# Conformity Confusion

by Matthew McDaniel

Contrary to popular belief, civil aviation and its various components were not wholly developed in the United States. Many other nations helped pave the way for the international aviation transportation systems we have today. But, there is no denying that the United States has a national airspace system and an aviation infrastructure unlike any other nation on earth. As such, it has been easy for U.S. aviators to become set in their ways and/or to believe that our way is *the* way. As international air travel became routine after World War II, it quickly became apparent that pilots operating to and from various countries could benefit greatly from a common set of rules, designations, procedures, radio phraseology, etc. Enter the International Civil Aviation Organization (ICAO), which was formed in 1947 under the auspices of the United Nations. Among its many mandates, ICAO helps the various aviation governing bodies to work in conjunction with one another by operating with as much conformity as practical.

ICAO has done a commendable job over the years of achieving its goals in those areas. But, all countries have their idiosyncrasies and rules/regulations that just don't translate well into other languages or cultures. Thus, we in the United States, operating under Federal Aviation Administration (FAA) regulations, sometimes find ourselves being the last holdout among the major international aviation players. A good case in point was the use of the phrase "position and hold." The U.S. Air Traffic Control (ATC) system continued to use that phraseology long after the rest of the international aviation community had committed to the ICAO-encouraged "line up and wait," as the standard clearance to taxi onto the active runway, into the takeoff position, and await further clearance. The FAA did eventually mandate the switch as well, much to the chagrin of U.S. airmen and controllers who, at first, found great difficulty in making their tongues form the latter phrase when their brain had been hard-wired from decades of saying the former version. Change is hard for people who hinge their safety on largely scripted norms. But, change is inevitable and, in aviation at least, conformity is the backbone of our safety-minded culture.

In recent years, there has been an increasing push for the United States and the FAA to better conform to ICAO-approved terminology, phraseology, procedures and policies. To the FAA's credit, they've been working hard to better equip U.S. airmen to operate internationally with minimal transitional fuss. But, it has not been without its challenges. One such trial is keeping the Federal Aviation Regulations (FAR's), the Aeronautical Information Manual (AIM) and various FAA publications up to date with the changes implemented in the name of ICAO conformity. One such modification occurred throughout 2013, causing confusion for instrument pilots. It is still in transition as this article is being prepared, but a little illumination is in order now, to keep us all on the same page until the final solutions shake out and are officially implemented.

First, some terms and definitions:

- **THR or Threshold –** Defined as the beginning of the portion of a runway which is usable for landing.
- **THRE or Threshold Elevation –** The elevation at the runway threshold (MSL).
- **TDZ or Touchdown Zone –** The first 3,000 feet of the landing runway surface, suitable for landing (beyond the threshold).
- **TDZE or Touchdown Zone Elevation –** The highest point within the touchdown zone of the runway.

TDZE is a notation on Instrument Approach Procedure (IAP) Charts (a.k.a., Instrument Approach Plates) that most instrument pilots are very familiar. It informs us of the highest point in the touchdown zone, assuming the approach in question has published straight-in minimums to a specific runway. This is helpful information because it is far more specific than the airport elevation. Airport elevation is measured at the Airport Reference Point (ARP), which may be a significant distance from one or all of the TDZs on the airport. The difference in elevation between those locations can be significant, especially at airports built on hilly or mountainous terrain, or those which cover significant acreage. Additionally, TDZE information is helpful because it takes into account runway slope. Pronounced runway slope can create differences between TDZE and THRE of 20 feet or more.

In early 2013, in an effort for better ICAO harmonization, the FAA began replacing TDZE information with THRE information on approach plates. This was done when existing plates were being updated for other reasons, and when new terminal procedures were introduced. This was mainly seen on RNAV (GPS) approach plates, as those procedures are being introduced with the most regularity and in the highest numbers, by a large margin.

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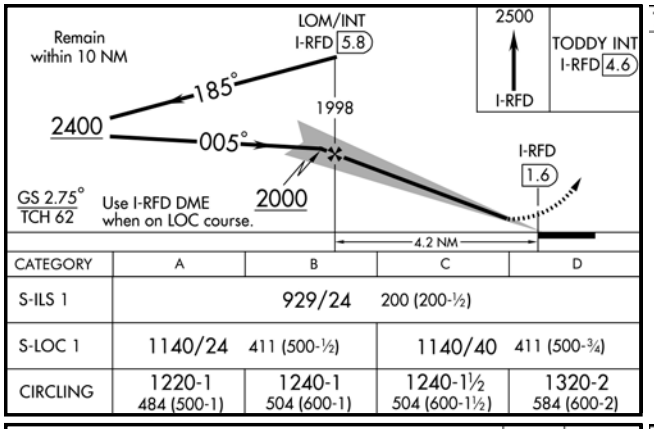
This caused some unintended consequences, mainly creating conflicting or insufficient data to comply with specific FARs.

