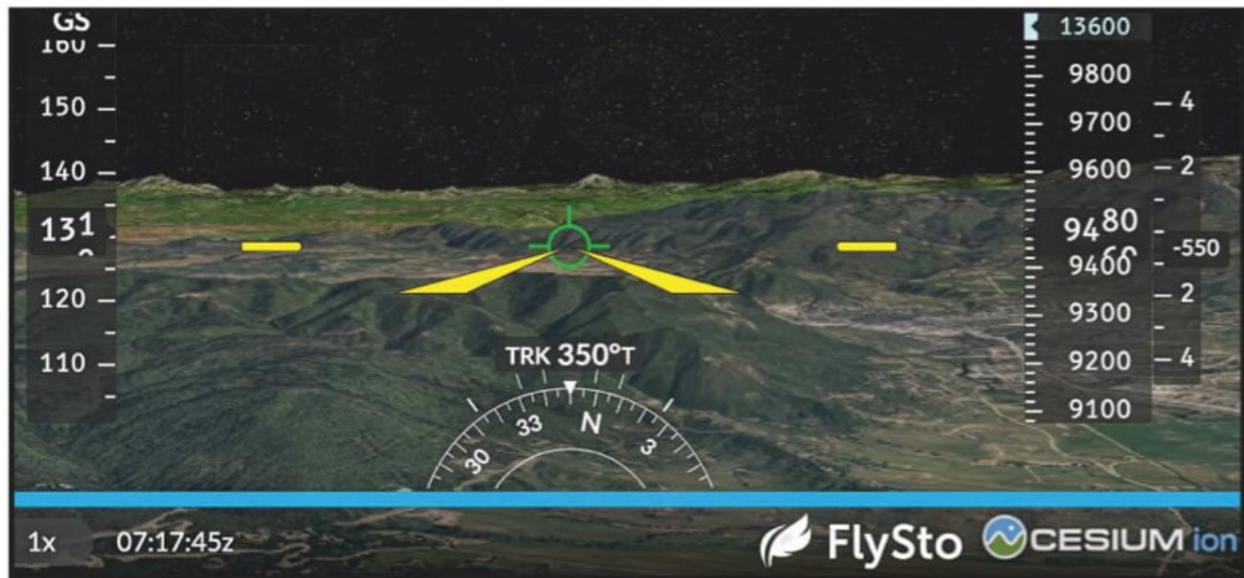


IFR

Level at MDA and don't go lower until you can see the runway environment.



DEADLY DISPLAY POTENTIAL

It's common misconception, but +V advisory glide slope isn't same as LPV glide path

MAX TRECSCOTT

FLYING AN RNAV (GPS) approach with a +V advisory glide slope looks and feels exactly like flying a glide path to LPV minimums. But while an LPV path is obstacle-protected down to a decision altitude (DA), a +V glide slope can run you through a mountain after you descend below the minimum descent altitude (MDA). Yet in both situations, the PFD display will look almost identical.

A recent fatal accident involving a 2024 Epic E1000 at Steamboat Springs, Colorado, highlights this issue. The E1000 is a capable six-place turbo-prop equipped with the latest NXi version of the Garmin G1000. While it's early in the National Transportation Safety Board's investigation, already much is known about what happened from ADS-B data.

The aircraft departed Kansas City Downtown Airport (KMKC) in Missouri at 11 p.m. CT. The

flight lasted about 2 hours and 20 minutes, and would have arrived at Steamboat Springs Airport (KSBS) about 12:20 a.m. MT. The pilot appears to have flown the RNAV (GPS) Z RWY 32 approach, a non-precision approach (NPA) with LNAV minimums.

Its final approach course is 340 degrees, which is relatively straight into Runway 32. That makes it the only approach at Steamboat Springs with straight-in minimums.

The MDA for the approach is 9,100 feet msl, which is 2,219 feet agl. That's just 180 feet below the reported cloud layer when the pilot started the approach. But it's well above the 1,600-foot ceiling reported two minutes before the accident.

The RNAV (GPS) Z RWY 32 approach has an advisory glide slope. Garmin calls it Advisory Vertical Guidance, though it doesn't spend much

ARTICLE

time explaining it in documentation. You may also see it called an advisory glide path. I'll continue to refer to it as an advisory glide slope, as that's what most pilots call it.

