



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

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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, 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

Enabling the Transition to PBN

Rationalization of the NAS Infrastructure

*By Deborah Lawrence, FAA Navigation Programs Manager
Jeff Williams and Leo Eldredge, Tetra Tech*

Over the years, we have experienced several milestones that have contributed to a new way of effectively and efficiently navigating in the NAS. A key enabler was the FAA's approval for U.S. civil operators to use GPS equipment for oceanic, domestic en route, and terminal instrument flight rules (IFR) operations on June 9, 1993. Prior to this approval, the NAS has primarily operated on fixed routes and procedures supported by legacy ground-based navigation aids dating back to the 1940s. These systems have performed well over the years in moving aircraft through the NAS; however, many frequent fliers have probably noticed system-wide delays.

It's widely recognized that traffic is predicted to increase in the future. Unless something changes, we can expect delays and potential gridlock in our system to increase. To meet this challenge, the FAA is transitioning the NAS to Performance Based Navigation (PBN), comprised of Area Navigation (RNAV) and Required Navigation Performance (RNP). A primary enabling technology of this transition is the Global Navigation Satellite System (GNSS), which encompasses GPS and its augmentations such as the U.S. Wide Area Augmentation System (WAAS) and Aircraft Based Augmentation System (ABAS). Aircraft use GNSS to fly RNAV and RNP routes and procedures virtually anywhere in the NAS, in all phases of flight.

GNSS is an excellent navigation service; however, we all know it's also susceptible to interference (intentional and unintentional). To mitigate GNSS vulnerabilities, FAA must provide for a robust and resilient navigation infrastructure consisting of a layered backup navigation capability. A significant population of commercial operations, approximately 95 percent, are capable of PBN operations using GNSS. When GNSS is not available, approximately 30 percent of the commercial operations will not be capable of flying RNAV procedures, resulting in reduced efficiencies in a given airspace. Therefore, FAA plans a layered approach (see figure 1) to enable aircraft to continue RNAV operations during GNSS disruptions using Distance

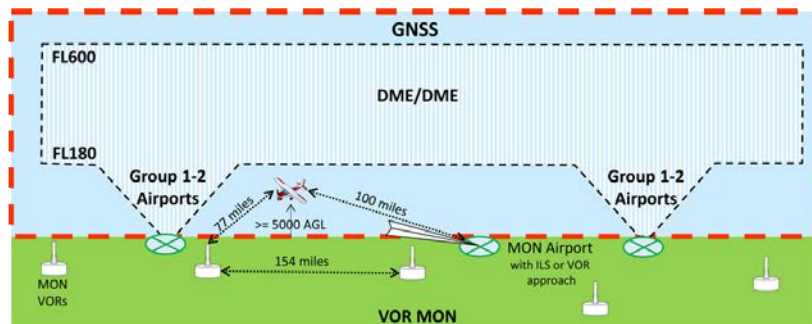


Figure 1. Layered backup strategy

Measuring Equipment (DME) and Very High Frequency Omni-directional Range (VOR) to provide a basic conventional capability for aircraft that are not equipped for DME RNAV.

DME is used by commercial aircraft to fly RNAV procedures. As it stands, the current network of DME does not provide sufficient coverage to enable aircraft to fly RNAV procedures without Inertial Reference Units (IRU). Since 30 percent of the commercial fleet operating in the NAS today do not have IRU, the NextGen DME project will fill the coverage gaps to enable non-IRU commercial aircraft to fly RNAV procedures. Through the NextGen DME project, the FAA will eliminate critical facilities to enable unrestricted RNAV for Class A airspace and terminal operations at the busiest airports to provide a resilient RNAV backup. Class A coverage may be limited to 24,000 MSL and above over the Western U.S. Mountainous Area. If a GPS outage occurs, DME RNAV aircraft will continue flying with PBN to its destination where an instrument landing system (ILS) or VOR approach can then be used to land.

An expansive network of VORs still remains in the NAS supporting en route, terminal, and approach operations. However, VORs are not capable of meeting PBN specifications for any phase of flight, reducing flexibility and efficiency. Therefore, the VOR network will be reduced to a Minimum Operational Network (MON) to provide a basic conventional navigation service to aircraft that are not equipped for DME RNAV. The current VOR infrastructure will be reduced approximately 30 percent, and coverage will be provided at and above 5,000 feet above ground level to allow affected aircraft to fly through the outage area or to a MON airport, no more than 100 miles away, where they can fly an ILS or VOR approach without DME. Maintenance cost savings achieved by reducing the number of VOR facilities and associated instrument flight procedures will free critical resources to sustain the PBN system.

