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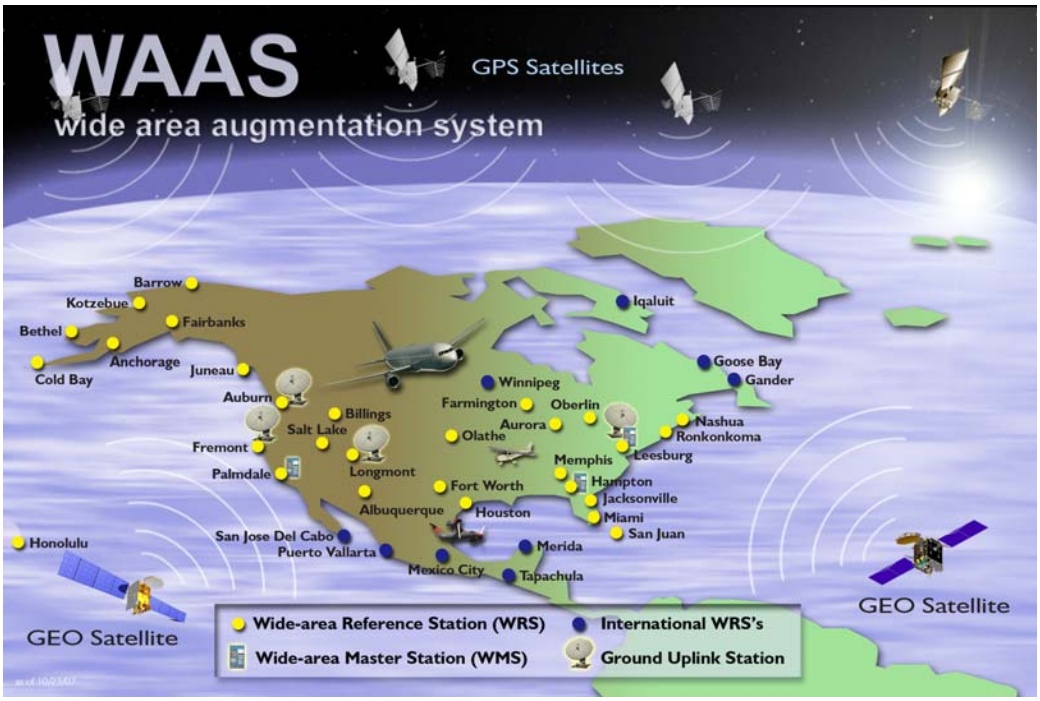
Federal Aviation Administration

SatNav News

FAA Satellite Navigation Product Teams

WAAS Now Available in Canada and Mexico



Thirty-eight wide-area reference stations (WRS) are located throughout the U.S., Canada, and Mexico. These stations monitor GPS satellites and collect the data used to create the WAAS signal-in-space which is broadcast by the two WAAS geostationary satellites.

On September 28th, Wide Area Augmentation System (WAAS) coverage was expanded into Canada and Mexico. This achievement was made possible by the integration of nine new international wide-area reference stations (WRS) into the WAAS network. In addition to extending WAAS coverage to users throughout large portions of Canada and Mexico, this expansion also benefits the U.S. WAAS users within the U.S., formerly on the fringes of WAAS coverage, are now well within its coverage boundaries. The new WRSs are located in Canada (Goose Bay, Gander, Winnipeg, and Iqaluit) and in Mexico (Mexico City, Puerto Vallarta, Mérida, Tapachula, and San Jose del Cabo).

The incorporation of these new WRSs into WAAS meets the FAA Administrator's Flight Plan goals to bring all nine WAAS international WRSs into operational status by the end of the year, a goal which was met four months ahead of schedule.

For WAAS users, this expansion of service means more locations where vertically-guided approach procedures based upon GPS/WAAS can be developed and used. The FAA has already published over 900 localizer performance with vertical (LPV) approaches throughout the U.S. As such, WAAS equipage has also been steadily increasing. There are currently over 20,000 aircraft equipped to fly LPVs and this number also continues to

In this issue:

The **SATNAV News** is produced by the Navigation Services (ATO-W) branch of the Federal Aviation Administration. This newsletter provides information on the Wide Area Augmentation System (WAAS) and the Local Area Augmentation System (LAAS), and initiatives associated with the implementation of satellite navigation into the National Airspace System (NAS).

Federal Aviation Administration
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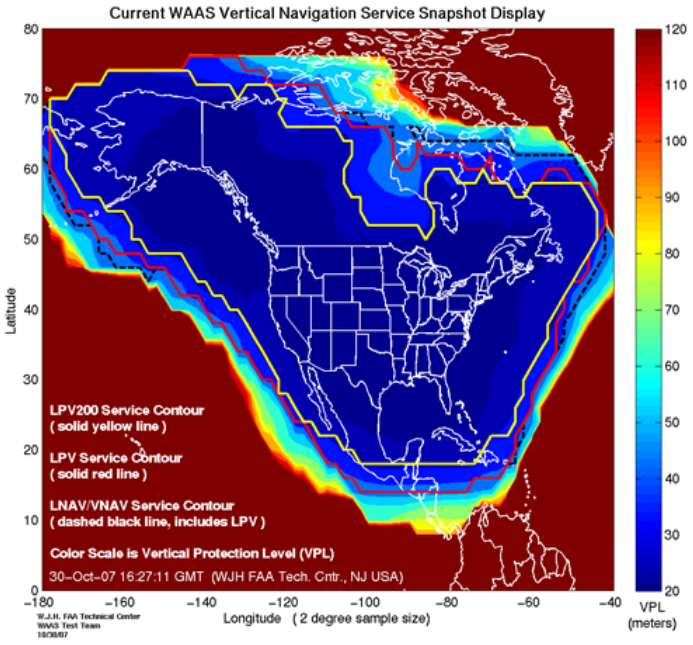
Washington, DC 20591
http://gps.faa.gov

grow. This latest expansion of WAAS coverage increases the number of locations that can benefit from LPVs, providing even more incentive for users to equip.



