A persistent myth

The 'real' hazards of the downwind turn

BY BARRY SCHIFF / AOPA Foundation Legacy Society chairman

MY SON, BRIAN, conducts a monthly and popular webinar series called *ForeFlight Workshops*. During a recent seminar, he administered an online survey to determine how pilots felt about certain issues. One such question was, "True or false? It is particularly important to monitor airspeed when turning 180 degrees away from a strong headwind." Such a turn is called a downwind turn because the airplane is turning from an upwind heading to a downwind heading. Out of 1,484 respondents, three-fourths (1,115) answered "true."

The alleged hazard associated with a downwind turn is one of aviation's most persistent wives' tales and refuses to die. Proponents claim that a downwind turn (turning away from a steady-state headwind) is aerodynamically different than an upwind turn (turning into a headwind). They insist that dangerous airspeed and/or altitude losses can occur at such times. They say, for example, that when climbing at low airspeed shortly after takeoff, this phenomenon can result in an inadvertent stall. The stronger the headwind—so the theory goes—the greater the danger. An identical low-altitude upwind turn, it is claimed, does not pose the same hazard.

The explanation goes like this: Shortly after takeoff and while climbing into a strong headwind, the airplane has a low ground speed. If a steep turn is made away from the headwind, so the reasoning goes, ground speed increases dramatically. It is then argued that the airplane is incapable of accelerating so rapidly to such a high ground speed and that something must give in the process. That something, we are warned, is airspeed and/or altitude.

Although Newtonian physics can be used to disprove this theory, I am not qualified to present such a treatise. Nor, I suppose, would you be interested in dredging through such heavy handed number crunching. Instead, it is easier to debunk the theory empirically.

If such a phenomenon really existed, then it also could be detected at altitude during a series of 360-degree climbing turns at low airspeed while under the influence of a strong and steady wind. In theory, the pilot would detect a decrease in airspeed or climb performance when turning downwind and a similar increase when turning upwind. The same change in performance would be detectable during a steep, spiraling glide. As one who has spent his share of time holding in a jet stream, I can assure you that this is emphatically not true.

If it were possible to detect changes in performance when turning downwind and upwind, then a pilot wearing a view-limiting device should be able to determine the approximate wind direction from his instruments while turning. Many years ago, I extended a challenge (in the form of a substantial wager) to anyone who could demonstrate this phenomenon during simulated instrument conditions (with an intentionally mis-set heading indicator to prevent taking advantage of a winds aloft forecast). No one has yet to pick up the gauntlet. Any takers?

Inertially, the change in groundspeed is no different when turning downwind than when making an identical turn in calm air.

Assume that an airplane is climbing at 80 knots into a 30-knot headwind. Groundspeed obviously is 50 knots. The pilot then turns downwind so that the wind is now on the tail. The new groundspeed is 110 knots. The total change in ground speed is determined by combining a groundspeed of 50 knots in one direction with 110 knots in the other, which is 160 knots. In other words, the pilot changed his forward progress by a total of 160 knots.

If the same turn is made in calm air, the total change in groundspeed is found by combining a groundspeed of 80 knots in one direction with 80 knots in the other, which—lo and behold—results in the same total change of 160 knots.

In other words, the total change in groundspeed is the same irrespective of whether the turn is made in moving or stagnant air. In each case, the total change in groundspeed (acceleration) is a direct result of the turning force of the wing and is the same in each case.

Just as there are those who believe that the Earth is flat, that man never walked on the moon, and that the Holocaust never occurred, there will always be a defiant core of pilots who—in the face of scientific proof to the contrary—steadfastly maintain that a downwind turn away from a steady-state headwind is inherently more dangerous than a turn in calm air.

Tune in next month, though, and we'll salvage the pride of "believers" by presenting the conditions and illusions that explain why they have been misled into believing that there is an aerodynamic difference between downwind and upwind turns. ■

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BARRY SCHIFF has been writing for *AOPA Pilot* for 61 years. This month marks the anniversary.