EFIS—HINTS AND TIPS TO EXERCISE

The advent of GPS and Electronic Flight Instrumentation Systems (EFIS) for GA aircraft ushered in an era of amazing capabilities.

By Joe Shelton

When I purchased my Garmin G1000-equipped Columbia eight years ago, I was told by three airline pilots that the G1000 was better than what they flew with in their Boeings and Airbuses.

The technology has matured and there are now several EFIS/GPS manufacturers. Because of my familiarity with the G1000, these hints and tips are slanted towards it. Other brands you fly may have some or all the same capabilities. I separated these tips into six categories to make them easier to grasp. Let me challenge you to become intimately familiar with these capabilities to make your flying safer and more pleasurable.

Autopilot

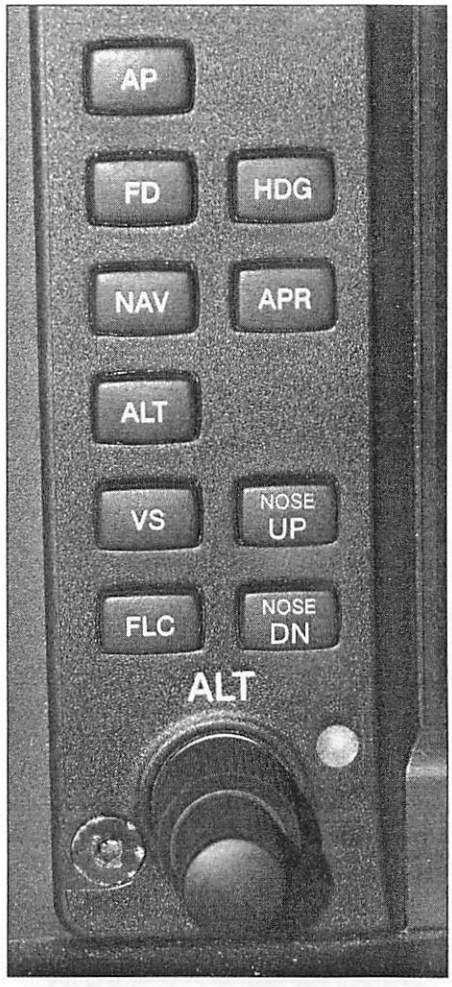
The autopilot is an important function, and the pilot must understand the various modes and button-ology to get the most out of it. First, get ahead of the game by programming it as much as possible before takeoff. It's best to use a bottom-up flow to set the AP: 1) Enter and activate the flight plan; 2) Select the departure procedure if appropriate; 3) Press VS to activate the vertical speed; 4) Press NOSE UP/DOWN to enter the desire climb rate; 5) Press HDG to set heading hold mode; 6) Set the Heading Bug to the initial heading (usually runway heading), and finally; 7) Verify all settings on the PFD's Navigation Status Bar. Pressing AP will then couple the autopilot.

The G1000's autopilot will command a climb at whatever rate (vertical speed) is set, but this can get you into trouble if a rate is selected that the aircraft cannot achieve or maintain as the altitude increases. As the AP pitches up attempting to maintain the VS rate; the airspeed can drop-off to the point where the AP will disconnect (typically about 70 knots). To adjust the VS rate, simply press NOSE DN to decrease the commanded rate by 100 fpm for each push.

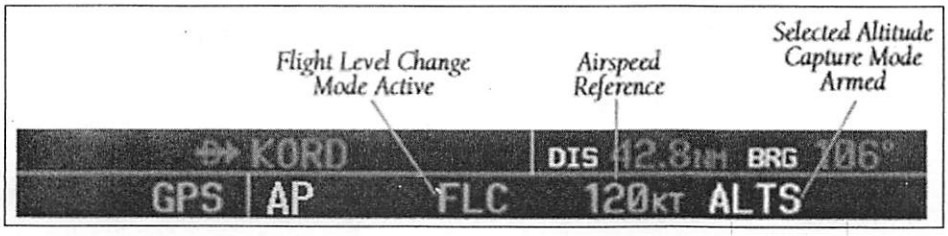
But another mode is more useful. FLC is Garmin-speak for Flight Level Change, or in more pedestrian terms, a constant airspeed climb or descent. Use it for Vx or Vy or extended cruise climbs (for additional engine cooling). Again, use NOSE UP or NOSE DN to change the airspeed one knot per push. Don't forget, there are minimum altitudes at which the AP can be engaged—400 feet for the Columbia and 800 feet for the Cessna 182.

