



FAA Navigation Programs AJM-32
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SatNav News

Horizon Air realizing the benefits of WAAS



It's been over a decade since Horizon Air, a regional affiliate of Alaska Airlines, made the determination to implement the Wide Area Augmentation System (WAAS) as a part of their overall solution for an increase in performance-based operations. During the past 10 plus years, the airline has identified the multi-faceted benefits they were hoping for; pre-departure planning, enhanced safety, and scheduled reliability to name a few - WAAS is delivering.

When Horizon started using its proprietary RNP instrument approach procedures at Friedman Airport (KSUN) near Sun Valley,

ID and Mammoth Lakes, Airport (KMMH) in CA, they both reported immediate benefits. For example, during the 2018 ski season, successful arrival percentages at KSUN alone improved by 30% due to the RNP approaches which incorporate lower weather minima. "Our schedule reliability has become the best in our route structure due to the lowest possible approach minimums at airports Horizon Air serves." said Perry Solmonson – Horizon Q400 Check Airman/Flight Ops Duty Officer.

“For hundreds of flights each day, the reduction of flight planning workload is substantial and seamless.”



Horizon Q400 Flight Deck.

The current fleet for the regional airline includes several Bombardier Q400s, flying throughout the Pacific Northwest and is based out of Portland International Airport (KPDX). WAAS is providing valuable alternatives, namely LPV approaches, to the legacy of ground-based approaches



Horizon Q400 Flight Deck.

which allows and saves time for the dispatchers not to declare alternate destinations when pilots fly into airports that have designated GPS approach only procedures. "For hundreds of flights each day, the reduction in flight planning workload is substantial and seamless." States Solmonson.

There is another big benefit to Horizon with WAAS. It provides precision-like approach minimums to both sides of some approved runways. Flying and navigating through the Pacific Northwest often involves difficult weather conditions, and challenging terrain. Solmonson says "we get in, when (...) other airlines, can't because they simply don't have that low of approach minimums."

It is clear that the investment made in WAAS (avionics) has paid off for the regional airline in more ways than one. Horizon Air is a true example that "WAAS is Working".

- Amy Trevisan, FAA AJM-32/NAV-TAC



Satellite-Based Augmentation System (SBAS) Interoperability Working Group (IWG)

Satellite Based Augmentation System (SBAS) providers from around the world, met in Delhi, India for the 36th meeting of the SBAS Interoperability Working Group (IWG) from February 4 -7, 2020. The SBAS IWG provides an opportunity for the coordination of SBAS standards and operations as a means to promote interoperable development and deployment of SBAS systems and operations. IWG-36 included one and a half days of parallel meetings of the Technology Subgroup (TSG) and the Operations Subgroup (OSG), a day of plenary meetings, and a day dedicated to interaction and coordination with industry and airlines. This was the first SBAS provider-industry-airlines interaction coordinated by the SBAS IWG. The participants felt that the coordination or outreach event was beneficial and will plan similar events in the future. Additionally,

the IWG welcomed representative from Nepal and regulators from India.

The TSG had several presentations on the following topics:

- Progress reports for the development of Dual Frequency Multiple Constellation (DFMC) SBAS standards.
- Analysis related to technical options for DFMC SBAS standards
- Technical observations related to existing SBAS systems and SBAS receivers
- Discussions of future services

The OSG discussed the operational implementation of SBAS. The session was particularly valuable to those SBAS systems that are expanding to provide new service offerings. Japan briefed its planned evolution to provide Local Performance with Vertical Guidance (LPV)

service around 2023. India briefed on its experience as India prepares to publish up to 50 LPV procedures by the end of 2020. The OSG discussed aspects that impact the achievable procedure minima including the runway and airport infrastructure and agreed to continue the discussion at future IWG meetings. There are differences based on whether there already exist instrument procedures to the intended runway or whether the airport supports instrument approaches to other runways. France presented an assessment of the achievable minima using SBAS for 83 runway ends at 46 French airports. The study showed the LPV minima are similar to the Category 1 (Cat-1) Instrument Landing System (ILS) minima at most airports and the LPV minima exceed the equivalent Lateral Navigation / Vertical Navigation (LNAV/VNAV) procedure minima.

