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# More than Machinery

AN INSIDE LOOK AT AIRPORT APPROACH LOGISTICS



Photo courtesy of U.S. Air Force

**“W**hy can’t my airport have an LPV approach?”  
Such is the common lament of instrument-rated pilots longing for more reliable all-weather access to their home airports. It was much easier to understand the answer to the previous question—“Why can’t my airport have an ILS?” As most pilots realize, the cost of the equipment, its initial installation, and the pricey ongoing maintenance (including recurring certification) is too daunting for smaller airports to justify. But these new GPS-based approaches, like an LPV, are just lines on a chart, right? Sorry, but not quite.  
So, what gives?

The FAA is committed to aggressively expanding the number of LPV approaches available, but there are real requirements behind those approaches. A quick look at Terminal Instrument Procedures (TERPS) will demonstrate that creating an instrument approach procedure (IAP) is far more complicated than simply sketching courses and altitudes on paper. In fact, the real challenge starts at the pavement.

## **The Runway Environment**

The virtual lines on your approach plates require some physical ones on the runway. The runway

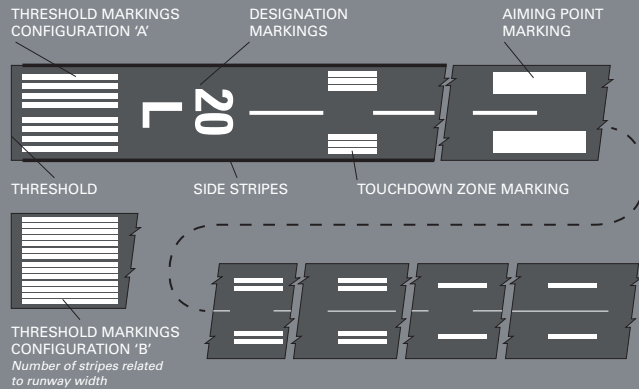
## Localizer Performance with Vertical Guidance (LPV) approaches

A new class of approach procedures that provide vertical guidance, but without meeting ICAO Annex 10 requirements for precision approaches, has been developed to support satellite navigation use for aviation applications worldwide. These new procedures are categorized as Approach with Vertical Guidance (APV).

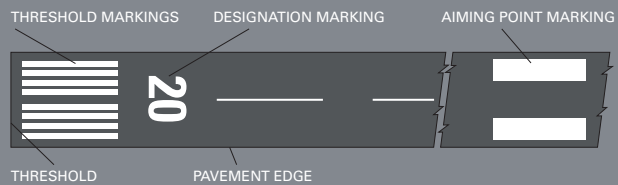
The LPV —localizer performance with vertical guidance — is the initial APV. The LPV approach takes advantage of the high accuracy guidance and increased integrity provided by the Wide Area Augmentation System (WAAS). WAAS-generated angular guidance allows the use of the same TERPS approach criteria used for ILS approaches. The resulting LPV approach procedure minima may have a decision altitude as low as 200 feet height above touchdown, with visibility minima as low as one-half mile when the terrain and airport infrastructure support the lowest minima. LPV minima are published on RNAV (GPS) approach charts.

The FAA has currently published 2,675 LPV approaches, more than 500 of which have a height above touchdown of 200 feet.

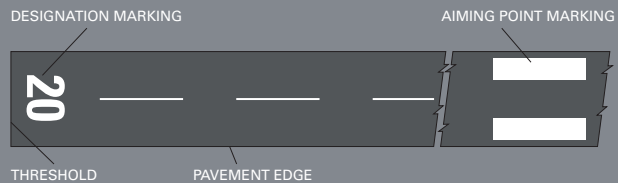
## Precision Instrument Runway Markings



## Nonprecision Instrument Runway Markings



## Visual Runway Markings



marking elements vary, but the most basic paved GA runways are only required to carry their designation (i.e., runway number) and a centerline. To be eligible for a non-precision approach, the runway must have threshold and aiming point markings. Still more markings are prescribed for a precision approach, which requires touchdown zone and side stripe markings.

So, now our runway is appropriately striped. We're done, right? Not so fast.

