

GPS (RNAV) Procedures

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Terminal Arrival Areas (TAAs)

- A method by which aircraft equipped with a FMS and/or GPS are transitioned from the RNAV enroute structure to the terminal area with minimal ATC interaction.
- TAAs are depicted in the planview of the approach chart, and each waypoint associated with them is also provided with a *unique five character*, pronounceable name. The TAA is *not found on all RNAV approaches* however, especially in areas of heavy concentration of air traffic. When the TAA is published, it replaces the MSA for that approach procedure. The TAA consists of a designated volume of airspace designed to allow aircraft to enter a protected area, offering guaranteed obstacle clearance where the initial approach course is intercepted based on the location of the aircraft relative to the airport.
- The RNAV procedure underlying the TAA is the “T” design (also called the “Basic T”) or a modification of the “T.”
- The “T” design incorporates from *one to three IAFs*: an IF that serves as a dual purpose IF (IAF): a FAF, and a missed approach point usually located at the runway threshold. Three IAFs are normally aligned in a straight line perpendicular to the intermediate course, which is an extension of the final course leading to the runway, forming a “T.” The initial segment is normally from 3–6 NM in length; the intermediate 5–7 NM, and the final segment 5 NM. Specific segment length may be varied to accommodate specific aircraft categories for which the procedure is designed. See next frame.

GPS Approaches

GPS and Area Navigation (RNAV) instrument procedures and associated minima now include:

NON PRECISION GPS Approaches

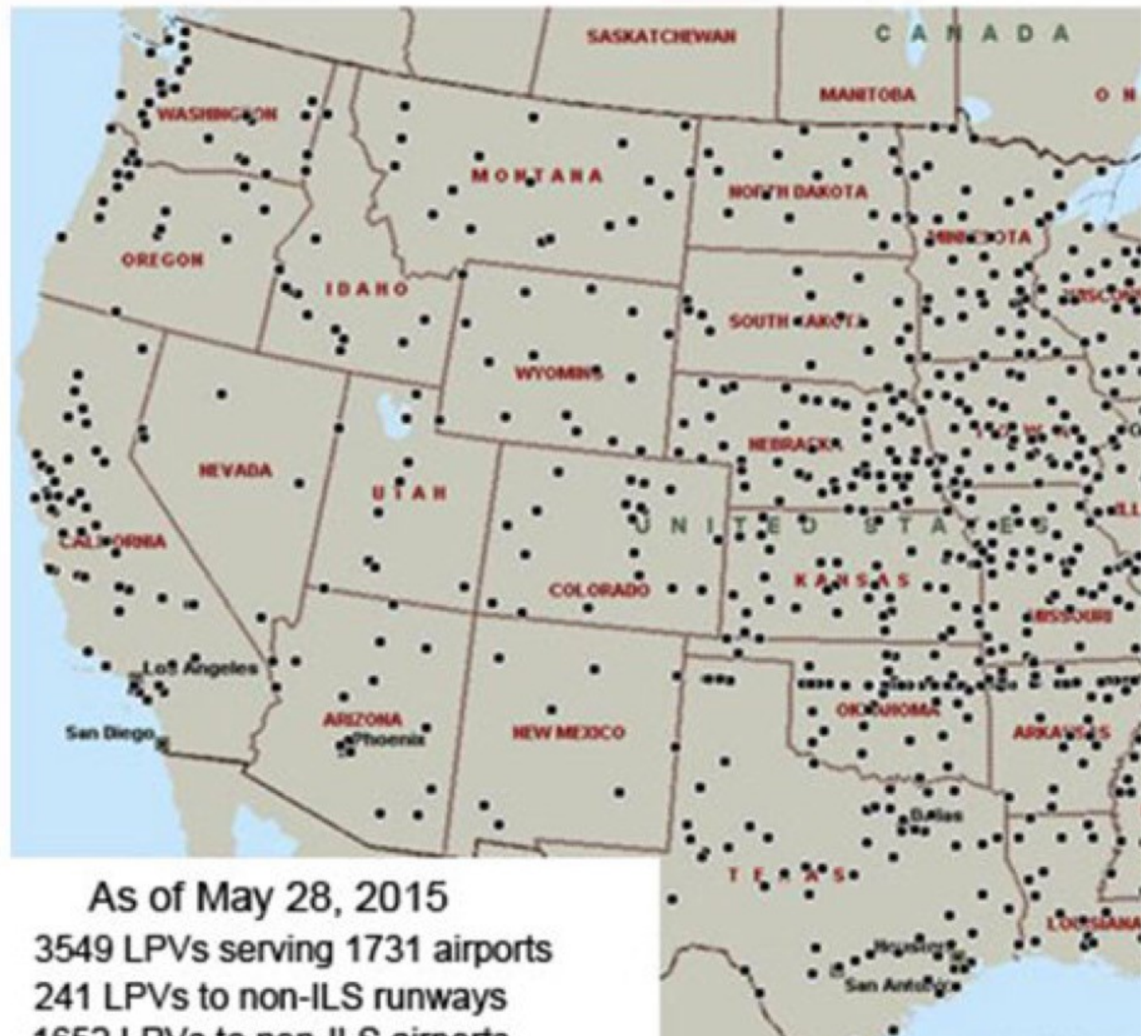
1. Conventional GPS Overlays – standard GPS lateral only replaced with LNAV
2. Lateral Navigation (LNAV), non-precision, lateral only guidance.
3. Lateral Navigation with Vertical ADVISORY (LNAV+V) Glideslope becomes active at the Final Approach Fix (FAF) but is ADVISORY only and not recommended for vertical guidance. Use stepdown distances only.
4. Localizer Performance Without Vertical Guidance (LP). Like LNAV, lateral nav, it is different in that it has an angular profile instead of the rectangular structure of LNAV. It more sensitivity the closer you get to the MAP. Think of it as the 21st century version of a localizer approach. It has a lower MDA than a LNAV.