SBAS IWG invited airlines and industry to a one-day SBAS community forum (outreach event). The forum provided and opportunity to learn about SBAS benefits, the progress of SBAS systems, the capability offered by manufacturers, and the use and benefit by airlines. The SBAS providers reviewed the perceived benefits from use SBAS and highlighted the current and emerging SBAS capability

worldwide. Industry participation included Airbus, Boeing, Collins, Honeywell, and ATR, with some briefs provided through remote connections. Airline participants included International Air Transport Association (IATA), Air France, Japan Airlines Group, Qatar Airlines, SpiceJet, Go Airlines, Air Asia, and IndiGo. Airlines identified the following benefits for SBAS equipped aircraft:

- Better performance of SBAS LPV compared with non-SBAS LNAV/VNAV
- LPV approaches to more runway ends
- Potential to achieve better minima and avoid disruptions for non-ILS equipped runways/airports
- More direct routes and associated fuel savings and environmental benefit
- Avoidance of costs associated with use of "Approval Required" procedures

In addition, the airlines provided several quotes from pilots that have flown the SBAS LPV approach, including "Approach Very Stable" and "Convinced that will quickly supersede ILS Cat-I".

SBAS IWG accepted the offer of ASECNA to host the next IWG meeting in Madagascar in October 2020.

- Joseph Dennis, FAA AJM-32/NAVATAC



Participants in the 36th meeting of the SBAS Interoperability Working Group (IWG) held in Delhi, India from February 4 -7, 2020.

Delta lands historic GLS approach in Punta Cana, Dominican Republic

On Oct. 16, 2019 Delta 737 pilots Captain Jon Hensler and Captain C.E. "Noah" Flood accompanied by 737NG Technical Manager Mike Mannino conducted a GBAS Landing System (GLS) approach in Punta Cana, Dominican Republic (PUJ). The GLS landing was a first for a North American carrier operating a revenue flight into Latin America. The crew reported that the GLS performed flawlessly.

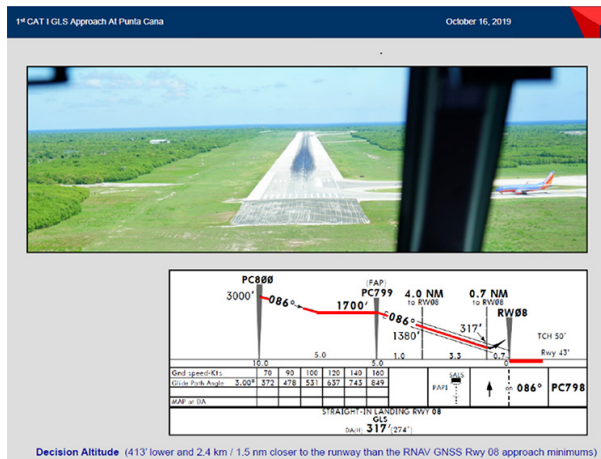


PUJ is the first Latin American airport with GLS capability. GLS approaches in PUJ permit significantly lower operational weather minimums, allowing aircraft to safely operate into this airfield when they would otherwise need to divert. The decision altitude is 413' lower and 1.5nm closer to the runway than the RNAV GNSS Rwy 08 approach minimums. In PUJ, this system provides the first precision approaches, which support lower approach minimums and enhance schedule reliability.

The approach was the beginning of a several month Delta trial for GLS approaches in PUJ. During the trial, line check pilots and senior instructors will perform data collection to confirm the effectiveness of GLS approach procedures. As the PUJ GLS approach trial continues and the team gathers data, Delta will report any milestones and next steps demonstrating how Delta Flight Ops is at the leading edge of this exciting

aviation technology.

