Should You Time the ILS as a Backup?

Hitting the timer at the outer marker when executing a full ILS has become IFR folklore.

By Wally Roberts

I'VE BEEN SUBJECTED LATELY to more than the usual dose of "you *must* time the ILS in case the glideslope fails" drivel. I've heard some FAA FSDOs consider it a "bust" during an instrument flight check (initial rating or proficiency check) if the applicant fails to hit the timer passing the outer marker. Other pilots who have check airman authority say it isn't a bust if the applicant doesn't time the ILS, but it certainly shows good headwork to time.

With this kind of pressure from the movers and shakers in the IFR pilot-certification world, pilots reasonably infer that timing is a fundamental procedural requirement of ILS approach flying. Perhaps timing an ILS is a good idea in certain circumstances, but it's quite impossible in other situations. In between, there are situations where it might be possible, but not good cockpit resource management (CRM).

Cockpit Resource Management

Flying an ILS to "200 and ½" requires the utmost in coordinated instrument flying, good scan techniques and careful thought about the actions required when nearing DH. The scan techniques used from glideslope intercept to 500 feet above the touchdown zone elevation must be doubled for that last 300 feet if you don't want the approach to get away from you. Especially during single-pilot operations, when the weather is really murky there is an element of instrument scan that must be integrated with marginal visual cues for perhaps another 100 feet below DH.

You must be prepared to continuously assess the flight visibility equivalent of the charted precision visibility minimum from just prior to DH to touchdown—this is supposed to be part of mindset. The mindset required to accomplish this continuous flight visibility assessment is certainly different when using the DH concept than when flying level at MDA.

When the weather is "800-2," whether you're using the DH or MDA concepts makes little difference as to flight visibility assessment techniques and requirements. But when the weather is at the nub, whether the aircraft is "in the slot" and in stable descent (DH concept) or flying level with the nose up (MDA concept) makes a difference in how you gauge and assess flight visibility.

Those who train instrument pilots, especially in light aircraft operations,

TERPs ILS Missed Approach Nuts-and-Bolts

When the FAA procedures folks draw up an ILS approach, and include "G/S out" minimums, they have designed two different procedures. These two separate procedures often have different final approach fixes (FAF) and almost always have different missed approach points (MAP). These two procedures appear on the same chart, whenever possible, simply to conserve paper. In fact, there was a period in the U.S. where a third approach procedure (the LOM NDB approach) appeared on the same chart with the ILS and LOC procedures.

The FAF for an ILS approach is the point at which the intermediate segment altitude intercepts the glideslope. At this point, the laterally protected airspace ramps down and electronic glideslope obstacle clearance formulae replace simple barometric obstacle clearance requirements. The ILS final segment criteria continue to the geographical point at which the glideslope reaches the true altitude of the published decision height/altitude (DH/A)—generally one-half nautical mile before the runway threshold. If the DH is higher than standard, the precision MAP will be even farther out from the threshold.

Non-precision FAF

The FAF for the LOC approach is the Maltese Cross fix. This is where the ramp down of the final segment begins for the localizer, continuing to the MAP which is at the runway threshold whenever possible.

Both the ILS and LOC missed approach procedures have a 1.5 nm straight-ahead section, which assumes straight-ahead flight during pull up and relatively accurate navigation. Where a turning missed approach is specified, the turn could begin as late as the end of this straight-ahead section or as early as the MAP. (A turning missed approach is where no turning fix is specified. Where a turning fix is specified, it is considered to be a combination straight/turning missed approach, and the turn must be made at the specified fix.)

This straight-ahead section begins at the DH-point for the ILS and at the non-precision MAP for the LOC approach, which will usually—but not always—be the threshold.

Any timing table shown on an ILS approach chart is for the distance from the non-precision FAF to the non-precision MAP. When DME is in the title, there won't be a timing table. In any case, the TERPs designers didn't intend for the timing table to apply to the precision ILS approach. In those unusual cases where an ILS approach doesn't authorize non-precision minimums, there will be no timing table.—*WR.*

often fail to train adequately for low visibility issues when operating at MDA or when approaching DH. The hood is simply taken off at the minimum instrument altitude and suddenly the student has good visibility. This type of training bears no relationship to a night approach at RVR 2400, with prevailing weather "W0X0."