Shown above is a screen shot from the FAA's "Current WAAS Navigation Service Snapshot Display" web page. This display updates once every two minutes to reflect fluctuations in service coverage. To access this site, please select the "Real Time WAAS Coverage Link" found at the bottom of http://gps.faa.gov or access this page directly at http://www.nstb.tc.faa.gov/RT_VerticalProtectionLevel.htm.

This significant milestone for satellite navigation would not have been possible without the commitment and valuable contributions of the Canadian and Mexican aviation authorities who have supported this work at the highest levels under the auspices of the North American Aviation Trilateral Agreement. The result is a highly accurate and reliable navigation service that will benefit all three nations. Although the international WAAS stations are operational, the cooperative work does not end. The FAA has signed supporting agreements with its counterparts in Canada and Mexico documenting a continued commitment to work together to ensure the ongoing operation of this expanded service. For WAAS users in North America, this expansion is the next step on the road of continuous WAAS enhancements. For the world, this is another step in the maturity of the International Civil Aviation Organization's (ICAO) Global Navigation Satellite System (GNSS) vision.

- Mary Ann Davis, FAA ATO-W/GPS TAC

WAAS Agreements Signed with Canada and Mexico

To prepare for the international expansion of WAAS, implementation agreements were signed between the U.S., Canada, and Mexico. The FAA's Wide Area Augmentation System (WAAS) program office participated in separate bilateral operational implementation meetings with authorities in Canada (NavCanada) and Mexico (Servicios a la Navegación en el Espacío Aéreo Mexicano, referred to as SENEAM) to refine plans for the implementation of the wide-area reference stations (WRS) in those countries.

During the meetings, the FAA WAAS program manager and her counterparts in NavCanada and SENEAM signed the international program implementation plans (IPIP). The first of these agreements was signed in December 2006 between the FAA and NavCanada. The second agreement was signed in January 2007 when the FAA met with SENEAM in Mexico. The IPIPs, one for each country, have been jointly developed between the FAA and NavCanada/SENEAM and provide the details of how the higher-level joint agreements to install and implement international WAAS assets will be accomplished. Additionally, the IPIP describes how operation and maintenance of the WRSs will be conducted now that the Canadian and Mexican WRSs have been integrated into the WAAS. The international assets are operated by U.S.-based WAAS operations specialists and maintained by Canadian and Mexican personnel. The international WAAS sites are

Deborah Lawrence (FAA WAAS Program Manager) and Jeff Cochrane (NavCanada CNS Service Design Manager) meet to sign the U.S./Canada IPIP.

Also pictured are members of the FAA/NavCanada team, including Alain Brunet (NC), Wally Peterson (FAA/GPS TAC), Joe Jaksic (NC), Dave Roth (FAA), Brian White (NC), Kenny Simmons (FAA), Steve Bellingham (NC), Claude Allard (NC), and Jerry Smith (FAA).

The SENEAM Director General Adjunto Tecnico, (Joaquin Diaz Garcia) and Deborah Lawrence sign the U.S./ Mexico IPIP.

managed nearly identically to the management of the U.S. assets.

Training for the initial staff of maintenance technicians for each of these locations was completed prior to the operational date for each of these nine international sites. Requisite resources for were also procured and deployed to the international sites to support the operation and maintenance.

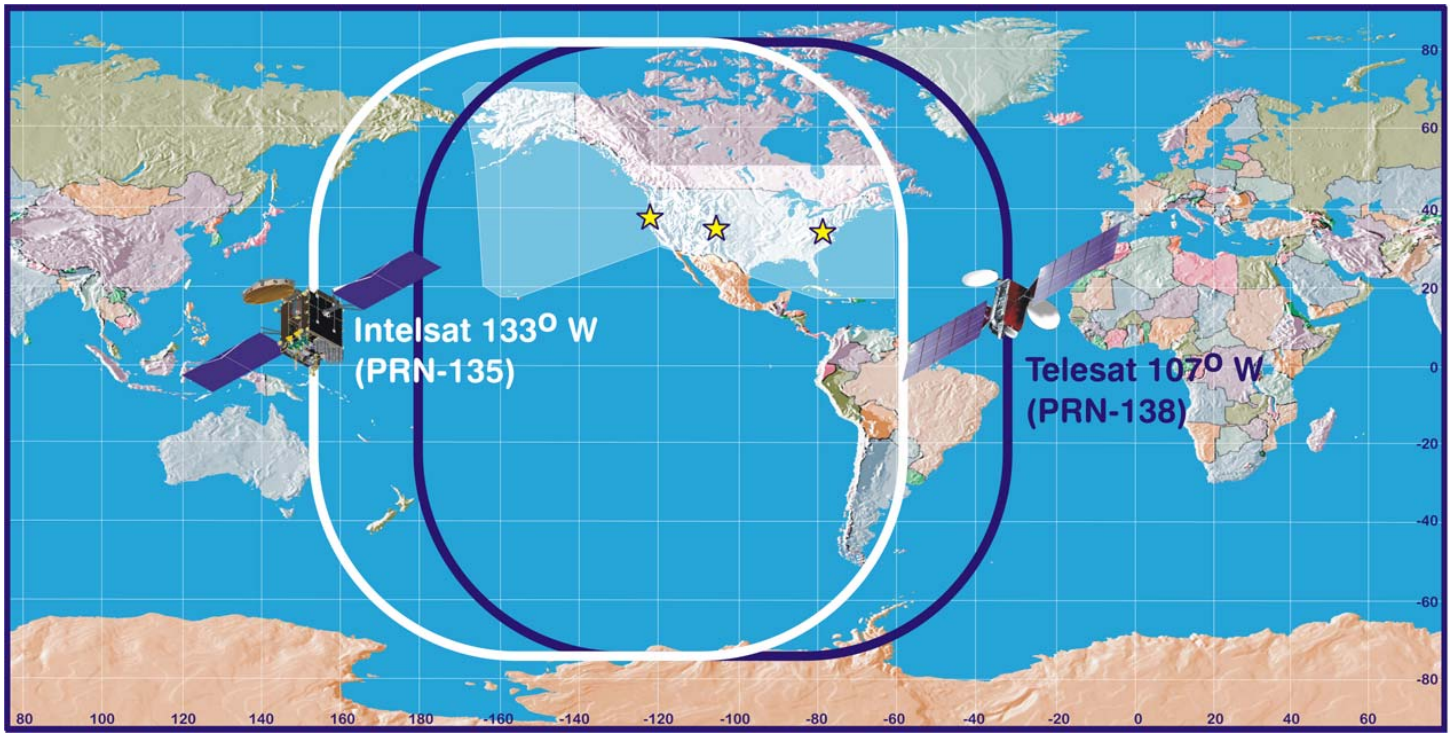
- Wally Peterson and Greg Clark, FAA ATO-W/GPS TAC

