



**Federal Aviation
Administration**

SatNav News

FAA Satellite Navigation
Product Teams

Latest International GBAS Working Group Hosted in Brazil

The seventh meeting of the international Ground Based Augmentation System (GBAS) Working Group (IGWG) was hosted from April 9th-11th, 2008 in Rio de Janeiro by Brazil's Departamento de Controle do Espaço Aéreo (DECEA). The IGWG continues to be valuable to all participants as it provides the only international forum on GBAS development and implementation which includes services providers, regulators, industry, users/airlines, and aircraft manufacturers. For this latest meeting, 55 participants came together to support the work of the group. Service providers and regulators included the U.S. (FAA), Europe (Eurocontrol), Brazil (DECEA), Chile (Dirección General de Aeronáutica Civil - DGAC), Japan (Japanese Civil Aviation Bureau - JCAB), Korea, Germany (Deutsche Flugsicherung - DFS), Spain (Aeropuertos Españoles y Navegación Aérea - AENA), France (Directorate of Air Navigation Services - DSNA), and Australia (Civil Aviation Safety Authority). Industry included Honeywell, Thales, Lens/MERC, IDS, ENRI, KARI, NEC, and Selex-si. Airlines included Japan Airlines, All Nippon Airways, TAM Airlines, and GOL Airlines. Airframe manufacturers included Boeing, Airbus, and Embraer. The meeting covered national GBAS activity updates, industry updates, technical and operational presentations, and working group sessions.



*Rio de Janeiro, host city of the
GBAS Working Group meeting.*

The national updates and briefings clearly indicate increased focus and progress on the implementation of GBAS. All nations present provided an update on their specific national activities. It is evident that GBAS is getting more visibility through an increased number of early operational activities like those of Australia, Germany and Spain, as well as an increased number of development and data collection activities like those of Brazil, Japan, Korea, and Italy. In addition to the national updates, Airbus presented GLS certification flight trial and interoperability results of the A380 and A320 trials against the Thales station in Toulouse and against the Honeywell station in Malaga (included only the A320). Boeing noted their customer base for B737NG Cat I GLS option which included Qantas, Delta, TUIfly, Sonair, Air Berlin, and Air Vanuatu. Boeing reported that the B787 and the B747-8 will also have GLS as standard avionics equipment and added that new B787 orders have exceeded 600.

Technical discussions centered on detailed information exchange between all participants on their various activities. Discussions covered the ionosphere (noting the range of ionospheric environments in the different regions of the world), GBAS siting activities, and

In this issue:

Latest International GBAS Working Group Hosted in Brazil.....	1
FAA and Chilean DGAC Join Together on GBAS Implementation.....	2
Partnership Opportunities to Expand WAAS/LAAS Equipage...2	
LPV Watch: FAA's Annual LPV Production Goals Increase.....2	
New ICAO Flight Plan Format Coming for RNAV Enroute Procedures.....	2
GEAS Phase I Report Published...3	
GNSS in the News.....	4
GNSS on the Road.....	4
Did You Know?.....	4

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
800 Independence Avenue, SW
Washington, DC 20591

<http://gps.faa.gov>



national data collection and evaluation activities (how this data can be shared and made available to interested parties to support the overall GBAS development and implementation activities). Several GBAS architectures (Honeywell, Thales, GM Merc-Curtiss Wright Joint Venture, and Spectr) were also discussed as several are available and in different stages of development.

In addition to these briefings, four breakout sessions were conducted:

- ◆ Data collection, sharing, test case harmonization
- ◆ Operational approval/implementation issues
- ◆ Local business case and implementation incentives
- ◆ GBAS siting, ionosphere, GBAS critical areas

The break out sessions provided the opportunity for the face-to-face exchange of information, the identification of common issues, and the opportunity to develop joint solutions.

Future meetings will be slightly reorganized to expand the time allotted for subgroup discussions and concentrated exchange of information and for harmonization of efforts as these discussions have proven very effective in leading to joint solutions. The next IGWG is planned for early 2009 in Europe with a location to be determined.

- Dieter Guenter, FAA ATO-W / GPS TAC

FAA and Chilean DGAC Join Together on GBAS Implementation

On March 31st, the FAA and Chilean Dirección General de Aeronáutica Civil (DGAC) signed a Memorandum of Agreement to solidify future collaboration on Ground-Based Augmentation System (GBAS) development.

More information is available by selecting [this link](#) to the United States embassy - Santiago website.

