



FAA Navigation Programs AJM-32
<http://gps.faa.gov>

SatNav NEWS

New WAAS GEO Satellite Launch



SES-15 satellite launched by Arianespace with WAAS payload

On May 18th 2017, Arianespace successfully launched SES-15 geostationary satellite from Guiana Space Center, French Guiana, into orbit . The communications satellite, internally referred to as GEO 6, will carry a Wide Area Augmentation System (WAAS) navigation payload. Operating from 129° (degrees) West in the geostationary orbit, it will offer extensive coverage over North America, Mexico and Central America, stretching from Arctic Alaska to the South of Panama and from Hawaii to the Caribbean.

The current GEO satellites supporting WAAS are the Intelsat Galaxy 15 at 133° West, launched in October 2005; the Telesat Anik F1R, launched in September 2005 and operating at 107.3° West ; and the Inmarsat 4F3, launched in August 2008 and stationed

at 98.5° West . At any given time, WAAS requires a three-GEO satellite constellation to meet its operational requirements. Since the time required to procure a new satellite lease service is approximately 5 years, the three-GEO satellite constellation requirement is in place to ensure redundant coverage over CONUS and Alaska.

Satmex 9 at 117° West, launched with a WAAS navigation payload on June 16, 2016, is expected to be operational in March 2018 and will replace Inmarsat 4F3 satellite lease service. SES-15, which is expected to be operational in June 2019, will replace the Intelsat Galaxy 15 satellite lease service. WAAS is expected to maintain the three-GEO satellite constellation during this replacement.
-Ranjeet Shetty, FAA AJM-32/NAVTAC

Current GEO satellites supporting WAAS

				
Intelsat Galaxy 15 Launched: 10/2005 Operating: 133 °W	Telesat Anik F1R Launched: 9/2005 Operating: 107.3 °W	Inmarsat 4F3 Launched: 8/2008 Operating: 98.5 °W	Eutelsat Satmex-9 Launched: 6/2016 Operating: 117 °W Operational: 3/2018	Boeing SES-15 Launched: 5/2017 Operating: 129 °W Operational: 6/2019

The following appeared in Avionics magazine at www.aviationtoday.com

Germany's First SBAS Flight Lands at Bremen Airport

By Woodrow Bellamy III
April 7, 2017



Members of NetJets Europe, DFS, after completing Germany's first SBAS approach at Bremen Airport.
Photo: DFS.

Germany's first purely satellite-based precision airport approach occurred Thursday at Bremen Airport. Performed by NetJets Europe using a business jet equipped with a European Geostationary Navigation Overlay Service (EGNOS) receiver, German

air navigation service provider Deutsche Flugsicherung GmbH (DFS) hopes to expand the use of purely satellite-based augmentation system (SBAS) navigation as an alternative to instrument landing system (ILS) CAT 1 approaches.

This first flight is the latest example of the European aviation community's growing interest in expanding the use of alternatives to ground-based navigation aids. The use of satellite-based augmentation systems such as EGNOS can complement existing global navigation satellite systems (GNSS).

EGNOS is a network of 40 reference stations in more than 20 countries throughout Europe that pick up signals from GPS satellites that are then processed in master control centers.

“In the medium to long term, the DFS wants to use the potential of purely satellite-based navigation and thus create an alternative to the instrument land system.”

Unlike GPS, EGNOS provides integrity of signal, increased accuracy, coverage and a service-level agreement. This makes it suitable to provide a number of navigation services. At the World ATM Congress last month, the European GNSS Agency (GSA) released an update on the latest EGNOS numbers, noting that there are more than 430 EGNOS-enabled

procedures available at more than 300 different European airports. More than 500 procedures are planned.

Bremen is the first German transport airport to operate with the new precision approach method SBAS. According to DFS, the use of EGNOS-enabled SBAS at Bremen has the ability to increase the positional accuracy of aircraft GPS from 10 to 20 meters, to one to three meters.

“In the medium to long term, the DFS wants to use the potential of purely satellite-based navigation and thus create an alternative to the instrument land system,” said Andre Biestmann, head of the air traffic control company's airspace and ANS support divisions.

According to DFS, the road to enabling the first use of SBAS at Bremen was guided by the International Civil Aviation Org.'s (ICAO)

satellite-assisted SBAS precision approach procedure under the designation “LPV 200.”

“It applies to three all-weather flying conditions in the first stage (CAT 1): The pilot is guided precisely to a height of 200 feet (60 meters) by means of satellites both horizontally and vertically. If he sees the runway, he can safely land,” DFS notes in an update posted to its website about the first use of SBAS at Bremen.