New WAAS GEO Integrated into System; Coverage Improved

On July 11th, the WAAS Signal in Space (SIS) broadcast from the Telesat ANIK-F1R geostationary satellite completed integration into WAAS and became usable by WAAS-enabled avionics receivers. The SIS broadcast by Telesat provides higher power and better coverage than the Inmarsat satellites initially commissioned with WAAS. The combination of the Intelsat Galaxy XV satellite, integrated in November 2006, with the Telesat satellite provides WAAS users with significantly improved WAAS availability. Further, the orbital location of Telesat extends WAAS coverage into northeastern Canada.

With the WAAS SIS broadcast successfully deployed on the Telesat and Intelsat GEOs, the initial WAAS GEOs were transitioned out. On July 30, 2007, both the INMARSAT Atlantic Ocean Region – West (AOR-W) satellite (PRN # 122) and INMARSAT Pacific Ocean Region (POR) satellite (PRN #134) were removed from WAAS operation.

WAAS receivers certified for instrument flight rule (IFR) operations are designed so that the addition of the Telesat GEO and the removal of the AOR-W and POR GEOs will be seamless to the operation of the receiver. The only visible change will be that of the different satellite GPS identification codes noted by the unit; the identifier for the new Telesat ANIK-F1R GEO is PRN #138.



Broadcast footprint of the WAAS GEOs

For non-certified WAAS receivers, you may want to check with the manufacturer of your unit to see if and how this change may affect the operation of your equipment.

- Ed Sigler, FAA ATO-W/GPS TAC

WAAS - Not Just for Aviation Users

What do tens of thousands of mapping/surveying professionals around the world have in common? They use precision GPS.

Some use GPS to map utility poles. Some use it for mapping agriculture fields and guiding farm equipment. Others use it for precisely marking property boundaries within a centimeter. There are hundreds of different GPS uses by the professional survey/mapping community around the world.

Traditionally, the survey/mapping community has used post-processing, a local real-time data link, beacon differential GPS (DGPS) or a private subscription service for DGPS corrections. However, in recent years, WAAS has emerged as a reliable and precise source of corrections for the professional GPS users.

A select number of manufacturers have developed technologies to exploit the use of WAAS for ground users. To overcome the loss of WAAS GEO satellite visibility in certain environments, they've developed technology that allows the user's receiver to be out of sight of a WAAS GEO satellite for tens of minutes without significant degradation in accuracy. Of course, in most cases, users are only out of sight for a minute or two at a time…like when moving through trees and around buildings. This sort of technology has made it possible for WAAS to be used as a primary correction source in places never thought of.

J.D. Irving, Limited, a large forest products company located in Eastern Canada, found WAAS so productive that they invested in 300 SXBlue (Geneq, Inc.) GPS units that use WAAS as a source of correction. They use the receivers in some of the thickest, wettest forests in North America. The WAAS GEO elevations are worse in their operating area than most, yet they rarely lose the WAAS correction according to John Paul McGrath, a Geographic Information Systems (GIS) analyst for JD Irving.

"Initially, a number of DGPS options were tested, and WAAS proved to penetrate our forest canopy type the best. Short outages do occur, but the technology in the SXBlue allows our operations to continue virtually uninterrupted," said McGrath.

"Our 300 users of GPS technology, both handheld and vehicle-based, rely on uninterrupted WAAS service 24 hours a day, 7 days a week in all weather and terrain conditions."

Caveat emptor though. Just like DGPS receivers, each WAAS-enabled receiver handles WAAS differently so don't expect the WAAS-enabled consumer receiver you bought at Wal-Mart to perform like a high performance one designed for ground users. To squeeze the maximum performance from the WAAS correction, the GPS receiver designer must spend time to understand how to exploit it.

Another innovative use of WAAS was unveiled earlier this year by high-precision survey receiver manufacturers. They've developed methods of utilizing WAAS in an unorthodox but effective manner to assist GPS receivers used for surveying to achieve centimeter accuracy.

Magellan Corporation's recently-introduced ProMark 3 RTK is an example of this. It utilizes the two WAAS GEO satellites much like GPS satellites. According to the presentation by Magellan scientists at the ION GNSS 2007 conference in September 2007, it's like adding two extra GPS satellites. This speeds up real time kinematic (RTK) initialization significantly, similar to the way the Russian GLONASS satellites are used. The two WAAS GEOs contribute the equivalent of three GLONASS satellites. One other benefit is that WAAS GEOs are geostationary so they can be counted on 24/7 as long as they are in view.

