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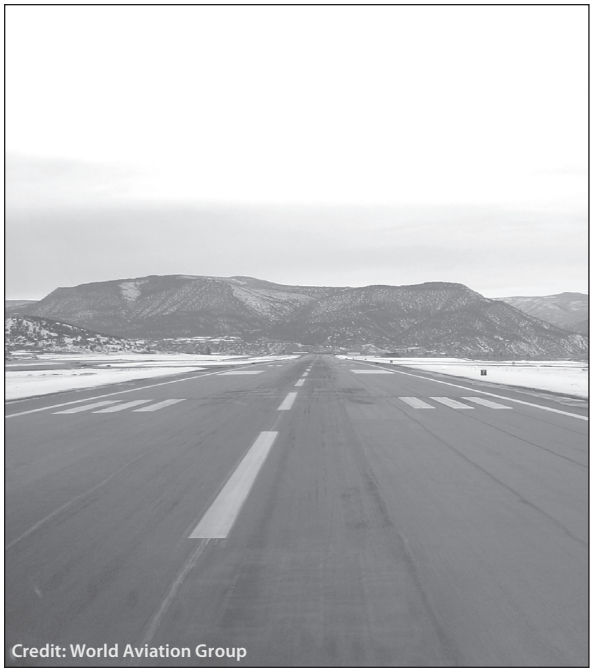

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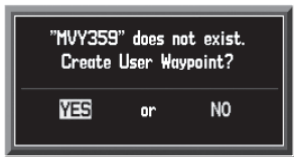

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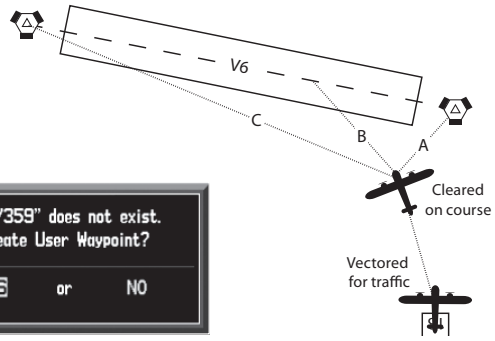

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USING USER WAYPOINTS

You can mark your Uncle Bob's fishing camp with them, but user WPTs can be just the right tool for the serious IFR pilot.

by Neil Singer

IFR GPS units are now so ubiquitous in aircraft that nearly every current IFR pilot understands the basics of direct-to operations and other simple GPS tasks. Most pilots of technically advanced aircraft (TAAs) have operational familiarity, if not mastery, of flight plans, GPS approaches and other intermediate tasks. Few pilots, however, have an appreciation for the oft-overlooked ability to create a user waypoint (UWPT). Most dismiss it as a cheap parlor trick to mark their house for flyovers.

Nothing could be further from the truth; in fact, creating UWPTs with the Flight Management System (FMS, the big-jet equivalent of an IFR GPS) was the subject of a detailed module during my regional-jet initial training. While there is almost always another way to accomplish tasks for which UWPTs are ideal, a well-crafted UWPT is typically more elegant, functional and accurate.

You Point It

A UWPT is simply a waypoint whose location (and, usually, name) is defined by the pilot. There are five ways to define that location: using a radial and distance from a known waypoint (or theta-rho); two radials from two known waypoints (theta-theta); a set of latitude and longitude coordinates; a position on the moving map; or the aircraft's current position. Different scenarios merit different methods for defining the waypoint.

For Garmin navigators the first three methods require inputting data into the UWPT creation page. This is found on the last page of the WPT chapter on G400/500 units, or may be entered in the G1000 by selecting "Create New User Waypoint" from the pop-up menu on the last page of the WPT chapter. Here's a power tip: Rather than locating the page by knob turning, it can be accessed more easily by simply entering into a flight plan a WPT name that does not exist. The navigator will then inform you that the WPT does not exist, and ask if you would like to create a UWPT. Answering "Yes" will take you to the creation page, and you will be returned to the flight plan when creation is complete.

There are two points to keep in mind when inputting data in the UWPT creation page. The first is that you can ignore the fields you aren't using. So if you're creating a UWPT by the location of two crossing radials, simply skip over the field that asks for distance. Or when using theta-rho, only one reference WPT is used, so ignore the second line that asks for info on another reference WPT. The second point is that once you start entering data into a field, you can't move to the next field with the wide knob (as would normally be the case) until you hit Enter.