Previously, the horizontal and vertical guidance to decision height of 200 feet could only be achieved by the use of a ground-based augmentation system or an ILS, DFS says.

The first purely SBAS landing at Bremen was also just the latest use of satellite-based precision landing technology flown by NetJets Europe. At the end of 2016, Europe's largest business jet operator completed a two-year study featuring 360 trial flights assessing the ability of augmented navigation and vision technologies to improve airport access and reduce aircraft environmental impact at numerous European airports, known as the Augmented Approaches to Land project.

One area of focus going forward for DFS will be aiding the European air transportation community in expanding its use of satellite-based approach procedures at Bremen and throughout Germany. This is also a goal that the GSA has throughout Europe.

In order to receive the EGNOS signals, aircraft need to be equipped with an EGNOS receiver, which the majority of the NetJets Europe fleet already has. However, DFS has noted that EGNOS receivers “have not yet been installed in the aircraft of all major manufacturers.” The agency wants to see “appropriate” incentives created to get more aircraft equipped in the near future.

18th International GBAS Working Group Meeting

Atlanta, GA, 24-27 April 2017

The 18th International GBAS Working Group (IGWG) was hosted by US Federal Aviation Administration (FAA) and Delta Air Lines in Atlanta, Georgia. The meeting was chaired by FAA and EUROCONTROL (Shelly Beauchamp, FAA and Andreas Lipp, EUROCONTROL). IGWG Secretaries for the meeting were Dieter Guenter, FAA (NAVTAC) and Lendina Smaja, EUROCONTROL.

A record one hundred thirty (130) participants from twenty-three (23) nations, international service providers, industry, airlines and aircraft manufacturers attended the meeting and working sessions with many new participants. Notably, representatives from nine (9) major airlines attended the meeting.

In his welcome, Capt. Steve Dickson, Senior Vice President of Flight Operations for Delta Air Lines, noted Delta's investment in GLS technology, citing the company's continued commitment to customer satisfaction and the need for resilience in equipment to ensure operations continue safely and on time.

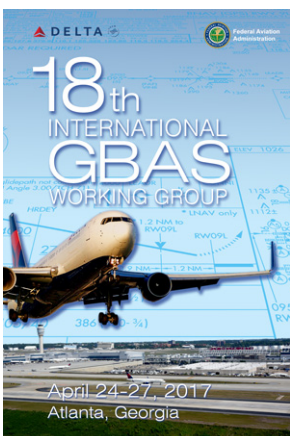
Continued commitment to GBAS development and implementation by participants was impressive, and visible in airline presentations from Delta Air Lines, United Airlines, Cathay Pacific, Ryanair, CargoLux, JAL and ANA. Ryanair, attending the IGWG for the first time, reported plans to be the largest GBAS equipped fleet in Europe and to pursue GBAS installations for at least six of their destinations in the region. Polish Air Navigation Service Provider (PANSNA) announced plans for the installation of a new GBAS at Krakow, Poland. Seattle International Airport and the Port Authority New York New Jersey (JFK, La Guardia) updated their progress towards installations. Fraport announced the recent start of new 3.2 degree GLS approaches into Frankfurt, a step towards decreasing noise

exposure to nearby communities. NPPF Spectr from Russia provided an update of their impressive GBAS implementation in Russia with 90 locations and 10 different aircraft types and CargoLux reported they had received approval to use a Russian GBAS station as an alternate. Australia continues GBAS implementation with planned installations at Brisbane and Perth. Sydney and Melbourne are operational.

Boeing and Airbus remain strongly committed to GLS and reported an increasing GLS customer base and increased number of GLS equipped aircraft sales. Boeing reported over 1900 equipped aircraft and over 100 airlines now taking delivery of GLS-equipped aircraft. Boeing also announced that the B-777X would be optionally GAST-D GLS equipped at entry to service in 2019 while GLS GAST-C is part of the standard fit. Airbus reported that 45 customers were choosing the GLS option on aircraft with ten new customers since last year.

The status reports of service provider plans, users and manufacturer updates were presented on the first day of the meeting and were important and informative. Participants appreciated the possibility to get a concentrated overview of the worldwide state of the activities in a single day. The key value of the GBAS working group continues however to reside in the parallel strings of technical and operational sessions on day two and three, where more in depth briefings can take place.

