Terminal Arrival Areas

So long procedure turns and MSAs. If this new arrival concept works out, GPS approaches will finally live up to its promise.

by Dave English

FAF, ILS, MAP, VOR, VDP — IFR flying is already peppered with plenty of three letter acronyms. Now comes the FAA with yet another one.

It's TAA and we think that all GPS-equipped pilots will eventually come to like it. (Like it or not, however, we're headed that way, so you might as well learn a little about it.) TAA stands for Terminal Arrival Area, a new instrument approach procedure design that takes advantage of GPS's unique capabilities. The TAA is part of the new basic "T" or "Y" layout of GPS IAPs, a concept still in development by the feds in Oklahoma City.

None of the details are final as this article is being written in mid-summer; the project is still being coordinated within the FAA. However the proposal has high-level FAA support, as well as the blessing of the Air Line Pilots Association, the Air Transport Association, Jeppesen- Sanderson and others.

Seamless Transitions

In the days of yore—when approaches were called "let downs"—the exact courses and altitudes you had to fly for an approach were dictated by the location of navaids relative to the airport and the surrounding obstacles. Without DME, the clock loomed large as a navigation instrument and dead reckoning was an essential skill in IFR flying.

Accurate clock or not, in the era of the low frequency radio range, you never knew *exactly* where you were until you overtopped the station. From there, you could fly one of the range's legs and let down toward the airport, tracking your progress by timing until you could go visual. If the airport happened to be in the opposite direction, you overtopped the station, did a course reversal, crossed the station again, then flew toward the airport; hence, the procedure turn.

Incredibly, 60 years later, timing and the procedure turn are still with us, although they're not as important. But even with VOR and DME, there are many instances in which procedure turns or VOR-defined transitions are the only way to get there. That's because VOR isn't a point-in-space system, at least not without some help from rho-theta RNAV.

For approach purposes, you often have to overtop the station and turn around, just as with the old LF ranges. And because of the VOR's location relative to the airport, restricted radials or obstacles, an approach course may come into the airport at some oddball, less-than-ideal angle to the runway, in which case you're stuck with circling minimums.

A New World

GPS changes everything, of course. It *is* a go-anywhere, earth reference nav system with no theoretical limitations on signal quality or declining accuracy with distance from the station. GPS doesn't miraculously banish obstacles, but it helps, because approach courses can be oriented anywhere, to best avoid high terrain or airplane-eating towers.

That's exactly the design philosophy of the basic T. The final approach segment is aligned on the extended runway centerline with the missed approach point, which is located at the threshold. The final approach fix is five nautical miles from the MAP and an intermediate fix (IF) is five nautical miles further back from the FAF. Two initial approach fixes (IAFs) are established on either side of the IF, four miles away at 90 degrees to the final approach course. The IF can also serve as an IAF for arrivals approximately lined up with the runway.

The basic T design and its surrounding airspace is shown in plan view at direction. The airspace surrounding the T consists of one outer area for straight-in traffic and two inner areas on either side of the runway. The outer (or top) area is defined by a 30-mile arc centered on the IF/FAF, the inner (or side) areas are defined by 30-mile arcs centered on their respective IAFs.

The terms "outer" and "inner" area are somewhat confusing, so take a look at the diagram. This airspace will be known as the terminal arrival area (TAA) and serves to link the en route phase of flight with the approach. Rather than zigzagging from VOR to VOR or being forced to backtrack just to follow some feeder route, pilots will proceed in the TAA direct to the IAF.

Arrivals in the outer area fly straight-in to the IF/IAF. Arrivals from the inner areas fly to the IAF, and then follow the Basic T IAP. No course reversals, no procedure turns, no DME arcs, no feeder routes. Starting to see the advantages? (Actually, the TAA concept does allow for *limited* use of course reversals, but only when there no better choice.)

So Long MSA

If obstacles aren't a factor, the TAA will be designed with only one minimum IFR altitude. However, there are always locations where terrain, airspace or air traffic requirements won't allow a single practical minimum altitude. Some TAAs will be divided like slices from a pie or perhaps a step-down arc will be included. To keep things refreshingly simple, there will never be more than three sectors in the outer area and no sector may be less than 30 degrees in spread. Current specs allow for only one step-down arc. In tight

mountain locations, a unique arrival route may have to be charted which may call for something called the Basic I. It's essentially a stright-in design, but without the TAA's broad obstacle-clear area, thus descents will be restricted to the course lines.

The TAA altitudes will eventually replace the minimum safe altitude (MSA) circle because by definition, the TAA altitude provides emergency terrain clearance. Indeed, the TAA altitude is somewhat similar to the use of the MSA in other countries. Within the TAA, you can safely descend to set-up a comfortable vertical transition to the instrument approach.

The ideal Basic T approach will allow a constant rate of descent down to a visual descent point located where the three-degree glidepath intercepts the MDA. So, 50 miles out, you could be given a clearance that would enable you to plan a fuel-efficient descent in the TAA, direct to a quick, no-procedure-turn Basic T approach, which in turn leads to a stabilized constant-rate descent on final.

The TAA is a huge step in the transition from a relatively inflexible airway system to a concept you've heard a lot about: free flight. If it works as planned, the transition from random route cruise flight to the initial approach fix will be simple and the approach itself won't have procedure turns or overlay the serpentine routes of underlying ground-based navaids. In short, the TAA is what GPS has promised but has yet to deliver.

Maybe Yes, Maybe No

Will TAA work exactly as we've described it here, with pilots merrily navigating themselves seamlessly from random routes and into approaches, using plates that look almost identical from airport to airport? There are a couple of flys in the ointment. One minor one (and probably not a showstopper) is that AOPA views the TAA idea as an airspace grab. The floor of Class E airspace will be lowered over several western states to accommodate TAAs. That will result in some restriction to weather minimums for VFR-only pilots who can now tool along in Class G with only a mile of visibility, clear of clouds.

Second, how will all of this fit into ATC's plans? Every facility is a little different and, in practice, every facility comes up with its own exceptions to the rules. We've already seen this in the form of procedure turns added to standalone GPS approaches at the behest of ATC. We suspect that at least some of this is due to inertia—i.e., we've always done it that way.

Rough spots notwithstanding, we're betting that TAA will fly successfully. When it does, we're looking forward to embracing one abbreviation and losing a couple of others—ADF and VOR.

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