With the continued expansion of WAAS and the development of other satellite based augmentation systems (SBAS) in Europe, Japan/Australia and India, you can bet this sort of innovation for ground users will continue. It's proving to be one of the most untapped Global Navigation Satellite System (GNSS) technologies in operation today.

- Eric Gakstatter, Contributing Author

Eric Gakstatter has spent the past 17 years in the GPS survey/mapping industry using many brands of GPS equipment and software. He is a Contributing Editor to GPS World magazine where he writes a monthly newsletter for Survey/Construction users and a daily blog for consumer GPS users.

FAA Flight Inspection Aircraft Upgrade Includes Advanced Satellite Navigation Capability

On August 15, 2007, the FAA announced that the first of 18 older Beech-300 flight inspection aircraft was upgraded with a new suite of avionics. The avionics package, the Pro Line 21 Retrofit Integrated Avionics System, has a wide range of capabilities designed to meet both current and future

View of Beech cockpit before upgrade

View of Beech cockpit after upgrade

operational needs. From a navigation perspective, this upgrade has much to offer. In addition to advanced navigation capabilities such as 3-D flight plan maps, overlays to normal navigation maps, and other bells and whistles; the new suite of avionics, offered by Rockwell Collins, incorporates the use of the Global Positioning System (GPS), the Wide Area Augmentation System (WAAS), and the Local Area Augmentation System (LAAS). The package is designed to take advantage of expanding satellite navigation operational capabilities as these systems are made available to the user. In short, this avionics package is designed to support the Next Generation Air Transportation System.

The FAA program to retrofit this older fleet of aircraft, which was acquired in the 1980s, with state of the art equipment has multiple benefits. For the FAA, this initiative will result in considerable cost savings as compared to the alternate, and significantly more expensive, approach of replacing the fleet of aircraft in its entirety. Tax payers can certainly appreciate the cost savings, but this is not the only benefit of this upgrade. Prior to this initiative to upgrade for this fleet of Beech Super King Air 300s, the FAA only had a small number of aircraft with the ability to flight inspect new WAAS localizer performance with vertical (LPV) approach procedures. With more WAAS-capable aircraft being added to the fleet as a result of this retrofit project, the scheduling for the flight inspection of new WAAS LPV approaches will be much easier. Additionally, as new satellite navigation capabilities become available to the user, such as that of LAAS, slated for initial operational capability in 2008, these aircraft will be equipped to assist with related flight inspections.

An FAA Beech Super King Air 300 Flight Inspection aircraft parked at FAA's Monroney Aeronauuctical Center in Oklahoma City

Following the completion of the first aircraft, FAA's Aviation Systems Standards (AVN) organization will modify the rest of the fleet. Over the next three years, FAA technicians will install the remaining 17 systems, along with an aircraft life extension program. Equipage is the key to realizing the benefits. The upgrade of these FAA Beech aircraft adds to the growing number of aircraft throughout the U.S. equipping to make the most of advancements in satellite navigation.

For more information on the Beech-300 flight inspection aircraft upgrade, please see the FAA Fact Sheet available at http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=9312.

For more information on equipage news, please see the Avionics Update article below.

- Mary Ann Davis, FAA ATO-W / GPS TAC

WAAS Avionics Update

Another avionics manufacturer has entered the WAAS market with their recently Technical Standard Order (TSO) and European Technical Standard Order (ETSO) Flight Management System (FMS). Universal Avionics Systems Corporation announced certification of their UNS-1 family of

FMSs. This effort represents the first WAAS-enabled Flight Management System for dual FMS applications. These units, in addition to being capable of WAAS LPV, LNAV/VNAV and stand alone LNAV procedures, are also compatible with other space-based augmentation systems, such as the European EGNOS, Japanese MSAT, and future systems that would comply with RTCA DO-229D standards. With the dual FMS TSO completed, Universal is now focusing efforts toward the development of what is referred to as a 'single thread' FMS This effort would provide for a single flight deck CDU for typically single FMS applications in both fixed wing and rotary wing aircraft.

Honeywell/Bendix-King is also stepping up their WAAS efforts. Bendix-King has announced the development of the KSN-770. It will feature a large, high resolution display that includes a moving map, WAAS-LPV navigator with Jeppesen electronic charts, maps and aircraft position overlay. The KSN-770 will also have optional capability that includes weather radar, weather data link, TCAS and TAWS-B. WAAS efforts are also underway in the Honeywell Primus series, as its modular design provides an upgrade path to meet future CNS/ATM requirements along with WAAS and LAAS.

Chelton Flight Systems has selected Spectralux Corporation's sensor for use in a new GPS WAAS receiver. Spectralux believes that as its sensor is available as a circuit card assembly, it should be compatible with many retrofit solutions, to include helicopter applications. Chelton advertises certification toward the end of this year.

Garmin International, with close to 20,000 WAAS-enabled avionics in the market place clearly holds the lead in GA applications. In addition to being named the flight deck of choice with the G-1000 in the Cessna Mustang, Piper has also announced the same flight deck configuration for its Piper Jet, which is presently under development.

We have been made aware of some rather substantial auto-pilot and flight display integration issues, when either upgrading existing avionics with WAAS or with newly purchased units. Garmin is scheduled to release a new software revision within the next few weeks that should mitigate many of these issues, but it's always wise to check for overall system compatibility before going forward with any new avionics purchase and installation.

- Tom Salat, FAA ATO-W / GPS TAC

The WAAS Avionics Update covers a sample of work currently underway in the WAAS avionics market. If your company is involved in any WAAS-related initiatives not included here, please e-mail Tom Salat (thomas.ctr.salat@faa.gov) and we can incorporate this information into future updates.

