

## Six Deadly Mistakes that Experienced Pilots Make on GPS Approaches

Despite their versatility, proliferation, and promise, GPS approaches aren't used very often. Unless their home base is a field served only by a Global Positioning System (GPS) approach or they frequent fields where GPS approaches are used, most pilots probably don't even know when to execute a GPS approach! This is unfortunate, because, barring ceilings or visibility that would require an ILS approach, the GPS approach may offer the greatest ease of use and the lowest minimums of any instrument approach to the field.

Because a GPS receiver is a computer, the standard "Garbage In, Garbage Out" rules apply. Adding to this, there is no standard for data input or output for GPS receivers, so manufacturers engineer very different units! Button sequences and procedures are even quite different on units from the same manufacturer. Given this, the number one mistake ALL pilots make is not being intimately familiar with their GPS receiver. Like setting flaps or changing RPM settings, a proficient pilot should be able to input and select data in their GPS receiver blindfolded!

However, assuming a pilot has read the information in the Aircraft Flight Manual supplement, and knows how to use the receiver, there are 6 deadly mistakes that experienced instrument flyers routinely make. This special report will examine the mistakes, why they happen, and explain what you can do to avoid them in your flying.

### **MISTAKE #1 - FAILURE TO REQUEST THE APPROACH**

If an airport has multiple types of approaches, you may be automatically assigned a type of non-precision approach other than a GPS approach. This is because (believe it or not) not all aircraft are equipped with approach-certified GPS receivers. Most, if not all, are equipped with at least one VOR receiver, so local controllers will designate the VOR or NDB approach "in use." In most cases, however, if an airport has one or more GPS approaches, they will better serve your needs, result in a more precise approach, and decrease the low-level maneuvering required to line yourself up with the runway.

As the Pilot in Command you are responsible for knowing all data pertaining to your flight. If you don't evaluate the pros and cons of all the approaches to your destination, including ease of the approach and Minimum Decent Altitude (MDA) you are shirking that duty! You should look at all of the approaches to your destination, make a command decision as to which approach best suits your needs and request that approach.

For example, the preferred approach to Camarillo Municipal in California is the VOR/DME RWY 26 approach. Comparing this approach to the GPS/RNAV RWY 26 approach, however, you should notice immediately that the MDA on the GPS approach is 200 feet lower. I listened to airplane after airplane divert from Camarillo early one morning, made a successful GPS

approach to the airport, and then watched professional pilots follow me in. They did not know that they had to ASK FOR THE GPS APPROACH until they heard me ask for it.

### **MISTAKE #2 - FAILURE TO LOAD THE APPROACH**

Although many veteran pilots will try, the approach waypoints can not be manually entered into the flight plan. To be approach certified, your GPS must allow you to load the entire approach straight from the database. In fact, **THE APPROACH CAN NOT BE LEGALLY FLOWN** unless the approach is loaded directly from the database. This is to ensure the user does not inadvertently select a waypoint from the database similar yet distinct to one of the approach waypoints and tells the unit to ramp down to approach sensitivity (see Mistake 3).

The procedures for loading the approach vary slightly on different models of GPS receivers, but the basic idea is the same on all of them. In either a procedure menu (Garmin) or on the airport information pages (King/Apollo) there is a list of approaches to your destination. When you select an approach, the GPS receiver will ask for the appropriate Initial Approach Fix (IAF) or give you a vectors-to-final option. This approach is then automatically loaded into the active flight plan. Upon receiving a “Direct-To” or vectors for the approach, select the waypoint in the approach section of the flight plan. That bears repeating: select the waypoint in the APPROACH section of the flight plan. If the waypoint is selected in the ENROUTE section of the flight plan, auto-sequencing will occur in an unpredictable manner.

### **MISTAKE #3 - FAILURE TO ACTIVATE THE APPROACH**

After successfully requesting the approach and loading it into the GPS, many experienced IFR pilots will still forget to activate the approach! On older GPSs, this is sometimes called “ARMING” the approach, but on all approach certified GPSs, you must tell the receiver that it is time to activate the approach.

To understand the importance of activating the approach, you must realize that full scale deviation using GPS navigation changes depending on the segment of flight. At thirty miles from your destination, the GPS unit tapers from 5 nm full scale deviation to 1 nm full scale deviation. In other words, if you are one dot off your course at 35 nm from the destination and hold your track, the unit will taper its sensitivity so that you are suddenly off course by the FULL SCALE! Failure to recognize this tapering may result in massive overcorrection to recapture the centerline of the selected track. Similarly, two nautical miles from the final approach fix, the unit tapers full scale deviation to .3 nm, but only if the approach is activated. If the approach is not activated, the course deviation indicator will continue to indicate 1 nm from the centerline, too broad to make even a non-precision approach!