Over the long term, if RNP is implemented on a large scale in en route and terminal airspace, an Alternate Positioning Navigation and Timing (APNT) solution may be needed. This would provide an opportunity to reduce VORs below the MON by providing backup navigation for PBN. Transitioning the NAS from conventional navigation to PBN has been a long journey with significantly more work ahead. The FAA is well on its way to ensuring a robust and resilient infrastructure to support a PBN-centric NAS. (*reprint from ATCA Bulletin No.3, 2016*)

First EGNOS LPV-200 Approach Implemented at Charles de Gaulle Airport

The European Satellite Services Provider (ESSP) announces that on 3rd May, the first LPV-200 approaches were implemented at Paris Charles de Gaulle Airport (LFPG) – the first such approaches to be implemented in Europe. This announcement follows the publication of the EGNOS-based procedures on 28th April.

LPV-200 enables aircraft approach procedures that are operationally equivalent to a CAT I instrument landing system (ILS) procedures. This allows for lateral and angular vertical guidance during the Final Approach Segment (FAS) without requiring visual contact with the ground until a Decision Height (DH) down to only 200 feet above the runway (LPV minima as low as 200 feet).

These EGNOS - European Geostationary Navigation Overlay Service - based approaches are considered ILS look-alike, as the LPV-200 service level is compliant with International Civil Aviation Organization (ICAO) Annex 10 Category I precision approach performance requirements, but without the need for the expensive ground infrastructure required for ILS.



Photos courtesy of Dassault Aviation



"EGNOS LPV-200 is now the most cost effective and safest solution for airports requiring CAT I approach procedures," says GSA Executive Director Carlo des Dorides. "The involvement of major aircraft manufacturers confirms that this service is a real added-value for civil aviation setting the basis for a better rationalization of nav-aids in European airports."

In fact, the publication of LPV-200 procedures provides numerous benefits, including:

- Reduced delays, diversions and cancellations thanks, to the lower minima, potentially reducing the operational costs for flying to this destination.
- Increased continuity of airport operations in case of ILS outage or maintenance.
- Enhanced safety levels, as the LPV-200 procedure effectively can serve as a back-up to the ILS (and as a primary one if there is none).
- Improved efficiency of operations, lowering fuel consumption, CO2 emissions and decreasing aviation's environmental impact.

...AOPA has released a WAAS LPV/LP Questionnaire to its members and received a good response rate. Preliminary results show AOPA members are highly satisfied with WAAS LPV/LP services and benefits...

"The LPV200 Service provides the means to implement the most demanding PBN operations as defined by ICAO to European airports" explained ESSP CEO Thierry Racaud. "Worthy to recognise and congratulate the effort of those involved in achieving this important milestone for the European aviation community".

DSNA, the French Air Navigation Service Provider, pioneered these procedures as an outcome of the work carried out since the GSA declared the EGNOS LPV-200 service level operational on 29th September 2015.

Maurice Georges, CEO of DSNA, the French Air navigation Service Provider, added: "The new LPV-200 approach procedures now implemented at Paris-CDG aim to demonstrate that the SBAS technology, EGNOS in Europe, is a Category I performance approach solution reliable and performing. We are convinced that SBAS is a fundamental technology to modernize our navigation infrastructure. Following this first implementation, LPV-200 approach procedures will be progressively deployed over our IFR runway-ends network."

The approach has already been flown by ATR 42-600, Dassault Falcon 2000 aircraft and Airbus A350 , with pilots' feedback being very positive: "The LPV system is much more stable, more reliable in terms of safety, but also more economical than even the ILS approach. It really makes the difference." stated Eric Delesalle, ATR Chief Pilot, landing first on the runway 26L of CDG airport.

Airbus Experimental Test Pilot, Jean- Christophe Lair, landing with the A350 said, "Airbus is pleased to have demonstrated that the A350 XWB complies with the new RNAV(GNSS) approaches with satellite-based augmentation, as implemented at Paris Charles de Gaulle. These approaches will be a valuable backup to the airport's traditional ILS approaches and will maximise runway availability for the A350 by maintaining CAT1 capability, down to 200ft decision height, even when the ILS ground station is not available."

