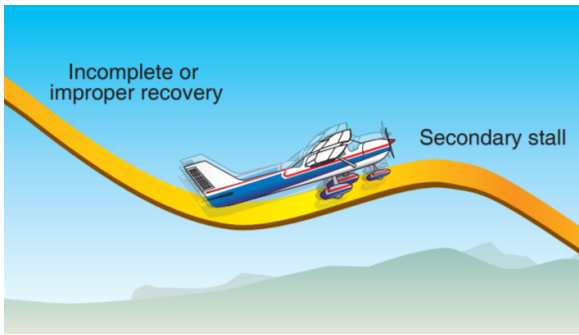


Secondary Stalls (Demonstration)

<p>Objective</p>	
<p>To ensure the applicant learns the purpose of and can exhibit a clear understanding of the secondary stall maneuver and how to perform the maneuver properly.</p>	
<p>Purpose</p>	
<p>Most student pilots have probably inadvertently experienced a secondary stall. When pilots fail to perform a proper stall recovery, a secondary stall can occur, and is often more violent and aggressive. The secondary stalls demonstration maneuver introduces CFI applicants to this maneuver so that they can be prepared for encountering these stalls during flight training.</p>	<p>Schedule</p> <ul style="list-style-type: none"> ● Ground Lesson: 15 minutes ● Initial <ul style="list-style-type: none"> ■ Flight: 40 minutes - <i>Demonstrate Maneuver</i> ● CFI Applicants Only <ul style="list-style-type: none"> ■ Flight: 30 minutes - <i>Practice Maneuver (Dual)</i> ■ Flight: 20 minutes - <i>Demonstrate Proficiency</i> ● Debrief: 10 minutes (<i>per flight</i>)
	<p>Equipment</p> <ul style="list-style-type: none"> ● Airplane Checklist ● Whiteboard / Markers (optional) ● Model Airplane (optional)
<p>Student Actions</p>	<p>Instructor Actions</p>
<ul style="list-style-type: none"> ● Ask any questions, receive study material for the next lesson. ● Watch linked video. ● Review listed references. 	<ul style="list-style-type: none"> ● Deliver the ground lesson (below). ● Demonstrate the maneuver in flight. ● Debrief after each flight.
<p>Completion Standards</p>	
<ul style="list-style-type: none"> ● Ground: Student can explain the purpose of the secondary stall maneuver, when it may be encountered during flight training, and the proper recovery procedure. ● Flight: Student can perform the maneuver to the following standards: <ul style="list-style-type: none"> ● Clears the area, performs a pre-maneuver checklist, and configures the airplane for landing. ● Selects an altitude no lower than 2,000ft AGL. ● Begins a stabilized descent at a normal approach airspeed. ● Reduces power to idle, increases back elevator pressure, and induces a stall. ● Intentionally applies an insufficient recovery and induces a secondary stall. ● Recognizes and acknowledges the secondary stall and applies nose down pitch and full power, while maintaining coordinated flight. ● Returns to a normal climb attitude and airspeed and returns to pre-maneuver altitude. 	

References

- MZeroA Flight Training - "Secondary Stalls"
 - YouTube - <https://www.youtube.com/watch?v=pVyns0kctbs>
- FAA-H-8083-3B (Airplane Flying Handbook) - Chapter 4, Page 5-6 [Stalls/Stall Recognition/Stall Recovery], Chapter 4, Page 10 [Secondary Stall]
- FAA-H-8083-25B (Pilot's Handbook of Aeronautical Knowledge) - Chapter 5, Page 25-26 [Stalls]
- FAA-S-8081-6D (CFI PTS) - Area XI Task F

Ground Lesson Outline

- What is a Secondary Stall?
 - More violent
 - Incomplete recovery
- Aerodynamics of Secondary Stalls
 - Angular momentum of a violent pitch up
 - Same as normal stalls, but potentially further beyond critical AoA
- Situations Leading to Secondary Stalls
 - Not relaxing elevator pressure/breaking stall
 - Overly aggressive pitch up after a stall recovery
 - Flight training maneuvers
 - Intentional stalls
 - Spin recoveries
- Recognition and Recovery
 - Normal stall indications
 - Normal recovery, but potentially more aggressive inputs required
- Maneuver Description - step-by-step
 - Entry position, airspeed, etc.

