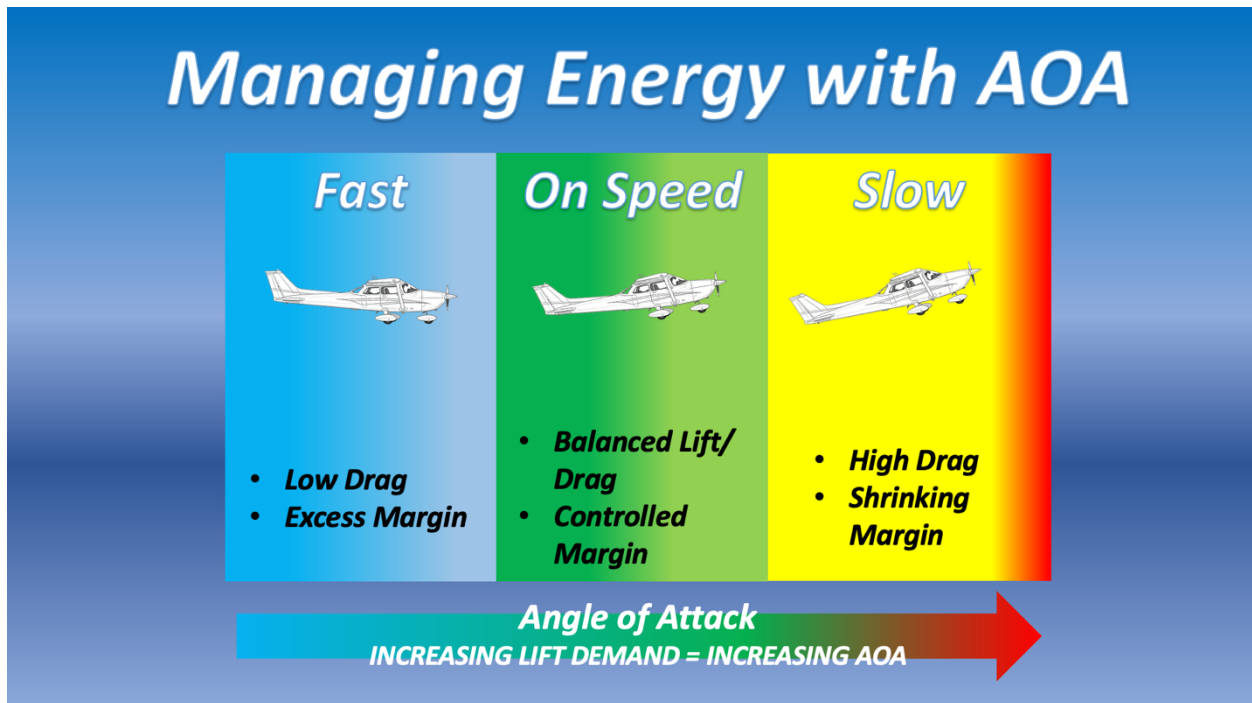


Standardizing Angle of Attack in General Aviation: The Fast–On-Speed–Slow Framework for Aircraft Control

Michael Vaccaro, Terry Lutz, James Allen, David Sizoo, Charles Precourt

FlyONSPEED.org © 2026



Thesis

General aviation should adopt the Fast–On-Speed–Slow angle-of-attack framework, long used in military aviation, to standardize how pilots interpret margin from stall and energy state for aircraft control.

Executive Summary

Angle of attack provides a direct aerodynamic reference for managing aircraft control and energy state during maneuvering flight. Pilots are continuously solving a fundamental control problem: the lift demand placed on the wing and whether sufficient energy exists to sustain it. Angle of attack defines the lift demand, while power determines whether it can be supported.

Unlike airspeed, which is an indirect proxy for lift demand under limited conditions, angle of attack directly shows the wing's proximity to stall. This allows pilots to maintain a consistent maneuvering condition across changes in weight, load factor, and configuration, while managing energy through power.

The on-speed condition represents a reference angle of attack for maneuvering and approach where lift demand, drag, and available energy are balanced. It is not a single airspeed, but an *aerodynamic condition* that remains consistent across changes in weight and load factor. Pilots interpret deviations from this condition as fast, on-speed, or slow, using angle of attack to manage aerodynamic margin while power controls energy and flight path.