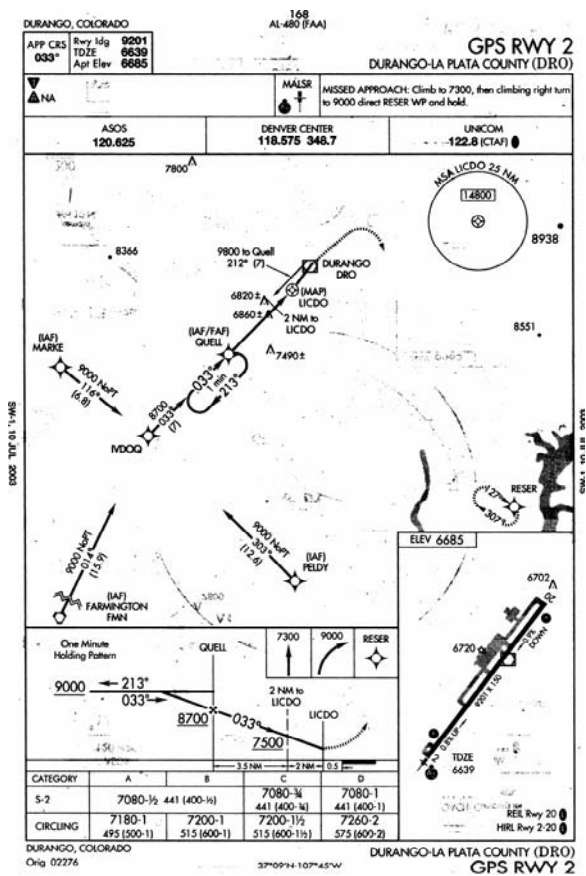
Since there is no standard for design and use of a GPS receiver, the procedure to activate the approach differs from unit to unit. For example, on the Garmin GNS 400/500 series, the pilot selects the “PROC” key, highlights “Activate the approach” and selects the “ENT” key. You must read the Aircraft Flight Manual supplement associated with your unit and make sure you know how to activate the approach you are using.

## MISTAKE #4 - ACCEPTING VECTORS TO THE FINAL APPROACH COURSE

At least in the Southwest, GPS approaches are not commonly used. Therefore, controllers treat them as an ILS or VOR approach and typically give you vectors to final. Many experienced instrument pilots willingly accept those vectors, get slam-dunked onto the centerline, and struggle to catch up with the approach. While vectors may be an acceptable way to start an “Overlay” approach (where the GPS course is overlaid on an existing VOR or NDB approach), GPS/RNAV approaches are specifically designed to be flown as an entire approach.

GPS/RNAV approaches are typically designed as a giant “T” or “Y”. IAFs are located on each of the branches (think base leg of a traffic pattern) and provide step-downs to the final approach course. The GPS receiver solves the “centerline-to-centerline” turn equation, and directs your turn at the appropriate time to finish on the centerline of the final approach course. **NO CONTROLLER CAN TIME THAT TURN BETTER THAN YOUR GPS RECEIVER.** You will arrive on the final approach course at a stabilized altitude and airspeed, ready to configure the airplane for landing well ahead of the final approach fix (FAF). Additionally, the GPS receiver will have plenty of time to make a smooth transition from Terminal to Approach sensitivity.

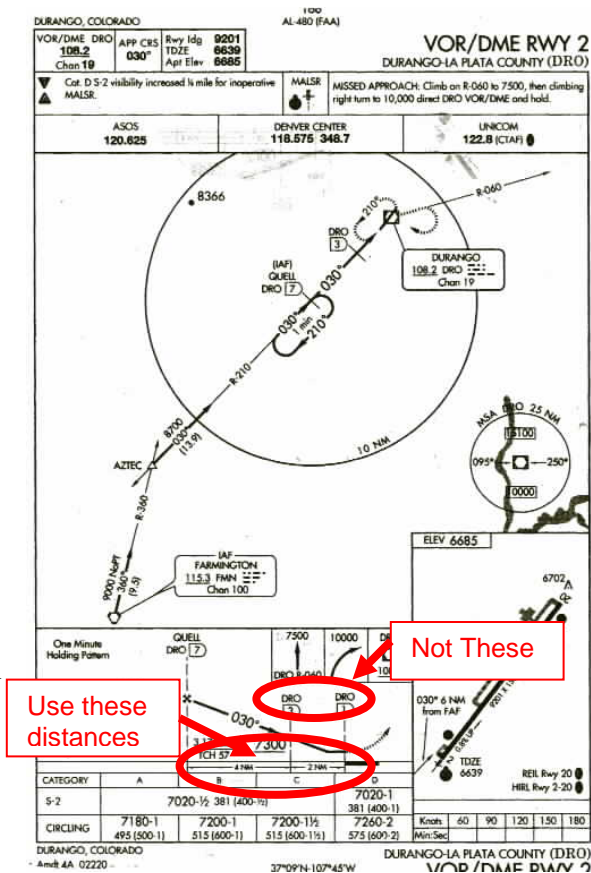
Avoiding this mistake goes back to requesting the approach. Ask the approach controller for a “Direct-To” clearance to the closest IAF for the GPS/RNAV approach. For example, “Denver Center, N123AB request direct-to MARKE for the GPS RWY 2 approach.” This not only tells the controller that you want the GPS approach, but also indicates that vectors-to-final are not acceptable.