"The accuracy and stability of the LPV guidance is really amazing, much better than with the ILS. Lowering the LPV minima down to 200ft in Europe is a great improvement enabled by EGNOS, very valuable for Business Aviation operations" confirmed Jean-Louis Dumas, Dassault Flight tests pilot. ([reprint from http://www.essp-sas.eu/news#news_119](http://www.essp-sas.eu/news#news_119))

Increased GBAS Activities Reported at the 17th International GBAS Working Group - Ingeniøreneshus, Oslo, 18-21 April 2016

The 17th International GBAS Working Group (IGWG) was hosted by Avinor, the Norwegian ATM service provider, and Indra Navia at the Ingeniøreneshus in Oslo, Norway. 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 David Duchet, EUROCONTROL. The IGWG addresses relevant issues for the development and implementation of GBAS. It also provides a forum for the exchange of data and information, which can effectively be used by the participants in formulating their business strategies and implementation plans.

About one hundred thirty (130) participants from twenty-four (24) nations, international service providers, industry, airlines and aircraft manufacturers attended the meeting and working sessions. Most notably, representatives from 11 major airlines attended the meeting.



In his welcome, Dr. Tom Cato Karlsen, Norwegian Secretary of State from the Ministry of Transport and Communication noted the importance of Satellite navigation for Norwegian aviation and the safety improvement brought by the S-CAT I system, a precursor of GBAS. Wideroe Airlines is flying to 17 equipped airports and assuring vital connections to remote communities at challenging locations. Also Norwegian Air Shuttle is already GBAS-equipped. This has as consequence that several Scandinavian airports receive up to 37% traffic with GBAS capabilities.

The commitment to GBAS development and implementation by participants was impressive, and visible by motivated airline presentations from Delta Airlines, United Airlines, Cathay Pacific, Lufthansa, Swiss, Qatar Airways, Emirates, JAL and ANA. An increased number of GBAS acquisition plans notably at locations in the USA, Dominican Republic, St. Helena and Melbourne were reported. In Russia, additional approaches have been published, notably at Moscow Domodedovo and 7 other airports.

Fraport who operates at Frankfurt, Germany an approved CAT-I system and experimental CAT III system offered an incentive of 100€ per approach with GLS approved aircraft; a 4M€ total budget for 2016-2018 timeframe. The motivation is based on the lower noise from aircraft able to fly the 3.2° glidepath being implemented at Frankfurt and reducing noise over densely populated areas. At Frankfurt the usage of modern aircraft increases the GBAS aircraft equipage rate from 4% in 2013 to 8% in 2015 and is expected to continue to grow.

Additional GLS benefit was demonstrated in Newark in January 2016, as snow accumulation during the snowstorm Jonas forced all ILS to be NOTAMed out of service for several days. Only the GLS equipped aircraft from Lufthansa and United did not have to be rerouted.

The national updates and SESAR project briefings demonstrated strong continued commitment and activities in implementation of GBAS CAT I; GBAS CAT II/III validation activities and increased research in the potential impact of future multi constellation and dual frequency environment are ongoing. All of the nations represented have GBAS related activities in one form or another from concept development, research prototype activities to actual implementation. Boeing and Airbus remain strongly committed to GLS and reported an increasing GLS customer base and increased number of GLS equipped aircraft sales, with Boeing reporting over 1500 equipped aircraft and 47% of customers (over 60 airlines) choosing the GLS option. Airbus delivered GLS aircraft to 31 different customers and noted the possibility to activate GBAS on over 1100 additional fielded Airbus aircraft.

Delta presented plans for three airports which have been approached with plans for a three phased GBAS implementation which would allow initially ILS overlays, then increased glideslopes and finally specific optimized procedures for each of the airports. An early demonstration of these advanced procedures is to be performed in 2016 at San Francisco using a portable GBAS system with participation of Boeing, Delta and United.

The key value of the GBAS working group continues to reside in the parallel strings of technical and operational sessions, where data collection and evaluation, siting experience and interference mitigation, ionospheric activities, operational plans and future operations are not only exchanged but actively coordinated.

The status reports of service provider plans, users and manufacturer updates as presented on the first day of the meeting 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 trend toward operational aspects noticed during the last meetings continued. More than 2/3 of the participants attended the operational working sessions in this meeting. The presence of representatives of regulatory organizations and a large number of active pilots was noted as beneficial to the discussions. In the operational sessions (CAT I Post Approval Activities and Future Operations) all aspects of use of the GBAS signals were discussed.

