COFFIN CORNER AND THE PISTON PILOT

Some pilots challenge the notion that a so-called "coffin corner" exists for piston airplanes. You need only experience it to believe it.

The term applies, of course, to the altitude at which a fixed-wing airplane's stall speed equals its critical Mach number. As such, it's a term usually reserved for jets. Piston drivers generally don't need to worry about Mach numbers, but we do need to at least think about what happens when we've climbed to an altitude at which engine power deteriorates to the point the airplane can't muster faster than indicated stall speed—and there's no more power available.

The chart reproduced as Figure 2 on page 13 highlights an airplane's service ceiling and absolute ceiling. Service ceiling, of course, is the density altitude at which the airplane's rate of climb deteriorates to no more than 100 fpm. Absolute ceiling, meanwhile, is the highest altitude at which an airplane can sustain level flight.

The main factor in this phenomenon for pilots of normally aspirated piston-engine airplanes involves the deterioration of power output as the air thins; for some airplanes, that power deteriorates to the point that stall speed is the maximum it can make—while, at the same time, the airplane is far from its maximum true speed limits. At this point any pitch increase results in a stall or, at the best, a mush—and the airplane descends.

Prolonged flight at an airplane's absolute ceiling isn't economical, thanks to the low indicated airspeed—at or near stall—it can muster. Since a high fuel burn—maximum available power—will be required to maintain the absolute altitude, the distance traveled requires more energy than if we choose a different, lower altitude, one at which, say, we can economically operate the engine(s) while maintaining an airspeed close to best lift versus drag. Often, we can just use V_Y as an approximation.