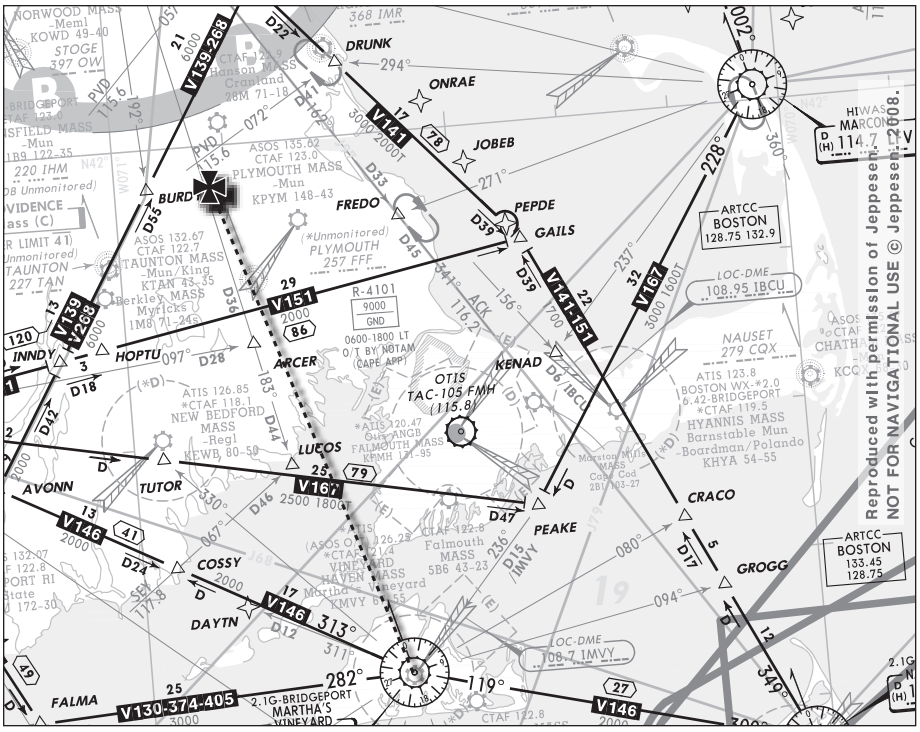
Creating user waypoints with the Flight Management System was a detailed module during my regional-jet initial training.

Snag a Radial

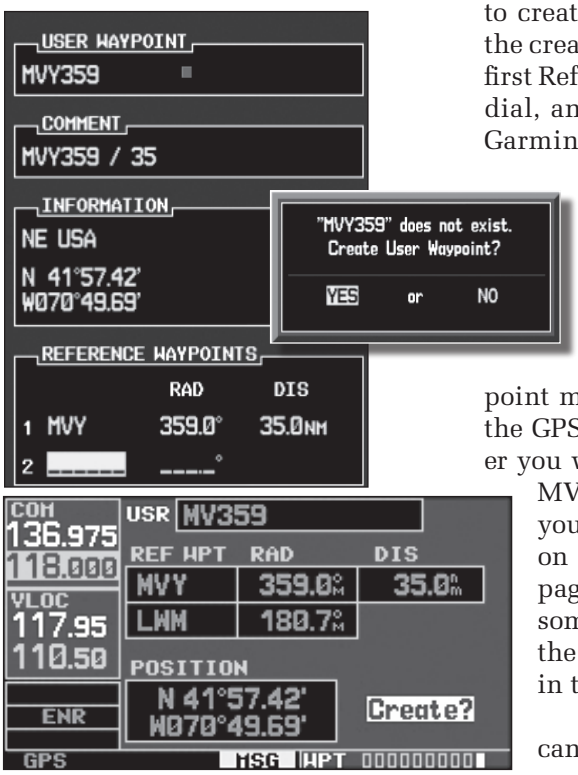
Here's a clearance frequently heard up here in the northeast: " … direct to the Martha's Vineyard 359 radial, 35 DME fix, direct Martha's Vineyard ... "

This is one case where the only simple method of

Right: *It's nice to have an over-the-ground course line when diverting visually, or in IMC, around nasty, convective buildups.*



