To: **Ms. Susan Parson and Mr. David Oord, Co-Chairman ARAC ACS Working Group**

From: **Society of Aviation and Flight Educators**

Date: **September 9, 2016**

Introduction

This letter proposes revision to the Area of Operation VII, Slow Flight and Stalls, in the Private Pilot Airplane Airman Certification Standards (ACS), (FAA-S-ACS-6) so training and evaluation will include maneuvers that enable learning *all* essential skills to be a safe pilot.

Everyone (Industry and FAA) agrees the goal of flight training is to create pilots who fly safely. Everyone agrees the pilots need to be properly trained to recognize **all** the indications of a stall and automatically correct to maintain aircraft control.

For the past several decades, the task of Minimum Controllable Airspeed has been used to allow students to learn and practice several new skills. While the Private Pilot Practical Test Standards for Airplane (PTS) (FAA-S-8081-14B) did not use the term 'Minimum Controllable Airspeed', it is clear from the elements that the maneuver was the Minimum Controllable Airspeed as described in the Airplane Flying Handbook (AFH) (FAA-H-8083-3A).

SAFE agrees with the statement in Safety Alert For Operators SAFO 16010 regarding high angle of attack and low airspeed situations which states: "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." (p.1, SAFO 16010). SAFE affirms pilots need to learn this as a skill to a level of automaticity in order to be safe pilots.

The change implemented in the Task VII.A, Slow Flight, in the new ACS may have changed only one element, but compared to the PTS, has had the effect of eliminating several of these essential skills from the maneuver as stated in the SAFO. Changing only one element in the Slow Flight Task in the ACS without adjusting the entire Task and Area of Operation has created a new set of issues and questions the validity of the task.

A SAFE representative met with members of the ACS Focus Team, shortly after the ACS went into effect June 15, 2016, to discuss this issue. Since then, many flight instructors and examiners have contacted the FAA, separate from SAFE, with their concerns that this change will reduce safety and lead to more, not fewer, loss of control accidents. SAFE agrees that the current change, as implemented, will indeed reduce safety.

The skills needed to be a safe pilot are well covered in the FAA's own documents as well as numerous letters to the FAA regarding the importance of pilot learning. The purpose of this letter

is not to cover why these skills are important to know and perform. The purpose of this paper is to recommend how to revise the ACS so that essential skills for new pilots continue to be evaluated on the practical test flight and so training recommendations in the Airplane Flying Handbook will officially include maneuvers that enable learning all essential skills.

Background

Educational Theory

The PTS and ACS Both Lack Clearly Stated Educational Goals and Objectives

Educational theory stresses the importance of having clearly defined goals and learning objectives for successful training. The Aviation Instructor Handbook (AIH) actually covers this well in Chapter 4 (FAA-H-8083-9A).

The knowledge and skills necessary to be a safe pilot, generate the goals and learning objectives for pilot training. These learning objectives should then be divided among the Area of Operations and Tasks in the ACS so that all objectives are evaluated.

For each learning objective, there should be learning outcomes with standards that define satisfactory performance. Evaluating the learning outcomes determine if the pilot meets the goals and learning objectives. The Aviation Instructor Handbook states "Standards are closely tied to objectives since they include a description of the desired knowledge, behavior, or skill stated in specific terms, along with conditions and criteria" (p.4-4 AIH). Standards, however, are not objectives.

In considering goals and learning objectives, the PTS was lacking in several areas considered important for a well-designed training and evaluation standard. In trying to keep the ACS as close to the PTS as possible, the ACS suffers from the same issues. In particular, the Tasks do not have clear objectives or purpose that relates to the goals of being a pilot.

In general, the objective of a maneuver task is to know and perform the maneuver. For example, in the ACS, the objective of Slow Flight Task is "To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with maneuvering during slow flight." The maneuver itself is not the objective. A better objective might be

The objective of the Slow Flight Task is to determine a pilot can safely

1. Control an aircraft at speeds in the 'region of reverse command'
2. Recognize and respond to the progressive signals of an imminent stall
3. Control the aircraft in situations where there are strong yawing tendencies

The Airplane Flying Handbook (AFH) describes maneuvers and gives some objectives, but the term 'objective' is used generally. Also, the AFH does not explicitly state all the objectives of a maneuver. There are statements about the training conditions and ancillary information that may

or may not be construed as objectives. As a result, instructors have variations in what they believe should be learned from practicing a particular maneuver.

If there were clear educational objectives established for each Task, then it would be easy to determine how a particular change in the ACS will effect evaluating the objectives. If there are clear educational objectives for each Task, then when a change in the ACS does effect an objective, it should be possible to move the objective and evaluation to a different Task in the same Area of Operation.

Currently, there is some overlap in the elements of the Stall Tasks and the Slow Flight Task and it may be possible to move some of the objectives from the Slow Flight to the Stall Tasks so that slow flight can be performed without the stall warning activated.

Test Validity

Another concept in education theory is test validity. Test validity is the concept of how well a test actually evaluates what it purports to measure. **SAFE believes the Slow Flight Task in the ACS is no longer valid based on criteria for test validity**. Even with the changes in the SAFO, the Slow Flight Task, as currently in the ACS, is no longer valid for the following reasons.

- It does not evaluate whether the applicant has learned to recognize and respond to the progressive cues associated with an imminent stall at a level where the response is automatic. Simply having an understanding of declarative knowledge is not sufficient.
- It assumes that it is possible to fly at a speed in the 'region of reverse command' without activating the stall warning device.
- It assumes the training aircraft has a stall warning device.