The increased interest in operational aspects noticed during the last meetings continued. More than two-thirds of the participants attended the operational working sessions at this meeting. Major aspects of the operational working groups were discussions on the newly coordinated means to allow extended service volumes, an important step for GBAS



GBAS Facts

SmartPath (aka, GBAS) activated at Melbourne Airport

2nd
in the Southern Hemisphere!

operations at airports with a requirement for extended final approach segments. Another topic of particular interest was the desire on progress towards approval of CAT-II operations on a GAST-C GBAS (CAT I) system. Progress was reported on RNP-to-GLS approvals in the U.S., Europe, and Asia and one major SESAR project deals with several solutions dedicated to pursuing enhanced arrival procedures enabled by GBAS.

The operational focus was also visible in the desire of most participants to attend after hours tours of the dispatch center and simulator sessions. Participants had an opportunity to experience hands-on GLS operations in the Boeing 737-900 and A 350 simulators.

The technical sessions, which included Data Collection and Evaluation, Siting and Ground Monitoring Topics, and Ionospheric Aspects, remained active. During the ionospheric aspects session, strategies used to complete validation of the GAST-D SARPS were briefed, as well as the completion of the Asia Pacific Threat Model and work on an independent Monte Carlo analysis tool. Other technical topics briefed included an update on EUROCONTROL'S PEGASUS data processing software, performance of the FAA's GLS service prediction tool, VDB compatibility work and GBAS implementation in low latitudes (Brazil).



FAA participants in an A380 cockpit simulator

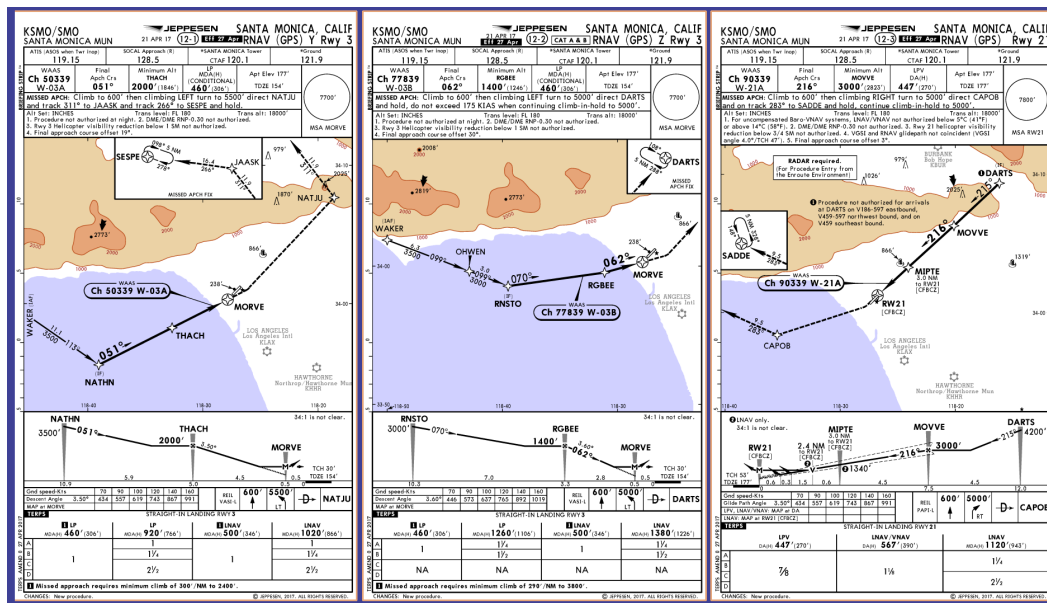
Participants were extremely satisfied with the outcome of the working group meeting, and agreed that the IGWG continued to fulfill a recognized function in GBAS development and implementation work. The meeting's format seems well adapted to the participants' needs, allowing for coordination between ANSPs, airports, airlines and OEMs. The working group addresses relevant issues for GBAS, and enables exchanges of data and information which can be effectively used by participants in formulating their business strategies and implementation plans. PANSAs extended an offer to host the next International GBAS Working Group in Krakow, Poland in 2018. Final dates will be determined.

- Dieter Guenter, FAA AJM-32/NAV-TAC



IGWG meeting attendees take some time at the Delta Air Museum

New RNAV Approaches Enable Greater Access to Santa Monica Airport



April 25, 2017

Three new RNAV approach procedures into Santa Monica Municipal Airport (SMO) will go into effect later this week, dramatically expanding access to the Southern California airfield in adverse weather conditions. The new procedures follow more than two years of engagement by NBAA with the FAA.

