

**TMF**

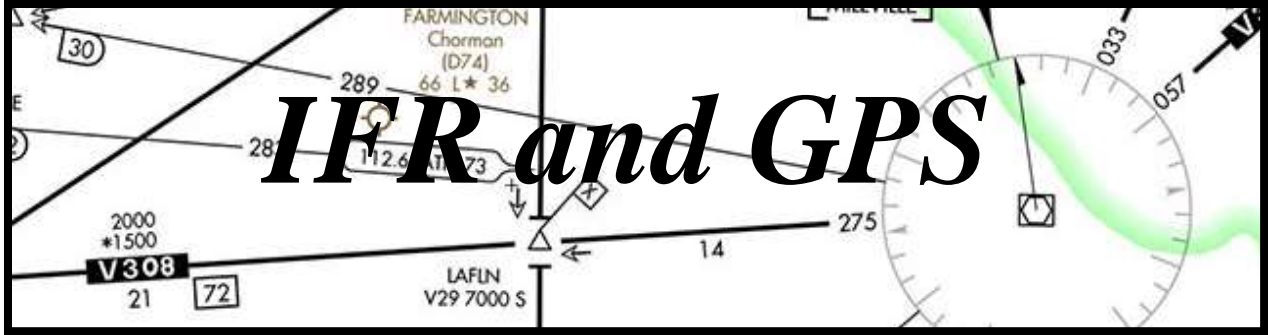
# All About GPS



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TMF



## **BEFORE YOU FLY, ENSURE YOUR DATABASE IS CURRENT**

Jeppesen's GPS NavData® Alerts and Database Cycles can be found at:  
<https://fly.garmin.com/fly-garmin/>

From The "Quick Links" menu, choose "Database Prices and Cycles"

Or simply [CLICK HERE](https://fly.garmin.com/fly-garmin/aviation_database_cycles.jsp) ([https://fly.garmin.com/fly-garmin/aviation\\_database\\_cycles.jsp](https://fly.garmin.com/fly-garmin/aviation_database_cycles.jsp))

### **APPROACHES YOU CAN and CANNOT USE**

You may fly an approach with your panel mounted certified GPS, if the approach indicates "RNAV (GPS)" or is an "overlay" on an existing approach, such as a "VOR or GPS" approach.



If your desired approach is an overlay approach, the 430/530 approach menu will

display "GPS" to the right of the overlay approach, for instance, **VOR 03<sup>o</sup>Ps**.

Examples of non-overlay approaches are an ILS, LOC or LOC BC.

If an NDB, VOR or TACAN approach is not an overlay, you must be able to receive the ground signal to legally use the approach. NDB, VOR or TACAN approaches are in the Garmin/Jeppesen database, and to improve situational awareness, you can load the approach in the GPS. However, course guidance must come from the ground signal.



### **USING a NON-WAAS GPS for IFR NAVIGATION**

The aircraft must have navigation equipment necessary to:

- Fly the route to the destination airport, and if an alternate is required, fly an approach at the required alternate airport without using the GPS.

**In addition:**

- All of the route's navigational aids must be operational, &
- The pilot must backup the route with a VOR.

## WAAS GPS BENEFITS

CATEGORY	A	B	C	D
LPV DA		1608-1	250 (300-1)	
LNAV/VNAV	DA	1685-1 1/2	327 (400-1 1/2)	
LNAV MDA		1740-1	382 (400-1)	1740
CIRCLING	1800-1 1/2 418 (500-1 1/2)	1840-1 1/2 458 (500-1 1/2)	1840-1 1/2 458 (500-1 1/2)	194

- Can be used as the primary navigation system from takeoff through landing, using “LNAV/VNAV”, “LPV”, or “LNAV” approach minimums.
- With WAAS, pilots can file for, and use, NAVAIDs that are NOTAMed out of service.

## SUBSTITUTING GPS FOR ADF & DME

(AIM 1-1-19 & 1-1-20)

An IFR GPS – either WAAS or non-WAAS – usually qualifies as a substitute for ADF and DME with the following exception:

If an approach is not a GPS overlay, such as an “**NDB or GPS**” approach, the aircraft must be equipped with an NDB to fly that approach.



### Non-WAAS GPS Alternate Planning – Exceptions Select another alternate if:

- The alternate airport’s only approaches are RNAV (GPS), **or**
- The alternate airport’s only approaches **requires** DME or ADF, and your aircraft does not have that equipment. (AIM 1-1-19 & 1-1-20).