- Mary Ann Davis FAA ATO-W/GPS TAC

Partnership Opportunities to Expand WAAS/LAAS Equipage

To further increase WAAS and LAAS applications for commercial aircraft, the FAA is planning to release a market survey for related government-industry partnerships later this summer. The initiative will be targeted to expand commercial fleet use of GNSS and related operations in support of advanced commercial applications.

This initiative has dual purposes. For commercial users, this initiative will help to identify and implement operational applications that will provide cost beneficial business cases

for equipping and using GNSS navigation and system solutions. For the FAA, this initiative will further expand WAAS and LAAS use in the National Airspace System and support early NextGen operational applications. This initiative should also result in an increase in the number of Supplemental Type Certificates (STC) for WAAS avionics by helping to overcome the initial cost burden associated with this process. The STC would then be available to the same model of aircraft throughout the industry - a significant benefit to the user community at large. The market survey is expected to be released in late June or early July.

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

LPV Watch: FAA's Annual LPV Production Goals Increase

The FAA's National Flight Procedures Office (NFPO) has increased their production goal to 400 LPVs for 2008. For the past three years, NFPO has commissioned at least 300 LPV procedures each fiscal year. Due to better screening and coordination, the FAA has increased the success rate

Total LPVs Published as of 6/5/08	1084
To Runways Also Served by ILS	457
To Runways Not Served by ILS	627
Total Number of Airports with LPVs	616
To Airports Served by ILS	367
To Airports Not Served by ILS	249

to the levels where they can increase their annual goals. In 2009, the goal will be 500 LPV or Localizer

Performance (LP) procedures. More information on LP procedures is available in the [March 2008 SatNav News](#).

Due to congressional language, the NFPO has adjusted their schedule to publish more LPVs at non-Part 139 airports in 2008. Readers visiting the [NFPO's procedure schedule webpage](#) will see this notice regarding the LPV production schedule. Still, the FAA projects there will be more LPVs than the 1,230 ILS instrument approaches currently published by September of this year.

- Martin Heller, FAA ATO-W/GPS TAC



Go

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.

New ICAO Flight Plan Format Coming for RNAV Enroute Procedures

There is a change, effective June 5th, in the manner in which pilots have to file flight plans if they plan *on filing* RNAV (GPS) *instrument procedures* for their navigation. Pilots have to submit the ICAO (International Civil Aviation

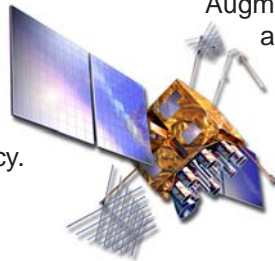


Organization), vice the FAA flight plan form, in order to get the flight plan accepted due to recent changes to the air traffic control software. While this is not specifically a SATNAV issue, it does affect SATNAV users, so we wanted to provide our subscribers with this information and provide a reference for more information. More information can be found in the [FAA Air Traffic Bulletin issued on March 8, 2008.](#)

- Martin Heller, FAA ATO-W / GPS TAC

GEAS Phase I Report Published

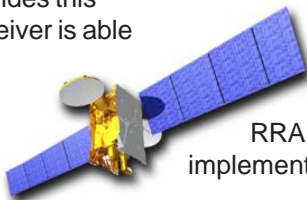
The GNSS Evolutionary Architecture Study (GEAS) was formed to define and evaluate Global Navigation Satellite System (GNSS) based architectures for providing robust localizer performance with vertical guidance (LPV) service worldwide circa 2020-2030. Specifically, GEAS is focused on effective use of the new L5 civil protected frequency. A constellation of L5-capable GPS satellites is envisioned to be operational in about 2018.



Earlier this year, the panel published their Phase I report. Phase I focused on understanding and bounding the complex relationships between satellites, ground processing networks and user avionics in monitoring and timely detection of GPS signal faults. GEAS Phase I produced three options, each which emphasize varying degrees of ground infrastructure to avionics responsibility for fault monitoring.

◆ **GNSS Integrity Channel (GIC)** - The GIC provides user receivers with GPS status information via geostationary satellites (similar to WAAS). The GIC monitor network monitors the status of GPS L1 and L5 signals worldwide providing fault detection information satisfying avionics time to alert requirements (~6 seconds).

◆ **Relative Receiver Autonomous Integrity Monitoring (RRAIM)** - RRAIM places fault detection equally between a monitoring network and the user receiver. The user receiver detects differences in the GPS satellite signal carrier phase measurements over time. The Monitor network continues to monitor for GPS satellite fault conditions and provides this information to the user receivers. As the user receiver is able to actively participate in fault monitoring, the GPS fault information can be forwarded at a lower rate, allowing the receiver to 'coast' between messages on the order of 30 to 300 seconds.



