



U.S. Department  
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**Federal Aviation  
Administration**

# SAFO

Safety Alert for Operators

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Flight Standards Service  
Washington, DC

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*A SAFO contains important safety information and may include recommended action. SAFO content should be especially valuable to air carriers in meeting their statutory duty to provide service with the highest possible degree of safety in the public interest. Besides the specific action recommended in a SAFO, an alternative action may be as effective in addressing the safety issue named in the SAFO.*

**Subject:** Maneuvering During Slow Flight in an Airplane

**Purpose:** This SAFO advises pilots, flight instructors, and evaluators of a change to the evaluation standard for the slow flight maneuver. The Private Pilot Airplane Airman Certification Standards (ACS) (FAA-S-ACS-6), which became effective June 15, 2016, reflects this change. The revised evaluation standard states:

*Establish and maintain an airspeed, approximately 5-10 knots above the 1G stall speed, at which the airplane is capable of maintaining controlled flight without activating a stall warning.*

**Background:** Loss of control in flight is the leading cause of fatal general aviation accidents in the U.S. and commercial aviation worldwide. As a result, the National Transportation Safety Board has listed the prevention of loss of control in flight in general aviation on its Most Wanted List of Safety Improvements for 2016. To address loss of control in flight in general aviation, the Federal Aviation Administration (FAA) revised the evaluation standard for the slow flight maneuver and is aligning the associated guidance accordingly.

A pilot's fundamental responsibility is to prevent a loss of control. Loss of control in flight is defined as a significant deviation of an aircraft from the intended flight path and often results from an airplane upset. Low altitude, low speed maneuvering is the most common condition for general aviation in flight loss of control accidents; however, in flight loss of control accidents can occur in all phases of flight. To prevent these types of accidents, it is important for pilots to recognize and to maintain a heightened awareness of situations that increase the risk of loss of control. One such situation is slow flight. A pilot can learn to prevent a loss of control by understanding how an airplane performs in the slow flight regime and by being proficient at controlling the airplane in slow flight.

Airplanes operate at low airspeeds and at high angles of attack during the takeoff/departure and approach/landing phases of flight. It is essential that pilots learn: (1) the airplane cues in that flight condition, (2) how to smoothly manage coordinated flight control inputs, and (3) the progressive signals that a stall may be imminent when deviating further from this condition. In these phases of flight, the airplane's close proximity to the ground could make loss of control catastrophic; therefore, the pilot must be proficient in slow flight.<sup>1</sup>

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<sup>1</sup> Title 14 of the Code of Federal Regulations (14 CFR) section 61.107(b), requires a private pilot applicant in the airplane category with a single-engine class rating to receive ground and flight training in slow flight and stalls. To receive the certificate, the pilot must demonstrate proficiency to the established standard.

**Discussion:** The purpose of performing the slow flight maneuver has not changed from the Private Pilot Airplane Practical Test Standards (PTS), FAA-S-8081-14B. One objective of the slow flight maneuver is to understand the flight characteristics and how the airplane feels with less airflow over the flight control surfaces while in the region of reverse command (i.e., back side of the power curve) near its aerodynamic buffet or stall warning.<sup>2</sup> These flight characteristics include the degraded response to control inputs, the difficulty of maintaining altitude, the need for larger power inputs to accelerate compared to normal flight, and the associated instrument indications. Additional sensory perceptions include seeing less or no horizon as a result of the higher pitch attitude and the reduced ambient sound.

These slow flight characteristics can be experienced, and therefore the learning objective achieved, in climbs, turns, descents, and straight and level flight without intentionally flying the airplane with the stall warning activated. The FAA does not advocate disregarding a stall warning while maneuvering an airplane.<sup>3</sup> With the exception of performing a thoroughly briefed full stall maneuver, a pilot should always perform the stall recovery procedure when a stall warning is activated.

As a result of the Private Pilot Airplane ACS development, and a review of all related guidance material,<sup>4</sup> inconsistencies were discovered. The previous standard for maneuvering during slow flight in the Private Pilot Airplane PTS was for the applicant to establish and to maintain “an airspeed at which any further increase in angle of attack, increase in load factor, or reduction in power, would result in an immediate stall.”

The Airplane Flying Handbook (AFH), FAA-H-8083-3, explains slow flight and recommends how to perform the slow flight maneuver. Version A (2004) of the AFH states that one of the elements of slow flight in pilot training and testing is to maneuver the airplane at “the slowest airspeed at which the airplane is capable of maintaining controlled flight without indications of a stall—usually 3 to 5 knots above stalling speed.”

