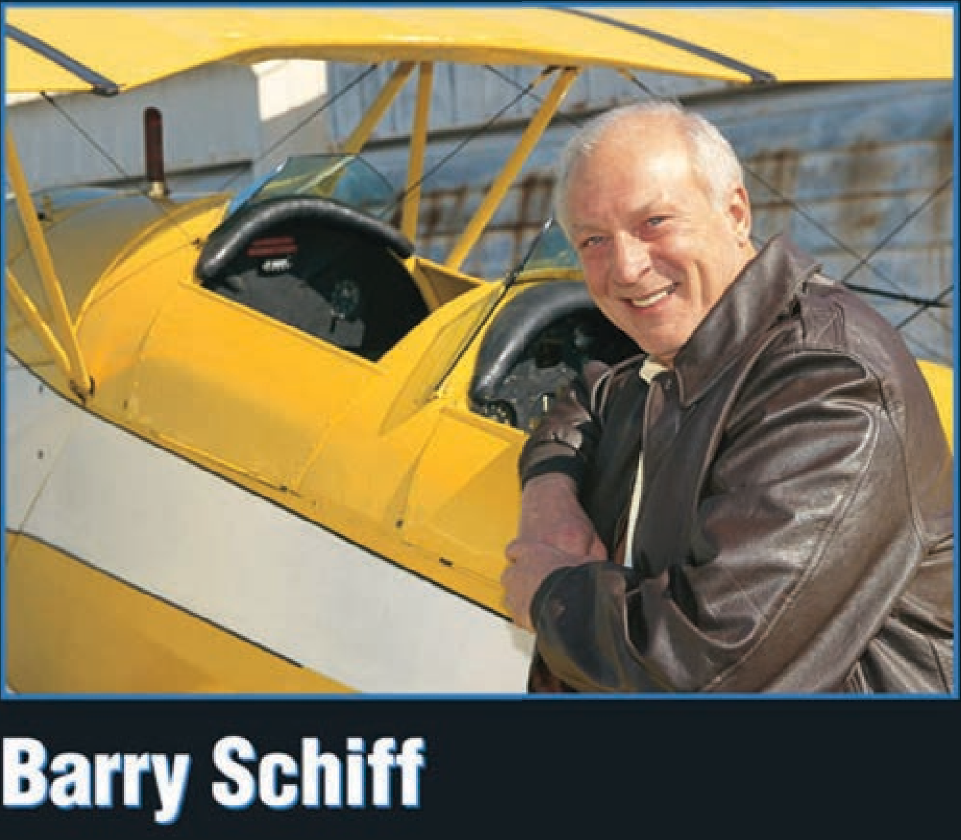
Flying Wisdom

The Proficient Pilot Volume 3



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Chapter 1 **The Danger of Skidding Turns**

My first instructor was somewhat of a sadist. Sitting in the back seat of the Aeronca Champ, he would take great delight in swatting me on the back of the head with a rolled-up sectional. I could expect to get clobbered whenever I failed to maintain glide speed during a landing approach and whenever I allowed the slip-skid ball to wander off-center, which seemingly was every time I entered or recovered from a turn. Mike taught me how to make coordinated turns all right, but he never did teach me why it was so important.

Most slips and skids are unnoticeable indiscretions. At other times, they are minor annoyances. But every once in a while, they kill people.

One of the most dangerous and insidious forms of uncoordinated flight is the inadvertent low-altitude skidding turn. It occurs most often in the traffic pattern, when turning from a close-in base leg to a relatively short final approach.

The scenario typically begins when a pilot incorrectly perceives an excess of airspeed while on base leg, a sensation most often caused by a tailwind that increases groundspeed while on base. A similar groundspeed increase also occurs while in the traffic pattern at high density altitudes and is the result of true airspeed being significantly greater than indicated airspeed.

In either event, or perhaps as a result of both, the pilot peripherally senses the increased groundspeed and subconsciously interprets this as excessive airspeed. Without so much as a glance at his airspeed indicator, he responds by applying back-pressure to the control wheel and raising the nose. Airspeed begins to wane. A similar speed bleed occurs when a pilot low on altitude misguidedly attempts to stretch his glide by raising the nose.

The second factor of the low-altitude skidding turn is introduced while turning from base leg to final approach. If the aircraft is being pushed along base leg by a tailwind, the turn onto final will take more room and consequently must be started sooner than usual.

A close-in base leg also necessitates turning earlier onto final approach. A pilot might ordinarily begin turning final when viewing the approach end of the runway at his 10 o'clock position, for example. But when flying a tight pattern, the same turn must begin sooner, when the runway is at the 11 o'clock position.