A recurring topic was the RNP-GLS transition which is key to address operational improvements and the needs of airports and operators in terms of flight efficiency and environment while maintaining the precision approach capability. CAT II operations on a GAST-C system again emerged as promising for operational benefit. Several

presenters underscored the need to go beyond ILS capabilities rapidly to exploit GBAS potential in noise reduction and shorter approach paths, but also extending the service volume, to which a special working session was dedicated. The capability to provide steeper and multiple approach paths for runway ends possible with GBAS can be immediately beneficial for noise reduction and wake turbulence avoidance.

The technical sessions (Data and testing, Ionosphere, Siting, Interference and Ground Monitoring) focused on the transition to operations, with significant feedback experiences in monitoring, notably of the ionosphere, interference, overflights and tools used for GBAS performance assessment. The investigation in effects of ionospheric events remained an important subject where ICAO validation still is ongoing, with intensive discussion of GAST-D ionospheric monitoring and further results towards validation of a Europe-wide threat model. In several areas the work will be continued between I-GWG sessions to progress on the exchange of methods and experiences on more detailed subject matters. SESAR reported significant progress on its technical and operational efforts and the intensifying of work on GBAS dual frequency and multi constellation architecture. The current SESAR Program will complete end of 2016 and both operational and technical activities on GAST-D and MC/MF GBAS are planned for a continuation of SESAR through 2019.

All participants were extremely satisfied with the outcome of the working group meeting, especially the members of the pilot community who noted the large amount of time devoted to operational aspects, the high quality of work presented and the significant amount of ongoing projects. I-GWG visibly continued to fulfil a recognized function in GBAS implementation and its format seems well adapted to the participants' needs. This working group addresses relevant issues for the development and implementation of GBAS, and exchanges data and information, which can effectively be used by the participants in formulating their business strategies and implementation plans.

The next meeting will likely take place in USA, from where an airline invitation has been received. While the exact location is still open, options are being reviewed and need to be confirmed. It is currently targeted for February/March 2017.

- Dieter Guenter, FAA AJM-32/NAVTAC

ARAIM Technical Subgroup Publishes Milestone 3 Report

Advanced Receiver Autonomous Integrity Monitoring (ARAIM) has the potential to provide two capabilities beyond that of traditional RAIM. First, ARAIM provides a means to safely incorporate new constellations and signals into aviation receivers while maintaining the safety required for aviation operations. Second, as identified in the GNSS Evolutionary Architecture Study (GEAS) report, ARAIM will eventually support vertical approach operations in addition to horizontal area navigation.

The TSG reported that ARAIM had important capabilities that complemented SBAS. The table below is from the report:

ARAIM Applications that Complement SBAS
Horizontal ARAIM in the Near Term Based on One Frequency: ARAIM may find near-term application before dual frequency GPS and dual frequency Galileo are operational. Specifically, ARAIM could enable dual or multiple constellation navigation based on one frequency. After all, single frequency GPS is already operational; single frequency GLONASS is already operational; and single frequency Galileo will be operational in 2020. ARAIM would enable the integration of these early constellations even if they differ sharply in P_{sat} and P_{const} . In the near term, ARAIM could store the ISM in the receiver's non-volatile memory or disseminate the ISM via an existing communications link or database. In the same manner, when operating in dual frequency, dual constellation, the single frequency mode would become a backup mode in case of lost measurements at the other frequency. In this sense, results in chapter 5 show that single frequency L5/E5a H-ARAIM mode provides robust RNP 0.3 service.
ARAIM to Support Arctic Navigation: The Arctic Ocean requires navigation with integrity for energy exploration, eco-tourism, and shipping. Importantly, ARAIM could enable the ship to travel in existing ice cracks or tracks from previous ships. Thus guided, the ship could double its speed. ARAIM supplants SBAS in the Arctic, because the needed ISM could be broadcast by the GNSS satellites or through the use of databases, while SBAS GEOs do not cover the Arctic.
Vertical ARAIM Worldwide Without Needing Geostationary Satellites: In time, ARAIM could obviate or reduce the need for geostationary satellites used by SBAS, and it can operate with a network of fewer ground stations than that of SBAS. As such, it would reduce a significant part of the SBAS operational budget. At the same time, ARAIM could reuse the SBAS reference stations, and so SBAS could be used to accelerate the deployment of ARAIM at lower cost.
ARAIM to Provide GNSS Resilience: As mentioned above, ARAIM does not need the SBAS geostationary satellites. The needed ISM will be broadcast over the GNSS satellites, stored in the receivers or disseminated through aviation databases. As such, ARAIM does not suffer from the signal outages associated with geostationary satellites that frequently appear low in the sky. These outages can be due to blockage by terrain or buildings, or they can be due to intentional or non-intentional radio frequency interference.