Setup & Navigation

Given the redundancy of the PFD and MFD controls (both bezels have the same set of buttons), consider operating the G1000 using an inverted T orientation. Only use the bottom soft-buttons on each display and all the controls between the two displays—ignore the controls on the



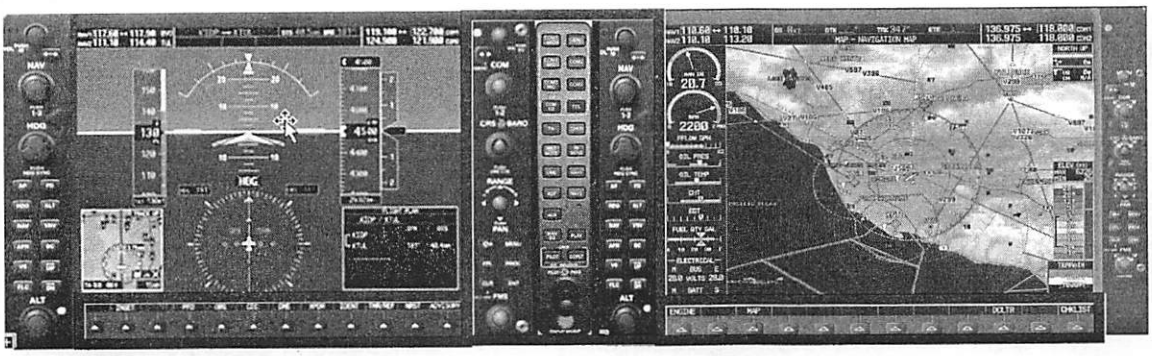
The Auto Pilot is arguably the most useful function in the cockpit for single-pilot operations. Know each mode and button.



Keep the Navigation Status Bar in your scan and verify each change in Auto Pilot mode with its presentation. Note here that Flight Level Change (FLC) has been selected with a speed of 120 knots and that Altitude Capture Mode (ALTS) is armed.

left side of the PFD and the right side of the MFD. This puts all the keys in your immediate scan.

To set up the G1000, start at the bottom right of the MFD, working across the bottom toward the center of the panel (checking that the appropriate traffic/weather/terrain icons are visible in the MFD), then up the left face of the MFD setting the autopilot, heading, and nav frequencies, verify the switch panel is set correctly, then down the right side of the PFD entering the com frequencies, altimeter, and etcetera. Finally, left across the bottom of the PFD. This flow makes setup a snap, especially if you touch each control and think about how it needs to be set.



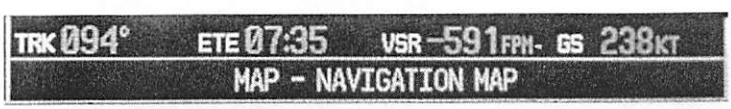
Regardless of the type of EFIS you fly, know the modes and functions of each button and display—especially if you are a renter. The inverted T technique works well for setting up the G1000.

All four fields in the MFD's Nav Status Box can easily be changed to show data pertinent to any phase of flight. My default choices are: TRK / ETE / VSR / GS . Track (TRK) is useful because comparing the PFD's BRG value and the MFD's TRK value allows hand flying as precisely as the autopilot. If the two values are identical, the aircraft should maintain the course. If there's even a one-degree difference, the aircraft will diverge from the desired route. Comparing these two values makes it easy to hand-fly approaches.

You might think that the HDG and CRS displays above the HSI are equivalent to using TRK and BRG, but they aren't. HDG includes wind correction while TRK shows the actual ground track—and that's what matters.

I also added the Vertical Speed Required (VSR) field. It shows the descent or climb rate needed to reach a user-specified altitude at a specific waypoint. VSR is useful for determining when to request or initiate an altitude change. For example, sometimes controllers will issue a slam dunk arrival that may not be comfortable for aircraft or passenger. Decide on a desired descent rate, monitor the VSR field, and then request a descent as it nears the desired descent rate.

When given a mandatory crossing altitude, use VSR to determine the climb or descent rate required. It's also handy when VFR to know when to initiate a descent into an airport traffic area. Just add the VSR field to MFD's Nav Status Box. Then enter the desired or reference altitude to the specific waypoint on the MFD Flight Plan page, and the target vertical speed (VS TGT) in the Current VNAV Profile box. I use a comfortable 500-fpm descent.



The Navigation Status Box at the top of the MFD can display a variety of flight data that are user selectable.