Advisory glide slopes are only found on non-precision RNAV approaches with LNAV or LP minimums. On a PFD, they're depicted with the same magenta diamond used to depict glide paths for approaches with LPV and LNAV/VNAV minimums. But they differ in one significant way.

RNAV approaches with LPV and LNAV/VNAV minimums are essentially precision approaches, so you're afforded protection as you descend along those glide paths down to the DA, which is usually just a few hundred feet above the ground. By contrast, on a non-precision RNAV approach, such as one with LNAV or LP minimums, an advisory glide slope provides obstacle protection down to the MDA, which may be thousands of feet above the ground. But once you're below the MDA, there's no protection.

In most respects, the approach into Steamboat Springs was flown well. The autopilot was likely used, as ADS-B data shows the approach mode was selected as the aircraft passed by the IAF. Also, the aircraft's descent angle was constant from the time it joined the approach until it crashed, with no change as it passed through the MDA.

Since this is a NPA, aircraft should fly level at the MDA until reaching the missed approach point, if they don't have the airport in sight. But instead of leveling off, this aircraft continued descending through the MDA, which is exactly what it would do if the autopilot were coupled to the advisory glide slope.

That combines two common misconceptions. One is that many pilots expect when, coupled to an advisory glide slope, the autopilot will level off at the MDA. But it doesn't.

Autopilots are designed to fly through minimums when coupled to a glide slope of any type, even an advisory glide slope. So to force the autopilot to level off, you need to either press the vertical speed (VS) key sometime before reaching the MDA, or you need to press the altitude hold (ALT) key as you reach the MDA.

The other misconception is that many pilots think it's safe to continue descending below the MDA if they stay on the advisory glide slope—but it's not. In this case, the advisory glide slope goes through terrain. The last data point recorded was at 8,240 feet, which was 860 feet below the MDA. Adjacent to the crash site, the top of Emerald Mountain is marked with an elevation of 8,250 feet.

It's worth reviewing the criteria for descending below an MDA. FAR 91.175(c) essentially says that you can't descend below an MDA until three conditions are met:

» The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and for operations conducted under Part 121 or Part 135 unless that descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing.

» The flight visibility is not less than the visibility prescribed for the approach being flown.

» And this one is critical: At least one of nine visual references for the intended runway must be distinctly visible and identifiable to the pilot. The list includes the threshold, runway lights/markings, touchdown zone, and VASI/PAPI. A 10th item, the approach lighting system, allows you to descend to 100 feet above the touchdown zone elevation (TDZE).

With a cloud ceiling over the airport, and a mountain in front, it's unlikely the pilot had any of the required visual references in sight that would have permitted him to descend below the MDA.

How can a pilot know there are obstacles, such as a mountain, below the MDA? Sadly, the clues to the presence of obstacles are subtle and easily missed. When obstacles are present, we'll see the same note found on the RNAV (GPS) 32 approach: "Visual Segment – Obstacles." Jeppesen charts use the same words but also include: "34:1 is not clear."

Another clue is the absence of a gray-shaded area in the profile view of charts. The FAA's *Instrument Procedures Handbook* says: "For RNAV approaches only, the presence of a gray-shaded line from the MDA to the runway symbol in the profile view is an indication that the visual segment below the MDA is clear of obstructions on the 34:1 slope. The absence of the gray-shaded area indicates the 34:1 OCS is not free of obstructions." So the absence of a gray-shaded area that you've probably haven't paid much attention to before tells you that there could be a mountain in front of you.

In 2001, the FAA announced that for non-precision approach procedures, the industry should discontinue the use of a "dive-and-drive" process and instead fly a stabilized continuous descent. Advisory glide slopes are designed to do just that, down to the MDA. But below the MDA, pilots must rely on outside visual references and not an advisory glide slope.

In a perfect world, the PFD would warn you when an advisory glide slope runs through obstacles below the MDA. For now, the rule is simple: Level at the MDA and don't go lower until you can see the runway environment. 🚫

Max Trescott is the host of the popular *Aviation News Talk* podcast, which focuses on GA and safety. He's the author of *Max Trescott's G1000 and Perspective Glass Cockpit Handbook* and another book on the G3000. He's the 2008 National CFI of the Year.