WAAS - LPV Watch

The FAA published 313 LPVs in fiscal year 2007, exceeding its Flight Plan Goal of publishing 300 LPV instrument approach procedures annually. In fiscal year 2006, the FAA published 351 additional LPV procedures. These procedures improve airport access by providing pilots with vertical guidance and often lower approach minima to the runway. For those runway ends already served by an Instrument Landing System (ILS),

Total LPVs Published as of 10/25/07	**964**
Located at Part 139 Airports	512
Located at Non-Part 139 Airports	452
To Runways Also Served by ILS	415
To Runways Not Served by ILS	549
To Airports Not Served by ILS	321
Total Number of Airports with LPVs	**550**
Part 139 Airports	246
Non-Part 139 Airports	304
LPVs to Non-Part 139 Airports w/No ILS	302

the LPV provides ILS redundancy and training capabilities for the aircrew. In 2007, LPVs to non-ILS runway ends were developed at twice the rate than to ILS equipped runways. More non-ILS runway end LPVs are being developed as more airport obstacle surveys are completed. It is expected that in 2008, the number of published LPV procedures will surpass ILS procedures.

A listing of current airports and runways served by LPVs can be found on our website. To access this information, go to http://gps.faa.gov and select the GPS/WAAS Approaches button from bottom of the front page.

- Martin Heller, FAA ATO-W / GPS TAC

FAA Leads Activities for Memphis Ground Based Augmentation System

The FAA is leading the development of the next generation satellite navigation system for aviation. Through Project Memphis, the FAA is addressing the final steps for the completion and certification of the world's first ground-based augmentation system (GBAS) to be developed in accordance to the International Civil Aviation Organization's (ICAO) recommendations and standards. GBAS will augment the Global Positioning System (GPS) to provide an all weather approach and landing capability (with both lateral and vertical guidance) for navigation in the terminal area. It is designed

to meet Category (CAT) I/II/III precision approach and landing service by broadcasting differential GPS corrections and integrity information. GBAS is an international term; the name of the FAA-specific system is the Local Area Augmentation System, or LAAS. The international community is working together on GBAS development and certification with FAA ATO leading this effort. In September 2006, the FAA successfully conducted GBAS flight tests in Memphis to validate technical and operational performance. FAA system design approval activities are underway and expected to be completed late 2008/early 2009.

The FAA is also working towards implementation of LAAS by working with industry to gain operational experience in anticipation of the certification of a LAAS ground station in Memphis. The Project Memphis team is composed of the

FAA, Federal Express (FedEx), Honeywell, Boeing, Rockwell-Collins, the Memphis Shelby County Airport Authority, and others. The team is working together to use this site to prove operational concepts and to obtain approval for LAAS operations in late 2008/early 2009.

The Project Memphis participants are working to provide multiple benefits:

- For the FAA - more capacity in the terminal area while reducing maintenance costs for the existing navigation infrastructure
- For FedEx / Airlines - approximately 10% less fuel consumption and weather-resistant operations that help to create greater efficiencies in the terminal area
- For the Memphis Shelby County Airport and Community - approximately 30-40% noise reduction and continuous descent approaches with greatly reduce emissions
- For the GBAS related Industry - a greater market domestically and internationally.

While this effort will prove near-term benefits for Memphis, the operational procedures proven in the Memphis Plan can also be implemented at other airports with capacity, congestion, and noise problems.

The Joint Planning and Development Office (JPDO) defined GBAS as an enabling technology in the Operational Evolution Partnership plan. GBAS was identified as key program dependency for the solution set “Increase Flexibility in the Terminal Area” for mid-term “Air Traffic Operations Capabilities.

In addition, the FAA is working with global partners to implement GBAS so that interoperable use of GBAS can have profound impact on air navigation worldwide. GBAS is strongly supported by multiple domestic and international users and service providers. AirServices Australia and Qantas are already using the Sydney GBAS prototype with initial operational restrictions in scheduled revenue flights. Spain and Germany have installed Honeywell prototypes; and Italy, Brazil, Korea, China, India, Russia and Japan are developing plans for GBAS implementation.

GBAS avionics standards have already been developed and GBAS receivers are available. In fact, GBAS/GLS (GNSS Landing System) capability is already implemented in Boeing 737 NG aircraft and will be standard equipment for the Boeing 787 “Dreamliner”. Airbus’ plans also include GBAS GLS for all new Airbus aircraft with A320 and A380 GLS certification planned for late 2007.

The FAA Air Traffic Organization (ATO), through the Project Memphis, is leading international GBAS implementation which will have an impact on GBAS implementation schedules worldwide.

- Dieter Guenter, FAA ATO-W / GPS TAC

LAAS /GBAS Keeps Moving - A New Applicant for a Non-Fed GBAS System

The FAA received another application for regulatory approval of a non-Fed ground-based augmentation system (GBAS). The first application for LAAS/GBAS approval received by the FAA was received was from Honeywell in 2006. In March 2007, Leading Edge Navigation Systems (LENS) and its partners, GM MERC and Curtiss Wright, submitted their application for a non-Fed GBAS to the FAA.

The GM GBAS 530 was designed by the University of Oklahoma where a group of scientists under LENS, headed by Professor John Fagan and research scientist, John Dyer,

designed and tested the GM GBAS prototype at several airports for the past 10 years. GM MERC and Curtiss Wright formed the GM MERC Curtiss-Wright Joint Venture for the development of the system.

The focus for the GBAS system approval and operational approval is the GM MERC prototype in Guam. The team will

Aerial view of Guam

set up the prototype in coordination with local Guam airport authorities and regional FAA support.