The GEAS II report from February 2010 identified many ARAIM technical issues. Working Group C under the United States – European Union (US-EU) Agreement on GPS/Galileo Cooperation chartered a Technical Sub Group (TSG) to work on resolution of the ARAIM issues and to continue development of the ARAIM concept. The TSG published its third and final report in February of 2016 (<http://www.gps.gov/policy/cooperation/europe/2016/working-group-c/>). This report outlines the ARAIM roadmap and it concludes that services should be implemented incrementally beginning with a Horizontal ARAIM (H-ARAIM) service to support near-term, proposed multi constellation applications.

ARAIM must ensure navigation integrity for en-route flight, terminal, and approach operations. For the latter, it must detect hazardous faults in the underlying Global Navigation Satellite System (GNSS) within seconds. In the case of Localizer Performance with Vertical guidance (LPV) or LPV-200, ARAIM responds to integrity threats within six seconds and either removes the faulty satellite from the navigation solution or provides indication to the pilot that the navigation service is no longer available.

ARAIM is intended to support air navigation for several decades. As such, it must be flexible enough to accommodate GNSS core constellations (e.g., Global Positioning System (GPS), Galileo, GLONASS, BeiDou) that have different performance characteristics, such as nominal errors and satellite failure rates. The core constellations will introduce signals at different times and the signals will mature at different rates. ARAIM introduces an Integrity Status Message (ISM) that contains performance parameters of the different constellations and provides for routine update of the ISM.

(reference: [ARAIM Milestone 3 Report](#))

- Max DeAngelis and Joseph Dennis, FAA A/JM-32/NAVTAC

Geotagging “One of the Wildest Places on the East Coast”

Navigating a remote reservoir in the Adirondack Mountains by boat can be a hazardous hobby because of the ever-changing water levels and the rock shoals and stumps hidden below the surface. But one FAA engineer with family ties to the reservoir used the skills he has gained at work to help expose those dangers in his spare time.

“I’ve never really seen it as work,” Nathan Vary, an electrical engineer who works on the Wide Area Augmentation System, said of his efforts to create digital maps of the Stillwater Reservoir. “It’s just fun to try to figure out where all the hazards are and make it safe for all.”

New York created the Stillwater Reservoir in the late 1800s by damming the Beaver River and flooding about 1,600 acres of land. Two subsequent infrastructure projects over the next three decades increased the size of the reservoir and the depth of the water. Four different wilderness areas border the reservoir, which to this day is mostly accessible only by boat, snowmobile, seaplane or hiking.



"It's probably one of the wildest places on the East Coast," Vary said. "... There are sections of the forest that are still old growth."

Vary's family connection to the reservoir dates back to the 1940s when his great-grandfather bought a piece of property. Vary has spent many family vacations there, swimming, water skiing and boating in the reservoir. He works at the William J. Hughes Technical Center in Atlantic City, N.J., and still makes the eight-hour drive to the reservoir once or twice a year.

One fact of reservoir life that he learned over the years is that without a good map, boaters are bound to pay a price. The water level can fluctuate up to 15 feet in a year, so a navigational path that works one time may expose a boat or engine to damage weeks later. An accident could leave

people stranded in a wilderness area without cellular signals to call for help.

"Every time you go out, you're nervous," Vary said. "It's just a matter of when, not if." He speaks from firsthand experience, having damaged his uncle's boat while on the water in his early 20s. "I always felt guilty about that."

The guilt may have contributed to Vary's musings about a reliable reservoir map. Paper maps were too difficult to use accurately, so he envisioned a digital solution. He heard local rumors of a map that used waypoints from the global positioning system but couldn't find it.

Then while visiting the reservoir in 2014, he wondered whether historical imagery might be available on Google Earth, and whether it would reveal the locations of rock shoals and other underwater hazards. He found eight images – enough to inspire a project that has occupied the equivalent of two working months of his time since then.

Vary eventually identified multiple sources for images of the reservoir. Government resources included NASA, the National Agriculture Image Program, the U.S. Geological Survey, the New York Division of Homeland Security and Emergency Services, and the New York Geographic Information Systems Clearinghouse.

