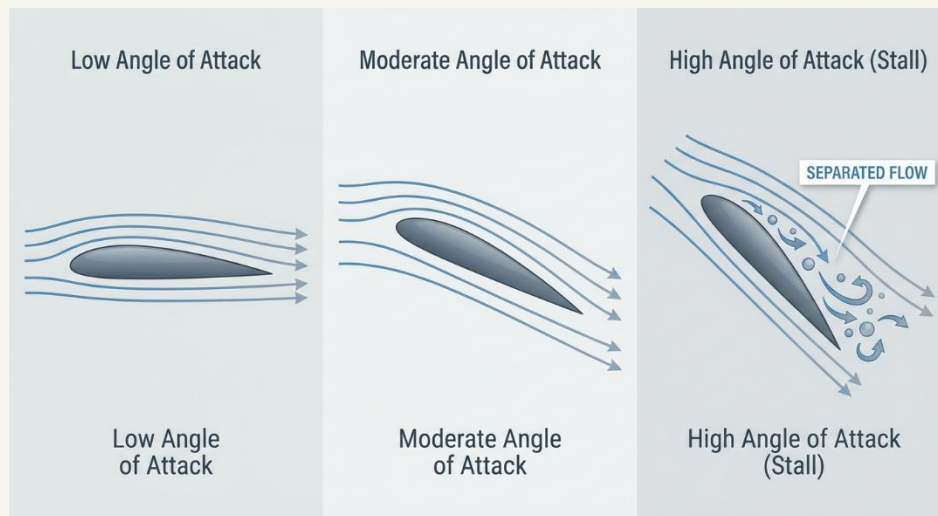


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Tips for Better Airplane Stall Recoveries (and quit fearing stalls)



Do stalls get your blood pressure and heart rate up? Well, they shouldn't, but this is a very common problem these days. Mastering stalls will lead to better confidence and flying abilities, and a safer pilot.

Hi, I am Mike Kloch (pronounced 'clock'), callsign "Cuckoo". I am the CEO and Chief Instructor at Specialized Aero Works (SAW), a contract test pilot and advanced instructor who teaches upset recovery, aerobatics, turbine transition and much more. When it comes to stalls, I have done a lot of them. Besides teaching them in a variety of aircraft, I have also conducted an extensive amount of certification and Research & Development (R&D) stall testing, to include stalls from low (but safe) altitudes up to FL340, to include normal, turning, accelerated, power off & power on stalls, and even inverted stalls.

Sometimes when performing R&D stalls, the airplane doesn't react as expected. When this occurs there may be roll-offs, which could lead to rolling inverted or even entering an inadvertent spin. The point is, I have seen a lot of stalls of varying types and characteristics. It is estimated that I have done around 5,000 flight testing stalls in one aircraft type alone!

I wish to pass on some knowledge and boil down to the essentials that all pilots, especially instructors, should know. Far too many pilots crash airplanes in stall or stall/spin mishaps every year unnecessarily, and I am sick of it! I believe that sharing my knowledge and experience with spins will help make a difference.

What all pilots should develop is a deeper understanding of the physics and aerodynamics occurring during the stall. But we need to understand them well enough to always be in control. Unfortunately, there are plenty of misconceptions, inefficient techniques, and poor instruction concerning stalls and stall recoveries that I am trying to clear up here. This is not intended to be the end-all, be-all of stall knowledge, but useful information to help anyone get better.

Understanding the Stall

All too often I question pilots "what causes a stall?" Most (not all) know the answer, but many must think about it for a moment to find the answer. Pilots must know this well enough to not have to think of it. It should take no time to recall. The answer, of course, is "when the wing exceeds the critical angle of attack" (AoA). Make sure you know deeply what AoA is, its varying effects, and how to control it. We need unconscious competence.

Similarly, the question "How do you unstall an airplane?" should elicit a straightforward answer: PUSH. This one-word directive simplifies recovery, avoiding unnecessary complexity, which is critical under stress or time constraints. Often pilots delay in answering correctly such a simple question.

Now there are a lot of nuances that goes into 'push', but we want simple. For instance, how much do we push? That depends on the situation, but it's always enough to reduce AoA below critical. Most of the time that is a relatively small amount of stick/yoke forward. If the airplane you fly doesn't stall until the stick is fully aft (or close to it), then moving the stick a few inches forward (usually) of that position will un-stall the airplane. In an upright stall, pushing the stick well forward of neutral will end up placing you in an extreme nose down attitude. We don't want to do that if we stall close to the ground, so why would you ever want to practice this way? Stall training should emphasize efficiency to prepare for high-stakes recoveries.

