Instrument Flying Handbook (FAA-H-8083-15B) Addendum:
Angle of Attack Indicators
April 2015

The FAA along with the General Aviation Joint Steering Committee (GAJSC) is promoting Angle of Attack (AOA) indicators as one of the many safety initiatives aimed at reducing the General Aviation accident rate. AOA indicators will specifically target Loss of Control (LOC) accidents. Loss of control is the number one root cause of fatalities in both General Aviation (GA) and Commercial Aviation. More than 25% of General Aviation fatal accidents occur during the maneuvering phase of flight. Of those accidents-half involve stall/spin scenarios. Technology such as AOA indicators can have a tremendous impact on reversing this trend and are increasingly affordable for GA airplanes.

The purpose of an AOA indicator is to give the pilot better situational awareness pertaining to the aerodynamic health of the airfoil. This can also be referred as stall margin awareness. More simply explained, it is the margin that exists between the current AOA that the airfoil will stall (critical AOA).

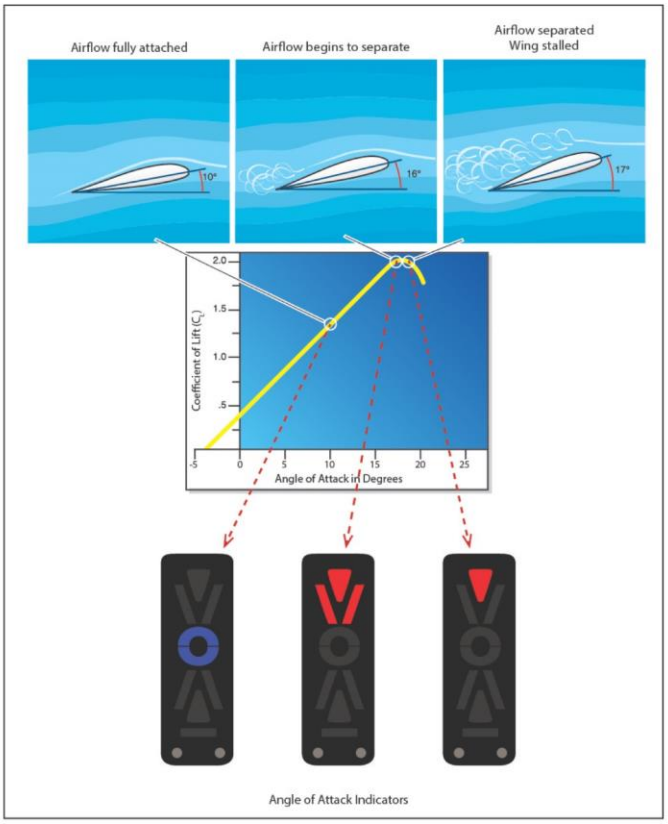

Figure 1. *Critical angle of attack, stall, and angle of attack indications.*

Angle of attack is taught to student pilots as theory in ground training. When beginning flight training, students will typically rely solely on airspeed and the published 1G stall speed to avoid stalls. This creates problems since this speed is only valid when the following conditions are met:

- Unaccelerated flight (a 1G load factor)
- Coordinated flight (inclinometer)
- At one weight (typically maximum gross weight)

Speed by itself is not a reliable parameter to avoid a stall. An airplane can stall at any speed. Angle of attack is a better parameter to use to avoid a stall. For a given configuration, the airplane always stalls at the same angle of attack, referenced to as the critical angle AOA. This critical AOA does not change with:

- Weight
- Bank angle
- Temperature
- Density altitude
- Center of gravity

An AOA indicator can have several benefits when installed in GA aircraft, not the least of which is increased situational awareness. Without an AOA indicator, the AOA is "invisible" to pilots. These devices measure several parameters simultaneously and determine the current angle of attack providing a visual image to the pilot of the current AOA along with representation of the proximity to the critical AOA. These devices can give a visual representation of the energy management state of the airplane. The energy state of an airplane is the balance between airspeed, altitude, drag, and thrust and represents how efficiently the airfoil is operating. With this increased situational awareness pertaining to the energy condition of the airplane, the pilot will have information that they need to aid in preventing an LOC scenario resulting from a stall/spin. Additionally, the less energy that is utilized to maintain flight means greater overall efficiency of the airplane which is typically realized in fuel savings. This equates to a lower operating cost to the pilot.