PRECISION GPS Approaches (linked to GLIDESLOPE)

1. Lateral Navigation With Vertical Navigation (VNAV/VNAV), Requires WAAS or Baro-Nav equipment in aircraft. It was the first type, older version, of vertical guidance for GPS. It is less accurate than LPV
2. Localizer Performance with Vertical Guidance (LPV), It is the highest level of accuracy and is flown as if on an ILS.
3. Required Navigation Performance (RNP) for commercial aircraft with specialized equipment for lower DAs and Category III (0 visibility) capability

RNAV

Description	Total
GPS (Stand - Alone)	108
RNAV (LNAV)	5,964
RNAV (VNAV)	3,421
RNAV (LPV)	3,547
RNAV (LP)	592
RNAV (RNP) (Specials)	4
RNAV (RNP) (Public)	716
0.10	53
0.11	59
0.12	14
0.13	8
0.14	9
0.15	66
0.16	12
0.17	14
0.18	10
0.19	4
0.20	38
0.21	5
0.22	5
0.23	6
0.24	2
0.25	5
0.26	4
0.27	2



RNAV (GPS) Approach Using WAAS

WAAS was commissioned in July 2003, with IOC. Although precision approach capability is still in the future, WAAS currently provides a type of APV known as LPV. WAAS can support the following minima types: LPV, LNAV/VNAV, LP, and LNAV. Approach minima as low as 200 feet HAT and 1/2 SM visibility is possible, even though LPV is not considered a precision approach. WAAS covers 95 percent of the country 95 percent of the time.

NOTE: WAAS avionics receive an airworthiness approval in accordance with Technical Standard Order (TSO) C145, Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Satellite Based Augmentation System (SBAS), or TSO-146, Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Satellite Based Augmentation System (SBAS), and installed in accordance with AC 20-138C, Airworthiness Approval of Positioning and Navigation Systems.

Precision approach capability will become available as more GBAS (LAAS) approach types become operational. GBAS (LAAS) further increases the accuracy of GPS and improves signal integrity warnings. Precision approach capability requires obstruction planes and approach lighting systems to meet Part 77 standards for ILS approaches. This delays the implementation of RNAV (GPS) precision approach capability due to the cost of certifying each runway.

Video Examples

LNAV+V LNAV with vertical ADVISORY, NOT VERTICAL GUIDANCE

<https://www.bing.com/videos/search?q=LNAV%2fVNAV+Approaches+Tutorial+YouTube&view=detail&&mid=B0A272F58C68EEC27CF8B0A272F58C68EEC27CF8>

LPV APPROACH

<https://www.bing.com/videos/search?q=how+to+fly+gps+approaches&view=detail&&mid=B0026860DDEF397E309EB0026860DDEF397E309E&rvsmid=B0026860DDEF397E309EB0026860DDEF397E309E&fsscr=0>

RNAV Approach Summary Checklist

- Terminal arrival areas (TAAs) provide a seamless transition from the enroute structure to the terminal environment for arriving aircraft equipped with FMS or GPS navigation equipment. Typically, TAAs support transition from the enroute environment to the terminal environment and join the basic T design
- Without additional ground equipment, standard GPS does not provide vertical accuracy necessary for precision approaches. With the deployment of new GPS systems using WAA and local area augmentation system (LAAS), Category I precision is possible.
- LNAV/VNAV identifies minima developed to accommodate an RNAV instrument approach procedure with vertical guidance, but with integrity limits larger than those of a precision approach. Aircraft using LNAV/VNAV minima descend to landing via an internally generated descent path based on GPS, FMS, or other VNAV systems approved for approaches.
- LNAV minima are for lateral navigation only, and the approach minimum altitude is published as a minimum descent altitude (MDA) because vertical guidance is not provided. LNAV provides the same level of service as the present GPS stand-alone approaches.
- GPS overfly approach charts use existing approach procedures, and require the underlying ground navaids and associated aircraft navigation equipment to be operational, but not monitored during the approach as long as the GPS meets RAIM accuracy requirements. GPS stand-alone approach charts eliminate requirement for conventional navigation equipment to be operational during the approach to your destination airport.
- You are not required to monitor or have conventional navigation equipment for stand alone GPS approaches to your destination airport.

RNAV Approach Summary Checklist

- You must have conventional navigation equipment aboard your aircraft as a backup for enroute navigation, and to fly to an alternate airport if it becomes necessary. While you can conduct an approach to an alternate airport using GPS, you must have the capability of conducting the approach using conventional equipment.
- The GPS continuously monitors the reliability of the GPS signal using a system known as receiver autonomous integrity monitoring (RAIM)
- Your GPS receiver is required to have current data before it is used for IFR navigation.
- *You may not use hand held GPS equipment to conduct IFR operations.*
- There may be a variance between the distance displayed on your GPS receiver and the distance published on the accompanying procedure. This occurs because GPS uses a straight line between waypoints while DME data published on instrument charts is based on slant range to the respective station.
- When you receive radar vectors to final you generally will have to manually sequence ahead and select the leg to which you are being vectored. You should avoid accepting or requesting radar vectors which will cause you to intercept the final approach course within 2 NM of the FAWP (final approach waypoint).
- All VOR/DME RNAV procedures require at least two waypoints; some require 6 or more !!