◆ **Absolute Receiver Autonomous Integrity Monitoring (ARAIM)** - ARAIM places the largest integrity burden on the user receiver. The user receiver will detect signal faults using redundancy of information from multiple satellites. As such, ARAIM requires a very robust satellite constellation (~30 satellites). A low rate integrity channel is still required, but the ARAIM solution allows large intervals (~1 hour) between updates.

The benefits of a dual-frequency (L1 & L5) GPS constellation are primarily evidenced when the earth's ionosphere experiences variations in time and in distance (temporal and spatial). For North America, nominally the ionosphere is very 'well-behaved' and is well approximated by algorithms currently used within the operational Wide Area

Augmentation System (WAAS). For periods of solar activity or in areas of the world where the ionosphere is not 'well-behaved' (primarily equatorial regions), approximations are not as accurate and large uncertainty must be accounted for in avionics position solutions. This large uncertainty can significantly reduce the availability of procedures (e.g. LPV).

With dual-frequency, algorithms in the avionics will be able to calculate accurate ionospheric corrections locally, significantly improving accuracy even without well-behaved ionospheres. However, for aviation (and other applications requiring high confidence in the position computed) the accuracy of the position estimate must be coupled with high-confidence that all information that is used in the calculation of position can be 'trusted' (integrity). The three GEAS options will all satisfy avionics integrity requirements when fielded. The RRAIM and ARAIM solutions will require additional study and analysis prior to fielding.

The GEAS has recently provided a recommendation for the pursuit of two options coupled with the Sun's solar cycle. The expected nearest solar cycle peak, 2011, will be supported by the WAAS and other regional satellite based augmentation systems (SBAS), such as the European Geostationary Navigation Overlay Service (EGNOS), GPS-aided Geo Augmented Navigation (GAGAN), and the MTSAT Satellite-Based Augmentation System (MSAS). The following cycle peak will be 11 years later in 2022. The GPS L1/L5 constellation is expected to be complete prior to the start of this cycle. The GEAS has recommended that a RRAIM implementation be developed, tested and implemented prior to the start of this solar cycle. This goal



will support LPV-200 capability with very high availability during this solar max period with moderate space, ground and avionics development efforts.

For the following solar max period in 2033, the GEAS will investigate an ARAIM solution. Such a solution reduces the need for space and ground infrastructure requirements.

The [GEAS Phase I Report](#) can be found in its entirety from a link on the main page of the FAA's GNSS Program website at <http://gps.faa.gov>.

- Ed Sigler FAA ATO-W / GPS TAC

GEAS efforts are coordinated and conducted by a panel of experts from the US Government and academia. More information on the origin of the GEAS and details on the participants can be found in the "GPS Evolutionary Architecture Study" article in the [November 2007 edition of the SatNav News](#), p. 10.

GNSS in the News

Below is information on, and embedded links to, a couple of articles that may be of interest to our readers.

◆ ["WAAS – Bigger, Better, Lower, and More"](#) by the FAA WAAS Program Office. (March/April 2008). FAA Aviation News, p. 24.



◆ ["Innovation: Good, Better, Best – Expanding the Wide Area Augmentation System"](#) by Timothy R. Schempp. (January 1, 2008). GPS World.

GNSS on the Road

As a part of user outreach, we have included a summary of upcoming events where the FAA GNSS Program will be participating as an exhibitor. Please stop by and see us if you attend.



Aircraft Owners and Pilots Association (AOPA) Fly-In

June 7, 2008
Frederick, MD
<http://www.aopa.org/>



15th Biennial International Flight Inspection Symposium (IFIS)

June 23-27, 2008
Oklahoma City, OK
<http://www.ifis2008.com>



AirVenture Oshkosh

July 28-August 3, 2008
Oshkosh, WI
<http://www.airventure.org/>

Did you know...?

- ◆ ...that WAAS will mark its 5th anniversary this summer. WAAS was officially commissioned into the National Airspace System on July 10th, 2003.
- ◆ ...that in September 2008, there will be more U.S. runway ends served by WAAS LPV approach procedures than are currently served by ILS. There are also LPVs now available in Canada.
- ◆ ...that the FAA's WAAS Program Office is helping to fund airport surveys for LPV approach procedures. For more information, please contact your local Airport District Office (ADO).
- ◆ ...that over 32,000 WAAS LPV-capable sets of avionics have been purchased to date.
- ◆ ...that WAAS is the first FAA system to enable real operational capabilities and benefits in support of NextGen.

SATNAV News is posted on our website. You may request to be notified by e-mail when new editions are posted by entering your e-mail address at <http://www.faa.gov/help/subscribe/> and selecting SATNAV News from the list of options.

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.