### WAAS GPS Alternate Planning – Exceptions (AIM 1-1-20)

Although LNAV/VNAV and LPV approach minimums approximate ILS approach minimums, and Garmin & Jeppesen refer to them as “precision approaches”, the FAA still considers them to be **non-precision approaches**. Technically, they are classified as an Approach with Vertical Guidance (**APV**). This is an approach based on a navigation system that is not required to meet the precision approach standards of ICAO Annex 10, but **provides course and glide path deviation information**.

Therefore, if an alternate doesn’t have an ILS or PAR approach, it must have,  $\pm 1$  hour of the ETA, a forecast of **800 & 2**. (Not 600 & 2 as required by an alternate with an ILS).



## **GPS & RAIM (Receiver Autonomous Integrity Monitoring)** (AIM 1-1-19)

The GPS receiver verifies the integrity or usability of the constellation of GPS satellite signals to determine if a satellite is providing corrupt info. A RAIM failure will annunciate:



- **Two minutes after** the GPS can't see at least **5** satellites for integrity monitoring, or
- **Two minutes after** the RAIM integrity monitor detects a potential error.

### **RAIM Warnings on Approach**

- If a RAIM failure annunciates prior to the final approach waypoint (FAWP) – Execute a missed approach.
- If a RAIM failure annunciates after passing the FAWP – The receiver may continue to operate and allow you to complete the approach without a warning. If a warning appears – Execute a missed approach.

### **PREDICTING GPS RAIM, *Non-WAAS GPS***

Non-WAAS GPS users must confirm GPS RAIM availability prior to an IFR flight. Checking [www.RaimPrediction.net](http://www.RaimPrediction.net) satisfies this requirement. If you flight plan with [www.FitPlan.com](http://www.FitPlan.com), it automatically checks RAIM for you.

### **Wide Area Augmentation System (WAAS) NOTAMs**

GPS NOTAMs can be located online at [WWW.FAA.gov/pilots/flt\\_plan/notams/](http://WWW.FAA.gov/pilots/flt_plan/notams/)



From the “NOTAM Functions” menu, select “View All GPS NOTAMs”

#### **SAMPLE WAAS NOTAM:**

**!BOS BOS WAAS LPV AND LNAV/VNAV MNM UNREL WEF 0305231700—0305231815.**

In a WAAS NOTAM, the term “UNREL” means that the expected level of WAAS service may not be available.

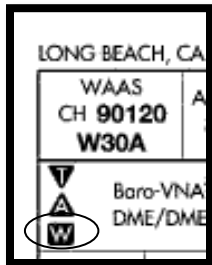
**WAAS NOTAMs are Predictive** and things could change.

For instance, using the sample WAAS NOTAM above: If upon arrival in BOS, it appears that the LNAV/VNAV or LPV service is available, (annunciated as such on the GPS), vertical guidance to LNAV/VNAV or LPV minimums is allowed.

If a WAAS NOTAM has not been included in the ATIS broadcast, controllers are required to tell pilots about the NOTAM as they clear him or her for a RNAV (GPS) approach.

## Negative “W” (No WAAS NOTAMs Symbol)

Airports that are on the edge of WAAS coverage may experience WAAS vertical guidance outages on a daily basis. At those airports, a negative **W** symbol appears on their RNAV (GPS) approach charts, meaning that WAAS NOTAMs **are not provided**.



At these airports, whether used for a destination or alternate, plan to use LNAV minimums. Upon arrival, if WAAS GPS annunciations indicate LNAV/VNAV or LPV, you may use the lower WAAS minimums.

Be prepared to revert to the higher “LNAV” minimums if a WAAS outage occurs.



## GPS TRAVEL TIPS

- If you're flying an overlay approach, like a “VOR or GPS-A”, or “NDB or GPS Rwy 24”, remember to back up the approach with your VOR or NDB, if installed.



- In most cases, GPS can substitute for ADF or DME. There are, however, exceptions:
  - **AT ALTERNATE AIRPORTS** - if the only approaches at your alternate require ADF or DME, aircraft with a non-WAAS GPS must be equipped to fly at least one of the approaches without the GPS.
  - **ADF APPROACHES** – If the approach is not a GPS overlay, like a “NDB or GPS” approach, the aircraft must be equipped with an ADF.
  - When cleared for a GPS approach, you must navigate to all the fixes.