The next step is for runway lighting and some type of approach lighting system, which are needed to allow round-the-clock use of the procedure and

the lowest possible minimums. When it comes to approach lighting, the most extensive is the High Intensity Approach Lighting System with Sequenced Flashing Lights. This array consists of 247 steady lights of three different colors and 15 flashing lights, better known to pilots as "the rabbit." This system extends 2,400 feet from the end of the runway. The approach and runway lights provide pilots with visual information not only on runway alignment, but also on perception of height, roll, and horizontal reference.

Few GA airports can justify the high intensity array. A less costly system is the Medium

Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). Because the MALSR is compatible with a decision height of 200 feet AGL, MALSR lights the runways at approximately 900 airports versus 155 times for its big brother. Incidentally, the FAA is testing an LED (Light-Emitting Diode) MALSR system to lower the maintenance cost of the system. A study determined that replacing all MALSR incandescent lamps with LEDs would pay for itself in two years.

### Imagination, Please

With the runway properly marked and brightly lit, what else is required?

You might scoff at the use of the word “imaginary” in connection with something as serious as an instrument approach procedure. But Imaginary Surfaces play a big part in keeping airplanes safe from encroaching obstacles. Most pilots are familiar with 14 CFR parts 61 and 91 and, depending on their training and work environment, with parts 141, 135, or 121. 14 CFR part 77 is probably not on most pilots’ reading lists. But that’s where you will find the regulations covering obstructions to navigable airspace.

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Specifically, 14 CFR section 77.25 covers Civil Aviation Imaginary Surfaces. These surfaces protect the approach path and areas surrounding the airport. These surfaces are defined in depth in 14 CFR section 77.25, but the area of greatest relevance to this topic is the approach surface. For runways that enable nothing more than a visual approach, that surface can be as short as 1,250 feet. It grows to a length between 2,000 and 4,000 feet for a non-precision approach and to 16,000 feet for a precision approach. The expansion from roughly one-fourth of a statute mile to roughly three statute miles makes a huge difference in the amount of area that must be surveyed for potential obstacles. That’s why the FAA recommends that airports survey for every potential type of IAP they might develop right from the start, so as to plan appropriately for future growth.

### Who Pays, and Who Decides?

With so many (expensive) requirements, you might think things are just as hopeless for your GPS-based precision approach dreams as they were in the days when ILS was the best available.



Photo courtesy of ATO

*An example of a precision instrument approach runway*



Photo by Raymond G. Stinchcomb

But, don't despair. Though complex, the process of developing a GPS-based approach is still much less onerous. Even better, the FAA has been pressing ahead to develop approaches for as many qualifying runway ends as possible. In the revision cycle ending August 25, 2011, the FAA published 148 new LPV approaches. That development brings the total number of LPV approaches to 2,675 nationwide. When combined with Localizer Performance Approaches (LPs), the total number of GPS-based procedures in the U.S. is now more than double the number of ILSs.

With respect to who pays, that's where the FAA comes in again. The FAA's Airport Improvement Program (AIP) allows public-use airports to apply for grants that can cover up to 95 percent of the costs of an airport improvement project. The grants can cover everything from planning and design, to lighting and weather stations — in short, anything that improves the airport's safety or efficiency.

If you're interested in exploring possibilities for a GPS-based IAP at your airport, the first step is to discuss the idea with airport management and your fellow airport users. Is the IAP right for you and the airport? Are you willing to accept the restrictions

that come with an AIP grant (e.g., commitments to keep the airport open to the public and to prohibit discrimination against any potential safe users)? And, of course, it is necessary to determine whether the airport can qualify for an AIP grant. Lighting improvements and obstacle removal or mitigations would generally qualify for funding since both improve airport safety and efficiency in bad weather.

For more information on the AIP, please see: <http://www.faa.gov/airports/aip/overview/>. And to see if your airport is on the list for development of a GPS-based IAP, visit <http://avnweb.jccbi.gov/schedule/production>. If it is not on the list, then maybe it's time to start working with your fellow airport users to amend it and, ultimately, improve access to your home airport. ✈️

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**Though complex, the process of developing a GPS-based approach is still much less onerous than the task of fielding an ILS.**

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## Learn More

### AC 90-100A, U.S Terminal and En Route Area Navigation (RNAV) Operations

[http://rgl.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgAdvisoryCircular.nsf/list/AC%2090-100A/\\$FILE/AC%2090-100A.pdf](http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/list/AC%2090-100A/$FILE/AC%2090-100A.pdf)