

DIVERSE DEPARTURES

You've seen the note about diverse departures from airports. But what does it mean and when do you have to apply it? Here's a review.

by Fred Simonds

Imagine that you have just landed at an unfamiliar airport following an instrument approach in IMC. You top off at the self-serve fuel farm and begin contemplating your departure. Looking down the runway, all you see is fog and cloud. You begin to picture a giant tower constructed by some diabolical entity right off the end of the runway, or a massive hill or mountain guaranteed not to make way for you.

There is no control tower, no FBO, not a soul in sight to ask. Now what? You consult your approach plates, but there are no takeoff minimums, no ODPs, no SIDs, seemingly no guidance at

all. And yet the FAA has not abandoned you. By their silence, they have approved an obscure little lifesaver called a diverse departure, or in ICAO-speak, an "omnidirectional departure."

TERPS to the Rescue

You may have heard of TERPS, the United States Standard for Terminal Instrument Procedures. Numbered

FAA Order 8260.3B, TERPS specifies the technical criteria by which instrument

procedures are built and certified.

When building an instrument approach, FAA designers, known colloquially as "TERPsters," appraise

the need for a formal Departure Procedure (DP), either a Standard Instrument Departure (SID) or an Obstacle Departure Procedure (ODP).

If a departing aircraft can turn in any direction within the TERPS-defined assessment area while still remaining clear of obstacles, then it passes the diverse departure (as in "depart in any direction you like") test and obviates the need for an ODP. A SID may still be built if needed for ATC traffic flow purposes. It will account for obstacle clearance, but it's there mainly for ATC convenience.

The profile drawing shows the assessment area as a shallow cone whose tip is located 35 feet above the departure end of the runway. From this point imagine a 360-degree rising plane with a 40 to 1 ratio—that is, for every 40 feet of outward horizontal movement, the plane rises one foot. This plane is called the Obstacle Clearance Surface, or OCS. Any obstacle that sticks up through the OCS in any direction will cause the TERPsters to construct an ODP that will route you clear of that obstacle, if you stay on the ODP.

The 40-to-1 ratio translates into a 152-foot per nautical mile climb (FPNM) gradient (divide 6046 feet

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AIRCRAFT REACHES ENROUTE OBSTACLE CLEARANCE OF 1000 FEET (2000 FEET IN MOUNTAINOUS AREAS)

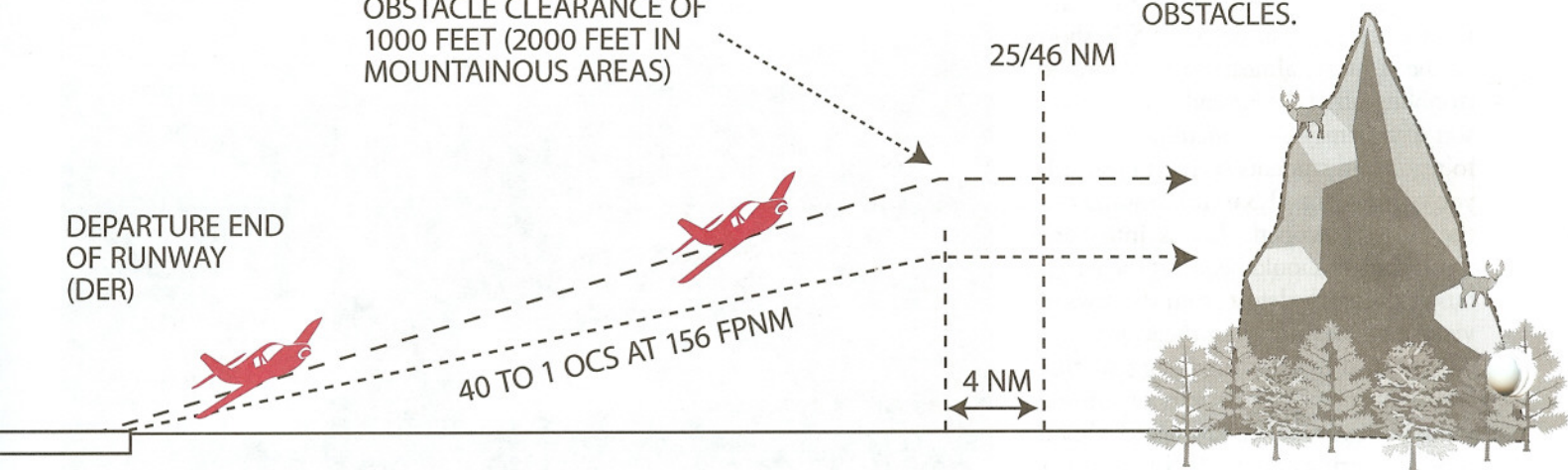
DEPARTURE END OF RUNWAY (DER)

