

# When Are You Established?

*A reader encounters differing opinions about when to descend on the glideslope from an arc.*

**By Wally Roberts**

THE FOLLOWING LETTER FROM a reader got my attention. The scenario in the letter represents a fundamental lack of understanding of the rigorous requirements of terminal instrument procedures by many professional pilots:

“While awaiting an arrival recently at an FBO in Oklahoma city, I overheard a flight instructor debriefing a student after a lesson. It seems that while flying a DME arc to an ILS approach, the coupled autopilot captured and began following the glideslope prior to their being established on the localizer. The instructor said you shouldn’t descend on the glideslope until you were established on the localizer. The student argued that it was okay to descend. The instructor and student then asked the opinion of two corporate jet pilots.

“The jet pilots agreed with the student. They pointed to the ILS approach to Grand Junction, CO (on right), where the arc is above the glideslope intercept altitude. Their argument was that if you didn’t descend as soon as the glideslope came into view you’d be too far above it to successfully intercept.

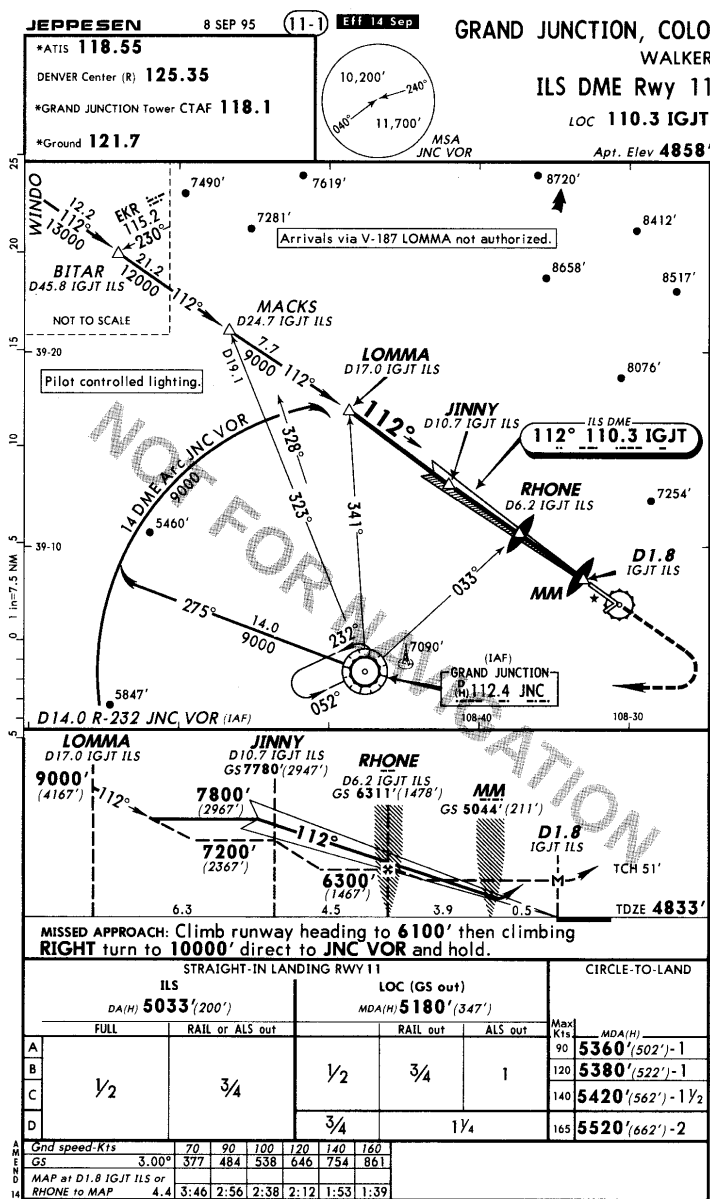
“The instructor still wasn’t convinced, so everyone asked another pilot whom they agreed was ‘the authority.’ They brought ‘the authority’ out (a retired FAA flight inspection pilot) and explained the question. He immediately agreed that you could descend on the glideslope after passing the ‘lead-in radials’ of the arc. He related that after passing the lead-in radials, you were allowed to begin your turn to intercept the localizer. He stated that being on the arc and passing the lead-in radials was considered ‘established’ on the ILS.

“At this point, I asked to join the discussion and stated that I believed they were wrong. I said I believed the lead-in radials were for position awareness only and not for an ILS intercept point

of any kind. I told them that if they descend on the glideslope before acquiring the localizer, they have no way of assuring horizontal positioning. I also said I believed you couldn’t turn off the arc until you had acquired the localizer.

“I asked ‘the authority’ what would happen if he began his turn and descent

off the arc before he had acquired the localizer because of unexpected winds did not capture the localizer quickly. What if you stayed off the localizer too long while continuing to descend on the glideslope? You could crash. His reply was ‘that would be pretty crappy flying.’ My response was that a missed ap-



*When transitioning from the arc, do not descend on the glideslope until you're well established on the localizer.*

proach should be called if the flying was crappy, but his kind of flying wasn't crappy but dangerous.

