INSTRUMENT READINGS™

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OBSTACLE DEPARTURE PROCEDURES

Part 4

This is the last installment is this series of articles on ODPs. After this, *Instrument Readings* will move on to other topics.

One of the things I would like to do in this installment is to critically examine some of the language in the AIM relating to ODPs and takeoff minima. The relevant AIM section is 5-2-6, but it is too long to reproduce here in its entirety. So I will extract sections and add my comments. I will put the AIM extracts in boxes. I recommend that you read the entire AIM section.

> **c.** Who is responsible for obstacle clearance? DPs are designed so that adherence to the procedure by the pilot will ensure obstacle protection. Additionally:
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> **1.** Obstacle clearance responsibility also rests with the pilot when he/she chooses to climb in visual conditions in lieu of flying a DP and/or depart under increased takeoff minima rather than fly the climb gradient.

It should be noted that the pilot doesn't always have a choice about flying the climb gradient. The airplane, under the prevailing conditions of density altitude, may not be capable of comfortably achieving the specified climb gradient. Be absolutely certain that you can maintain the required climb gradient all the way to the specified altitude before departing under a procedure that requires it.

> Standard takeoff minima are one statute mile for aircraft having two engines or less and one-half statute mile for aircraft having more than two engines. Specified ceiling and visibility minima (VCOA or increased takeoff minima) will allow visual avoidance of obstacles until the pilot enters the standard obstacle protection area. Obstacle avoidance is not guaranteed if the pilot maneuvers farther from the airport than the specified visibility minimum prior to reaching the specified altitude.

These last two sentences are models of opacity. What is a "standard obstacle protection area?" There is no such thing in TERPS nor is any such term defined or used elsewhere in the AIM. I think what it means is the area within which a standard 200 fpnm climb gradient will clear

obstacles without dependence upon visual avoidance; for example, after reaching the climb-to altitude in a VCOA.

Under what circumstances does the second sentence apply? For a VCOA, it is not correct. The radius of a VCOA Visual Climb Area (VCA) is, somewhat simplistically, 3-5 miles from the airport reference point (ARP), and the minimum visibility requirement is two to three miles. So it is apparent that the visibility requirement will usually be less than the VCA radius, and that venturing farther from the airport reference point than the specified visibility is a normal maneuver in a VCOA climb. The AIM phrase "farther from the airport" is unclear. The VCOA DP description will say something like "Remain within 3 NM of the XYZ airport while climbing in visual conditions…". This distance is relative to the airport reference point. The maneuver is intended to be performed visually, but a GPS set to the airport can be a great aid, especially in low visibility. The GPS uses the airport reference point.

The VCA radius is chosen without regard to obstacles. It is intended by TERPS that the specified visibility will allow visual avoidance of obstacles within the VCA during the climb.

Current TERPS criteria (Change 19) require that a VCOA procedure be provided in lieu of a nonstandard climb gradient when there are obstacles beyond 3 NM of DER that cannot be cleared using a standard climb gradient from the DER. However, there are still many DPs that were generated under older criteria and have not been updated. Many of these procedures will specify a nonstandard ceiling/visibility to allow obstacle avoidance while climbing at a standard climb gradient. The ceiling will be just above the highest obstacle that must be avoided in the area or along the route where the flight will be conducted. What this amounts to is flying along inside a visibility bubble, not over the airport but out in obstacle land, avoiding obstacles on a progressive basis. The obstacle(s) to be avoided might be a TV tower with guy wires, or a hill, or a massive mountain ridgeline. In the latter case, you will not be able to outclimb the terrain, and you may not have the ability to turn back in time after you finally see the ridgeline and realize your predicament, especially since you do not know the terrain to your sides, and you may be in canyon-like terrain with ridges to both sides. Splat! The infeasibility of this approach is what finally got the FAA to implement VCOAs. But, these DPs are still out there, so beware.

There are some who believe that, when you can't make the climb gradient, and there is no VCOA specified, you should climb over the airport to cross the DER at or above the specified ceiling. This amounts to an improvised VCOA for a DP produced under older criteria. This sounds somewhat like the AIM statement "Obstacle avoidance is not guaranteed if the pilot maneuvers farther from the airport than the specified visibility minimum prior to reaching the specified altitude." That sounds like an attempt to describe an unpublished climb over the airport to me.

> That segment of the procedure that requires the pilot to see and avoid obstacles ends when the aircraft crosses the specified point at the required altitude. In all cases continued obstacle clearance is based on having climbed a minimum of 200 feet per nautical mile to the specified point and then continuing to climb at least 200 foot per nautical mile during the departure until reaching the minimum enroute altitude, unless specified otherwise.

Many procedures do not have a “specified point”, just an altitude. If the takeoff minima specify a ceiling and visibility, you know that there obstacles to be avoided visually. In the absence of local knowledge, you might want to climb over the airport, using the DER or ARP as the “specified point”, and the altitude specified in the procedure or takeoff minima.