40 TO 1 OCS AT 156 FPNM

25/46 NM

4 NM

BEYOND THE DIVERSE OBSTACLE AREA, THERE MAY BE SIGNIFICANTLY HIGHER OBSTACLES.



DEPARTURE REFRESH

in one nm by 40). Therefore, if an aircraft maintains a 200 FPNM gradient on departure, that builds in a 48 FPNM safety factor. The OCS is further analyzed to see if the aircraft can turn in any direction from a runway while still in the assessment area and remain clear of obstacles. If it can, then diverse departure criteria are met and there will be no ODP.

Your Takeaway

If no DP is published and there is no note that a diverse departure is not authorized, then you can depart safely by maintaining runway heading (mind the drift) and climbing with a 200 FPNM gradient to 400 feet above the DER elevation. Continuing your climb, turn in the shortest direction to your first filed point and you are on your way. You have a head start on the climb because you are already at least 35 feet up once you pass the end of the runway.

At one time, the FAA considered adding a notation on the instrument approach plate to indicate that a diverse departure was an option. This never happened and so the diverse departure is just something you have to know. Some airports have a notation indicating that diverse departures are not authorized, either for the airport or for certain runways. Others may have a notation limiting diverse departures to certain headings.

No IAP, No Departure

It is important to note that an obstacle analysis is performed only for airports with at least one instrument approach. You are on your own if you depart from an airport lacking an IAP. At private airports, the FAA may not be responsible for developing an IAP. In such cases, those responsible for the airport need to make sure a TERPS assessment as described above is done, and an ODP created as needed.

