



**ROBERT N. ROSSIER**

BETTER PILOT / STICK & RUDDER



# Crossing Over

Tips for passes and ridges

**SOME OF THE MOST** spectacular flying is found away from “civilization” in what we consider “mountainous terrain” that covers nearly half of the contiguous United States. Whether we’re talking the high country of the Rockies and Sierra Nevada mountains, or the hillier and mountainous regions of the Appalachians, pilots in these areas may sometimes find themselves tackling terrain that poses potential risks beyond those normally encountered when flying over the flatlands. Whether it’s an en route segment, or near the approach to an airport, mountain ridges and passes can offer some serious challenges to unprepared pilots. By understanding these risks, and planning and preparing for them, we can greatly improve our chances of a safe, successful flight.

If you’ve ever participated in a mountain flying course, then you’re likely aware of the hazards posed by ridges and passes, and the techniques and precautions needed to mitigate the risks. For those who haven’t had such an opportunity, or who could use a refresher, we offer a quick primer on safely negotiating such obstacles.

Before we delve into the techniques required for safely crossing ridges and passes, there are a number of considerations of which we should all be aware. Our

route of flight, local weather, aircraft performance, and flight-planning procedures are all critical to safety when tackling high terrain of any sort.

#### WHERE TO FLY

When choosing a route over high terrain, it is often best to choose one that follows roads and highways. This helps to ensure the continuing possibility of an off-field landing site, and keeps us close to civilization should one be necessary. Always consult those with local knowledge of passes, and heed their recommendations. Some passes may appear safe or appealing but hold hidden dangers that those unfamiliar with the area might not fully appreciate.

#### FLIGHT PLAN

Regardless of the route you plan to fly, it's best to file a flight plan and activate it on or before departure. If flight following is available, use it, but be aware that in many mountainous areas such service might not be

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available. In that case, it is essential to make position reports as frequently as practical. Having done so will focus the search area if you run into a problem and must put down off-field. Position reports can be made via local FBOs, to flight service via remote communications outlets depicted on sectional charts, and via many VORs.

#### WEATHER AWARENESS

Remember that high terrain often generates

its own local weather phenomena, and area forecasts can be misleading or lacking in details. Especially when ceilings are low or fronts are approaching, some passes may be impassible, even if the valleys offer good VFR flying. Here again, local knowledge, pilot reports, automated surface observing systems, automated weather observing systems, and other sources can provide invaluable insights when it comes to flight planning.

#### AIRCRAFT PERFORMANCE

Mountainous terrain often goes hand in hand with high density altitude, and its impact on aircraft performance is an important consideration. As density altitude increases, we can expect longer takeoff and landing distances, poorer acceleration and climb performance, and a larger turn radius due to higher true airspeeds. If it's been a while since you've reviewed the effects of density altitude on the performance of your aircraft, do so before heading off into the high country.



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## ROBERT N. ROSSIER

### UPS AND DOWNS

One of the first things to be aware of when attempting to cross a ridge or pass is that we're likely to encounter updrafts, downdrafts, and turbulence. Like water flowing in a rocky streambed, winds follow the terrain. When wind is blowing across a mountain range, it will create updrafts on the upwind side of rising terrain and downdrafts on the downwind side. As it squeezes through a pass, it can accelerate as in a venturi to twice the speed of winds aloft, increasing turbulence and lowering the local atmospheric pressure. In fact, the decreased pressure can cause an altimeter to read 500 to 1,000 feet higher than true altitude.

For a pilot who is attempting to cross a ridge or pass, it is critical to know what to expect. Especially if the density altitude is high, or the aircraft is heavily loaded, there may not be sufficient performance margin left to accommodate a strong downdraft. When mountaintop winds exceed 25 to 30 knots, turbulence can be moderate to severe, and downdrafts can exceed 500 to 1,000 feet per minute!

Although updrafts usually occur on the upwind side of a pass, there are exceptions to that rule. In some areas and conditions, a reverse flow or "mountain riptide" can occur due to differences in local atmospheric pressure. A good example of this is Hagerman Pass in Colorado, which lies between Aspen and Leadville. Normally, the winds aloft

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blow from west to east, causing an updraft on the upwind (Aspen) side of Hagerman Pass. The opposite can occur when the local pressure in Leadville is higher than that in Aspen, causing a reverse flow of air over the pass from Leadville to Aspen. Many a pilot has been surprised over Hagerman by a sudden downdraft just where an updraft was expected, and more than one has ended up in the trees as a result.

### ANGLES AND ALTITUDE

When attempting to cross a ridge or pass, approach at a 45-degree angle. This way, if a downdraft is suddenly encountered, a much shorter turn will have you happily headed toward lower terrain.

Altitude is also important. When possible, approach the pass at an altitude of at least 500 to 1,000 feet above the pass or ridge elevation. Consult a sectional chart for the pass elevation, but remember the altimeter errors we discussed earlier that can

### MOUNTAIN RIPTIDE TURBULENCE



*Winds usually follow the terrain, with updrafts on the upwind side and downdrafts on the downwind side. However, in some areas a "mountain riptide" can occur due to differences in atmospheric pressure.*

occur with strong winds over a pass. With this in mind, visually check to see that you are in fact clearing the terrain. As you fly closer to the ridgeline, you should be able to see more and more of what is on the other side. If not, you don't have enough altitude to cross and should execute an immediate turn or climb.

Once the ridge or pass is crossed, turn perpendicular to the ridgeline to get clear of the terrain as quickly as possible. If a downdraft is present, extra distance from underlying terrain will be a welcomed comfort.

#### COMMUNICATION

One of the last surprises we want to have when attempting to cross a ridge or pass is another aircraft headed across in the opposite direction. A local UNICOM frequency, if one is available, can be helpful in monitoring area traffic, but these aren't always available. While some pilots have used 123.45 MHz to announce intentions of crossing a ridge or pass in remote areas, use of this frequency is not authorized in US airspace. An announcement in the blind or position report over a local CTAF or FSS frequency may be more appropriate. Check with Flight Services or local operators for the proper frequencies and procedures, and keep your eyes open – just in case.

#### FINAL THOUGHTS

Any time we're flying over desolate or inhospitable terrain, it's a good idea to carry survival equipment aboard. In the event that an emergency requires an off-field landing, having the right stuff with you can make the difference between a bad night and a disastrous one. Warm clothing and boots, a sleeping bag, shelter, first-aid equipment, signal equipment, fire-making tools, and food and water are all items to be considered in a flying survival kit.

Ridges and passes found in mountainous areas can add excitement and danger to flying. By learning about the hazards, as well as the techniques and procedures to mitigate the risks, we can avoid the surprises that might otherwise ruin our day. *EAA*

**Robert N. Rossier**, EAA 472091, has been flying for more than 30 years and has worked as a flight instructor, commercial pilot, chief pilot, and FAA flight check airman.

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