Above: *Going direct to the 35 DME mark on some radial makes a controller's life easier but isn't exactly intuitive for the pilot. The trick is easy and accurate with GPS (**below**). On popular Garmin units, you can create a user waypoint at a distance from the VOR on a specific radial. You can do the same with many handheld GPS units, too, so you don't need a fancy panel-mount for expert nav.*



compliance is to utilize a UWPT (unless you happen to have an old RNAV unit on board). As the fix does not exist as a named waypoint, we'll need to create a user waypoint there. Entering a WPT into our active FP with the title of MVY359 (Garmin 400/500 units only allow for 5 digit WP titles, so we can use MV359), and entering "Yes" when prompted to create a UWPT will bring us to the creation page. Input MVY as the first Reference WPT, 359.0 as the radial, and 35.0 as distance. On the Garmin 400/500 ignore the second reference WPT and distance fields (which will be already filled in by the GPS), and select Create. Voila! We can now proceed directly as cleared.

The name of the waypoint means absolutely nothing to the GPS, so you can call it whatever you want. FRED15 is as good as MVY359 to the GPS. However, you will see the UWPT name on your MFD or moving map page of the GPS, so name it something meaningful to you, the decidedly analog computer in the aircraft.

Theta-rho UWPT creation can be used to comply with another type of IFR clearance puzzler: " … after takeoff, fly heading 360, intercept the Lawrence 290 radial outbound, expect vectors to Concord, then as filed ... "

Here, ATC's intention is to send us outbound on a radial until we are far enough away from the terminal area to clear us on course. We could comply with this clearance by using the raw VOR signal, or the slightly trickier OBS mode of our GPS. But both have the disadvantage of not drawing the desired course line on our moving map in many GPS/MFD installations.

So we create a flight plan and insert the Lawrence VOR (LWM) followed by a point we'll call LWM290. We'll input LWM as the reference WPT, 290.0 as the radial, and 100.0 as the distance. Note that the distance we pick doesn't matter, as long as it's far enough away from the VOR that we'll never get to it. Return to the flight plan, and by activating the leg between LWM and LW290, we'll be ready for flight, with a magenta line drawn on the MFD and GPS showing the position of the 290 radial.

Theta-theta creation comes up less frequently, but can be all the more perplexing for its infrequency. Consider the following clearance: "After departure fly heading 140, intercept the Lawrence 080 radial to join Victor 3, as filed ... "

What we'd like to do is this: Create a flight plan from LWM to a point where the LWM 080 radial intercepts V3, to PSM (the first fix on V3), then onward. To accomplish this, we'll enter a UWPT between LWM and PSM in our flight plan and call it LWM080. In the UWPT creation page we'll set the first reference WPT as LWM, and the radial as 080.0. We'll skip over the field asking for distance from LWM, as we don't know it, and won't need it. We then set the second reference WPT to PSM and the radial to 201.0 (which defines V3).

By activating the leg between LWM and our created point, we'll be set to intercept and navigate the 080 radial; by creating a flight plan, the GPS will autosequence to V3 once

we've intercepted. We'll have front-loaded our workload: A little more time on the ground will mean greater ease of navigation in the air.