> ATC must be immediately advised if the pilot does not possess the assigned SID, or the aircraft is not capable of flying the SID. Notification may be accomplished by filing "NO SID" in the remarks section of the filed flight plan or by the less desirable method of verbally advising ATC.

Some pilots believe that putting “NO SID” or “NO STAR” in the remarks section of their filed flight plan will keep them from having to fly a SID or STAR. The truth is, if the controller needs you to fly the SID or STAR, your clearance will include the SID or STAR; not by name, but by a potentially long and complex verbal description of the procedure which you have to copy and readback. This increases you workload for no good reason. The only good reason I can think of to put NO SID on the flight plan is that your airplane cannot fly the procedure for some reason such as climb gradient or type of navigation required. You will still probably have to explain to the clearance source that you cannot fly it and why.

That ends my comments on the AIM.

The time to begin thinking about how you will depart an airport is when you are planning your flight to it. It is possible to fly into an airport from which you will be unable to depart safely in IMC, or cannot depart for an indeterminate time while ceiling and visibility improve to allow visual obstacle avoidance if you cannot make the required climb gradient. This also suggests that alternate airports should be planned carefully considering the departure conditions, especially in areas with difficult terrain.

TERPS criteria, including those for takeoff minima and departure procedures, are constantly evolving. When a change takes place, new procedures should be developed under the new criteria. But when publishing a TERPS change, the FAA cannot simultaneously revise all previously-developed procedures. A great many, if not most, procedures out there have been produced under criteria that no longer exist or have been substantially revised. Lessons learned from continuing expert work on the subject and from accident experience have not made their way into all older procedures. Instrument pilots can be well served by a personal continuing education process, one component of which can be learning to understand possible pitfalls in older procedures in light of newer criteria.

Oh, one more thing. In the first installment of this series, I mentioned that one type of roll-your-own departure procedure for Part 91 operations is to fly an IAP backwards. I didn’t suggest that it is a bad thing, but I would like to comment a little further on it.

The most common slope for the final approach segment of an IAP is about three degrees. That is, of course, simple to accomplish on a descent. But a climb at three degrees, which is 318 fpnm, requires 318 fpm climb rate at 60 knots and 636 fpnm at 120 knots. The nonprecision final segment gradient can be as high as 400 fpnm (400 fpm @ 60 kts, 800 fpm @ 120 kts). Be sure that, at your gross weight and density altitude, you can comfortably achieve the required

climb gradient at the airspeed you need to fly. Use the full runway and get as high as you can in the shortest distance you can on takeoff.

Another significant factor to keep in mind when deciding whether you can sustain a climb gradient is wind. The climb gradient is strictly ground-referenced; if you are climbing at 90 knots TAS and the departure has you turn to a direction where you will have a 45 knot tailwind, you just lost half of your climb gradient. Splat! Altitude and temperatures are another factor, determining density altitude. An IAS of 90 kts at 6,000 ft and 80°F is a TAS of 103 kts, at standard pressure and no humidity. This will decrease your climb gradient by over 10%.

If no Visual Descent Point (VDP) is published for a nonprecision approach, then no obstacle protection is provided during the descent from MDA. The specified minimum visibility is supposed to allow you to see and avoid obstacles during the descent to the runway. Conversely, on an improvised departure, you must be able to visually avoid obstacles as you climb to MDA along the procedure track. Keep in mind that during the climb, the airplane will be in a nose-high attitude, making it more difficult to see and avoid obstacles. An exception to the No-VDP caution is when there is a VGSI of some type, e.g. VASI or PAPI. If you stay at or above the visual glide path on descent, you will have obstacle clearance within 4 nm of the runway. If on departure you climb at or above the VGSI glide path *from the VGSI location*, you will likewise have obstacle protection. On departure, you will not be able to see the VGSI. With no VGSI or VDP, you *must* have good local knowledge.

Another roll-your-own that is sometimes discussed is flying the missed approach procedure. On a nonprecision approach, the missed approach segment is predicated on a minimum 200 fpnm climb from MDA from the MAP or DA point. In case you were to contemplate flying the missed as an improvised departure, you need to understand that you will not be assured of obstacle clearance unless you begin from MDA and the MAP. You will have to remain visual until you can get to that altitude over the airport.

For any improvised departure procedure into IMC, good local knowledge of terrain, towers and other obstructions is absolutely necessary.

You might find it instructive to fly some of the more demanding published ODPs on a simulator, such as the Elite PCATD or Microsoft Flight Simulator. Some to consider are Aspen (KASE), South Lake Tahoe (KTVL, try rwy 18), and Eagle, CO (KEGE). In the sim, set the ceiling and visibility to the specified takeoff minima. Try it again in clear conditions so you can see what is happening. Also try some stiff crosswinds and tailwinds.

I hope this series of articles on ODPs has encouraged you to carefully consider your departures under IFR, and has provided some information to help interpret takeoff minima and obstacle departure procedures.

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