Often, however, the pilot is unaware of the need to begin turning so soon. As a result, the aircraft overshoots final. But if final approach is relatively short, the turn must be much steeper than usual to align the aircraft on final while there still is enough time, distance, and altitude to do so. Many pilots, however, are ground shy; they are apprehensive about making steep turns near the ground, an ordinarily healthy attitude. As a result, the turn onto final approach may be too shallow.

Shallow bank angles, however, result in low turn rates. If the aircraft does not turn rapidly enough to become aligned with the runway, a pilot reluctant to steepen the bank might instead and unwittingly apply bottom rudder to help the nose come around. Applying bottom rudder causes the bank to steepen, which is what the pilot wanted to avoid in the first place. Overbanking due to rudder input is a result of the outer wing being given more airspeed, and hence more lift, than the inner wing. To counter the increasing bank angle, the pilot then applies opposite aileron, which places the aircraft in a skidding, cross-controlled turn. (The most extreme skidding turn is called a flat turn; yaw is induced with rudder while opposite aileron is applied to maintain a wings-level attitude.) Because bottom rudder also causes the nose to drop somewhat, the pilot may offset this by pulling back on the control wheel, which causes a further erosion of airspeed.

An interesting aspect of a skidding turn is that the nose always points inside the turn. (During a slipping turn, the nose points outside the turn.) As a result, a pilot may perceive that the airplane is turning faster than it really is. The rate of turn, however, is less. This is because a rudder usually is not powerful enough to turn an airplane rapidly. High turn rates are best accomplished in a conventional manner using the horizontal component of lift from a banked wing.

Assume that the pilot is in a skidding left turn and, therefore, is applying left rudder and right aileron. Applying right aileron creates adverse yaw effect that causes the nose to yaw left even further. Every pilot knows that adverse yaw effect causes the airplane to yaw opposite to the direction in which the airplane is being rolled. But is there such a thing as *proverse* yaw, a force that yaws the airplane in the same direction as the roll? Yes, some sophisticated aircraft have exhibited this tendency. Fighter pilots claim that proverse yaw is beneficial while dogfighting because the nose moves a bit more rapidly in the direction of the roll and makes sighting a target a bit easier.

All of this skidding means that the airplane is flying somewhat sideways, which adds substantial drag. This reduces glide performance and may cause the pilot—in another misguided attempt to stretch the glide—to raise the nose and decrease airspeed even further.

Moving the control wheel or stick to the right while in a left skidding turn means that the left aileron is deflected downward. And this has the effect of increasing the angle of attack of the left, or inside, wing. Conversely, the right aileron is deflected upward, which decreases the angle of attack of the outside wing. The lowered aileron increases the lift coefficient of that wing, but it also reduces the angle of attack at which the wing will stall. The raised aileron on the outside wing decreases the lift coefficient of that wing but increases its critical angle of attack.

In other words, if the nose is raised sufficiently during a cross-controlled, skidding turn, the inside wing will stall well ahead of the outside wing.

Such an asymmetric stall most often occurs with the nose below the horizon. Unfortunately, modern training methods do not adequately prepare a pilot to anticipate stalling in such a nose-low attitude. Instead, stalls normally are associated only with an exaggerated nose-high attitude. And because the airplane is skidding, the nature of the stall is going to be somewhat different than is ordinarily expected. During conventional stalls in a typical general aviation aircraft, the stall usually begins at the trailing edge of the wing root and spreads, or propagates, forward and outboard (spanwise) as the stall deepens. As a result, the outboard wing panels often do not stall at all. This provides a measure of stability to the stall and explains why airplanes usually tend not to roll right or left during power-off stalls.

But during skidding flight, the stall tends to begin in the vicinity of the wing tip of the inside wing, a characteristic similar to that of a swept wing. The result is a loss of roll stability, an increase in stall speed, and a more abrupt stall. (The inside wing behaves like a swept wing because the relative wind during a skidding turn does not come from straight ahead. Instead, it comes from the right during a left skidding turn, and vice versa.) The airflow about the aircraft during skidding flight might also allow a stall to occur without warning. This is because one wing can stall without activating the stall warning indicator or causing the tail to buffet.

When the left wing does stall, the aircraft obviously rolls left. This occurs not only because of the loss of lift, but because the right wing is still flying and wants to rise. The combination of one wing stalling and the other lifting can produce an impressive roll rate. But as the left wing drops, its angle of attack increases even more because the relative wind is now coming