Anyone who advocates reverting from precision ILS to non-precision LOC midstream in the final approach segment should consider the implications of doing this during low-visibility weather conditions. You must evaluate your ability to make the proper visibility assessments under the circumstances you have elected—precision or non-precision.

Poof! Goes The Glideslope

The folklore about timing always includes, "What if the glideslope fails?" Well, if it fails early on and the weather is good, so what? Assuming a LOC procedure on the same chart, you could continue a stabilized descent to the MDA and land if all becomes good visual prior to that point. If not, pull up well before the non-precision MAP. If the weather is bad enough that you were really attuned to doing that extra-demanding precision scan below 500 feet, perhaps this is the wrong place to be going any further down if the glideslope disappears.

Step-down Fix and CRM

If there is one or more step-down fixes in the LOC approach's final segment, that's another CRM flag not to revert from precision to non-precision, unless the decision is made well prior to the FAF. Controlled flight into terrain (CFIT) studies indicate there should be "fault gates" through which an aircraft must cross during an approach without a "fault" warning. These "fault gates" could be descent rate, cross-tracking error, airspeed variance from target, turbulence and navigation or aircraft systems performance. Some of us already do such things on an intuitive basis. Presence of any step-down fix in the final should be considered as a "fault gate" whenever the glideslope becomes unusable inside the precision FAF.

The Analog Gem

Many experts believe DME on an ILS adds an immeasurable amount of safety redundancy to the approach, whether it be precision or non-precision. It provides that concrete running fix, which can otherwise only be imputed with timing or with an abstract mental view of present altitude on glideslope vs. runway elevation. If the approach uses DME optionally, there

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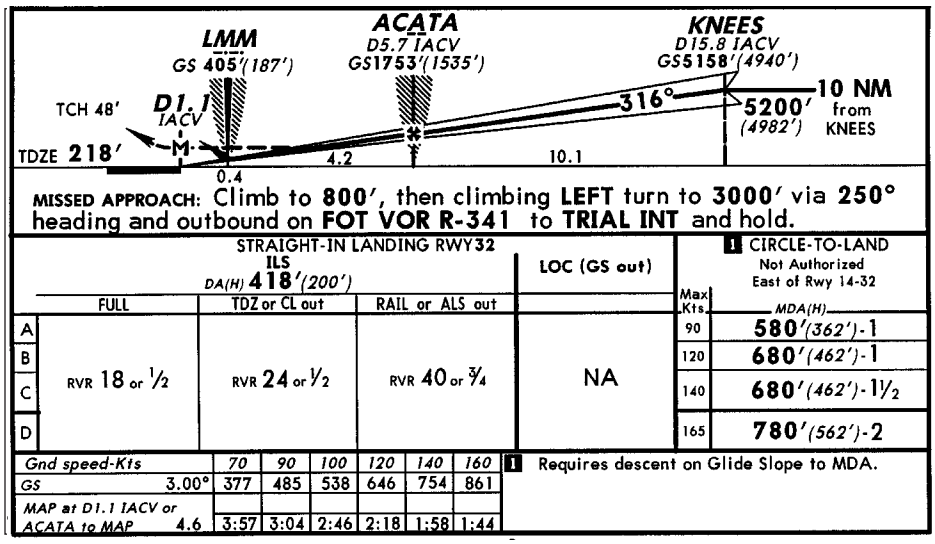
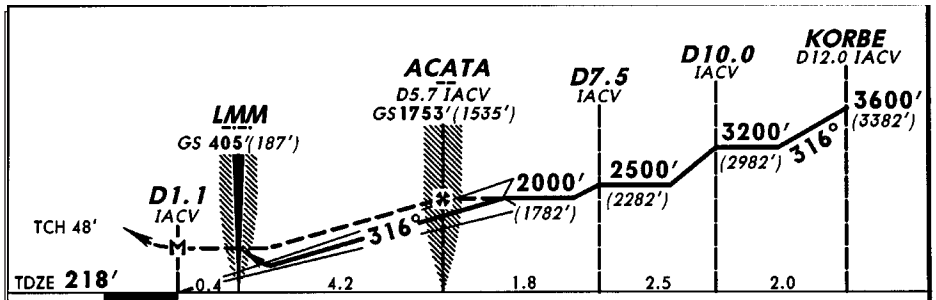


Here are two separate ILS approach charts to Runway 32 at Arcata, CA. The standard ILS (above) doesn't allow straight-in non-precision minimums, but does allow circling. The timing table is only for aircraft that elect to level off and circle. Descent on the glideslope is mandatory for both precision straight-in and non-precision circling. The chart below is the ILS/DME RWY 32. There's no timing for non-precision straight-ins because of DME.