Delta has the largest fleet of airplanes equipped for GLS. Delta will equip additional aircraft with GLS as part of Standard Flight Deck 2023, which seeks to define aircraft equipment requirements



that ensure Delta aircraft meet or exceed compliance mandates, as well as leverage emerging technologies to provide competitive advantages.

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

DOT holds first GPS backup technology demonstration

Reprint from GPS World, March 16, 2020
By Dana Goward

Notes from DoT GPS Backup Demos – Part I

Government officials, advisors and congressional staff gathered at NASA's Langley Research Center on March 13. They were there to discuss the Department of Transportation's (DoT's) GPS Backup Technology Demonstration program and view the offerings of six different companies.

A second event to view and discuss technologies offered by the other five companies in the program is scheduled (as of this writing) for Friday, March 20, at Joint Base Cape Cod, Massachusetts.

View from Washington, D.C.

The day began with remarks by Karen Van Dyke from the U.S. Department of Transportation, as well as remarks prepared by Colonel Joseph Frankino, deputy director of the National Coordination Office, a multi-agency staff that supports the National Space-Based Positioning, Navigation, and Timing (PNT) Executive Committee, whose members were unable to attend.

Van Dyke provided an overview of the program and pointed out the increasing importance of resilient PNT. As just one example, improvements in autonomy and

self-driving cars are entirely dependent upon consumers having confidence in the entire system, much of which is underpinned by PNT.

Col. Frankino's remarks reflected the Defense Department's commitment to and support of DoT's resilient PNT efforts. He pointed out that the nation's military depends upon the defense industrial base, which depends upon uninterrupted PNT.

Volpe Transportation Systems Center

The technology demonstration effort is being coordinated by Andrew Hansen from DoT's Volpe Center. Dr. Hansen pointed out that the ongoing effort, the analysis and assessment of which is expected to be concluded in May, is a series of demonstrations vice tests. This means that the companies involved were showing what their systems could do, vice being measured against set criteria.

He also mentioned that the maturity of all the systems involved seems to have improved significantly over the last year. All are at Technical Readiness Level 6 or better. Also, that things so far had gone very smoothly with no need for any "re-dos."

GPS and a cesium clock were being used as reference standards for the demos. Two of the systems, NextNav and Skyhook, were also demonstrated on a drone at Langley's 150 acre open air site.

Report and Transparency

Data from the demos is not proprietary and belongs to the government which intends to make "as much of it available as possible." DoT representatives mentioned

Admiral (ret.) Thad Allen (left), chair of the National PNT Advisory Board, was among the attendees learning about DoT's GPS Backup Technology Demonstration project at NASA's Langley Research Center. (Photo: RNT Foundation)



several times their desire for maximum transparency.

Attendee Observations

After a day of viewing and discussing the six different technologies with their vendors, the group reconvened to offer feedback. All agreed the day was very worthwhile and complemented DoT and NASA on the event.

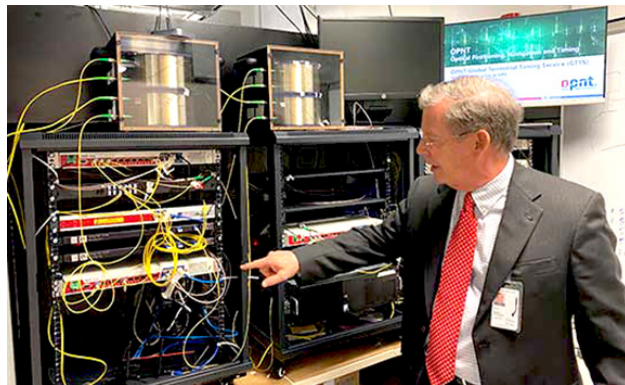
Kicking off the discussion, the DoT hosts remarked that the department is fully committed to GPS and its modernization. That said, there is broad recognition of the importance of other PNT systems. This is evidenced by the recent White House Executive Order on PNT.

Also, that there is no single solution that will fill the PNT needs of everyone. In fact, GPS does not serve the PNT needs of everyone. The need across sectors for a wide variety of sources to “backup” GPS is why the demonstration project includes some systems that only provide time, or only positioning.