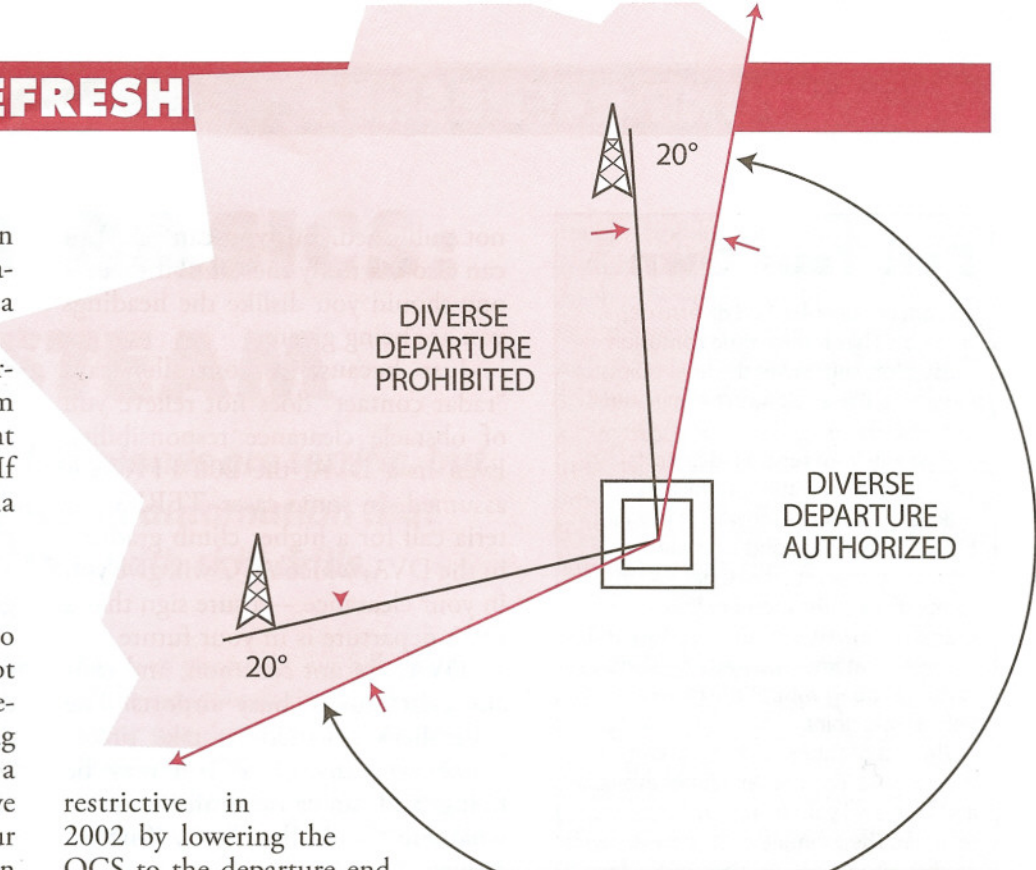
TERPS criteria were made more

restrictive in 2002 by lowering the OCS to the departure end of the runway, not 35 feet above it. This could pose a hazard to aircraft if there is an obstacle as high as 35 feet as was allowed under the old criteria. Since you have no way of knowing under which set of criteria your intended departure was evaluated, be very aware of obstacles near the departure end of the runway if you expect to cross it at 35 feet or less.

Once the aircraft has attained 1,000 feet of obstacle clearance, or 2000 feet in mountainous areas, the assessment area ends as the aircraft's altitude meets minimum en route obstacle clearance criteria. Indeed, this is the purpose of any departure procedure--to get the aircraft into en route airspace safely. The cone typically extends as far as 25 nm from the runway's end in non-mountainous areas or up to 46 nm in mountainous areas.

Diverse Vector Areas

Diverse departure criteria can be used in another way. Sometimes ATC will set a minimum vectoring altitude (MVA) around an airport, based on terrain and obstacle clearance



BEALE AFB (KBAB)

MARYSVILLE, CA (KBAB) 04246

Runway 15 diverse departure not authorized. Use the following departure procedure for obstacle avoidance. Between 005° and 087° bearing from DER, standard with minimum climb rate 250 ft/NM to 4900.

Runway 33 diverse departure not authorized. Use the following departure procedures for obstacle avoidance. Between R-353 and R-066 bearing from DER, standard with minimum climb rate 250 ft/NM to 11,000.

When diverse departures aren't authorized, the lead item in the note will say as much. In this case, follow the published departure procedure or otherwise assure that you remain clear of terrain.

requirements. However, it may be necessary to vector departing aircraft while below the MVA for the sake of smooth traffic flow.

As the second figure above shows, ATC resolves this contradiction by establishing a Diverse Vector Area based on TERPS criteria. You may suspect that a DVA is in use if ATC begins vectoring you right off the departure end of the runway and so well below the MVA, or if the initial heading you are given is not the same as any published DP. You have no way of knowing because DVAs are

Roll Your Own

The advent of published diverse departure notes has reduced the confusion most pilots suffer over the finer points of launching IFR. But it hasn't eliminated it entirely.

If you fly from controlled airports where radar separation is available practically from the runway, you're at both an advantage and a disadvantage. The advantage is that ATC has you in its hands from the moment you taxi onto the runway, providing vectors and altitudes that imply obstacle clearance. Nothing wrong with a little government help at that point.