“Before these new procedures, only a non-precision VOR circling approach was available,” said Heidi Williams, NBAA’s director of air traffic services and infrastructure. “That can be problematic due to Santa Monica’s proximity to LAX [Los Angeles International Airport] and, furthermore, the VOR-A approach isn’t permitted at night.”

Implementation of RNAV approaches into Santa Monica had been hindered by a required vertical descent angle (VDA) that precluded straight-in approaches. NBAA representatives worked with FAA officials to overcome this

issue through the association’s involvement in the Regional Airspace Procedures Team and the Southern California Metroplex Project.

Thanks to these discussions, the FAA’s Flight Standards Service Procedures Review Board ultimately agreed the VDA could be safely lowered to accommodate the RNAV procedure requirements. Members of the Santa Monica Airport Association helped overcome another hurdle by coordinating with the Los Angeles Department of Water and Power to aid with the removal of an obstruction along the approach path.

While all three new RNAV approaches offer significantly improved access to SMO for business aircraft operators, the localizer

“ Before these new procedures, only a non-precision VOR circling approach was available ”

performance with vertical guidance (LPV) approach to Runway 21 is the “game changer,” according to Williams.

“The LPV approach comes just in time for the upcoming ‘June Gloom’ across the Los Angeles basin, when a low-level marine cloud layer is common in the mornings,” explained Williams. “This stabilized, straight-in approach is much less complex than flying the circling approach and provides minimums, allowing pilots to safely get below the weather.”

NBAA encourages business aircraft pilots to review the updated approach plates and familiarize themselves with the new procedures ahead of the April 27 implementation date.

“For business aviation to thrive, it is vital to have access to airports and airspace,” Williams concluded. “These new approaches dramatically improve access to SMO.”

<https://www.nbaa.org/ops/airports/smo/20170425-new-rnav-approaches-enable-reater-access-to-santa-monica-airport.php>

Capstone Loan Program



Did you know Alaska has a loan program for ADS-B, GPS/WAAS and other avionics equipment called the Alaska Capstone Avionics Loan Program? You may be eligible for a loan to purchase and install eligible Capstone avionics in aircraft that are principally operated in Alaska.

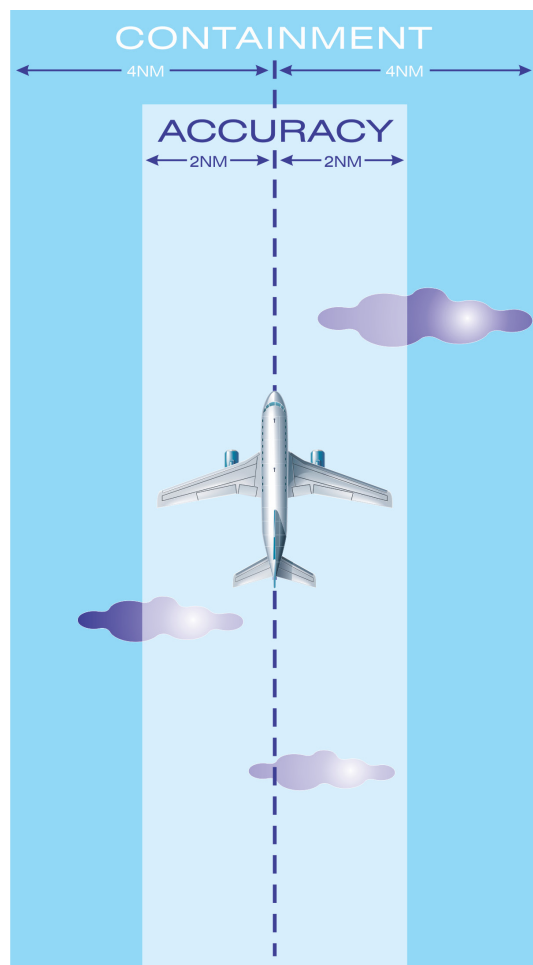
Eligible equipment includes:

- Automatic Dependent Surveillance – Broadcast (ADS-B)
- GPS/WAAS navigation equipment
- A moving map multifunction display (MFD)

- Other equipment as determined by the Department of Commerce, Community and Economic Development in consultation with the Department of Transportation and Public Facilities

Don't miss out! If you are working toward the 2020 deadline for ADS-B equipage or would like to take advantage of the many WAAS LPVs in the state of Alaska, now is the time to equip. Follow this link to find out more information: <https://www.commerce.alaska.gov/web/ded/FIN/LoanPrograms/CapstoneAvionics.aspx>
- Amy Trevisan, FAA AJM-32/NAV-TAC

Did You Know . . .



