airport departures, and airport arrivals. This includes vertically-guided landing approaches in instrument meteorological conditions at all qualified locations throughout the NAS.

WAAS augments the Global Positioning System (GPS) L1 C/A signal. The GPS L2 P(Y) semi codeless signal is used in conjunction with the L1 C/A signal to measure ionospheric delays at the ground-based WAAS Wide-area Reference Stations (WRS). WAAS currently models the ionosphere based on measurements from each GPS satellite in view at each WRS. The measurements are then sent to the WAAS Master Stations (WMS) where the ionospheric data from all WRSs is processed into an ionospheric delay grid. This ionospheric delay grid is then transmitted via the Ground Uplink Stations (GUS) to the WAAS GEO satellites, which broadcast data messages to WAAS equipped GPS receivers. The ionospheric grid data is used by the WAAS equipped receivers to estimate ionospheric delays for in-view GPS satellites.

Under WAAS Phase IV - Dual Frequency Operations, the FAA plans to introduce a new dual frequency navigation service while retaining the current single frequency user service. Aviation users who will take advantage of both the L1 C/A and L5 GPS signals are referred to as Dual Frequency Users. The use of the two frequencies, L1 (C/A) and L5 - both in the protected Aviation Radio Navigation Service (ARNS) bands - will allow WAAS equipped dual frequency GPS receivers to directly measure the ionospheric delay, removing the constraints imposed by the WAAS broadcast ionosphere correction grid.



Also, during Phase IV, computation of the WAAS ionospheric grid will be switched from L2 P(Y) to the L5 signal.

The first operational L5 satellite was launched May 5, 2010 and the second was launched July 16, 2011. A full constellation of L5 capable satellites is estimated to be available in 2018. The FAA plans to initiate WAAS Dual Frequency service in concert with the full L5 capable GPS constellation. The FAA will continue to support the current Single Frequency service.

The ground segment upgrades needed to transition to the dual frequency user capability will be implemented incrementally, thus maintaining continuous legacy single frequency services. All upgrades, culminating in the Dual Frequency Operations Capability, will first be thoroughly tested within the WAAS Shadow System prior to operational fielding. The WAAS Shadow System is a collection of operational and test hardware and software that closely emulates the fielded WAAS.

- Scott Speed, FAA AJW-9131/NAVTAC

Safety: Wake Turbulence Countered in WAAS Procedure

Every aircraft in flight generates a wake. Historically, when pilots encountered this wake the disturbance was attributed to "prop wash." It is known, however, that this disturbance is caused by a pair of counter-rotating vortices trailing from the wing-tips. The vortices from large aircraft pose problems to following aircraft. For instance, the wake of these aircraft can impose rolling moments exceeding the control authority of the following aircraft. Further, turbulence generated within the vortices encountered at close range can damage aircraft components and equipment and

cause personal injuries. The pilot must learn to envision the location of the vortex wake generated by larger (transport category) aircraft and adjust his/her flight path accordingly.

If a pilot accepts a clearance to visually follow a preceding aircraft, the pilot accepts responsibility for separation and wake turbulence avoidance. The pilot is expected to adjust aircraft operations and flight path as necessary to preclude serious wake encounters.

Through a Government Industry Partnership (GIP) between the Federal Aviation Administration (FAA) and Cape Air, this safety issue is being addressed. Cape Air operates a fleet of sixty-four (64) Cessna 402C aircraft serving thirty-six (36) cities ranging from New England, Florida, the Mid-Atlantic, Mid-West and Caribbean.

Advisory Circular AC90-23F, Section 9b. warns: "When landing behind a larger aircraft - when parallel runway is closer than 2,500 feet (figure 10) - consider possible vortex drift onto your runway. If you have visual contact with the larger aircraft landing on the parallel runway, whenever possible, stay at or above the larger aircraft's final approach flight path. Note its touchdown point." Throughout this advisory circular, the pilot following the "wake-generator" to the same or parallel runway is instructed to remain higher and land longer than the larger aircraft in order to avoid encountering the wake.

A demonstration project at Boston Logan Airport (BOS) is scheduled to take place in the fall of 2011. Utilizing