Feedback from attendees included:

- The reason for this project is that we have a 20th-century GPS and 21st-century threats. New technologies need to be examined for vulnerabilities. Security must be “baked in” from the beginning. Moderators commented that the DHS Conformance Framework was one of the tools that would help with this.

- Rural and other underserved areas (such as wilderness, remote transportation networks, maritime) need PNT and should be a part of the government calculus.
- Many systems depend upon infrastructure provided by others versus being self-sufficient.
- In the view of many in Congress, it is good to see the demos going well. Overall, though, things are about two years late. Members and staff are very interested in when there will be an RFP and schedule for implementing the timing system mandated by the National Timing Resilience and Security Act of 2018.



Monty Johnson of the company OPNT demonstrates precise time transfer through 100 kilometers of spooled fiber-optic cable. (Photo: RNT Foundation)

Systems Demonstrated at NASA Langley

During the course of the day, attendees had the opportunity to interact with representatives from the following companies and their systems.

Vendor	Service	Technology
TRX	Positioning	Inertial Measurement Units
NextNav	Positioning & Timing	Metropolitan Beacons
Skyhook	Positioning	WiFi, cell ranging, very large proprietary database of site locations
Echo Ridge	Positioning & Timing	Uses Global Star LEO constellation of 24
OPNT	Timing	Timing Fiber & White Rabbit protocol
Seven Solutions	Timing	Timing Fiber & White Rabbit protocol

As a follow-up to our previous edition of the SatNav News - *Worlds First: Boeing 737NG / 700 successfully completes an LPV approach*. The following EGNOS article takes it a step further and shares how airlines in Europe will benefit from SBAS LPV.

World's First: B737NG successfully completes an LPV approach

Reprint from EGNOS Bulletin, Issue 32, Spring'20 Edition



Credits: CMC Electronics

As airlines look to prolong the lifespan of their aging fleet, one Canadian company, CMC Electronics, offers a solution that keeps aircraft flying by meeting current worldwide ADS-B Out mandates and also takes advantage of the ever growing EGNOS infrastructure.

A historic moment

On a chilly day in October 2019 a B737NG successfully flew its first LPV approach into Kenai Municipal Airport (PAEN) in Alaska. The aircraft was equipped with CMC Electronics' CMA-5024 GLSSU which is fully compatible with EGNOS and supports SBAS navigation throughout all phases of flight.

The Federal Aviation Administration had just approved an STC certifying the installation of the CMA-5024 for the

B737NG aircraft family (-600/-700/-800) for DO-260B ADS-B out compliance and SBAS/GPS navigation with LPV approach capability.

It remains the first and only solution available today that is approved to introduce LPV approaches on a B737NG aircraft.

This achievement was a collaborative effort between the FAA and CMC Electronics to make LPV a reality on one of the most popular air frames of all time, the B737NG.

European Approvals

Two EASA approvals are currently in progress. The first, approved by the FAA and TCCA and presented above, features the CMA-5024 as an SBAS positioning source for navigation and to meet worldwide ADS-B Out requirements

in addition to supporting LPV approach capability. It is already approved by the FAA and TCCA.

The second is a standalone ADS-B Out and LPV approach STC.

EASA approvals for both solutions are well under way and expected within the current year.

Initial EGNOS Customers

There are currently two European customers that will be utilizing these B737NG solutions.

The initial customer is an Italian airline offering scheduled and charter flights from Italy to various international destinations. Their installation will be for SBAS navigation and ADS-B Out only but provisioned for future growth to LPV. They appreciate the low cost solution that would allow their fleet to meet ADS-B Out mandates in the short term, while still providing the flexibility to take advantage of LPV approaches in the medium to long term. The next customer is ASL Airlines France; based in Paris-CDG they offer a full range of aviation services: scheduled, chartered and on-demand flights for passenger and freight activity. The airline operates a fleet comprising 18 Boeing 737 aircraft. They recently launched a project to equip this fleet with CMC's CMA-5024 for standalone LPV approach capability and ADS-B Out compliance with funding from the European GNSS Agency's (GSA) EGNOS Adoption for Aviation grant. By employing this LPV solution, ASL Airlines France will continue to strengthen and maintain its high quality of service to its customers.