Pilots should know their aircraft V-speeds and the G1000 offers the option of displaying three (Vx, Vy, Vg) on the Airspeed Tape. Having Best Glide displayed can be useful if it's needed. Keep in mind that the POH V-speeds are usually accurate at gross weight and can be significantly lower at lower weights.

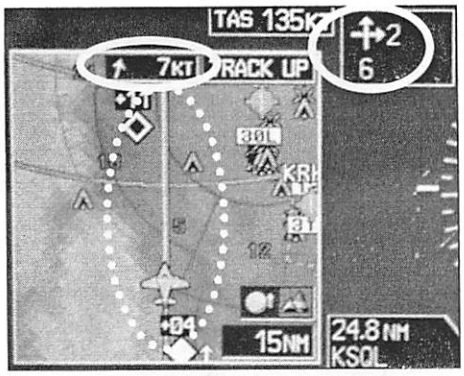
Winds Aloft And Track Vectors

The current winds aloft can be shown in two locations on the PFD, the INSET Map window and the Wind Data field; both are grouped together to the left of the HSI. There are three display options: a) longitudinal and lateral wind speeds, b) total wind direction and speed, c) total direction with head- and cross-wind speed components. I set the total wind direction and speed in the Wind Data field and the lat/lon wind speeds in the Inset Map. It's the best of both worlds.

The Track Vector is a track-based line extending from the nose of the aircraft icon showing where the aircraft should be at the end of a pilot-determined time. It's useful when being vectored and cleared direct to a waypoint. Simply turn the aircraft to point the vector line at the waypoint and then program the navigator.

It also serves as a course reference when hand flying. If the vector line overlies the course line the aircraft is on course. If it's even slightly off, the aircraft will diverge from the course. There are several line length/time options that can be selected during a flight to meet the current situation. I use a five-minute Track Vector during terminal area arrivals or departures and 30 minutes while en route.

Runway Centerlines extend from



The Wind Data Field (two solid ellipses) and the Track Vector (dotted ellipse) are two useful functions.

all of the flight plan's destination airport runways and are useful for aligning with the landing runway, especially in low visibility conditions, with parallel runways, or where the airport isn't immediately visible; for example in forest or mountainous terrain.

The Scheduler is a good way to remember to change fuel tanks, check fuel consumption, oxygen reserve, or the pilot's blood oxygen saturation. For each, there are choices for how often you are notified.

The Columbia/Cessna TTx has a small keyboard between the seats called the MFD/PFD Control Unit that allows choosing which main display it controls. Set it to the MFD and do most of the MFD data entry, paging, etc. on the keyboard rather than having to reach over to the MFD.

Windows & Maps

Every map displays the aircraft location but the map range may have to be increased significantly before the aircraft is visible. The MFD Airport Page for example, is good for visualizing the aircraft arrival in relation to the runway orientations. Ditto with the Intersection page if navigating the terminal area and are referencing an intersection that isn't in your flight plan.

The PFD has the option to open a small Flight Plan, Nearest, or TMR/REF window at the bottom right of the screen. I use the Flight Plan window for terminal operations because it's easy to select waypoints or procedures or to edit or add to the current flight plan.

En route, the Nearest Airport window is particularly useful when geography or paucity of airports are an issue. This feature continuously updates so the nearest airport is immediately available. There's a caveat regarding choosing the nearest airport. Always take wind, geography, size/type of airports (runway length), services, etc. into account rather than necessarily selecting the closest airport. Also, losing an engine and turning into a strong wind to reach the nearest airport may not be as smart as turning downwind to reach one further away. The TMR/REF window is used for entering MDA/DH information for the active IAP and also has a timer for timing approaches. The MDA/DH will then show on the PFD at the bottom of the altitude tape. When not using the timer, I keep either the flight plan or nearest window open.

As noted, the PFD displays the INSET Map on the left side of the HSI. It supplements the MFD's larger map by being in the pilot's primary scan, and can display a different range, and/or presentation (e.g. Weather on MFD map, Terrain on PFD) than the MFD. If the MFD or Inset map seem too cluttered, there are three declutter options.

The map orientation on MFD Map and PFD INSET Map can either be North Up (the default) or Track Up. I prefer Track Up because everything displayed on the map is then relative to the actual aircraft—no analysis required. Weather, traffic, terrain, and waypoints are North up only. If the aircraft is flown by several pilots, always verify your desired settings.

Next month we'll review another set of EFIS modes and functions. §

Joe Shelton, is an IFR pilot of 35 years whose Columbia 400 is now on the block. Contact him at jshelton26@yahoo.com.

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