## EXECUTE A MISSED APPROACH

**WHEN** a RAIM warning appears, or when the

GPS doesn't switch from ENR to:

- APR (Garmin 530/430 non-WAAS)
- or in the case of the Garmin 530W/430W, it does not switch to LNAV, LPV, L/VNAV or LNAV+V, within 2 nm of the final approach fix.
- Pressing and holding the COM flip-flop key for about 3 seconds switches the **active** frequency to 121.5.
- If you need to get a DME from an ILS localizer, you could enter the localizer identifier as your GPS waypoint, i.e., I-ABE entered as IABE. **NOTE:** Some localizer IDs are NOT in the database.



## GPS AND DATABASE LIMITATIONS

(1) GPS systems are so good, that we often forget that paper or Electronic Flight Bag (EFBs), such as ForeFlight, Garmin Pilot, Wing X, etc. En-route charts, as well as departure, arrival and approach charts are still required and necessary for flight. The GPS does not provide all the navigation information needed to conduct a safe and legal flight. GPS IS NOT A CHART SUBSTITUTE. Always confirm that the waypoint or NAVAID is at the correct location.

(2) Not all instrument flight procedures can be coded into a SID (DP), STAR, or approach procedure. “Uncodeable” procedures, like those containing radar vectors or complicated contingent instructions, ARE NOT INCLUDED IN THE DATABASE.

(3) Step-down fixes between the FAF and MAP are not included in the database because not all systems can handle the inclusion of step-down fixes. YOUR DATABASE MAY NOT INCLUDE EVERY LEG OR SEGMENT OF THE PROCEDURE YOU'RE FLYING.

(4) If you don't have a chart to fly an approach, you are not authorized to fly it. For instance, you should not fly to private airports, or execute private, or helicopter approaches.



When passing each RNAV waypoint, think -

### “SOURCE, FORCE, and COURSE”



**SOURCE** — Verify that the correct CDI SOURCE is being used for navigation, (GPS or VLOC).

**FORCE** — VERIFY THE CORRECT GPS MODE:

Enroute (“ENR”), Terminal (“TERM”) and Final Approach Sensitivity, such as -

“APPR”, and “0.3” for the **430/530**, and

“LNAV”, “LPV”, “L/VNAV”, and “LNAV+V”, for the **430W/530W**.

**COURSE** — Put the proper COURSE in the CDI/HSI. Don't wait to be prodded by your GPS.



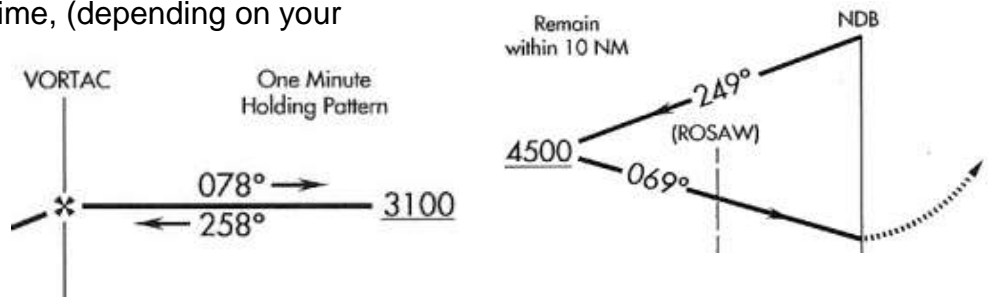
## Non-WAAS GPS and the AUTOPILOT

If you have a **430** or **530**, (non-WAAS), your autopilot will not fly a charted holding pattern's outbound leg, or a procedure turn's 45/180.

## WAAS IS GREAT, BUT DON'T BE A SPECTATOR

If you have a **430W** or **530W**, and **GPSS**, the autopilot will follow the magenta line and fly the entire holding pattern and/or procedure turn.

**CAUTION:** Don't be a spectator! Watching the 430W/530W do it's thing can be fascinating. However, you are still responsible for ensuring that the holding pattern does not exceed the required time, (depending on your altitude), and that the procedure turn or holding in lieu of procedure does not exceed the charted "remain within" distance or time.



## RNAV / GPS Direct Flight Planning

- Avoid all sensitive areas such as TFRs, Restricted, and Prohibited areas.
- Your route should include one "real fix" – a fix that ATC will recognize – in each ARTCC area.
- ATC requires radar coverage and monitoring for a direct flight.

**Unpublished RNAV Routes** are direct routes based on area navigation / GPS capability between waypoints defined by:

- Latitude/longitude, *or*
- Degree-distance fixes, *or*
- Offsets from established airways at a specified distance and direction.

All unpublished RNAV routes require ATC radar monitoring.

Chapters in a Book

There are four chapters in the GNS 430W/530W



*Chapters are accessed with the LARGE knob*

*NAV, WPT, AUX and NRST*