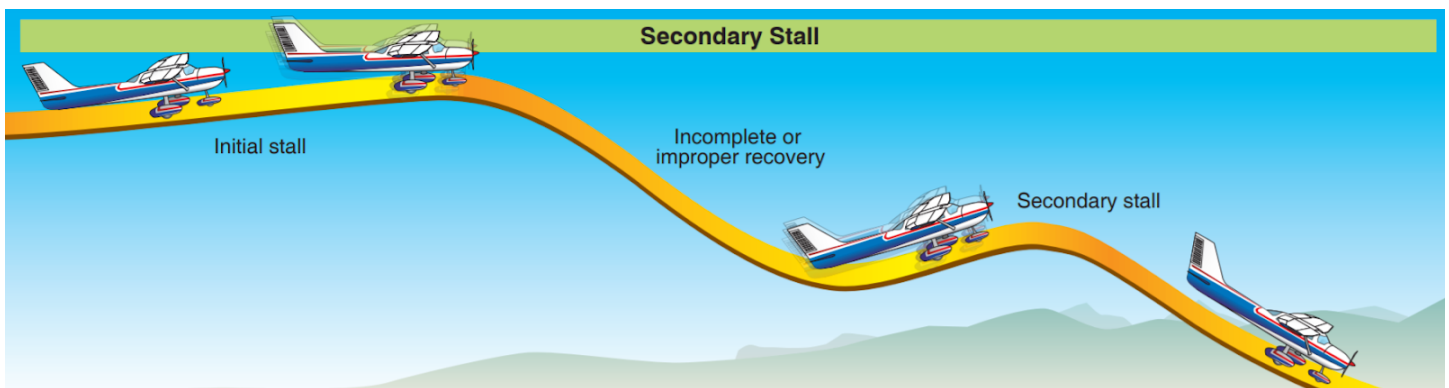
Common Errors

- Failure to establish selected configuration prior to entry.
- Improper or inadequate demonstration of the recognition of and recovery from a secondary stall.
- Failure to present simulated student instruction that adequately emphasizes the hazards of poor procedure in recovering from a primary stall.

Ground Lesson Content

- **What is a Secondary Stall?** - A *secondary* stall is simply a stall that is encountered during the incorrect or incomplete recovery from another stall. **Unlike ordinary stalls, however, secondary stalls tend to be more violent or aggressive than the initial stall.**
- **Aerodynamics of Secondary Stalls** - Secondary stalls are aerodynamically the same as ordinary stalls, in that the wing has exceeded the critical angle of attack, but they are usually caused by rapid control movements. When a pilot attempts to recover from a stall by only slightly lowering the nose and then rapidly pitching up, **the angular momentum of the upward pitching motion may cause the airplane to exceed the critical angle of attack by an even larger margin than the original stall.** This can lead to a situation called a *deep stall*, where a more dramatic nose-down pitching movement may be required in order to break the stall.
- **Situations Leading to Secondary Stalls** - Secondary stalls are always encountered after a normal stall, and are generally caused by pilots not reducing pitch enough to break the stall, or by applying excessive back elevator pressure to raise the nose back to the horizon.
 - Because secondary stalls can be more violent than the original stall, and can be deep stalls, they must be avoided. **Secondary stalls will generally result in a large loss of altitude, and in the case of a spin recovery, can cause the airplane to re-enter the spin.**
- **Recognition and Recovery** - Pilots can recognize a secondary stall by paying close attention to the normal indications of a stall, control buffet, mushiness, or the stall warning horn.
 - Recovery is simple: **relax back elevator pressure.** It may be necessary to apply forward elevator pressure to break the stall if the stall has deepened.

Maneuver Description



- **Entry Altitude** - Stalls should always be performed at a safe altitude, in case of a delayed or inadequate recovery, or other problems. The maneuver should be performed such that accounting for altitude loss during the stall, the final altitude is no lower than 1,500 feet AGL. Therefore it is best to begin the maneuver **at least 2,000 feet AGL.**

- **Entry Airspeed** - The maneuver should be started at a normal approach airspeed.
- **Checklists** - Pilots must perform a pre-maneuver checklist before beginning the maneuver. Because this maneuver is meant to simulate an approach to landing, it is a good idea to also perform a pre-landing checklist.
- **Configuration** - Configure the airplane for landing (generally add flaps and lower landing gear).
- **Entry Power** - Initially, reduce the power to begin a normal descent for landing at the approach airspeed.
- **Bank** - If requested, begin a turn in the specified direction. The bank angle should be *less than 20 degrees* to keep a low load factor.
- **Descent** - After the airplane is established in a stable descent, pitch the airplane up to prevent any further descent and induce a stall.
- **Stall** - Acknowledge (call out) the first indications of an approaching stall (especially the buffet or stall warning horn). Maintain back elevator pressure and allow the airplane to stall.
- **Incomplete Recovery/Secondary Stall** - Attempt to 'recover' by only slightly relaxing back elevator pressure to silence the stall warning, and then begin to increase pitch again to induce a secondary stall.
- **Recovery** - Promptly **reduce back elevator pressure, level the wings, lower the pitch attitude, and apply full power**. Once the airplane has regained flying airspeed, establish a climb at V_x or V_y to get back to the pre-maneuver altitude. If performed in the dirty or landing configuration, progressively retract flaps, landing gear, etc.
- **Coordination** - Due to the strong left-turning tendencies present at high power settings during stall recovery, **proper coordination is essential**. Attention should be given to proper rudder input during turns.
- **This is a visual maneuver!** Eyes should remain outside the cockpit as much as possible to scan for traffic and to hold heading.