Throwaway WPTs

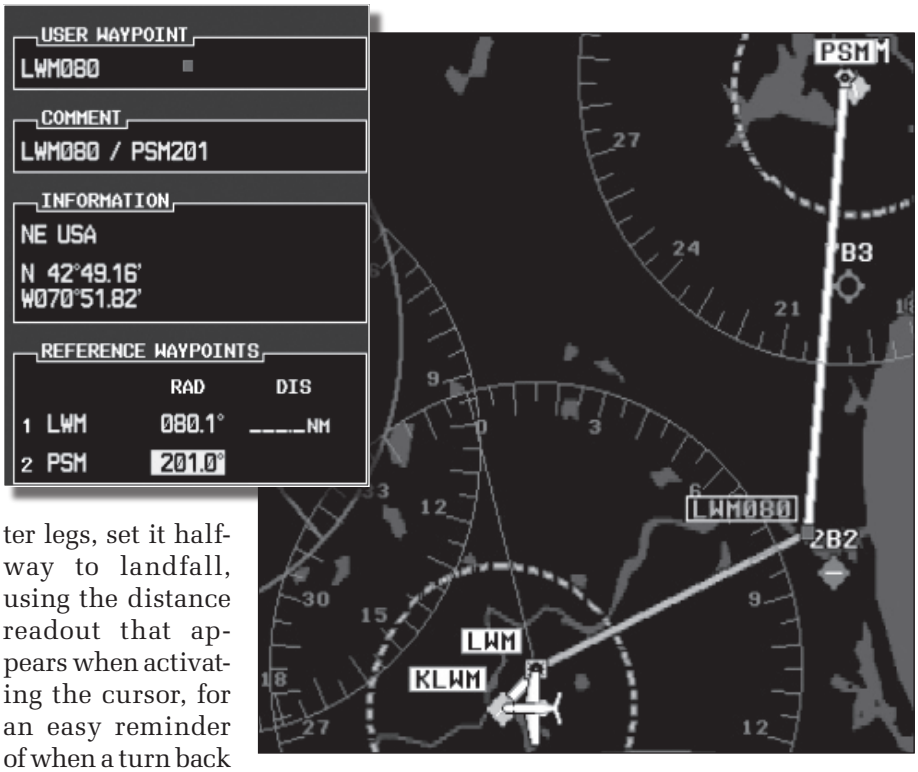
Creating a UWPT from the moving map is the most versatile of the methods, and lends itself to use in a variety of scenarios. Called "+MAP" by Garmin 400/500 units, a "MAP-WPT" by the G1000, the map-derived UWPT can be inserted into a flight plan, and is dynamic in that its location can be easily changed, and the unit will recalculate flight plan legs automatically. As an example of where this capability is useful, let's look at using the MAPWPT to navigate around an area of convective weather.

Having identified via nexrad an area of convection between us and the ABC VOR, the active WPT in our flight plan, we wish to deviate left of course. ATC says to deviate as necessary, then proceed direct to ABC when able. Using the cursor on the moving map of our GPS/ MFD, we scroll to a point far enough from the convection that a turn back on course looks doable.

With the cursor at the point where we would like the MAPWPT to be, we hit the Direct button on our navigator. We will be asked to confirm direct to MAPWPT, and after selecting Enter, a course from our present position to the MAPWPT appears.

To link that leg to our flight plan, we insert MAPWPT before ABC. Now that MAPWPT is in the flight plan, we can adjust it as needed to maintain distance from the convection. If we see that our original turn will bring us too close to the cell, we simply move the cursor further out, select Direct and Enter and watch the FP be redrawn on the screen. This is a tremendously useful tool, as seeing our intended flight path drawn on the MFD is worth a thousand guesses as to whether our intended path is a good one or not.

The use of the MAPWPT is only limited by imagination. On overwater legs, set it halfway to landfall, using the distance readout that appears when activating the cursor, for an easy reminder of when a turn back is no longer the best option in the event of trouble. Flying into or near busy metro airports, mark the location where heavy airline traffic crosses your flight path for wake-turbulence awareness. Flying VFR, use the MAPWPT to make avoiding special use or Class B airspace a breeze. Insert it into your FP, even if it's a FP of only two points, and adjust the position on the map until you achieve the optimal path to efficiently steer clear of airspace.



Above: *Once you've created the waypoint, it's a snap to put it into your flight plan—great when your usual departure contains an unnamed intersection.*

Waypoint, Mon!

Lat-Long input may be the most infrequently used method of UWPT definition, but it still has value. Many private airports are excluded from GPS databases, but the airport itself may be open to the public, or to a large segment of the public. For example, in the Bahamas, many nominally private airports are part of resorts, and are open to anyone stopping by for a stay, a meal, or even just a drink (presumably a non-alcoholic one if you're not exercising the option to stay awhile).

Trying to navigate to the airport by ICAO identifier will cause to GPS to draw a blank, and default to trying to create a UWPT. In the aforementioned case of flying in the Bahamas, the indispensable Bahamas and Caribbean Pilot's Guide, the bible for island fliers, lists the Lat/ Long of every airport in the islands. Some quick data entry from the UWPT creation page allows for normal navigation.

GPS Zen Master

Most of the tricks we can perform with UWPTs can be achieved otherwise, by using "close enough" headings, or (horrors!) by reverting to tuning VOR's for intercepts. But the mark of a professional approach to IFR flying is to always search for the most functional and elegant solution to a given task. Staying in GPS navigation allows for a more accurate, stable and autopilot-friendly solution—a triumvirate to please any IFR pilot.

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