Here at the SatNav News we frequently field questions through emails and when we are at events. This recurring column will answer a question each edition that we have heard more than once. No question is too basic, or detailed. Email us and we will do our best to get the answers!

Our first question was an inquiry at an event: **What is the difference between “accuracy” and “containment” in the context of Performance Based Navigation (PBN)?**

PBN, is a way of navigating not associated with a particular navigation aid, but instead with the ability of an aircraft to maintain a certain level of performance. PBN operations consist of two specifications:

Area Navigation (RNAV) A navigation specification for point-to-point navigation that permits aircraft operation on any desired flight path within the coverage of ground or space-based navigation aids, or a combination of both. Many Instrument Flight Rules (IFR) pilots are familiar with RNAV (GPS) approach procedures.

Required Navigation Performance (RNP) A navigation specification based on RNAV plus aircraft-based monitoring and pilot alerting when navigation performance is not acceptable for the intended Instrument Flight Procedure (IFP) designated by the prefix RNP.

For both RNAV and RNP designations, the numerical designation (RNP 4, RNP 2, RNP 1, RNP 0.3, etc.) refers to the lateral navigation accuracy required in nautical miles (from centerline) which

is expected to be achieved at least 95 percent of the flight time by the population of aircraft operating within the airspace, route, or procedure. The accuracy value is one times (1X) the RNAV/RNP value, and the containment is two times (2X) the value. For **accuracy**, an aircraft on an RNAV-2.0 route must stay within 2 NM of the centerline 95% of the time. For **containment**, in the same RNAV-2.0 route, the aircraft must not exceed four NM from centerline, for a total route width of 8NM.

Follow these links to advisory circulars and Airman Information Manual for more information:

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_90-100A_CHG_2.pdf

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_90-105A.pdf

http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC%2090-107.pdf

https://www.faa.gov/air_traffic/publications/media/aim.pdf

- Dave Kerr FAA AJM-32/NAVTAC

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, controller, dispatcher, 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 Amy Trevisan at: amy.ctr.trevisan@faa.gov

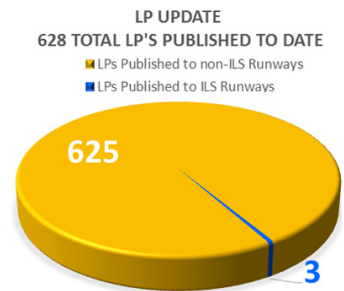
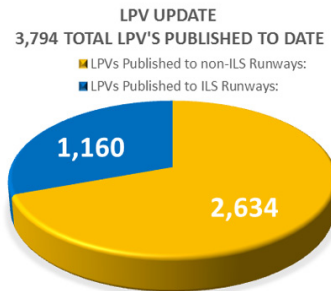
Satellite Navigation Approach Procedures

WAAS LPVs

The table to the right reflects the continuing growth of satellite-based approach procedures. For more detailed information about satellite-based instrument approach procedures, please visit our GPS/WAAS Approach Procedures web page. http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/approaches/index.cfm

Satellite-based Approach Procedures			
RNAV (GPS) Approaches	ILS Runways	Non-IL Runways	Total
LPV Line of Minima <250' Decision Altitude	1,160	2,634	3,794
			1,021
Exactly 200' Decision Altitude			977
LP Line of Minima	3	625	628
LNAV Line of Minima	2,437	3,715	6,152
LNAV/VNAV Line of Minima	1,939	1,731	3,670
GPS Stand-Alone Procedures	6	0	79
GLS Approach	11		11

(Data as of May 25, 2017)



EGNOS LPVs

The number of LPVs in Europe is also growing. The table to the right shows LPV procedures in Europe as of March 30, 2017, as included in the EGNOS Bulletin Quarter 1. (Source: EGNOS Bulletin, Issue 22 Q1 2017)

Follow this link to the most recent EGNOS Bulletin Quarter 1 Issue 22:
http://egnos-user-support.essp-sas.eu/new_egnos_ops/content/quarterly-bulletin

Country	Airports – SBAS APV procedures	# SBAS APV Procedures
Austria	2	2
Belgium	4	8
Croatia	1	1
Czech Republic	4	8
Denmark	4	8
Estonia	1	2
Finland	1	2
France	89	143
Germany	22	37
Guernsey	1	2
Italy	7	17
Netherlands	2	3
Norway	14	23
Poland	5	9
Portugal	1	2
Romania	1	2
Slovak Republic	2	4
Spain	2	3
Sweden	1	1
Switzerland	7	9
United Kingdom	10	20
Total	181	306