Base to Final Stall Spin Scenario

The “Base to Final Turn Stall/Spin” accident has been killing people for years and it is still not understood by many, including “experts” who foster the misunderstanding.

What affects Stall Speed?

Before I get into the scenario, it is important to know and internalize the fact that Bank Angle does not affect Stall Speed.

I will say that again, Bank Angle does not affect Stall Speed.

In order for Bank Angle to have any effect on Stall Speed you must add an additional element to the equation, and that is “at a constant altitude”. Pulling back on the elevator control to maintain or increase altitude increases the Load Factor, not Bank Angle. Increasing the Load Factor increases the Stall Speed.

For this discussion, Stall Speed of an airplane is that speed at which its wing reaches its critical angle of attack after a slow deceleration.

The only thing that affects Stall Speed is Weight. More Weight = higher Stall Speed. The only way you can add weight to an airplane after it has left the ground is by adding G force (increasing the Load Factor). Increasing the Bank Angle does not increase the Load Factor unless you also pull back on the stick.

What does the above have to do with the Stall/Spin Scenario?

Instead of teaching our new aviators to fly the airplane, we are teaching them not exceed 30° of bank in the traffic pattern. We leave the impression that if they exceed 30° of bank they will stall/spin and die. This sets up the following scenario.

OH NO! If I increase my bank I’ll die!

The typical Stall/Spin Scenario starts when our aviator misjudges his turn and overshoots the final approach course when turning from base to final.

He has everything set, his flaps and trim are set where he wants them, and he has the turn indicator pegged on 30°.

He sees he has overshot the final approach course. His first instinct is to increase his bank angle and he starts that movement and realizes that he is already at 30° bank. His instructor has pounded into him during all his training to never go beyond a 30° bank. He stops his control movement to maintain the bank angle.

We all agree that given his background and training he should initiate a go-around. If he does, he lives to make another approach.

All too often, what happens next is our aviator pushes on the bottom rudder trying to get the nose around and get lined up with the runway. This is not a conscious decision.

When he pushes the bottom rudder (left for left traffic, right for right traffic. We will assume left traffic) several things happen simultaneously.

1. The nose does move to the left.
2. Since he is in a bank the nose also moves down.
3. The right wing moves forward (increasing lift) and the left wing moves aft (decreasing lift) so the bank angle increases.
4. The relative wind which was on the nose in coordinated flight is now coming from the right of the nose because the airplane is now flying in a skid.

So, picture the airplane now flying in a skid in the original direction (it did not turn)

1. The nose has moved left, but the airplane has not corrected to the desired course. Our aviator pushes some more bottom rudder.
2. The nose moved down (noticed by the aviator). He moves the elevator control aft to bring the nose back to his original pitch attitude.
3. He also noticed that his bank increased because of the increased lift on the right wing. He moves the aileron control right to return to his original 30° bank.
4. The relative wind is now coming from the right of the nose and sets up some transverse flow across the wings (no longer moving perpendicular). This causes the fuselage to block some of the air from reaching the left wing (low wing). It also effectively changes the left wing from a straight wing to a swept wing (because of the transverse flow). We know a straight wing is designed to have a stall start at the root and progress outboard causing some buffeting to warn of a stall. A swept wing; however, stalls toward the tip first with no warning. The left aileron is down because of the right aileron control input. This increases the effect angle of attack on the left (low) wing.

All these factors if not corrected cause the left wing to stall. It drops, the right wing comes over the top and a spin ensues.

Conclusion

I believe some of the classic base to final stall/spin scenarios can be avoided if we stop putting the artificial limit of a 30° bank in the pattern.

Consider if you will that a 1.5 G load factor (level 45° bank) increases the stall speed approximately 18%. If the original stall speed is 50 kts, the new stall speed is 59 kts. 1.3 x 50 kts (a standard approach speed) is 65 kts. if we apply the 1.5 G load factor to the original stall speed the result is still 6 kts below the original approach speed hence no stall. No stall = no spin.

If we are not comfortable getting the approach speed that close to the stall speed, we could teach how to increase approach speed by 5 – 10 kts and still maintain the same approach angle this would solve a lot of the problem and allow more flexibility in the pattern.

We are not teaching our students to fly the airplane, instead we are giving them artificial limits that cause misunderstanding of a critical phase of flight.