AVIATION QUARTERLY

Room To Manoeuvre

by Bryan Quickmire

One Turn Too Many

In both Canada and the United States there is a fervent desire to help Private Pilot Licence holders avoid becoming stall/spin accident statistics.

Therefore, in Canada actual spins are incorporated in the training curriculum.

In the United States, they are not.

Whether or not to require actual spins of student pilots is one of the oldest controversies in aviation. The United States eliminated the requirement in 1949. Let's take a look at what we do in Canada and what it accomplishes. Let's also think about potential improvements.

Canadian procedure

The standard curriculum calls for the demonstration and practice of spin entry and recovery. In most training environments this is done in a very specific fashion. After a suitable ground briefing the flight is launched and the airplane ascends to a great height.

Once established in straight and level flight, power is reduced to idle and as speed decays the nose is gradually raised to maintain altitude. When the stall occurs, the nose is very high and the noise level is very low.

Rudder is then applied to enter the spin. After perhaps three-quarters of a rotation, full opposite rudder is used to stop the yaw and forward stick is used to reduce the angle of attack. The rotation stops soon thereafter and there only remains the small matter of the ensuing dive before the novitiate can breathe again.

This procedure is repeated as necessary until the student is likely to get a check in the box on the flight test.

Unintentional spins

However, in the real world airplanes don't suddenly spin out of straight and level cruise at 5,000 feet. Accidents resulting from unintentional spins generally occur while manoeuvring in or near the traffic pattern.

One all too frequent example happens right in the circuit. A strong crosswind pushes the downwind leg in too close and rushes the airplane along base. During the turn to final the airplane overshoots the extended runway centerline.

At this low altitude most pilots are reluctant to do a steep turn, so they use rudder to skid the nose around more quickly and opposite aileron to keep the bank shallow. The proximity of the ground causes the mind's subconscious survival mechanism to command more and more back pressure on the yoke. With full flaps and the power at idle, an aircraft such as a Cessna will not have a pronounced nose high attitude when it stalls. The distracted pilot may not sense what's developing until it's too late. The positions of rudder and aileron will guarantee a spin, and a smoking hole.

Another classic example happens while climbing out after takeoff. The chart slips between the front seats and onto the floor in the back. The pilot twists around and reaches down and behind, right hand patting the floor, hunting for the elusive map. The left hand is still on the yoke, inadvertently pulling back, inadvertently feeding in some aileron. The engine starts to labour but the pilot is too preoccupied to notice. If fate is out hunting this day then the next scene is the nose pitching down and the airplane starting rotating. Another crater!

It is scenarios such as these that generate the accident statistics. There just isn't enough space to effect any portion of a spin and recover. The only sure way to survive is to avoid these situations in the first place.

The standard training scenario does not effectively teach the recognition and avoidance of unintentional spins because it bears little resemblance to the real world killers. In training, the power is at idle and the nose is high. In the real world, if the power is at idle the airplane will be descending so the nose will be low. If the nose is high, the airplane will be climbing so the engine will be developing substantial power.

To teach the student to avoid these irrecoverable messes we must explain, demonstrate and practise realistic detection and avoidance scenarios. This awareness building process must ingrain in the student the sensory cues of an impending stall - sight, sound, seat-of-the-pants - so that they intuitively recognize what's happening early enough to avoid disaster.

National Transportation Safety Board reports show that most stall/spin accidents are caused by distractions which divert the pilot's attention from the primary task of flying the airplane. A dropped chart is an insidious trap because it is such an innocuous event. Who would imagine the potential consequences of picking up a map?

The very simplicity of these traps makes sensitizing the student to them straightforward. During realistic training scenarios it is quite easy for the instructor to introduce realistic distractions - drop a chart, call for a checklist, ask a complex navigation question.

This strategy of realism in training has no cost but immeasurable benefits and should be considered seriously.

Intentional spins

The current training curriculum requires getting acquainted with intentional spins. Playing with spins is like playing with a pit bull - one moment you're having a good time, the next moment the beast has its jaws clamped around your face and won't let go.

A fully developed spin is a state of autorotation. The pilot must take the correct recovery action or the airplane will continue spinning until it literally augers in. This action consists of the right control inputs in the right sequence at the right time. It varies from airplane to airplane. What worked in the Cessna or Piper during training will not necessarily work in the airplanes the graduate flies later.

In fact numerous aircraft have never been spin tested. One turn and you're a test pilot! Even aircraft which have been tested and certified for spins may only recover if the weight and balance are within a very narrow range. With an aft CG an airplane can enter an unrecoverable flat spin. These nuances are often not driven home.

The one-turn spin never exposes the beast's true nature. The rate of rotation after a single turn is but a fraction of the rate after two turns when the spin is fully developed. Then it may even take two hands and a good deal of muscle to push the stick forward for recovery.

Pushing the stick forward before opposite rudder is applied can accelerate rotation to rates that have to be seen to be believed. You will think a wing has come off! Spinning with the flaps extended, carrying power or feeding in aileron inadvertently can all delay or even preclude recovery.

Teaching spins is itself dangerous because the student can quickly get the airplane into a condition beyond the capabilities of most instructors. If the student holds the rudder in too long after entry the result is a many-turn whirling dervish.

It will take much longer to stop the rotation in a fully developed spin, as much as one and a half turns instead of a quarter turn. This delay can seem like an eternity if unexpected and often causes the inexperienced to think that the rudder being stepped on is the wrong one. Sadly, when they switch pedals the airplane is held in the spin.

After three to six turns, the eyes lose their ability to track and vision becomes blurred. When the spin finally does stop, the motion detectors in the inner ears trigger a sensation of spinning in the opposite direction. The eyes still think the airplane is turning in the original direction. The confusion can be so overpowering that the pilot enters another spin!

The other common error is to hold in opposite rudder too long, so the spin changes direction instead of stopping. It is remarkably easy to end up alternating left and right so much that vertigo and disorientation set in. At this point it becomes next to impossible to determine the direction of rotation, and therefore which rudder to step on.

When stuck in a spin, with altitude decreasing and fear increasing, of their own accord the upper body leans back, away from the onrushing earth, and the arm pulls back on the stick, trying to pull up. What happens next is usually quite messy.

Intentional spins are far too capricious, too dangerous, to be trifled with. To become truly competent in spins, or more particularly in spin recoveries, requires a dedicated course of 5 to 10 hours flight time delivered by a spin specialist.

Most graduates of the current training curriculum go forth with a false sense of security in their ability to deal with the risk of stall/spin accidents. Some think they're spin wizards and go forth as hazards to themselves and the world at large. Other students quit the program because doing spins wasn't featured in their dreams of flying.

The one-turn spin now required induces significant risks but does not improve the pilot's ability to avoid real world hazards. The requirement for intentional spins should be deleted from the Private Pilot curriculum and replaced with more realistic training focused on problem detection and avoidance.