

# GPS Approaches

Instrument Rating  
Dual – Local (3.0 hours)

## Lesson Objectives

- Understand the principles of GPS approaches including their common uses and limitations
- Develop an understanding of the avionics of this aircraft
- Continue developing instrument skills: Cross Check, Instrument interpretation, and Aircraft Control
- Execute GPS approaches within ACS standards

## Content

### Review

- Instrument Flying Handbook Chapters 2, 4, and 6
- Airmen Certification Standards Task II B and VI A

## Global Positioning System (GPS)

- The Global Positioning System (GPS) consists of 31 satellites deployed by the USA that orbit the Earth at ~11,000 miles
  - 3 satellites signals are required for 2D triangulation
  - 4 satellites signals are required for 3D triangulation
- **WAAS** – Wide Area Augmentation System
  - Uses a network of ground-based reference stations
- **RAIM** – Receiver Autonomous Integrity Monitoring
  - Assesses the integrity of GPS signals
  - Requires 5 satellites to check for fault
  - If the onboard GPS does not have RAIM capabilities, you must use [sapt.faa.gov](http://sapt.faa.gov) to check for GPS outages if you plan on flying with RNAV (AIM 1-1-19, AC 90-100A, AC 90-105)

## GPS Approach Terms Review

- Angular vs. Linear Guidance
  - **Linear Guidance** – course sensitivity is constant
  - **Angular Guidance** – course sensitivity increase closer to the runway (like an ILS)
- **MDA** – Minimum Descent Altitude
  - The lowest altitude (in MSL) to which a descent is authorized...in execution of a standard instrument approach procedure, *where no electronic glidepath is provided*.
  - Absolute minimum, "floor" you can fly along until you see the runway or go missed
- **DA** – Decision Altitude
  - A specified altitude in the approach at which a missed approach must be initiated if the required visual reference *to continue* has not been established.
  - Only applies with vertical guidance
  - You make the "continue-to-land" or "go missed" decision at DA while on the glidepath
- **VDP** – Visual Descent Point
  - Defined point on the final approach course of a non-precision straight-in approach procedure from which *normal descent from the MDA* to the runway touchdown point may be commenced

## Types of GPS Approaches

Approach Type	Vertical Guidance?	WAAS	Course Guidance	Minimums	Explanation
LNAV	No	No	Linear	400' MDA	Simple lateral GPS navigation
LP	No	Yes	Angular	300' MDA	GPS navigation like a localizer
LNAV + V	Yes	Yes	Angular	400' MDA	Lateral navigation + a programmed vertical glidepath
LNAV/VNAV	Yes	Yes	Angular	350' DA	Lateral navigation + Baro- or WAAS- aided vertical guidance
LPV	Yes	Yes	Angular	200' MDA	Lateral navigation + a precise WAAS glidepath

- LNAV = Lateral Navigation
- LP = Localizer Performance
- LNAV + V = Lateral Navigation + Advisory Glidepath
- LNAV/VNAV = Lateral Navigation + Vertical Navigation
- LPV = Localizer Performance with Vertical Guidance

## “RNAV”

- Area Navigation
  - “method of navigation that permits aircraft operation on any desired flight path within the coverage of ground- or space-based navigation aids or within the limits of the capability of self-contained aids, or a combination of these” (AIM 1-2-1)
- **RNAV (GPS)** – Uses the US GPS satellite system
- **RNAV (RNP)** – Required Navigation Performance (RNP) requires on-board navigation performance monitoring and alerting capability to ensure that the aircraft stays within a specific area
- There are RNAV (GNSS) approaches that use international GPS systems but US registered aircraft aren't allowed to fly these

## Constant Descents

- Without vertical guidance, diving and driving is acceptable but a constant descent is the best practice
- Multiply the descent angle (in degrees) by miles-per-minute (MPM), then add two zeros to the end (x100)