The reason for the Guam installation is to assist Continental Airlines with their regional requirements. Continental Airlines sees a tremendous benefit in the use of GBAS for their operations, not only in Guam but also in CONUS. Continental has equipped nine Boeing 737-800s with the GBAS capability and is eager to implement GBAS for their operations in Micronesia. Continental plans to request initial limited operational approval (Visual Flight Rules) to fly against the GUAM GBAS under revenue service, similar to the Qantas operations in Sydney, Australia. This early operational approval will allow for an extensive data collection effort important for the final regulatory approval of the GM MERC 530 GBAS.

A kick-off meeting was held in Oklahoma City, home of LENS, on April 24th and 25th. The LENS team presented the status of their activities and the system architecture of their GM MERC 530 GBAS. LENS has received a patent on their closed loop GBAS architecture design, which uses independent, external monitors for feedback (see also www.gmmerc.dk).

There are several levels associated with the final FAA approval of a non-Fed LAAS/GBAS. Since this is a new navigational system with a new architecture, the FAA's LAAS Program Office must sign off on the System Design Approval (SDA) packet. Once a SDA packet is approved, the applicant's approved SDA system is evaluated against any Technical Operations siting, installation, operations, maintenance and sparing criteria. If acceptable, the GBAS ground system can be approved by Safety and Operations Support in accordance with Federal Aviation Regulations (FAR) Part 171. At the same time, the FAA will ensure that the applicants and the air carrier, if not one in the same, have developed and received acceptance of the specific LAAS procedures they expect to fly, and that all have been flight inspected and approved. The ultimate customer or user (in this case, Continental Airlines) must work with its airframe manufacturer and avionics supplier to obtain an FAA certified airborne receiver and submit an operational specification (ops spec) packet proving that its airframes are properly equipped and maintained and that their crewmembers are proficient in the utilization of this new navigational capability.

- Dieter Guenter, FAA ATO-W / GPS TAC

U.S. Hosts Latest International GBAS Working Group

The FAA and Boeing hosted the sixth international GBAS working group meeting at the Boeing facility in Seattle from July 17th - 21st. GBAS meetings are held twice a year at alternating locations and support the development and implementation of LAAS/GBAS technology internationally. The last meeting was held at Airbus in Toulouse, France in September 2006. The working group meetings provide a forum to discuss national and international GBAS plans and identify areas of cooperation and complementary activities; such as GBAS integrity analysis, ionospheric data collection, safety assessments, early operational implementation activities and GBAS siting.

Participants in the latest meeting included several nations and organizations including FAA, EUROCONTROL, DFS Germany, AENA Spain, AirServices Australia, Japanese Civil Aviation Bureau (JCAB), Korea, China, and DECEA Brazil. Other organizations representing U.S. efforts included JPALS program representatives from the U.S. NAVY, USAF Flight Standards and ARINC. Industry participants included Honeywell, Thales, LENS/MERC, NEC, Rockwell Collins, Boeing, and AIRBUS. Airline representation included Continental Airlines, All Nippon Airways, Japan Airlines, and Qantas.

During this meeting, there were several updates of nations and users moving from GBAS research to the implementation of GBAS. Several service providers presented an update on their activities. AirServices Australia reported on its plans to install a "red label" system in Sydney in early 2008. Accordingly, special approval was given in June for Airbus A380 GBAS approaches (against the prototype) in Sydney. Additionally, AENA reported on the upgrade of their GBAS installations in Malaga to include real-time monitoring of GBAS performance. AENA plans for certification activities to begin in 2008. Airbus A320 flight test are planned to start in October 2007. Likewise, DFS plans flight tests with a TUI Flight B737 during revenue flights and the installation and certification of a GBAS system by December 2008. NPPF Spektr (Russian GBAS) activities were presented by EUROCONTROL which conducted interoperability evaluations of the Russian GBAS system with Western GBAS receivers. Four ground stations are installed in Russia, one is installed in Braunschweig, Germany for testing, and two more are planned in Russia. Airborne receivers are installed in a variety of aircraft including helicopters. Operational approval is in process.

Several airlines also provided updates on their activities. Qantas reported operating nine GLS capable/equipped aircraft with five more to enter service in 2008. All B737 flight crews (580 pilots) are trained to perform GLS approaches and over 100 approaches have been conducted successfully. Qantas has on order up to 115 Boeing 787 with GLS as basic feature. Qantas is also the launch customer for A 380 which also includes GLS as basic equipment. Continental Airlines continues to pursue GLS implementation in Guam where nine B737s are equipped. Additionally, all future B737 aircraft will be GLS-capable. Continental believes that GBAS implementation (RNP plus GBAS) in New York will improve local issues. Japanese Airlines ANA and JAL plan to introduce GBAS-capable aircraft every year from 2008. Boeing and Airbus also participated and provided information on their plans. Boeing 787 and B747-8 plan to include GLS as basic equipment. Airbus pans to achieve GLS certification for A320 and A380 by the end of 2007 and for the A340 in 2008. Flight test are currently being performed against a Thales ATM ground station in Toulouse. These discussions help to improve a common understanding and practice of GBAS system approval. Common test cases and tools can be achieved through improved communication and coordination of activities.

Several working group sessions were held as a part of the meeting. These working group sessions included the Test Cases and Data Evaluation Working Group, the Local Business Case Working Group, and the Operational Implementation Working Group.

There is strong consensus that the GBAS group is necessary and is complementing existing international groups like international Civil Aviation Organization (ICAO) working groups. Brazil offered to host the next GBAS WG in March 2008. FAA and EUROCONTROL are also considering conducting the next meeting just prior the Amsterdam ATC event (former Maastricht ATC) to include a GBAS forum discussion during Amsterdam ATC.

- Dieter Guenter, FAA ATO-W / GPS TAC

White House Announces End of Selective Availability Procurement

On September 18, 2007, the White House issued a statement outlining the U.S. government's plans to end the procurement of GPS satellites that include the capability to intentionally degrade the accuracy of the GPS service. The statement in its entirety is reprinted below.

