Glideslope Failures

Can you recognize the warning signs when the ground-based equipment fails?

By Harry Kraemer

WE ALWAYS THINK OF AN ILS as a "no-brainer" procedure. All you have to do is intercept the needles and keep the cross-hairs centered. As long as your nav equipment doesn't flag you're good to go, right? What if there's a failure of the ground-based equipment? How will you detect it and how will you respond?

During a recent flight, I was en route to Lancaster, Pennsylvania. The weather there was 300 overcast and ½-mile in light rain. Level at 5,000 feet with the autopilot flying, I was handed off to Harrisburg Approach. I checked in and told the controller I had the current ATIS. The controller gave me vectors to the ILS Runway 8 (see chart page 15). I set up the avionics for the approach and decided to let the autopilot fly this one.

I was eventually cleared down to 3,000 feet. After intercepting the localizer, I noticed the glideslope indicator had a full-down deflection. At my position, the glideslope should have had a "fly up" indication. I was about to discuss the discrepancy with the controller, when I was cleared for the ILS and told to contact the tower. Something didn't seem right. I told the approach controller I wouldn't accept the approach. From the tone in his voice, I could tell he was both surprised and unhappy about my refusal.

After issuing a heading to fly, the controller asked why I refused the approach and what my intentions were. I explained about the full-down deflection and requested vectors back to the ILS. I verified the altimeter setting and the localizer frequency. I decided to hand-fly the approach.

The aircraft I fly is equipped with an electronic flight instrumentation system (EFIS) on both sides of the panel and a mechanical VOR indicator. All systems were set for the ILS. This time I was vectored well outside the outer marker, but all three displays showed a full-down indication. At this point I suspected the problem was in the glideslope equipment on the ground. Again I refused the approach. It was decision time since the weather was below localizer minimums.

The controller contacted the tower and was advised there were no apparent problems with the glideslope transmitter. The good news was the weather had improved. The controller vectored me again and I flew the localizer procedure. I broke out and landed without problem, however, the glideslope indication remained full-down throughout the approach and landing.

As I taxied in, I reported the problem to the tower. Meanwhile, another aircraft inbound on the approach called: "Tower, we must have a strong tailwind up here. We're descending at 2,000 feet per minute and can't catch the glideslope!" Moments later, the pilot reported the runway in sight. The tower then notam'd the glideslope out-of-service.

The pilot on the approach should have suspected something wasn't right when he had to fly such an abnormally high descent rate. He was fortunate that he broke out before he flew the false indication into the ground.

Verify Indications

Never blindly follow a glideslope without first verifying the correct cockpit indications. The typical 3.0-degree glideslope provides a descent rate of approximately 300 feet per nautical mile. As a result, the glideslope will correspond to the following altitudes:

- 3,000 feet height above touchdown (HAT) at about 10 nm to touchdown;
- 2,100 feet HAT at about 7.0 nm to touchdown; and
- 1,500 feet HAT at about 5.0 nm to touchdown.

You can check your approximate height on the glideslope by multiplying the distance from the runway (in miles) by 300. For example, at 2.0 nm from touchdown, you should be approximately 600 feet above the touchdown zone elevation.

To figure your descent rate (in feet per minute) on the glideslope, divide the groundspeed by 2.0, then add a zero. For example, a groundspeed of 100 knots requires a descent rate of 500 fpm (100/2 = 50 + 0 = 500). Another method of figuring this is to multiply your groundspeed by 5 (100 x 5 = 500).

It's also important to cross-check your altitude when crossing the outer marker and compare it with the glideslope crossing altitude. If you detect a discrepancy, don't continue the approach until you resolve the problem. Never succumb to pressure to continue the approach if something doesn't feel right.

Harry Kraemer is a corporate pilot and NAFI Master CFI in the Washington, D.C. area.

"No Flag Failures"

Glideslopes can be persnickety. As a result, they can "fail" or be erratic in modes that won't prompt a warning flag on the indicator itself. Some causes for this problem are:

- Ground-Based interference: snow piling up around the glideslope transmitter can cause erroneous indications when the signal reflects off snow. Vehicles and other aircraft operating in the glideslope critical area can also interfere with the signal.
- Airborne interference: Other aircraft on the approach ahead of you can cause glideslope fluctuations. This is especially true at busy airports where traffic is sequenced at minimum spacing on the approach.
- Environmental interference: precipitation static (P-static) can result in improper indications. In "A Routine ILS Approach" (July 1995 *IFRR*), we reviewed an accident where a Beech 1900 crew flew the airplane into the ground during a standard ILS. P-static on the aircraft was suspected to have caused a constant "fly-down" indication during the approach. At one point, the crew's descent rate was 2,000 fpm, which corresponds to a groundspeed of 350 knots.
- Mechanical failure: On a mechanical nav indicator, the meter itself can fail, which usually causes the glideslope to center with no flag. If your ILS seems a little too perfect, slow the descent rate and see whether the indicator moves. Be suspicious if it remains "stuck."