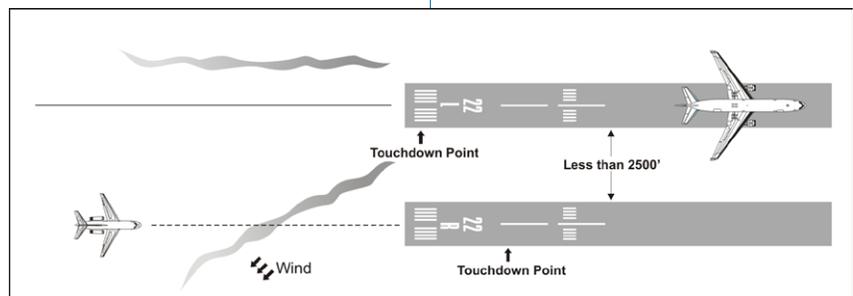
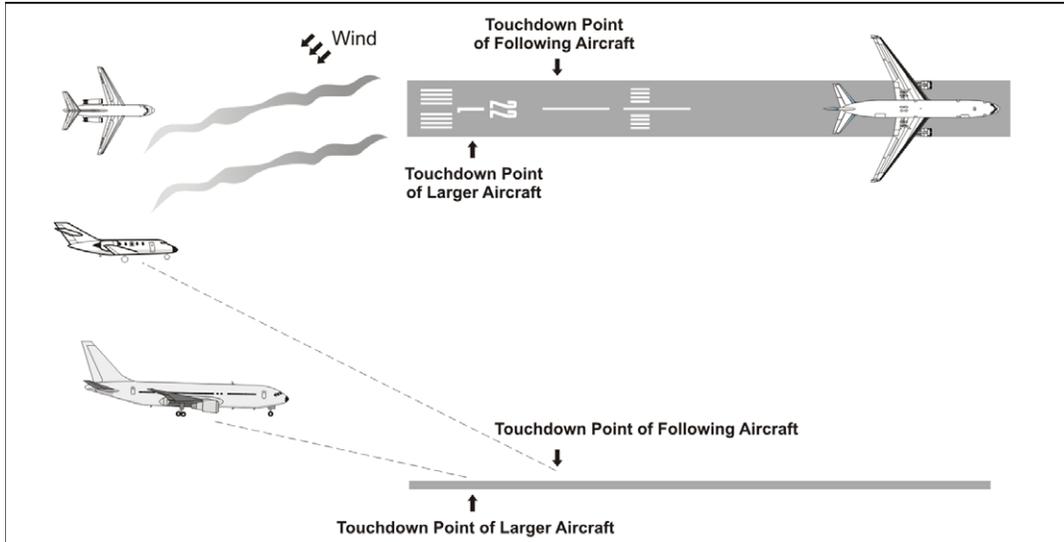


Figure 10. Parallel Runway Approach



WAAS technology, Cape Air will fly a vertically guided wake turbulence avoidance approach procedure that is currently a visual maneuver.

In the demonstration project, the approach to runway 4R at BOS will guide the aircraft vertically to remain above the usual glide path, horizontally to remain precisely on the runway centerline, and directing it to land one thousand feet beyond the wake-generator's touchdown point.

The data collected for this project will determine if WAAS wake turbulence avoidance approaches can be implemented operationally.

- Dave Khanoyan, FAA AJW-9131/NAVTAC

Wide Area Augmentation System (WAAS) Avionics Enable Horizon Landings

The weather in the Spokane, Washington area on Thursday, October 6, 2011 was overcast with poor visibility and low ceilings at Spokane International Airport (GEG) and nearby Pullman-Moscow Regional Airport (PUW). Runway construction at GEG had also caused the Instrument Landing System (ILS) on the main runway (3/21) to be out of service. The outlook was not good for the Horizon Air flights scheduled for landings at those two airports.

"Once the aircraft routers and dispatchers became aware of the conditions of the day," said Steve Bush, Horizon Air's Flight Operations Manager, "and what WAAS offered toward schedule completion, they actively routed the WAAS aircraft in such a way to keep them in those markets and therefore were able to realize the full benefit of WAAS approach capabilities."

Seven flights were confirmed "saves"—meaning LPV equipped aircraft were able to land successfully instead of being diverted or cancelled. Two

more flights were probable saves. "That equates to 18 flights – inbound and outbound – saved due to WAAS," said Mr. Bush. "Our company leadership got a firsthand glimpse at what could be possible when we equip the full fleet with WAAS avionics."

In one example of the effectiveness of WAAS, planes

using LNAV/VNAV to Runway 7 at GEG normally would be restricted to the following minimums: a decision altitude of 2,834 feet above Mean Sea Level (MSL), 458 feet Above Ground Level (AGL), and visibility of 1.5 miles. Using an LPV approach at that same runway, the minimums improve to: 2,576 feet MSL, 200 feet AGL, and visibility of .75 miles.

- Scott Speed, FAA AJW-9131/NAVTAC



Satellite Navigation Approach Procedures Update

September 30, 2011 – The number of Wide Area Augmentation System (WAAS)-enabled approach procedures continues to increase. The tables shown here reflect the latest numbers. More information about WAAS approach procedures can be found on our GNSS - GPS/WAAS Approaches web page (http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/approaches/index.cfm).

- Mary Ann Davis, FAA AJW-9131/NAVTAC

What's New on the Web!

Just type <http://gps.faa.gov> into any web browser to access the best and most accurate information available from the FAA's Navigation Services Global Navigation Satellite System (GNSS) website.

Satellite-based Approach Procedures (by Procedure Type)			
	Procedures (Part 139 Airports)	Procedures (Non-Part 139 Airports)	Total Number of Procedures
LPV Procedures	1751	3491	5242
LPV/VNAV Procedures	1248	1350	2598
LPV Procedures (LPV w/200' HAT)	1206	1469	2675 (541)
LP Procedures	32	133	165
GPS Stand-Alone Procedures	23	276	299

Note: Number of GPS Stand-Alone will continue to decrease as they are replaced by RNAV procedures (Data as of September 30, 2011)

Instrumentation Approach Procedures (IAPs) Based on Traditional NavAids	
ILS	1,285
ILS (CAT II)	171
ILS (CAT III)	120
NDB	901
VOR	1,341
VOR / DME	974

(Data as of August 25, 2011)

Table truncated for publication. Full table available at http://www.faa.gov/air_traffic/flight_info/aeronav/ifpinventory-summary/