Should You Time…

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will be a non-precision DME MAP in addition to the timing MAP. Use this invaluable tool! If DME is in the title of the ILS or LOC approach, it's the only authorized method to determine the non-precision MAP—timing is out.

Of course the DME can fail. So can the localizer. These are emergencies that must be dealt with as such, rather than as contingencies. As far as I am concerned, a glideslope failure without related ground component failures is as unlikely as these other contingencies, especially for aircraft with two independent glideslope receivers.

Pulling Up and Turning

If an ILS approach is abandoned because of glideslope or other navigational problems early in the final segment, the threat of CFIT is minimal. When you're close to DH, however, the CFIT risk is far greater unless the pull up is executed properly. A pull up commenced near DH has automatically "wired" the MAP for purposes of any required turn. You aren't suppose to turn until 400 feet in a turning missed approach in any case. Keep in mind that relatively big 1.5-mile straight-ahead section.

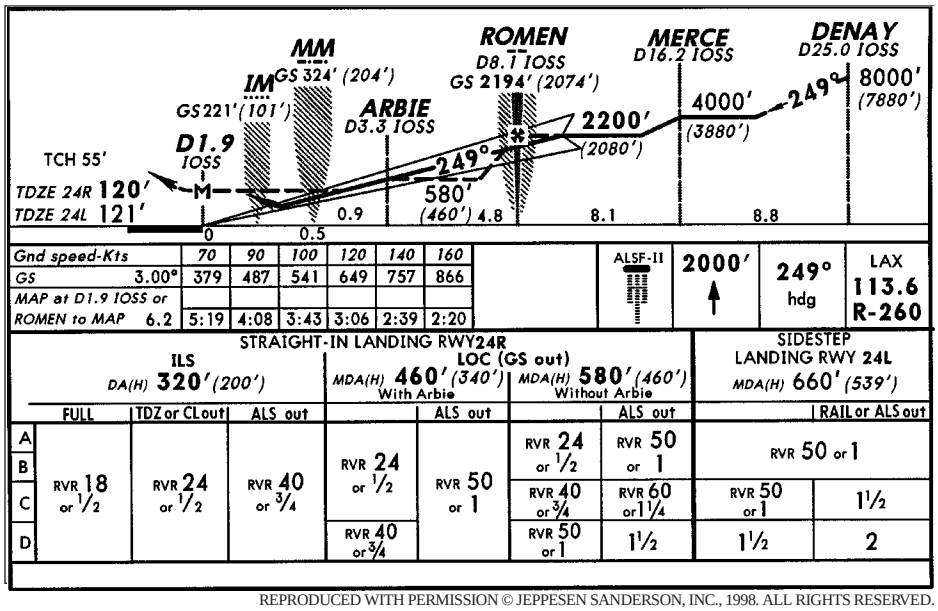
If you pull up early in the final segment, and have to make a turning missed approach without benefit of DME, fly straight-ahead using a dead-reckoning (DR) position "guesstimate" about where the threshold should be. Then, do the turn at your best estimate. By this time, you're probably so high that CFIT concerns are well below you. And your turn point will have been sufficiently accurate to keep you within missed approach protected airspace when you are well downstream of the airport.