For Immediate Release
Office of the Press Secretary
September 18, 2007

Statement by the Press Secretary

Today, the President accepted the recommendation of the Department of Defense to end procurement of Global Positioning System (GPS) satellites that have the capability to intentionally degrade the accuracy of civil signals. This decision reflects the United States strong commitment to users of GPS that this free global utility can be counted on to support peaceful civil activities around the world.

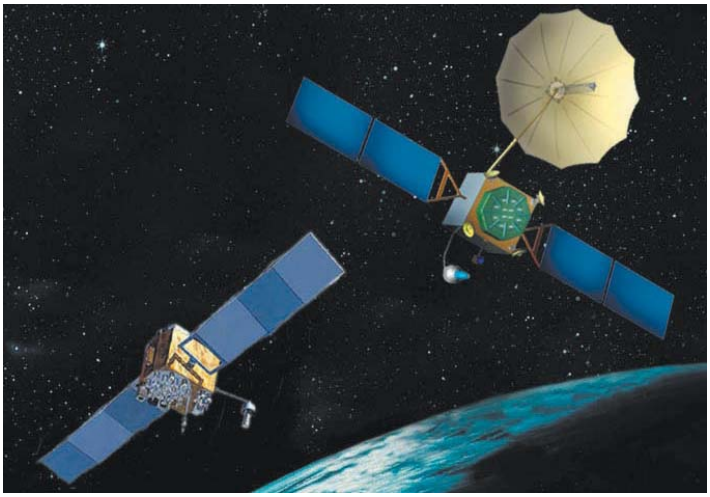
This degradation capability, known as Selective Availability (SA), will no longer be present in GPS III satellites. Although the United States stopped the intentional degradation of GPS satellite signals in May 2000, this new action will result in the removal of SA capabilities, thereby eliminating a source of uncertainty in GPS performance that has been of concern to civil GPS users worldwide.

GPS benefits users around the world in many different ways, including aviation, road, marine and rail navigation, telecommunications, emergency response, resource exploration, mining and construction, financial transactions, and many more. All users, and their governments, have a stake in the future of GPS. The United States promotes international cooperation in the operation of civil global navigation satellite systems and continues to work to build international support for the protection of these signals from intentional interference and disruption.

To access this announcement on-line, please visit…
http://www.whitehouse.gov/news/releases/2007/09/20070918-2.html

GPS Evolutionary Architecture Study (GEAS)

The modernized Global Positioning System (GPS) will provide two civil frequencies in aeronautical radio navigation system band – L1 and L5. This frequency diversity will alleviate the two most significant limitations of the current GPS-based navigation systems: estimating ionospheric disturbances and reducing the vulnerability to Radio Frequency Interference (RFI). In addition to providing these benefits, modernized GPS may also enable improved internal signal fault detection and provide a more convenient data communication channel to broadcast integrity information to the users. Today, the Wide Area Augmentation System (WAAS) ground segment has virtually full responsibility for detecting fault modes and determining integrity for real time operations within its service volume. With modernized GPS, signal fault monitoring responsibility could be distributed differently (between space, ground, and user segment) in order to improve performance at reduced cost.



GPS Satellites (Image courtesy of Los Angeles Air Force Base, http://www.losangeles.af.mil/art/)

The GPS Evolutionary Architecture Study (GEAS) panel was formed to define and evaluate Global Navigation Satellite System (GNSS)-based architectures to provide robust localizer performance with vertical guidance (LPV)-200' service worldwide circa 2025-2030. The approach for this study is to define the most optimal and cost effective distribution of signal fault monitoring responsibility between the space, ground, and user segment. The corollary objectives for GEAS are as follows:

- Assess capability of modernized GPS to simplify fault detection and provide an alternate broadcast channel
- Provide a clear path to worldwide autoland capability
- Provide reasonable architecture for military aviation within NAS
- Enable a smooth integration of Galileo in the user equipment
- Facilitate constructive interaction with national effort coordinated by the U.S. Department of Defense's Navigation Security Space Organization (NSSO) and the Department of Transportation's Research and Innovative Technology Administration (RITA)

The GEAS panel consists of experts from the Federal Aviation Administration (FAA), Department of Transportation (DOT), GPS-Wing (GPS-W), NSSO, Jet Propulsion Laboratory (JPL), academia (Stanford University, Ohio University, and Illinois Institute of Technology), MITRE, Zeta, AMTI and other government support contractors. The GEAS panel is co-chaired by Deane Bunce (FAA) and Professor Per Enge (Stanford University).

There have been eight GEAS meetings conducted so far. The final report from GEAS will be delivered to the FAA Global Navigation Satellite System (GNSS) program office by December 2007. Also, there have been three interim "architecture recommendation" status briefings to the NSSO's Position, Navigation, and Timing (PNT) architecture selection committee.

In an effort to down-select potential future architecture options, the GEAS forum has converged on three possible architecture options:

1. GNSS Integrity Channel (GIC) - The GIC monitor network would be a worldwide implementation of dual frequency GNSS signal monitor stations. The external monitors detect all satellite faults including: clock runoff, ephemeris errors and modulation deformations. Similar to current WAAS, the monitors feed confidence information to the aircraft using a broadcast capacity comparable to present WAAS data bandwidth of 250 bits per second. GIC places the smallest integrity burden on the aircraft and a large burden on the monitors external to the aircraft.
2. Absolute Receiver Autonomous Integrity Monitoring (ARAIM) - ARAIM is a snapshot detection algorithm that exploits redundancy in measurement. It checks range residuals relative to position estimate and obviates the need for fault specific monitoring. Absolute RAIM can be implemented with a low data rate integrity-broadcast-channel since there is a relaxed requirement on GPS to convey the failure information to the user equipment. ARAIM places the highest burden of integrity threat detection on the user and smallest burden on the ground segment.
3. Relative RAIM (RRAIM) - RRAIM fault detection is based on differences in carrier phase measurement residuals over time. RRAIM has the performance

coasting capability based on carrier phase measurements (without carrier cycle ambiguity resolution). The position and velocity estimates can also be propagated using the carrier phase measurements. The integrity broadcast data rate requirement for RRAIM is higher than that of the absolute RAIM. RRAIM distributes the integrity burden between the aircraft and the external network.