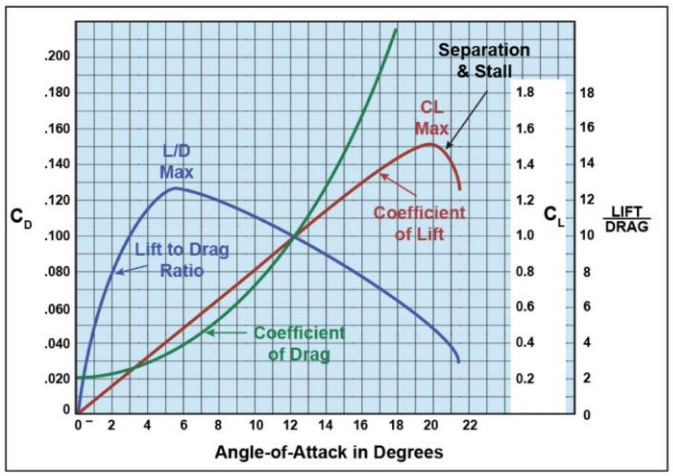

Figure 2. *Lift/drag curve.*

Just as training is required for any system in an aircraft, AOA indicators have training considerations also. A more comprehensive understanding of AOA in general should be the goal of this training along with the specific operating characteristics and limitation of the installed AOA indicator. Ground and flight instructors should make every attempt to receive training from an instructor knowledgeable about AOA indicators prior to giving instruction pertaining to or in airplanes equipped with an AOA indicator. Pilot schools should incorporate training on AOA indicators in their syllabi whether their training aircraft are equipped with them or not.

Installation of AOA indicators not required by type certification in GA airplanes has recently been streamlined by the FAA. The FAA established policy in February 2014 pertaining to non-required AOA systems and how they may be installed as a minor alteration, depending upon their installation requirements and operational utilization, and the procedures to take for certification of these installations. For updated information on this, please reference the FAA webpage at http://www.faa.gov.

While AOA indicators provide a simple visual representation of the current AOA and its proximity to the critical AOA, they are not without their limitations. These limitations should be understood by operators of GA airplanes equipped with these devices. Like advanced automation such as autopilots and moving maps, the misunderstanding or misuse of the equipment can have disastrous results. Some items which may limit the effectiveness of an AOA indicator are listed below:

- Calibration techniques
- Probes or vanes not being heated
- The type of indicator itself
- Flap setting
- Wing Contamination

Pilots of GA airplanes equipped with AOA indicators should contact the manufacturer for specific limitations applicable to that installation.

Instrument Flying Handbook (FAA-H-8083-15B) Addendum B:
False Courses
November 2019

The following will replace the content found on page 9-40 under "ILS Errors":

2. False courses. In addition to the desired course, glideslope (GS) facilities inherently produce additional courses at higher vertical angles. These false courses occur at angles between approximately 6° and 12°. Some false courses (false null) resemble a normal 3° GS, but are at a steeper angle or at the wrong location and may result in a high descent rate if followed, while other false courses (signal reversal) occur when the signal is reversed (i.e., signal transitions from a "fly-down" command to a "fly-up" command) and depending on the GS capture logic, may result in the aircraft pitching up. The type of false course is dependent on the GS antenna type, but in general, signal reversals will occur at 9°, false nulls will occur at 12°, and both may occur around 6°. Although indications of an abnormal condition may be present, flight crews should be aware that there may be no warning prior to crossing a false GS. Specific airplane indications and autoflight responses when approaching or capturing a false GS are aircraft-dependent; therefore, operating and/or training manuals should be referenced for additional information regarding the consequences of capturing a false GS and for guidance to detect and prevent false GS captures.

   Note that, if the approach is conducted at the altitudes specified on the appropriate approach chart (GS captured from below), these false courses are not encountered. Intercepting the GS from above increases both the possibility of a non-stabilized approach and the risk of capturing a false GS. Flight crews should also maintain flight path awareness (i.e., altitude vs. distance crosschecks) during the approach to ensure false GSs are not encountered or followed.

FAA-H-8083-15B
Instrument Flying Handbook
Updated October 10, 2014

Errata as of October 10, 2014

1. In the caption for figure 9-19 on page 9-20, "ORM" should be changed to "OMN."
2. In the caption for figure 9-20 on page 9-21, "ORM" should be changed to "OMN."

Errata as of July 2, 2014 (Revised version of entries previously dated February 12, 2014)

1. In the right column of page 5-13 *Northerly turning Errors*, the reference to Figure 5-20A should be removed.
2. In the right column of page 5-13 *Southerly Turning Errors*, the reference to Figure 5-20B should be removed.
3. Disregard Figure 5-20 on page 5-14 due to inaccurate graphics.
4. In Figure 9-7 on page 9-7, the blue and yellow ADF needles in the top instruments should point to 005 degrees and the airplane's heading should be 355 degrees to maintain the track. The label in the lower left corner stating WCA as 10 degrees left and RB of 10 degrees right should be located next to the top airplane graphic.

   In the second-from-the-top instruments, the blue and yellow ADF needles should point to 005 degrees to indicating that the airplane is back on course. In the middle instruments, the ADF needles should point to about 350 degrees, to the right of the wind correction heading of 340 degrees. Next to the middle airplane graphic, there should be a label stating a WCA of 25 degrees left.
5. In the second full sentence from the bottom of the right column on page 7-7, "turn-and-slip" should be changed to "turn coordinator."

Errata as of July 25, 2013

1. In the second-to-last sentence of the second paragraph in the right column of page 9-11, the VOR CDI deviation value should be changed from "12°" to "10°".

Errata as of December 21, 2012

1. In Figure 5-3 on page 5-4, the "1,000 ft. pointer" label should be changed to read "100 ft. pointer," the "100 ft. pointer" label should be changed to read "10,000 ft. pointer," and the "10,000 ft. pointer" label should be changed to read "1,000 ft. pointer."