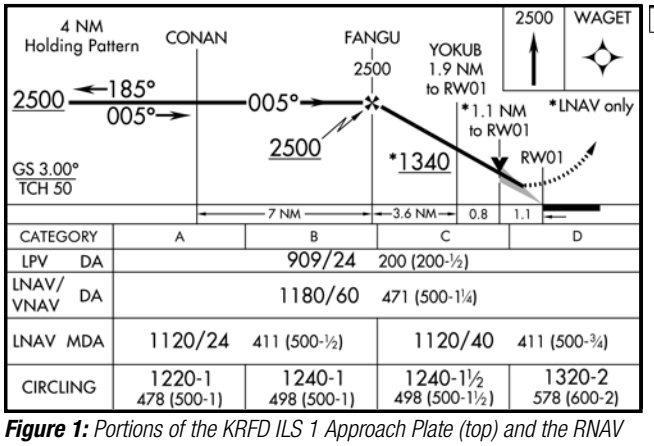
To begin with, the Pilot/Controller Glossary (PCG), which is considered the "Bible" of aeronautical terminology, contains no reference to THRE, nor did the AIM or the most recent FAA Instrument Flying Handbook (2012 FAA-H-8083-15B). In fact, the only widely available reference to THRE available to U.S. instrument pilots was in the front matter of Terminal Procedures Publications. Imagine the confusion when confronted with an example like the following:

An accomplished instrument pilot was practicing instrument approaches at Chicago/Rockford International Airport (KRFD) in Rockford, Ill. After flying the ILS RWY 1 a couple of times, he decides to change it up and fly the RNAV (GPS) RWY 1. It is then that the inconsistencies become noticeable (see Figure 1). At first he notes that both approaches allow a descent to 200 feet AGL, assuming the aircraft is equipped and legal for the WAAS LPV minimums published on the RNAV (GPS) and all necessary equipment is functional for the lowest ILS minimums. Yet, their MSL minimums differ by 20 feet! While the ILS minimums are published at 929 feet MSL, the LPV minimums are published 20 feet lower, at 909 feet MSL. Keep in mind these approaches are to the same runway!

So how is the 20-foot difference accounted for? As you've probably guessed by now, it is the difference between TDZE on the ILS approach (729 feet) and THRE on the LPV approach (709 feet). The ILS uses TDZE to establish the 200 feet AGL minimums (929 feet MSL), while the LPV uses THRE to establish 200 feet AGL (909 feet MSL). The difference, in this case, is relatively large because the touchdown zone of the runway has an upslope of 0.6% (not at all an insignificant slope, in spite of the relatively flat terrain where KRFD resides). This puts the highest elevation within the first 3,000 feet of the useable runway 20 feet higher than the threshold itself. Because the runway is sloped up beyond the threshold, the threshold would be the lowest point within the touchdown zone, not the highest.




| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| S-ILS 1 | 929/24 | 200 (200-½) | | |
| S-LOC 1 | 1140/24 | 411 (500-½) | 1140/40 | 411 (500-¾) |
| CIRCLING | 1220-1<br>484 (500-1) | 1240-1<br>504 (600-1) | 1240-1½<br>504 (600-1½) | 1320-2<br>584 (600-2) |




| CATEGORY | A | B | C | D |
|---|---|---|---|---|
| LPV DA | 909/24 | 200 (200-½) | | |
| LNAV/VNAV DA | 1180/60 | 471 (500-1¼) | | |
| LNAV MDA | 1120/24 | 411 (500-½) | 1120/40 | 411 (500-¾) |
| CIRCLING | 1220-1<br>478 (500-1) | 1240-1<br>498 (500-1) | 1240-1½<br>498 (500-1½) | 1320-2<br>578 (600-2) |

***Figure 1:*** *Portions of the KRFD ILS 1 Approach Plate (top) and the RNAV (GPS) 1 Approach Plate (bottom).*

TDZE 729

A problem exists for our pilot in that the approach chosen does not publish a TDZE, but rather a THRE. Using the THRE in lieu of the TDZE not only fails to meet the letter of the law as stated in FAR 91.175(c)(3), but it also would cause the pilot to calculate an acceptable descent to 80 feet above the TDZE, as the THRE in this example is 20 feet lower than the TDZE. That piece of information would be impossible to ascertain from the RNAV (GPS) RWY 1 approach plate alone, as TDZE no longer appears on that chart. We can only piece together this information by referencing both the RNAV (GPS) and the ILS approach plates for RWY 1.