He also used Bing Maps, MapQuest, topographic maps, aerial imagery and family home video. Images and an aerial video from 2001 proved particularly valuable. They showed the reservoir during the first drawdown in 75 years. The water level was 30 feet below normal, providing the best look at rock shoals and stumps.

The skills that Vary developed at the FAA to help pilots navigate the national airspace system came in handy as he built maps to help boaters navigate the Stillwater Reservoir. "A lot of our analysis tools are geographic-based," he said, adding that Google Maps is the underlying framework for many WAAS tools.

Working on the WAAS also helped him understand the limits of GPS when drawing "safe zones" for navigating the reservoir. "I know how far you have to be from hazards to compensate for possible errors in your receiver's position solution," he said.

The end result of his work is an online clearinghouse replete with downloadable maps, detailed guides for how to use them, links to the original imagery used to create the maps, and plenty of other resources and background information.

"What you do as a user is install the recommended app for your mobile device, download the routes, hazards and campsites layers, and then download at least one underlying satellite imagery file," Vary said. Once that information is loaded, the captain of the boat clicks the route he or she wants to follow. "It will just guide you on that route." Vary hopes to find funding for a drone boat to enhance the mapping of the reservoir. (Photo: Oceanscience)

Last summer Vary explained the project in a presentation to the New York Geographic Information Systems Association. Residents of Stillwater hamlet and the Town of Beaver River, the only communities anywhere near the reservoir, also have been receptive to his work.

Vary has integrated all of the currently available imagery but still looks for new or better footage about once a year. He also has turned his attention to an idea that could take his project to the next level – a drone boat to take georeferenced,



precise depth measurements. The venture would be too costly for him, so he pitched it to USGS and is spreading the word to try to help raise funds for the boat.

The project has evolved into something bigger and better than Vary first envisioned. "I've learned a lot, discovered a surplus of content and information, and made new friends who share a common interest in the area," he said. "It's definitely a passion I will keep working on as long as I continue to find new information that contributes to its quality."

(reprint from FAA Focus, April 13, 2016)

Satellite Navigation Approach Procedures Update

Satellite-based Approach Procedures			
	Procedures (Part 139 Airports)	Procedures (Non-Part 139 Airports)	Total Number of Procedures
RNAV (GPS) Approach LNAV Line of Minima	1,778	4,295	6,073
RNAV (GPS) Approach LNAV/VNAV Line of Minima	1,402	2,151	3,553
RNAV (GPS) Approach LPV Line of Minima	1,404	2,274	3,678
Non-ILS runway	50	1,689	1,739
ILS runway	1,354	585	1,939
RNAV (GPS) Approach LPVs w/200' HAT			940
RNAV (GPS) Approach LP Line of Minima	86	523	609
GPS Approach GPS Stand-Alone Procedures	8	83	91
GLS Approach	11	0	11

(Data as of May 26, 2016)

The tables shown here reflect the continuing growth of satellite-based approach procedures as compared to the inventory of instrument approach procedures based on conventional NAVAIDs. 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

The number of LPVs in Europe is also growing. The table to the right shows LPV procedures in Europe as of March 31, 2016, as included in the Quarter 1 EGNOS Bulletin. (Source: EGNOS Bulletin, Issue 18 Q1 2016)

Follow this link to the most recent Quarter 1 EGNOS Bulletin, Issue 18: http://egnos-user-support.essp-sas.eu/new_egnos_ops/content/quarterly-bulletin

Instrument Approach Procedures (IAPs) Based on Conventional NAVAIDS	
ILS	1,291
ILS (CAT II)	156
ILS (CAT III)	121
LOC	1,441
NDB	586
VOR	1,095

(Data as of March 31, 2016)

More information is available on the FAA Inventory Flight Procedures (IFP) Inventory Summary at https://www.faa.gov/air_traffic/flight_info/aeronav/procedures/ifp_inventory_summary/

Country	Airports – LPV procedures	# LPV Procedures
Austria	2	2
Belgium	2	3
Croatia	1	1
Czech Republic	4	8
Denmark	3	6
Finland	1	2
France	81	131
Germany	20	33
Guernsey	1	2
Italy	7	17
Netherlands	2	3
Norway	10	21
Poland	2	4
Portugal	1	2
Slovak Republic	2	4
Spain	1	2
Sweden	2	3
Switzerland	8	10
United Kingdom	2	4
Total	152	258