Yaw and Spins
By Rick Wheldon

When training in the MU-2, I have frequently flown past the stick shaker to aerodynamic stall, and the handling was entirely conventional. Coordinated reduction of the angle of attack with the elevator and application of power resulted in minimal altitude loss. However, once, early in my career, I got sloppy and flew past a stall into a spin. The spin, of course, was outside the normal training curriculum and outside the certified flight envelope for the MU-2 as well. It was a boneheaded maneuver on my part, but, since I'm here writing about it, it obviously was a maneuver from which I could recover.

What happened? Well, I had heard that some instructors were demonstrating simulated single engine stalls, and I thought I would try one for myself. I was transiting home VFR, and had the presence of mind to start this maneuver at 16,500 feet, just in case… I set full power on one engine and flight idle power on the other. I then slowed the airplane toward stall.

I now know that if I'm going to do single engine stalls, I had better be paying close attention to the balance ball. As the pilot approaches the stall speed, changes in yaw forces become rather rapid. Unfortunately, I wasn't nimble with my feet, and my scan of the ball broke down. Needless to say, I wasn't in balanced flight when I stalled. The results were predictable.

A spin cannot develop without a stall. When I first received spin training many years ago, I was taught to stall the aircraft and kick in rudder in order to induce yaw. The yaw causes one wing to increase velocity and the other wing to lose velocity (i.e., if you kick in right rudder, the left wing is advancing faster than the right wing.) The result is that more lift is generated on the forward (and upward) moving wing and a rolling moment is generated. An autorotation in yaw and roll is created where the outside wing continues to generate more lift. Spins can become self sustaining due to complex aerodynamic forces.

Recovery generally involves removing the factors that caused the spin – namely, yaw and stall. First, reduce power on both engines to idle. Next, use full rudder to oppose the yaw. Some pilots might be disoriented by the fairly rapid rotation of the spin, so a quick glance at the turn needle provides a fail safe means to determine which rudder to step on. If the needle is pointing to the right, step on the left rudder. At the same time, eliminate the stall. Push forward on the yoke to reduce the angle of attack. Once the stalled condition is corrected, the pilot should find himself in a nose low attitude, accelerating. He will need to neutralize his rudder input since the airplane is no longer spinning. Finally, keeping the wings level, smoothly pull back on the yoke to return to level flight. Do not pull so hard as to induce an accelerated secondary stall or high G's.

One common mistake during spin recovery is to correctly make the spin recovery inputs, but not to hold them until the aircraft is recovered. Some airplanes actually "accelerate" their roll rate at the initiation of the recovery. A normal response is to take out the control

inputs, since it doesn't appear that the airplane is recovering properly. However, relaxing the recovery inputs usually prolongs the spin. Once the recovery inputs are initiated, hold them in until the airplane has recovered from the stall.

Another consideration with the MU-2 is that a portion of the wing and the elevator are blanketed behind the propellers. The flat pitch of the propellers at idle power actually reduces the airflow over the wing and the elevator. When I was in my spin, after pulling the engines to flight idle, I actually added a small amount of power on both engines for a moment, and the airplane immediately recovered from the spin. Adding power effectively reduced the angle of attack on the wing by increasing the velocity of the airflow over the wing. It also increased the airflow over the horizontal tail, thus assisting in eliminating the stall. Once recovered from the stall, and accelerating, I reduced the power back to flight idle and returned to level flight.

Two weeks ago, I returned from my annual recurrent at SIMCOM, and, believe it or not, I actually had to perform a spin recovery in the simulator. The instructor had me close my eyes for about 30 seconds, and when I opened them, I was looking at the ground spinning in front of me. Although the "G" forces could not be duplicated in the simulator (they are not excessive in the airplane), the visual cues were extremely realistic, and the control forces and recovery were similar to what I remembered them to be. I think, overall, it was a very instructive experience, and one which could not, because of certification issues, be replicated in the airplane.

Again, I'll restate the obvious – SPINS SHOULD NOT BE ATTEMPTED IN YOUR AIRPLANE. It is not certified for this maneuver. However, with proper airspeed control, you should never enter a spin. If you should someday inadvertently find yourself spinning, just remember this – get rid of the stall with down elevator and oppose the yaw with rudder. Once the airspeed is increasing, neutralize the controls, keep the wings level, and smoothly pull the nose up to the horizon. It works. I lost less than a thousand feet in my spin.