THRE 709

To conclude, this situation would not only lead to an illegal descent below published minimums, but would also create a less-safe situation by potentially taking the pilot to a mere 80 feet AGL without having the actual runway environment in sight.

Trust me; I already know what some of you are thinking! Isn't this strictly an academic discussion in terms of being able to accurately perform the maneuver in question to within a 20-foot tolerance? I know you are a good pilot, but are you *that* good? Additionally, in the United States, we don't adjust published minimums based upon variations in outside air temperature or dewpoint. Furthermore, our altimeters are considered "accurate" for the purpose of IFR operations if they

are found to be within 75 feet of a known altitude (such as field elevation) when adjusted to the current barometric pressure. So, given an altimeter that is barely within its legal IFR tolerance to begin with (say 60 feet off) on a day with temperature and/or dewpoint extremes, we are already operating well outside of a 20-foot tolerance. But, that is not a question of academics, it is exactly the point! I would propose that given that we already have the potential to operate with a fair bit of "legal" inaccuracy in our altitude reporting systems, throwing another "acceptable" error on the pile could very easily be the difference between inadvertent ground contact (i.e., a controlled flight into terrain (CFIT) accident) and a safely executed low-altitude missed approach.

All this begs the question: what is the FAA going to do about this issue and when? Rest assured, they are fully aware of it, thanks to a sharp-eyed general aviation pilot, who reported it as early as February 2013. But like the proverbial ocean liner that takes many miles to change its course, so too is it impossible to fix this problem overnight. Many different agencies, branches, offices, groups and data collection entities must be included to come to a common and satisfactory resolution. The FAA's Instrument Procedures Group has published notes from a series of meetings, beginning in April 2013, on this topic (a document that is publicly available via FAA Control #13-01-307). In it, three recommendations are made to address the issue: 1) Update 14 CFR (FAR) 91.175 to add a Threshold Elevation (THRE) option. 2) Add a description in the PCG to define THRE. 3) Add information to the AIM and the Instrument Flying Handbook to discuss the change. The letter also points out that this issue originated from TERPS Change 20, way back in December 2007, but that the specific changes within Change 20 related to THRE data had not been implemented until recently. Additionally, it states that this is not viewed as a safety issue but as a rule compliance technicality, yet concedes that it could, indeed, cause pilots to violate a Rule (FAR).

From those recommendations, three options were proposed to clear up the confusion. The options were 1) Revert IAP chart design back to using TDZE. This choice would negate ICAO harmonization, however. 2) Update FAR 91.175(c) to affirm the transition using either TDZE or THRE. Changing federal regulations generally requires multiple proposals and comment periods. The letter indicates an opinion that this issue would not merit a fast-tracked rule change process, thus this option would certainly take many months, at the least. 3) Continue to use TDZE in operational rules and to use THRE in procedure development. This alternative would eventually put both TDZE and THRE information on IAP charts, necessitating a change to over 4,000 existing approach plates (with that number growing by roughly 150 with each new chart cycle). Until all IAP charts are corrected, TDZE information would have to be made available to pilots by alternate means (such as NOTAMs or publishing all TDZE data in one document). An official decision is expected in January 2014, but was not yet available again late January. Yet, by all indications, the final decision will likely be some combination of options two and three above. While the decision will hopefully be final before you read this, it will almost certainly take many chart revision cycles for the changes/corrections to appear universally.

As with almost everything in instrument flying, the devil is in the details here. While TDZE and THRE could be used interchangeably in many situations, there are a great many circumstances where they cannot and should not be. Understanding the difference intellectually is important, utilizing it operationally could be nothing short of critical. KA

**About the Author:** Matthew McDaniel is a Master & Gold Seal CFII, ATP, MEI, AGI & IGI. In 23 years of flying, he has logged over 13,000 hours total, over 5,000 hours of instruction-given, and over 2,500 hours in the King Air & BE-1900. As owner of Progressive Aviation Services, LLC, (*www.progaviation.com*), he has specialized in Technically Advanced Aircraft and Glass Cockpit instruction since 2001. Currently, he also flies the Airbus A-320 series for an international airline and holds six turbine aircraft type-ratings. Matt is one of less than three dozen instructors in the world to have earned the "Master Certified Flight Instructor" recognition for six consecutive two-year terms. Mr. McDaniel can be contacted at (414) 339-4990 or *matt@progaviation.com.*