



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

# SAFO

Safety Alert for Operators

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Flight Standards Service  
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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:** Airman Certification Standards (ACS): Slow Flight and Stalls

**Purpose:** This SAFO cancels SAFO 16010 and advises the general aviation community of changes to the evaluation standards for the slow flight task and certain stall tasks in the Private Pilot – Airplane ACS (FAA-S-ACS-6A) and the Commercial Pilot – Airplane ACS (FAA-S-ACS-7), which will be effective June 12, 2017.

**Background:** Loss of control in flight continues to be the leading cause of fatal general aviation accidents in the United States and commercial aviation worldwide. As a result, the prevention of loss of control in flight in general aviation has been retained on the National Transportation Safety Board’s (NTSB) Most Wanted List of Safety Improvements for 2017. With the release of the Private Pilot – Airplane ACS in June 2016, the Federal Aviation Administration (FAA) revised the slow flight evaluation standard to reflect maneuvering without a stall warning (e.g., aircraft buffet, stall horn, etc.). The FAA explained this change in SAFO 16010<sup>1</sup> as one approach to addressing loss of control in flight accidents in general aviation. The FAA received feedback on these publications from the general aviation community and has made additional changes.

One of the primary concerns was that because a pilot would no longer be evaluated while flying at slow speeds with the airplane near the critical angle of attack (AOA), that pilot would not be trained or proficient at maneuvering under these conditions, or understand what happens beyond the stall warning. The FAA asserted in SAFO 16010 and maintains the position that a pilot is still expected to “know and understand the aerodynamics behind how the airplane performs from the time the stall warning is activated to reaching a full stall.” The FAA also suggested that the pilot can acquire this knowledge in ground training and further consolidate it in the airplane while practicing the Stall Task skills in the ACS. The FAA did, however, review the entire Slow Flight and Stalls Area of Operation<sup>2</sup> to ensure the knowledge, risk management, and skill elements adequately capture what a pilot should know, consider, and do relative to each task. As a result, the FAA has revised the evaluation standards for certain tasks for the private pilot-airplane and commercial pilot-airplane practical tests.

<sup>1</sup> To avoid confusion the FAA has cancelled SAFO 16010 and replaced it with a more comprehensive discussion in this SAFO.

<sup>2</sup> Title 14 of the Code of Federal Regulations (14 CFR) sections 61.107(b) and 61.127(b), require a private pilot applicant and commercial pilot applicant, respectively, 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 FAA’s review considered that 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 aircraft upset. 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.

While accidents due to loss of control in flight can occur in all phases of flight, maneuvers at low altitude or low speed are the most common situations for general aviation. A pilot can prevent loss of control by understanding how an airplane performs in the slow flight regime and how it performs from the stall warning (e.g., aircraft buffet, stall horn, etc.) to the critical AOA, or stall, if flight continues past the initial stall warning. A pilot should also be proficient at controlling the airplane in slow flight, be able to recognize an impending stall and full stall if they occur, and be proficient in performing a stall recovery procedure.

**ACS Changes:** The paragraphs below explain the changes made to Private Pilot – Airplane ACS (FAA-S-ACS-6A) and the Commercial Pilot – Airplane ACS (FAA-S-ACS-7).

**A. Slow Flight.** Airplanes operate at low airspeeds and at high AOA during the takeoff/departure and approach/landing phases of flight. These phases of flight are critical and, given the airplane’s close proximity to the ground, a loss of control could be catastrophic. Therefore the pilot should become proficient in slow flight through training and practice at a safe altitude. It is essential that pilots master the following:

- (1) understand the aerodynamics associated with slow flight in various aircraft configurations and attitudes,
- (2) recognize airplane cues in these flight conditions,
- (3) smoothly manage coordinated flight control inputs while maneuvering without a stall warning, and
- (4) make prompt appropriate correction should a stall warning occur.

With the primary focus on understanding aerodynamics associated with flying slow in different phases of flight, there is only one knowledge element for slow flight available for evaluators to select for the practical test. The FAA also refined and consolidated the risk management elements in the ACS. Regarding the skill elements, the FAA maintains that the desired 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. It would not be appropriate for a pilot to fly the takeoff/departure phase or approach/landing phase with the stall warning present. Therefore, considering that the pilot typically performs these phases of flight at low airspeeds, the FAA maintains that a pilot should not be evaluated on the ability to maneuver an airplane in the slow flight task while disregarding a stall warning.<sup>3</sup> To address community feedback, however, the FAA modified the phrasing of the skill element as follows:

*Establish and maintain an airspeed at which any further increase in angle of attack, increase in load factor, or reduction in power, would result in a stall warning (e.g., aircraft buffet, stall horn, etc.).*

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<sup>3</sup> This is consistent with the guidance published in Advisory Circular 120-111, Upset Prevention and Recovery Training, and the revised Airplane Flying Handbook (AFH), FAA-H-8083-3.