According to § 23.207(a), part 23 certificated airplanes must have a “distinctive stall warning.” That distinctive warning alerts a pilot of an impending stall and therefore prompts a pilot to perform a stall recovery. When the manufacturer conducts airplane certification testing, the stall warning is required to “begin at a speed exceeding the stalling speed by a margin of not less than 5 knots and must continue until the stall occurs.”<sup>5</sup>

Based on the airplane certification standard for a stall warning, a pilot following the AFH guidance of 3-5 knots above the stall speed would most likely be intentionally flying with the stall warning activated, which is a stall indication. Therefore, the AFH guidance to maneuver “without indication of a stall,” is

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<sup>2</sup> Understanding there is variability in when the stall warning activates in different airplanes, pilots should select an airspeed just above the stall warning activation to perform the slow flight maneuver. The 5-10 knot range above the stall speed is a general guide.

<sup>3</sup> This is consistent with the guidance published in Advisory Circular 120-111, Upset Prevention and Recovery Training.

<sup>4</sup> Through the Aviation Rulemaking Advisory Committee (ARAC) the Airman Certification Standards Workgroup (ACS WG) was established. In addition to the development of the various ACS documents, this group of industry representatives was tasked with reviewing the FAA Handbooks and recommending changes to the guidance so they are aligned with the standard. The FAA considered those recommendations as part of its review of the handbooks and will be publishing revisions where necessary. For more information visit: [https://www.faa.gov/training\\_testing/testing/acs/](https://www.faa.gov/training_testing/testing/acs/)

<sup>5</sup> 14 CFR § 23.207(c)

inconsistent with the suggested airspeed range of 3-5 knots above the stalling speed provided in that same handbook. The PTS requirement to fly at an airspeed at which any further increase in angle of attack would result in a stall means the applicant would have to perform the maneuver with the stall warning activated, which is also inconsistent with the AFH. Advocating maneuvering the airplane just below the critical angle of attack with the stall warning activated is neither desirable nor intended.

While not specifically performed or evaluated as part of the slow flight maneuver, the FAA still expects a pilot to know and understand the aerodynamics behind how the airplane performs from the time the stall warning is activated to reaching a full stall. This can be learned in ground training and further consolidated in the airplane while practicing the Stall Task skills in the ACS. The training should build off of what was learned from the slow flight maneuver and highlight the continued degradation of the flight control response, the more pronounced left-turning tendencies in reciprocated-engine airplanes, and the importance of maintaining coordinated flight. This all contributes to a better understanding of slow flight aerodynamics, stalls, and the necessary actions to recover from a stall, which can ultimately prevent a loss of control in flight.

The revised evaluation standard requires the pilot to maintain a speed referenced to the 1G stall speed. One way to set up for the maneuver is to slow the airplane to the stall warning in the desired configuration and note the airspeed. Next, pitch down slightly to eliminate the stall warning, adjust power to maintain altitude, and note the airspeed required to perform the slow flight maneuver in accordance with the standard. For example, the pilot may first note that the stall warning comes on at 50 knots. A slight pitch down to eliminate the warning, while adjusting the power to maintain altitude, might then cause the airspeed to increase to 52 knots. That 52 knots would be the base airspeed to perform the slow flight maneuver. The pilot can adjust pitch and power as necessary during the maneuver to stay within the ACS airspeed standard of +10/-0 knots (i.e., using the example, the range would be 52-62 knots) without activating the stall warning. By setting up the maneuver this way, the pilot can achieve similar angles of attack for the maneuver, regardless of weight or density altitude, and meet the objectives of the slow flight task.

To remove the inconsistencies, the FAA is revising the AFH, which includes a significant rewrite of Chapter 4. The revised slow flight standard in the Private Pilot ACS will be reflected in that chapter. The FAA anticipates publication of the AFH revision in October 2016.

**Recommended Action:** Student pilots, flight instructor applicants, flight instructors, flight schools, part 141 pilot schools, part 142 training centers, and private pilot – airplane evaluators should familiarize themselves with the information in this SAFO and adjust training and testing for the slow flight maneuver accordingly.

**Contact:** Questions or comments regarding this SAFO should be directed to the General Aviation and Commercial Division, AFS-800, at 202-267-1100.