Intuitive Cockpit

One of the greatest benefits of CMC's solution is the intuitive cockpit design that drastically reduces the cost of airline training.

This is achieved by the re-use of the existing Gables NAV control panel, which comes factory fit from Boeing, for LPV approach selection. As this panel is already in use for ILS approaches, the design ensures all approach selection is centralized in the same cockpit location.

The single difference from line fit is an annunciator indicating when an LPV approach is actively being flown.

Additionally, CMC's ADS-B Out integration is designed to be indistinguishable from that of Boeing, in terms of cockpit and flight crew perspective.

The overall result is a simpler, more effective mental model for flight crews to absorb. In the words of one of the first pilots to fly an LPV on a B737: "From the pilot's perspective, CMC's LPV system provides a clean, straightforward interface which behaves exactly like an ILS, but with the exceptional [SBAS] performance and availability."

Airliner Benefits

The use of the CMA-5024, is a cost-effective alternative to replacing the current B737NG multi-mode receiver (MMR). When paired with any DO-260B compliant transponder, it allows operators to meet worldwide ADS-B Out requirements, including EASA's. It also allows airlines to take advantage of the EGNOS-capabilities, specifically the increasing number of LPV approaches being developed all across Europe. These high precision GPS instrument approaches



Credits: CMC Electronics

are equivalent to CAT I ILS approaches and do not require specialized crew training. Their aim is to reduce costs associated with flight delays and cancellations

“ Given the enhanced performance provided by EGNOS along with the undeniable safety, reliability and cost-saving benefits of LPV approaches, the need to increase the number of EGNOS and LPV-compatible aircraft should be a top priority. ”

and provides airlines with a safe approach into airports where ILS is unavailable.

As indicated by one of the first B737 LPV customers: “The addition of LPV capability to our aircraft permits us to provide significantly improved schedule reliability for our scheduled and charter clients, given the absence of traditional ground-based approach aids at many of the

remote destinations we serve.”

Lastly, this solution future-proofs airlines, by offering a simple upgrade path for their B737NGs to benefit from advanced GNSS functions such as GBAS GLS by

upgrading to CMC’s new CMA-6024 GPS/SBAS/GBAS receiver system.

Given the enhanced performance provided by EGNOS along with the undeniable safety, reliability and cost-saving benefits of LPV approaches, the need to increase the number of EGNOS and LPV-compatible aircraft should be a top priority for regulators, airlines and manufacturers alike.

The approval of an STC that allows one of the world’s most popular aircraft models ever sold, the B737NG, to successfully fly an LPV approach is truly exciting news.

This well-developed solution stands out on many levels. It is cost effective, allows airlines to meet current mandates, provides a future path to LPV approaches and overall SBAS compatibility and provides flight crews with an intuitive interface. The hope is that this will encourage more airline operators than ever before to upgrade their fleets to be EGNOS compatible.

WAAS Team Attends AACCA Conference



The WAAS team attended the annual Alaska Air Carriers Association (AACCA) conference March 4th and 5th held in Anchorage, AK. The conference was successful bringing together current and future original equipment manufacturer (OEM) suppliers and services to the region such as Universal Avionics, Sabrewing Aircraft Company and DASH. The WAAS

program office participated in a number of educational panels including those encompassing the mission to support and advocate for commercial aviation community and the ongoing business opportunities for air carriers in Alaska.

During the conference, one of our team members, JoAnn Ford, was recognized and honored as this year’s recipient of the Arlo Livingston Award. This award recognizing individual achievement in the betterment of Alaskan aviation and has only been awarded 6 times in 37 years.



Members of the B737 Team attend Awards Ceremony at AACA 2020.