"After making my best argument, the jet jocks all decided I was wrong and they were right. The student thanked them for clearing it all up and went merrily on his way.

"I'm writing to suggest you address this question in an upcoming issue. If four experienced, commercial pilots can be this confused, I wonder how many others might need to be reminded. If I'm missing something here I would appreciate knowing."

Randy Gilbert (Just a low-time private pilot)  
Midland, TX

### CFI correct

Let me say at the outset that the flight instructor referenced in his letter is correct, Mr. Gilbert is correct except for his understanding of the turn onto final from the arc, and the jet pilots and "the authority" are wrong.

### PCG vs DR headings

The underlying principle implicit in TERPs in assuring vertical and lateral obstacle clearance is that positive course guidance (PCG) will be used with very limited exceptions, and those exceptions will be set forth in the procedure. These PCG exceptions are: limited dead reckoning initial approach segment with strict criteria limitations, course-reversals, and missed approach procedures that specify a heading rather than course. (TERPs, Paras 211 and 273.)

### What constitutes "established"

Although the AIM "Pilot/Controller Glossary" has a fairly good definition of what constitutes "established," the body of TERPs offers only one option, though, for most initial approach segments, and all intermediate and final approach segments: the pilot knows with certainty that, (1) he has passed the fix or point that marks the beginning of the segment being entered *and*, (2) the PCG indication is "on-course," and continued tracking of the "on-course" is assured. ("on course" means that the pi-

lot is flying the indicated centerline of the segment to at least minimum certification standards for instrument pilots.)

If only one of the two foregoing requirements is met, entry into the segment is incomplete, thus the prior segment's altitude applies until both requirements are met. Requirement number 1 is typically met prior to number 2 during an ATC vector, but it can cut either way with a DME ARC, such as in the Grand Junction procedure.

### Lead radials

TERPs normally only require lead radials when the course change from the initial approach to intermediate segment exceeds 90 degrees [TERPs Paragraph 232a.(1) and (2)]. So, you never see lead radials on VOR/DME IAPs, because the intercept angle of the arc to the intermediate segment with a collocated VOR/DME is always 90 degrees.

ILS, however, is a special case because any arc initial segment established on an ILS must be predicated on a VOR/DME facility, even though the ILS may have its own collocated DME (this is the case at GJT). The reason for this special ILS arc requirement is so that VOR azimuth information will be available to those well-equipped aircraft that have RMIs. ([TERPs Paras 282 and 912] DME arcs were originally established with the assumption that RMIs would always be used for the arc orbit maneuver.) Also, any arc lead radial on an ILS/LOC IAP must be contained within the reliable course indication zone of the localizer [AIM 1-1-10b.5.(a) in the case of the GJT ILS].

TERPs, Paragraph 232 states in part: "The angle of intersection between the initial approach course and the intermediate course shall not exceed 120 degrees. When the angle exceeds 90 degrees, a radial or bearing which provides at least two miles of lead shall be identified *to assist in leading the turn onto the intermediate course.*" (emphasis added.)

Where this leading turn begins is at the pilot's discretion, because it will vary greatly with groundspeed. The pilot is expected to be sufficiently profi-

cient to lead the turn so as to intercept the intermediate course in a reasonable and prompt manner. Flying past the lead radial fails to meet either of my stated requirements for "established," thus descent below the prior segment's minimum altitude is not authorized. Keep in mind that the lead radial is nothing more than a pilot assistance tool.

Also, note carefully that the JNC VOR 14.0 arc does not intercept the localizer at a 90 degree angle because of the geometry of the offset of JNC VOR from the localizer. At this location, the heading along the arc at the JNC 328 radial (058 degrees, no wind) is close to what should be held to intercept the localizer. This is a subtle variable that is significant where the non-collocated VOR/DME used for the arc is substantially offset from the localizer course.

### No blind turn

The two "established" requirements stated earlier must be met before you can consider yourself established within the segment being entered. Further, if you simply make a blind turn to an inappropriate heading based solely on the lead radial, it's conceivable the aircraft could leave protected airspace as the inappropriate heading fails to keep pace with the ramping down of the lateral dimensions of the intermediate segment. In an obstacle-rich environment, this could prove fatal, even without descending below the previous segment's altitude.

### Glideslope intercept

A reminder is in order about the use of the glideslope. It is not the *primary* aid for the vertical flightpath until the beginning of the feather shown in the Jeppesen chart, or the lightning bolt on NOS charts. More important, however, the glideslope is of no operational use (not even for additional "pilotage" outside the Jeppesen feather) until both requirements for being established are met. The worst possible situation is to use a glideslope both beyond its charted position and before tracking the localizer. This can be  
*(continued on next page)*

## When Are You. . .

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“gotten away with” in the typical vector to the typical “metropolitan” ILS final approach course, and where the controller has fouled the vector up, but it can kill you in extended, non-radar procedures such as at GJT. In any case, the “gotten away with” practice at the “metro” location is bad business, does not meet the requirements of the IAP, and breaks down the discipline needed to stay out of the rocks everywhere.

