



## NextGen Approach Procedures for General Aviation

Pilots flying all types of aircraft are now able to reach more runways in low visibility conditions than ever before. Using the Wide Area Augmentation System (WAAS), aircraft can take advantage of NextGen procedures to access over 3,000 runways in poor weather conditions with minimums as low as 200 feet. WAAS-enabled NextGen procedures can even get you into places where an Instrument Landing System (ILS) is not available.

There are now three times as many WAAS-enabled NextGen procedures as there are ILS approaches in the National Airspace System and nearly 82,000 aircraft are certified to use satellite-based guidance.

Localizer Performance with Vertical Guidance (LPV) approaches take advantage of WAAS lateral and vertical guidance accuracy to provide an approach with minimums similar to Category I ILS. As distance from the runway increases, WAAS provides greater accuracy and more signal stability than ILS. Like an ILS, an LPV has vertical guidance and is flown to a Decision Altitude.

The design of an LPV approach incorporates angular guidance with increasing sensitivity as an aircraft gets closer to the runway. Sensitivities are nearly identical to



*Photo courtesy of Cirrus Aircraft*

those of the ILS at similar distances. This is intentional to aid pilots in transferring their ILS flying skills to LPV approaches.

### **WAAS LPVs Provide Similar Level of Service to Category I ILS**

- Vertical guidance
- Glide path more stable than that of ILS
- Minimums as low as 200 feet, which is lower than all conventional non-precision approaches such as VOR and NDB

### **WAAS LPVs Outnumber Category I ILS Approaches Within the United States**

As of July 23, 2015, there are 3,556 LPVs serving 1,733 airports, 1,655 of those serving 990 non-ILS airports.

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Since WAAS became operational in 2003, the FAA has made remarkable progress implementing NextGen approaches enabled by the technology. Thanks to the consistent development of LPVs and other types of WAAS approaches, pilots enjoy safe access into places that would have been unavailable just a few years ago.

## WAAS LP Approach Procedures

WAAS has enabled a new Localizer Performance (LP) approach procedure which provides the same lateral accuracy as LPV but without the vertical guidance. LP minimums is added in locations where terrain or obstacles do not allow publication of vertical guidance. The accuracy from WAAS enables procedure designers to optimize the approach path which results in lower minima than lateral navigation. As of July 23, 2015, there are 592 LPs serving 428 airports.

*NOTE: WAAS receivers certified prior to Technical Standard Order (TSO) C-145b and TSO C-146b, even if they have LPV capability, do not contain LP capability unless the receiver has been upgraded. Receivers capable of flying LP procedures must contain a statement in the Flight Manual Supplement or Approved Supplemental Flight Manual stating that the receiver has LP capability.*

## More LPV and LP Procedures To Come

The FAA plans to publish an additional 120 LPVs and LPs in FY 2016. Additionally, the agency expects to continue developing procedures beginning in FY2017 until every qualified in the National Airspace System has one. The projected procedure production rate in the out years fluctuates based on a number of factors.

## WAAS and How It Works

WAAS is a satellite technology that has become essential in making air travel safer and more efficient for both private and commercial travelers. WAAS represents an enormous leap forward in air navigation. When it was first activated on July 10, 2003, WAAS allowed pilots for the first time to rely on the Global Positioning System (GPS) as a primary means of navigation. That means that pilots can use WAAS alone to navigate and land, in most instances. It is important that pilots have as accurate information as possible when landing; WAAS collects, processes, and corrects the GPS information to ensure that the data the pilot receives can be trusted.

WAAS uses a network of precisely located ground reference stations that monitor GPS satellite signals. These stations are located throughout the continental United States, Alaska, Hawaii, Puerto Rico, Canada and Mexico. The stations collect and process GPS information and send the information to WAAS master stations.

The WAAS master stations develop a WAAS correction message that is sent to user receivers via a 'GPS-like' signal from navigation transponders onboard geostationary satellites. The WAAS message improves the accuracy, availability and integrity of GPS-derived position information.

Using WAAS, GPS signal accuracy is improved from 20 meters to approximately 1.5 – 2 meters in both the horizontal and vertical dimensions. WAAS hardware consists of: 38 ground reference stations, 3 master stations, 3 geostationary satellites with navigation transponders onboard, 6 uplink stations, 2 operational control centers, and the WAAS terrestrial communications network.