Seeing the benefits of GNSS initiatives, in particular WAAS, JoAnn has dedicated her business goals and efforts working tirelessly for Alaskan aviation. Her passion for success through partnerships was also noteworthy as the B737 team, consisting of CMC Electronics, Northern

Air Maintenance Services, Logic Air, and FAA Engineering also received an award. The B737 team was recognized for the installation, modification and data collection significance of the equipage of WAAS LPV on a commercial aircraft.
- Amy Trevisan, FAA AJM-32/NAVTAC

AACA ARLO LIVINGSTON AWARD

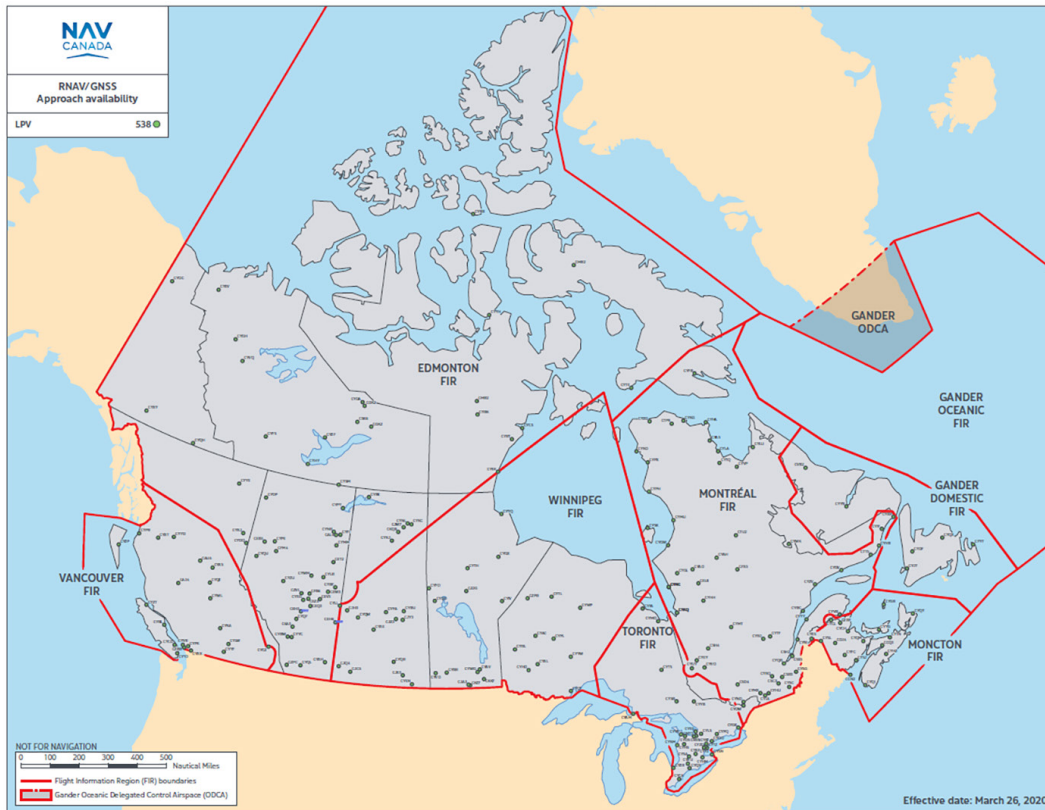
The AACA Arlo Livingston Award was created in 1983 in memory of a remarkable man who made a lifelong contribution to the aviation industry. Arlo was instrumental in starting the Alaska Air Carriers Association in 1966. This award is considered each year but is given only when a deserving candidate is identified who has made an exceptional contribution to Alaskan aviation.



Did You Know . . .

How many Localizer Performance with Vertical Guidance approach procedures – LPVs are there in Canada?

In every issue we publish our most recent numbers of WAAS LP / LPVs in the National Airspace System. We also include numbers for Canada and Europe. Canadian LP / LPVs are powered by WAAS and their numbers continue to grow. Outlined below is the latest map depicting the location and number of LPVs is up to 538.