## MISTAKE #5 - MATH ERRORS ON OVERLAY APPROACHES

A typical VOR approach lists the step-down fixes in the planform and profile views by DME distance to the VOR. Using GPS, however, the distance shown is to the next waypoint. Therefore, many experienced pilots become disoriented when flying “overlay” approaches because they fail to do the math to translate the difference between DME distance and distance to the next waypoint. Many incorrectly believe themselves to be closer to the station than they actually are!

For example, QUELL is shown as 7 DME from the Durango VOR. The intermediate stepdown fix is shown as 3 DME from the DRO VOR. However, a pilot flying the GPS overlay to this approach between QUELL and the stepdown fix will see a distance on the GPS receiver of between 4 and 0 nm. If the pilot did not recognize that the distance shown is to the stepdown and not the DRO VOR, he may incorrectly believe himself to be well inside the stepdown and proceed below the minimum altitude for that leg to the minimum descent altitude.



You can avoid this mistake by realizing a GPS unit only navigates from waypoint to waypoint and shows the distance to the next waypoint in its active flight plan. Therefore, the DME distances shown in the planform and profile views of the IAP are irrelevant. Instead, you should refer to the distances shown UNDER THE PROFILE VIEW. Yes, the nice people at the FAA have done the math for you! Those are the distances that will be reflected on the GPS receiver.

## MISTAKE #6 - FAILURE TO AUTO-SEQUENCE AT THE MISSED APPROACH POINT

Another requirement to be approach-certified is that THE GPS UNIT MUST SUSPEND AUTOMATIC SEQUENCING OF WAYPOINTS INSIDE THE FINAL APPROACH FIX. In other words, the FAA mandates that your GPS quit working like it does 99.9% of the time precisely at the highest pilot workload moment! Why? Precisely because it is a high workload situation.

If you allow your autopilot to fly your airplane “Direct-To” a waypoint that is not on the unit’s active flight plan, you will notice that upon arrival at the waypoint, the autopilot continues on the selected course on the other side of the waypoint. This is because the GPS receiver does not auto-sequence to the next waypoint in the flight plan and give the autopilot a different direction

to go. Now translate that to the final approach. If you reach the missed approach point (MAP) and the GPS receiver does not auto-sequence to the next waypoint, the autopilot will continue on the final approach course until told to do differently. After all, what safer place is there in the entire sky than the area immediately over a runway?

Remember, the GPS navigates from waypoint to waypoint. It does not understand missed approach instructions such as “Climb to 7300, then climbing right turn to 9000 direct RESER WP and hold.” The GPS just knows that the next waypoint is RESER. So, if it auto-sequenced at the MAP to RESER, the autopilot would begin an immediate right turn to RESER! If the pilot was not quick enough to disengage the autopilot at or before the MAP, the aircraft would turn away from the landing runway or fly a non-published missed approach procedure. Therefore, the FAA requires the GPS to suspend auto-sequencing inside the FAF to keep the airplane pointed directly down the runway.

Many instrument pilots fail to tell the GPS to resume auto-sequencing once the decision has been made to go around. They disengage the autopilot (or select “Go-Around” mode) at the MAP, climb on the required heading, and select “Direct-To” on the GPS receiver. They are stunned to find the receiver attempting to take them DIRECTLY BACK TO THE MAP!

Avoid this mistake by resuming auto-sequencing at the MAP as part of your missed approach checklist (you do mentally brief yourself on missed approach and go-around procedures before beginning descent to the MDA, don’t you?). Again the procedure to resume auto-sequencing varies from unit to unit, however, it can be done on all receivers with a single button. Then, at the correct time, when you select “Direct-To” the GPS will navigate to the next waypoint in the missed approach procedure.

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Pilots can avoid all of these mistakes by being familiar with the GPS receiver they are using, thoroughly reading and understanding the Aircraft Flight Manual supplement that came with the receiver, and receiving competent instruction from a Certified Flight Instructor who is also intimately familiar with your GPS unit (and autopilot, and annunciators, etc.). Finally, practice, practice, practice. The time to become familiar with your GPS receiver is not when you are making an IFR approach!

Brock Lorber is a Corporate Pilot and FAA Certified Flight Instructor (Single and Multi-Engine Land Airplane, Instrument Airplane) with over 2,000 hours of instruction given. For more flying tips visit his Internet Website at <http://www.southwestcirrus.com>.

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