To make the Slow Flight Task valid, SAFE believes the Slow Flight Task, along with the Stall Tasks need to be revised in their entirety to create a cohesive set of objective, elements, completion criteria, and standards. **The Stall Tasks could be revised to include the objectives and outcomes no longer being evaluated in the Slow Flight Task.**

Negative Transfer of Learning

Key educational psychology theories on Transfer of Learning are in Chapter 2 of the Aviation Instructors Handbook. While positive transfer of learning is always desired, curriculum design may result in negative transfer of learning or unintended learning. Designing training to avoid one negative outcome should not introduce a different negative outcome.

AC 120-111, Upset Prevention and Recovery Training, defines "negative transfer of training" as "the inappropriate generalization of knowledge or skills learned in training to line operations." (p.3, AC 120-111). Performing a maneuver with the stall warning continuously engaged could indeed result in negative transfer of learning where the student learns to ignore the stall warning. However, in reducing the potential for negative transfer of learning, it is important to not

introduce unintended consequences such as failing to cover other important learning objectives or creating a new negative transfer of learning in other area.

Negative transfer of learning is a threat to learning just as there are other threats to learning. As such, the risk due to negative transfer of learning can be mitigated in various ways. **Alternative mitigation methods to reduce negative transfer of learning should be researched** and could include, for example, briefing the student prior to a maneuver.

Stall Warning in Primary Trainers

The stall warning device on a primary trainer aircraft is designed as the first alert of a possible stall. While a good safety tool, it has limitations and some aircraft, depending on age or certification category, may not be equipped with a warning device. Initiating a stall recovery every time the stall warning activates will actually preclude a pilot learning the skills associated with learning "the progressive signals that a stall may be imminent" as part of this task.

The change in the ACS Slow Flight Task is based on the assumption that primary trainer aircraft can actually be flown at speeds slow enough to be in the 'region of reverse command' without activating the stall warning device. SAFE believes this is not a valid assumption.

The region of reverse command occurs at airspeeds below the minimum power-required speed, also referred to as maximum endurance speed. The speed is between stall speed and glide speed (L/D max) varies with weight, power, and altitude and is not a published V speed.

The requirements for stall warning for virtually every training aircraft in use today are contained in 14 CFR 23.207 as amended in 1969 that requires the stall warning should come on between 5-10 knots before a stall. This was further amended in 1996 to remove the upper limit and instead issue guidance that the stall warning should not come on so far in advance of the stall as to be a nuisance.

Therefore, in order to fly in the region of reverse command without a stall warning, the minimum power speed needs to be at least 15 knots faster than stall speed.

As an example, a clean C-152 at maximum weight, has a glide speed of 60 knots, and stall speed of 40 knots. With just a 20 knot difference between stall and glide speed, it is very unlikely the minimum power speed is more than 15 knots faster than the stall speed and it is unlikely the aircraft can be flown in the region of reverse commend without the stall warning engaged.

A possible solution is to **thoroughly brief the student regarding the stall warning prior to performing the slow flight maneuver with the stall warning activated. This would allow the student to perform this maneuver while minimizing negative transfer of learning.**

Finally, is the state of the stall warning simply a condition of the training environment the same way flap configuration is a condition for a maneuver? Or is the state of the stall warning an evaluation criteria? This is something that needs to be addressed. In addressing it, consideration

needs to be given to aircraft without stall warning devices and how to evaluate the absence of an alert.

Recommendations

SAFE's recommends that the ACS be revised immediately so that pilots will learn the skills essentials of stall recognition and avoidance as part of the Stall Tasks. To accomplish this, SAFE makes the following four recommendations.

1. SAFE's recommends that the FAA **revise the entire Area of Operation Slow Flight and Stalls,** so it is a complete, cohesive set of tasks, elements, completion criteria, and standards needed for safe flight in the flight regime covered by this Area of Operation. The revision needs to
   a. Clearly establish the objectives related to Slow Flight and Stalls
   b. Edit and/or create new task elements or even a new task if necessary, to insure that, taken together, the A/O meets ALL of the objectives needed to achieve the goal of a safe pilot
   c. Clearly establish any restrictions on the training environment separate from the objectives
   d. Clearly establish the evaluation criteria for meeting each objective, separate from any restrictions on the training environment

   To do anything less, is a band aid that will only make the problem worse. Trying to change just one element of the Slow Flight Task is how this problem started.

2. SAFE recommends that the FAA **reorganize the objectives of slow flight and stalls** with
   a. Slow Flight Task be treated as a normal operation with objectives appropriate to 'region of reverse command', and strong yawing moments.
   b. Stall Tasks be treated as a non-normal operation with objectives appropriate to stall recognition, avoidance, and recovery.
3. SAFE recommends the **FAA investigate and address diversity of stall warnings in primary trainers.**
   a. Validate that the objective of controlling an aircraft at speeds slow enough to be in the 'region of reverse command' can actually be met in the current primary-trainer fleet without activating the stall warnings.
   b. Establish how to specify the training environment and evaluate learning objectives in aircraft without stall warning devices
   c. Establish alternative methods to mitigate the risk of negative training with the stall horn engaged in aircraft where the only way to fly at speeds in the region of reverse command is with the stall warning engaged.

4. SAFE recommends the **FAA Form a 'Tiger Team'* to implement a solution no later than the first scheduled revision of the ACS.**

   Time is of the essence. Having a tiger team, including professional curriculum designers, SMEs and pilot examiners, will enable the Area of Operation to be revised in time to be released with the first revision of the ACS. Having a tiger team will also send a message to the training community that the FAA is committed to aviation safety and resolving this issue.

   *A tiger team is a small group of experts put together to solve an immediate, specific problem. The members are key players with the experience, knowledge, and authority to cut through the bureaucracy, make decisions, and take action in order to solve the problem.

Respectfully submitted,

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Society of Aviation and Flight Educators