For all these options, the level of GPS fault monitoring responsibility for space and ground segment along with the potential mechanism to convey integrity information to the user are currently under study. Future ground infrastructure requirements to provide worldwide coverage for both these options are also under works.

Analysis to date indicates that the performance of these architecture options greatly depends on the GPS constellation definition, GPS satellite failure assumptions, and GPS ranging measurement performance (User Range Accuracy-URA). Over the course of next couple of months, GEAS forum will evaluate the details of the architecture options and finalize the fault monitoring responsibility between ground, space, and user segment. Ground infrastructure requirements (to meet the LPV-200 requirements) for all three options will also be finalized. GEAS will complete the analysis to conclude the dependency of the architecture options on the GPS constellation parameters and recommend minimum GPS III constellation performance to support the future aviation requirements.

- Navin Mathur, FAA ATO-W /GPS TAC

New RNAV Departure Route Improves Operations and Airspace Flows at Las Vegas McCarran International Airport

A new of Area Navigation (RNAV) Standard Instrument Departure (SID) was implemented on Tuesday, March 20 at Las Vegas McCarran International Airport, Las Vegas, NV. The procedure, available to both Global Positioning System (GPS) and conventionally equipped RNAV aircraft, was developed in concert with the FAA's goals, objectives and initiatives to implement performance-based navigation procedures, both SIDs and Standard Terminal Arrivals (STARs), to improve airspace access to our 35 OEP airports in the NAS.

Las Vegas has led the FAA in RNAV SID/STAR implementation and recently added a new route call the STAVV THREE (RNAV) SID. This new RNAV procedure will be used for departures making a right turn off of Runway 25L/R and will serve those RNAV equipped turbojets proceeding northeast out of Las Vegas filing over Milford, Bryce Canyon, and Dove Creek.

This joint FAA and industry effort not only improves operations at Las Vegas McCarran International Airport, but is expected to better serve aviation customers and system providers utilizing this airport. This procedure increases capacity by implementing a diverging procedure off the airport, and it also increases safety by reducing pilot/controller communication. This translates to reduced workload and less chance of a read-back/hear-back error occurring.

In addition to the efficiencies in airspace management and operations, the procedure has reduced flying miles flown by approximately 38 miles. This reduction in flight miles results in significant fuel cost savings for the aviation users.

- Jim Arrighi, FAA RNAV/RNP Group

The Website Gets a New Look

No, you didn't type in our web address incorrectly. The FAA GNSS Program Office website (http://gps.faa.gov) has a new

look. The FAA is completing an agency-wide effort to consolidate the web presence of all the various FAA organizations into one cohesive style. In mid-June, the gps.faa.gov was transferred into the new FAA template and migrated to a new server as a part of this process. As a result, you may notice a few changes to our website.

Location - You can still type "gps.faa.gov" into your web browser to reach the main page for the FAA GNSS Program Office, but the web addresses of our subordinate pages have changed. As a result, you may want to reset any bookmarks

that you had to these pages after navigating to them from our main page using the menu bar on the left side of the page.

Content - Although most of the information that you were able to find on our website in the past is still available, you will find a few changes in the way that we refer to some of the programs. WAAS is now represented as "Satellite Based Augmentation System" on the left menu bar and LAAS is represented as "Ground Based Augmentation System".

Search/Quick Find – The "Search" and "Quick Find" functions at the top of the page include a search of the entire FAA website, as opposed to just the FAA GNSS Program Office section.

Web Page Subscription Service - A new feature is now available through the website that allows visitors to subscribe to select web pages. There are currently five pages in our section of the FAA website that offers this option. When you see the option, "Subscribe to this page", in the top right margin of the web page, as noted in the graphic here, simply click on it to sign up. This is an easy way to stay up-to-date on the latest information without the need to constantly check to the web page. When new information is posted to the page to which you subscribe, you will receive an e-mail alerting you to this change.

The FAA GNSS Program Office is glad to support the FAA's agency-wide goal of presenting a unified and cohesive FAA web presence. We hope you like the new look and structure of our website and are able to easily find the information that you need, so your feedback is always welcome. If you have any comments or questions regarding the website, please let us know by sending an e-mail to maryann.ctr.davis@faa.gov

- Mary Ann Davis, FAA ATO-W / GPS TAC

New Distribution Process for the SatNav News

SATNAV News subscription requests have increased dramatically over the past several years, so to help us better manage these requests, we are taking advantage of the web page subscription service mentioned in the previous article.

All of our current subscribers have been migrated into this new system. We have also added current SATNAV News subscribers to the e-mail notification service for: Wide Area Augmentation System (WAAS) web news updates, Local Area Augmentation System LAAS web new updates, and GNSS Implementation web news updates. This way, subscribers will receive notification of any significant WAAS, LAAS, or GNSS Implementation news as the information is posted to our website. This will help keep subscribers up-to-date on the latest news as it happens. If you would prefer not to receive these interim e-mail notifications, there is a quick and easy process to unsubscribe. Just follow the link at the bottom of the e-mail notification when you receive one for an easy "unsubscribe" process.

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- Mary Ann Davis, FAA ATO-W / GPS TAC

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If you have any questions on the e-mail registration process, ideas for future articles, or general feedback on the newsletter, please contact Mary Ann Davis at maryann.ctr.davis@faa.gov.