A common phrase used in primary training for stall recovery is to "reduce the backpressure" of the yoke. This is another variation of push. Anytime the yoke moves forward, it's a push. I recommend that if the back-pressure phrase is used, it is supplemental to 'push', or 'unload'. Stall recoveries should be positive & brisk, without being excessive. Over-controlling is a common problem with flying in general. We definitely don't want to over-control stall recoveries close to the ground. Therefore, positively move the stick forward to an un-stalled position that does not create an excessive nose-down position (for upright stall recoveries). Practice this so you become proficient and know where the stick should be placed for recovery. A common error is to push to unload, then quickly pull back to near the original control position. Be careful not to undo a stall recovery with a secondary stall.

A key question is, "When can a stall occur?" The answer is 'in any attitude and at any airspeed.' However, instructional contradictions arise, such as advising to "push the nose down" for recovery. This is inconsistent; during inverted stalls with positive AoA, pushing does not direct the nose earthward. Pilots must adopt three-dimensional thinking to avoid contradiction, fostering superior stall comprehension and recovery techniques.

Determining Your AoA

Enhanced awareness of Angle of Attack improves overall flying. Every aircraft features a basic AoA indicator: the stick or yoke. Forward positions indicate low AoA; aft positions, high AoA. Familiarize yourself with neutral and stall-onset stick positions to guide recoveries, noting variations with configurations. A "light-in-the-seat" feeling indicates low G, which also means low AoA.

Addressing Roll During a Stall

Why does an airplane roll during a stall? The usual answer is due to being uncoordinated. This is the most common reason, but not always the answer. Wing shape asymmetry, ailerons, flap tuning and other issues can be a cause (especially in experimental airplanes). Even certified models, such as the Mooney, may exhibit roll-offs from minor aileron deformations caused by improper preflight handling.

How do you deal with roll during a stall? The most common answer I get is “use the rudder”. Yes, if you wish to remain stalled, such as during a Falling Leaf maneuver, using the rudder will control the yaw. Some may say use ailerons, or students or pilots who don’t understand will try to use ailerons, but that is definitely NOT a good choice. Aileron use during a stall (high AoA) can lead to control reversal and have you rolling the wrong direction, towards a steeper bank and possibly inverted! If you have never heard of control reversal, I am not surprised. This is yet another failing of today’s flight training environment. All pilots should know and understand control reversal.

If you wish to recover from the stall, we are back at ‘Push’ to recover. Once you have initiated the push, AoA is reduced below critical and the roll generally stops or slows dramatically. In training aircraft, the roll usually completely stops, in my experience. In bigger airplanes, airplanes with tip tanks, or when a wing “blows out” (stalls) losing most or all lift on one side, creating a large lift asymmetry, then there is momentum that will keep the roll going longer. The solution here is still push (quickly), then counter the roll with aileron, once the AoA is well below critical. Quickly pushing then adding aileron can keep a recovery from getting into a high angle of bank situation. It is crucial that the push and reduction of AoA comes first (and stays there), before aileron input. This takes practice to get good at, as one might expect.

More on Recovery Techniques

To recover from a stall quickly, you must move the stick quickly, and smoothly, which is generally not taught well, if at all, from what I have seen. The slow, generic stall recoveries taught in light GA airplanes are not always adequate in all situations, or in other airplanes.

When recovering quickly, the key is to not push excessively. You don’t want to go to zero or negative G. Pushing to 1/2 to 1/4 G is usually plenty. Since most airplane do not have a G-meter, 1/4 to 1/2 G has a “light is the seat” feel. Also, not pushing the nose excessively low on upright stalls is not desirable, as previously mentioned (this warrants repeating). Getting the correct amount of ‘push’ correct for efficiency takes forethought and practice.

Once a stall has been recovered from, priority number 2 is to stop descending. Far too often I see pilots lagging on this step. I believe the issue is that stalls are usually practiced at 2,000ft AGL and higher, so the pilot doesn’t have a sense of urgency for recovery. Anyone can do a stall recovery at high altitude. It’s not hard.