I’m surprised that the retired flight inspection pilot wouldn’t have pointed out to Mr. Gilbert’s assemblage the fact that the GJT glideslope is about 9,800 feet msl, at Lomma intermediate fix, thus a hard “fly-up” indication would be expected when turning inbound from the arc. If there were a “fly-down” indication at this point in the procedure, something would be amiss, and abundant caution would be in order. At 9,000 feet, you’d intercept the glideslope at about 14.5 IGJT DME (2.5 miles inside Lomma) on a standard temperature day; the glideslope would be about half-scale “fly-up” at Lomma.

### Authority for “established”

Beyond my insights into TERPs, which mandate my definition of “established” for purposes of proper use of the IAP, the course, distances and minimum altitudes set forth for each segment are not only based on TERPs, they are a matter of regulation (FAR 97) once the IAP is published by the FAA. Any interpretation of the individual IAP’s regulation, other than what I have set forth, is tearing at the edges.

### Important for GJT

To summarize the situation at GJT:

- The arc is flown as published at not less than 9,000 feet, and preferably no higher than 9,000 feet when well into the arc maneuver;
- A lead turn can be made based on the JNC 328 radial, but only to the extent necessary to smoothly and promptly intercept the IGJT localizer

near Lomma. The extent of lead will vary considerably with groundspeed;

- The heading resulting from the lead turn does not permit descent below 9,000 feet. The IGJT DME must read 17.0 miles, or less, and localizer tracking must have begun in order to leave 9,000 for 7,800 feet (7,200 feet LOC-only procedure);

- Careful attention must be paid to the proper tuning of the IGJT DME on a timely basis. This should be done passing the JNC 328 lead radial. This is a high-workload, tricky item that is easily overlooked and could be fatal at some locations if the wrong DME is used inbound on the localizer. (The FAA is supposed to use DME arcs onto ILS IAPs only where there is a “unique operational requirement”— whatever that means);

- If the glideslope shows “fly-down” at IGJT 17.0 DME, something is wrong. It should be a solid “fly-up;”

- Once on the localizer, the pilot can elect to remain at 9,000 feet until intercepting the glideslope, but with the understanding that the barometric floor of 7,800 feet applies as primary vertical navigation until the point where 7,800 feet is met on the glideslope. When inside Lomma, tracking the localizer, it is acceptable practice to descend on the altimeter to 7,800 feet, so as to intercept the glideslope from below. (Once on-track and inside Lomma, staying at 9,000 feet until intercepting the glideslope, and using the glideslope as “additional nav” until at 7,800 feet, is probably a bit more prudent where there are mountains around. Keep in mind, however, that not only are you outside the authorized point for use of the glideslope as sole means for the vertical flightpath, you are almost certainly outside of the glideslope’s service volume [AIM 1-1-10d.3] with a long ILS final, like the GJT procedure.)

When using autoflight approach couplers, the pilot is in command of the coupler. Too many pilots let the autopilots or “flight director” take over even though the pilot has programmed the coupler inappropriately. At GJT, the glideslope coupler should not be armed

until tracking the localizer inside Lomma.

### Invitation

We invite the retired FAA flight inspection pilot, who is referred to as “the authority” in Mr. Gilbert’s letter, to write for publication in *IFRR* his counterpoint views on the procedural requirements for the arc transition in the GJT ILS DME Rwy 11 IAP.

Finally, if anyone can come up with an arc transition to an ILS where the arc is above the glideslope altitude extended to the intermediate fix, point out the IAPs to IFRR, so we can get the FAA to fix them. Keep in mind, you must mentally calculate the glideslope’s altitude at the intermediate fix, because that is not shown on the approach chart, nor should it be (318 feet per mile for a 3-degree glideslope.)

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Editor’s Note: The following temporary FDC NOTAM was applied to the GJT ILS IAP at the time of this article. Jeppesen will probably have issued a new chart reflecting the notam by the time this article is published. NOS won’t issue a changed chart, since it doesn’t chart FI/T notams:

!FDC 6/1251 GJT FI/T WALKER FIELD, GRAND JUNCTION, CO. ILS/DME RWY 11, AMDT 14.

TIMING TABLE N/A.

CIRCLING MINIMA CAT C: MDA 5440, HAA 582, VSBY 1 1/2; CAT D: MDA 5540, HAA 682, VSBY 2.

Note the deletion of the missed approach timing table. A user group recently found several ILS/DME IAPs with timing tables, contrary to government charting requirements.