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, reduce the pitch or AOA slightly and eliminate the stall warning indication, 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 the stall warning indication at 50 knots. A slight pitch down to eliminate the stall warning, while adjusting the power to maintain altitude, might then cause the airspeed to increase to 52 knots. That 52 knot airspeed 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<sup>4</sup> without the stall warning indication. By setting up the maneuver this way, the pilot can achieve similar AOA for the maneuver, regardless of weight or density altitude, and meet the objectives of the slow flight task. If a stall warning occurs while maneuvering in slow flight, the expectation is the pilot will take the appropriate action to correct it.

**B. Stalls.** Stall training should build upon knowledge and skill acquired from the slow flight maneuver and encompass the period of time from the stall warning (e.g., aircraft buffet, stall horn, etc.) to the stall (i.e., reaching the critical angle of attack). It is essential that pilots understand:

- (1) the aerodynamics associated with stalls in various aircraft configurations, attitudes, and power settings,
- (2) how the airplane performs/responds as it approaches the critical AOA,
- (3) factors and situations that can lead to a stall and how to prevent them,
- (4) how to recognize the different airplane cues in an impending and full stall, and
- (5) how to perform a stall recovery procedure.

To capture these essential components in the evaluation standards, the FAA has modified the knowledge elements for the stall tasks. In addition, the agency has revised the risk management elements for the stall tasks to focus on key considerations for stall prevention and full stalls.

(1) ***Private Pilot – Airplane ACS, Power-Off & Power-On Stalls.*** With the exception of performing a thoroughly briefed full stall maneuver, a pilot should always perform the stall recovery procedure when a stall warning occurs. To evaluate an applicant’s ability to recognize the airplane cues for an impending stall and a full stall, the FAA has added a requirement for the applicant to acknowledge the initial indication of an impending stall. The pilot could meet this requirement by simply stating “stall warning” or “buffet.” The element now reads: “*Acknowledge cues of the impending stall and then recover promptly after a full stall has occurred.*”

The FAA emphasizes that as the pilot transitions from the initial indication and acknowledgement of the impending stall, the flight control applications should be smooth and coordinated – not abrupt or rushed – until a full stall is reached and throughout the stall recovery. This requirement enables an evaluator to assess the applicant’s understanding of how an airplane performs in this regime and his or her ability to maintain coordinated flight throughout the maneuver and the recovery.

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<sup>4</sup> Private Pilot: +10/-0 knots (i.e., using the example, the range would be 52-62 knots); Commercial Pilot: +5/-0 knots (i.e., using the example, the range would be 52-57 knots)

**(2) Commercial Pilot – Airplane ACS, Power-Off & Power-On Stalls.** The FAA has maintained the requirement for stall recovery procedures to be executed at the first indication of an impending stall (e.g., buffet, stall horn, etc.). However, the FAA has modified the skill element as shown below to require the applicant to acknowledge the impending stall cues. The element now reads: *“Acknowledge the cues and recover promptly at the first indication of an impending stall (e.g., aircraft buffet, stall horn, etc.).”*

**(3) Commercial Pilot – Airplane ACS, Accelerated Stalls.** Accident history shows that pilots have failed to recover from accelerated stalls. The FAA added this task to the Commercial Pilot – Airplane Practical Test Standards in 2012 and required it to be performed in single-engine and multiengine airplanes. Recently, members of the aviation community have raised safety concerns regarding accelerated stalls in multiengine airplanes as a task on the practical test. After reviewing the learning objectives of the maneuver, accelerated stall aerodynamics in multiengine airplanes, 14 CFR part 23 airplane certification standards, and comments from FAA flight test engineers, the FAA determined that the maneuver can be performed safely in a multiengine airplane. Therefore, the FAA retained this task in the Commercial Pilot – Airplane ACS.

Stalls that result from abrupt maneuvers or with high load factors tend to be more aggressive than unaccelerated, +1G stalls. Because they often occur at higher-than-normal airspeeds or at lower-than-anticipated pitch attitudes while the airplane is in a bank, they can surprise an inexperienced pilot. To perform an accelerated stall safely in a multiengine airplane and achieve the learning objectives, the FAA emphasizes the power should be set so that the airspeed is at, or below, the design maneuvering speed ( $V_A$ ) for the airplane. The pilot should maintain coordinated flight and, once the turn is established, use a deceleration rate of 3-5 knots per second to reach the first indications of a stall. The pilot should promptly initiate the stall recovery procedure at the first indication of a stall. During the recovery, the FAA stresses the importance of reducing the angle of attack first, followed by rolling wings level prior to the addition of power to alleviate the risk of asymmetric thrust while in a turn. The FAA also notes that the pilot should delay application of high power if the aircraft is not above minimum control speed ( $V_{MC}$ ) and responding as expected.

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

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