The mindset should be you are in a close to the ground scenario, so your stall recovery requires efficiency in order to survive. This creates a sense of urgency so now you must be quick and efficient in your stall recovery. To do this, you briskly push forward just enough to break the stall but not create excessive nose-down attitude. Then immediately and smoothly add power at a rate that is not hard on the engine but allows for enough power to start climbing. This is usually full power on small low-power

trainers, and often less than full power on high performance aircraft with abundant excess power.

As soon as power is added, it's usually time to start pitching up. Find the rate that does not create a secondary stall but doesn't let the airplane gain excessive speed. If your airplane climbs safely at V_x , why would you wait until you are 20 or 30 knots above that speed to climb? That would only mean you are not being efficient and giving away altitude during the recovery.

Why Do Pilots Fear Stalls?

Easy answer. Lack of understanding and good training. If the fear is that a stall can lead to a spin, you are correct. The solution is to fix the stall quickly. No stall, no spin! Fear kills performance and can lead to improper actions. Fear impairs judgment and actions; pilots should build knowledge and practice until apprehension dissipates. I have already described how easy a stall is to fix, so why would there be any fear? Only respect is warranted. Fear in aviation compromises safety.

Seek Competent Instruction

Unfortunately, too many instructors have not been taught stall recoveries well. Fear of stalls has been passed on from instructor to instructor in recent years. If your instructor shows fear of stalls, I consider that dangerous. I recommend you seek an instructor with a better understanding of stalls.

Instructors, if you have any apprehension doing stall training, you must fix this! How can you teach stall recoveries if you don't understand them well and have an irrational fear of stalls? Seek competent stall instruction and you will learn that stalls can be relatively easy and comfortable. Do stall training until you are comfortable with them.

Good instruction should be able to get anyone past a fear of stalls. If not, you need to stop flying. Fear of stalls is dangerous. A healthy respect for and strong understanding of stalls is what we all need to have to help fly safely.

Mindset

Relax! Nervousness/excess stress crushes performance. If you understand stalls, then you can quickly build confidence performing them with safe and efficient recoveries. Pilots should not be afraid when flying. Learn to stay calm under pressure.

Believe in yourself. The first step towards success in anything is believing you can. Don't use phrases such as "I can't" (this is bad!). That feeds your subconscious negative thoughts and decreases performance. An appropriate level of self-confidence is crucial for safe flying. Don't be arrogant or overconfident. Know your limitations.

Seeking Superior Instruction

If you want the highest levels of competency in stall instruction, the best instructors are Upset Prevention & Recovery Training (UPRT) instructors, in my opinion. These instructors teach all-attitude flying, which includes plenty of stalls. Other instructors with significant aerobatic, stall & other experience can be good also. All-attitude instructors are the best source. Why? A strong understanding of AoA, energy management, stalls, etc., and no fear of being inverted, with the capabilities to back it up!

The Upset Prevention and Recovery Training Network (UPRTN.org) has a Spin Accredited Instructor (SAI) program. Using an SAI or accredited UPRT instructor is a great way to find knowledgeable and competent instructors. This is a new accreditation so numbers are small but will be growing significantly. Of course, anyone at my school, SAW, will be very competent.

Master AoA

Learn to not fear flying at high AoA. Slow flight is flying at high AoA. Pilots should be able to fly at high AoA without fear. What happens if your AoA becomes excessively close to stall? Simple, push. Usually that means a very small forward stick movement and then maybe add some power to stop a descent. When I teach pilots slow flight maneuvers with a high bank angle and explain the techniques, they're often surprised at how easy it is when everything is put into a proper context.

Summary of Tips

1. Push! Quickly & smartly, but not excessively
2. Know the target stick/yoke position for recovery.
3. Avoid over-controlling
4. As soon as AoA is reduced below critical, add power and climb, without delay.
5. Unload prior to aileron input.
6. Prioritize efficiency. Train at safe altitudes but practice stall recovery as if you are close to the ground.
7. Learn to relax. A calm mind performs much better than when stressed.
8. Proper understanding of stalls and practice makes recoveries easier.
9. Seek unconscious competence. Start with good instruction.
10. Learn to be aggressive when needed, but...
11. Always strive to be smooth!

There you have it. Master AoA management and stall recoveries and flying will become easier and more enjoyable. You will become a safer pilot as well.

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