Look closely and you will be amazed at the vast geographical distance covered by WAAS and consequently, the potential for LPVs serviced. It boggles the mind to those of us who live in the lower 48 to think an airport as far north as Resolute Bay, Nunavut Canada (CYRB) would have a WAAS LPV approach. This little airport is one of the northernmost airfields in Canada and certainly experiences its fair share of extreme weather. Since weather conditions do not effect flying a WAAS LPV line of minima, there is no doubt the LPV approach to the runway at Resolute Bay comes in handy more than a few times a year.

With cold weather restrictions on other navigational aids, it is no wonder the number of WAAS LPV approach procedures continue to grow every year in Canada.

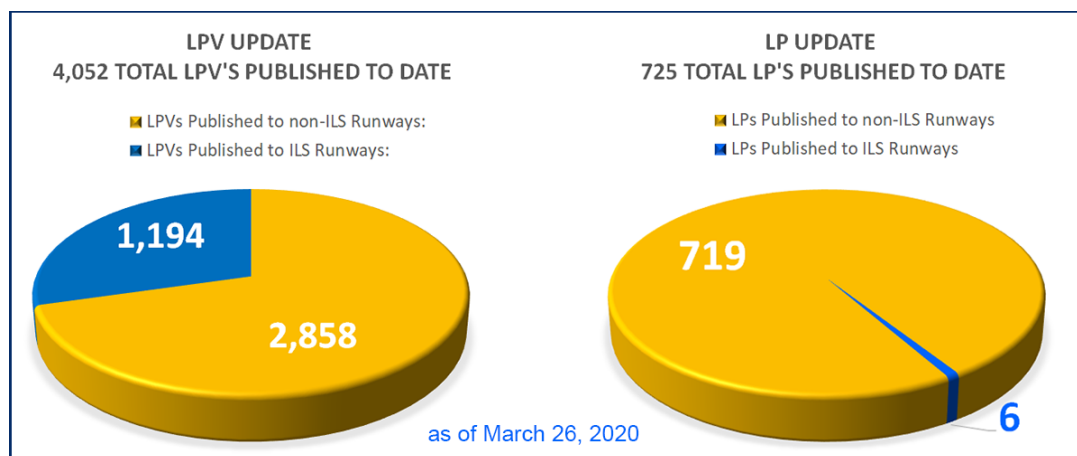


Airport and runway at Resolute Bay, Nunavut Canada (CYRB).

Satellite Navigation Approach Procedures

WAAS

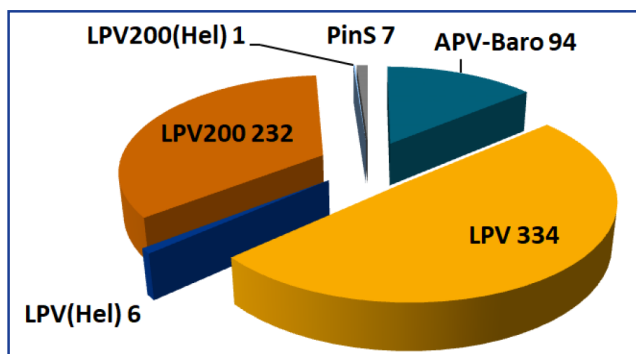
The table below reflects the continuing growth of satellite-based approach procedures. For more detailed information about satellite-based instrument approach procedures, please visit our GPS/WAAS Approach Procedures web page. http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/approaches/index.cfm



EGNOS

The number of LPVs in Europe is also growing. The table below shows LPV procedures in Europe as of January 30, 2020, as included in the EGNOS Bulletin Spring'20 (Source: EGNOS Bulletin, Issue 32, Spring'20 Edition)

Follow this link to the most recent EGNOS Bulletin Issue 32, Spring'20 Edition: http://egnoss-user-support.essp-sas.eu/new_egnoss_ops/content/quarterly-bulletin



Canada



Numbers provided by NAV CANADA as of March 26, 2020