The disadvantage is that you can get used to that. Then, when it's not available and you're on your own, you might not realize it. The example is the non-towered airport without an approach of any kind. These are getting rarer, but they're out there. You can, of course, legally depart from such an airport and many pilots routinely do. With no departure procedure, what is the procedure?

Frankly, you're on your own. ATC won't say as much, but when no heading or vector is heard in the initial clearance and there's no ODP or diverse, ATC is expecting that you'll have a workable plan to get off the runway and into controlled airspace without hitting anything. And don't expect controllers to specify a departure procedure whether one exists or not.

The signal phrase is: "Upon entering controlled airspace, fly heading..." That doesn't mean you can turn to that heading immediately after takeoff, although that might be perfectly safe. What it means is exactly what it says: Get into controlled airspace, then fly the assigned heading. Controlled airspace typically begins 1200 feet above a Class G airport with no approach. But it can be much higher in some areas.

ATC makes no guarantees and has no responsibilities for you until you get into controlled airspace. After that, separation services and terrain clearance is implied in the terms of the clearance. The fact that most airports have approaches and thus ODPs and/or diverse procedures makes this problem all the rarer. But it's no less deadly for the unprepared pilot who expects ATC's instructions to always assure obstacle protection.

not published. But you can ask. You can also ask to fly the ODP if there is one should you dislike the headings you are being given.

Just because a controller says "radar contact" does not relieve you of obstacle clearance responsibility. Even in a DVA, the 200 FPNM is assumed. In some cases, TERPS criteria call for a higher climb gradient in the DVA, which ATC will give you in your clearance—a sure sign that a DVA departure is in your future.

DVAs are not common, and usually exist only at busy airports. The controller's instructions take precedence over any ODP you may be flying, and can cause confusion as to what you should fly. Clarify if necessary.

Your Departure Checklist

Initial obstacle clearance is largely up to you. Before leaving, look around. Consider the terrain and other obstacles that might affect the safety of your departure. Look at a sectional map and any available approach plates for cues. Ask local pilots for information. They can be hugely helpful.

Check for an ODP. If there is one, your choice is to avoid obstacles visually or fly the ODP. In IMC and at night especially, fly the ODP, even VFR. You can specify that you will fly an ODP in the remarks section of your IFR flight plan. There is an apparent misconception that ODPs are only for non-tower airports. That's not the case. They exist at more non-towered airports than ever before because these airports are getting approaches of some kind.

While checking for that ODP, find out if diverse departures are allowed by the absence of a note to the contrary. I know how crazy that sounds, but that's how it works. Note that low close-in obstacles (within 1 NM of the DER and penetrating the OCS) may be published for a diverse runway, or indicated by 300-

1 visibility minimums. ATC hardly ever assigns an ODP, and few tower controllers know about them. If a tower controller gives you a departure heading that doesn't match the ODP, politely decline it if the visibility is poor or if it's nighttime. Inform them that you will fly the published departure procedure instead per your clearance.

Calculate your required climb gradient. To quote the *Instrument Procedures Handbook*, "Departure design, including climb gradients, does not take into consideration the performance of the aircraft; it only considers obstacle protection for all aircraft."

For most aircraft, 200 FPNM is no problem, but if the required gradient is too great, the time to find out is on the ground, not in the air. If you are in a multi-engine airplane, consider the effect on climb gradient should an engine fail. If you cannot stay above the OCS, you risk striking an obstacle.

When Is It Over?

Once you are vectored off an ODP or a SID, as onto an airway, you can consider the transition canceled unless the controller informs you that you can expect to resume it.

If this happens, you will be advised or advised again of any restrictions. If told to maintain an altitude, and you cannot cross a fix at the minimum crossing altitude, inform ATC and request a climb or alternate routing.

Pilots and controllers share the responsibility to fly departure procedures safely. Safety is only possible when we work together. All the same, you are in the seat that's moving and as always, no one can take better care of you than you.

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