Missed Back to LOM

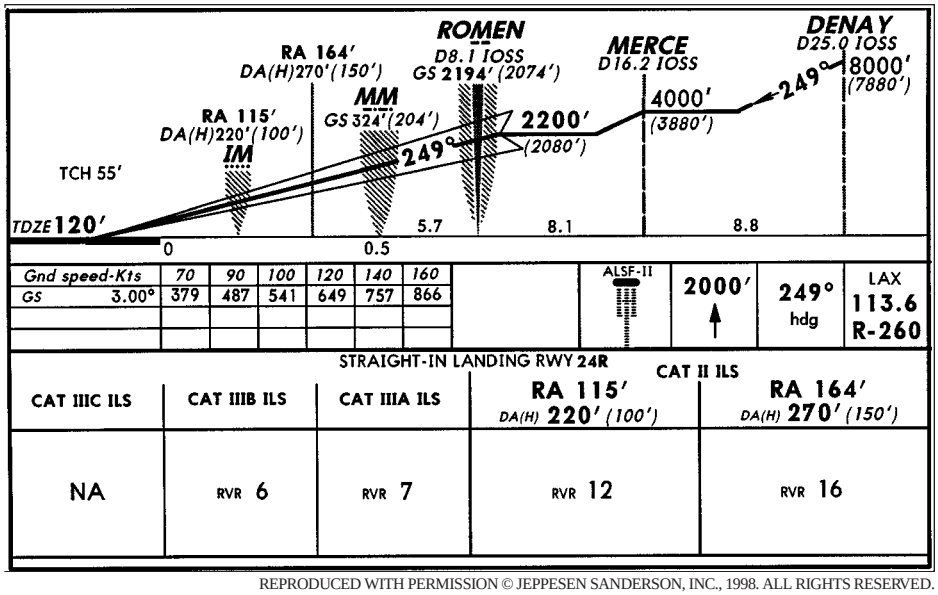
Although you need to turn in the turning area ballpark for a missed that departs the final approach course, extended, it's different where the missed approach turns around and goes back to the LOM. In that case, there's all kinds of missed approach protected airspace along side the localizer, from the LOM to 1.5 miles beyond the non-precision MAP. Think about it! Because the glideslope descends at 3 degrees, but the missed approach climbs at a much flatter 40:1 slope, when you are on the glideslope you are always above the floor of that return-to-LOM missed approach airspace along side.

The Turning Fix

As I said earlier, where a missed approach is straight ahead to a fix, followed by a turn, the turn must be made at that fix. In this case, of course, timing has no meaning whatsoever as to when to make the missed approach



The chart above is the ILS RWY 24R at Los Angeles, CA. DME is part of the procedure, but not required. It's use, however, for reverting to non-precision minimums is far preferable to timing and is mandatory to use the lowest non-precision minimums. It would be easy to wrap yourself around the "reversion axle" if you decided to revert to non-precision minimums at the ARBIE step-down fix. The chart below is the Cat II/III ILS to the same runway. CAT II/III procedures never use timing.



turn. Some pilots with examining authority assert that an ILS should be timed simply to protect for a turning missed approach in the event of glideslope failure. Well, not so with DME, and not so with a turning fix. Also, not so when near DH because you're already in the MAP ballpark. Only when you're early in the final and high does timing to protect for the turning miss even have a modicum of validity, and just a modicum at that.

Summary

If you want to time in order to revert to non-precision minimums when the weather is relatively good, I have no argument. When the weather is foggy or marginal for non-precision, however, the decision to time becomes a bit marginal in my view. If the weather is likely below non-precision minimums, timing (in my opinion) is poor judgment, not to mention an increase in workload for an already demanding precision approach. In any case, be careful not to wrap your sweep second hand around a final segment step-down fix when timing a precision approach, then attempt to revert to the non-precision profile somewhere around that critical fix.

For those "timing inclined" instructors, inspectors, and examiners out there: Relegate precision timing backup to the arena of technique, which may be good with some weather and some approach profiles, but not such a good idea on others. Keep in mind the single-pilot workload and CRM aspects of shooting to "200 and ½" are sometimes quite incompatible with timing for reversion to the non-precision approach and simply unnecessary for making good any turn in the missed approach.

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Instrument Rating Practical Test Standards

The instrument rating practical test standards (PTS) do *not* require timing during an ILS on the practical test. Listed below are the performance standards an instrument rating applicant is expected to demonstrate during an ILS:

- Establishes the appropriate aircraft configuration and airspeed, considering turbulence and wind shear, and completes the aircraft checklist items appropriate to the phase of flight.
- Maintains, prior to beginning the final approach segment, specified altitude within 100 feet, heading or course within 10 degrees, and airspeed within 10 knots.
- Applies the necessary adjustments to the published DH and visibility criteria for the aircraft approach category when required…
- Establishes an initial rate of descent at the point where the electronic glideslope is intercepted, which approximates that required for the aircraft to follow the glideslope.
- Allows, while on the final approach segment, no more than three-quarter-scale deflection of either the localizer or glideslope indications and maintains the specified airspeed within 10 knots.
- Avoids descent below the DH before initiating a missed approach procedure or transitioning to a normal landing approach.
- Initiates immediately the missed approach procedure when, at the DH, the required visual references for the intended runway are not distinctly visible and identifiable.