Angle of attack lets the pilot control the wing directly rather than determine its state from secondary cues, providing a consistent way to manage aerodynamic margin, maneuvering performance, and energy where precision matters most. Despite its availability, the lack of a consistent operational interpretation leaves most systems optimized for stall awareness, with inconsistent cueing across configurations that limits their use as primary control references.

Adopting a common interpretation of AOA would:

- improve precision and consistency in approach and landing
- provide a common aerodynamic reference for aircraft control and energy management
- align pilot training with the physics of flight
- improve recognition of diminishing aerodynamic margin during maneuvering

This paper explains why angle of attack is the correct reference for managing lift demand and energy state, and how the Fast–On-Speed–Slow framework—where AOA defines lift demand and power determines whether it can be sustained—can be applied across general aviation to improve aircraft control and energy management.

Standardizing this interpretation aligns pilot training with the fundamental physics of flight and provides a practical tool to improve aircraft control, landing precision, and reduce loss-of-control accidents.

The Wing Only Sees Angle of Attack

This framework is grounded in a simple aerodynamic fact: the wing responds only to angle of attack. The aerodynamic limit of flight is specifically defined by AOA, as shown in Figure 1, which relates lift coefficient directly to angle of attack.

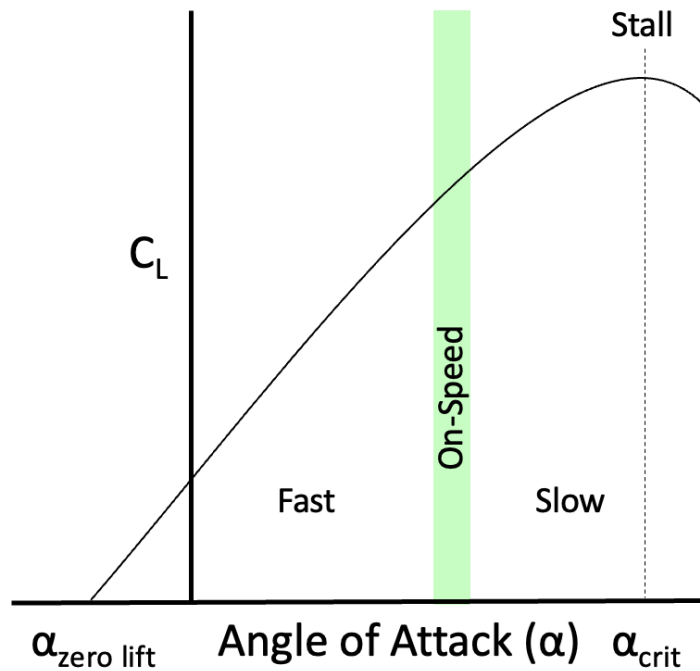


Figure 1. Lift coefficient as a function of angle of attack. Lift coefficient increases with angle of attack to a maximum at the critical angle of attack, beyond which the wing stalls. The critical angle is nearly constant for a given configuration and is independent of airspeed. Angle of attack therefore provides a direct measure of margin from stall, while airspeed remains an indirect, condition-dependent proxy, valid only in coordinated, unaccelerated (1 g) flight.

Because the aerodynamic limit is defined by angle of attack rather than indicated airspeed, an airplane can stall at many different airspeeds and attitudes while the critical AOA remains nearly constant for a given configuration. Stall speed varies with weight and load factor, so airspeed cannot uniquely define aerodynamic margin—it only correlates under specific conditions. In maneuvering flight, where load factor and energy state change continuously, the relationship breaks down. AOA removes ambiguity by directly showing proximity to the aerodynamic limit.

Because stall occurs at a specific AOA, a measured value of AOA will directly reflect proximity to the aerodynamic limit, independent of weight and maneuvering load. This makes AOA a direct, self-compensating indicator of aerodynamic margin across operating conditions. Measured AOA defines the lift demanded of the wing. Increasing lift demand will increase induced drag, so it is tied not only to stall margin but also to the energy required to sustain flight. Power sets the available energy, while AOA sets the lift demand. The energy available must then support the desired flight path.

Why Airspeed Became the Default Reference for Aircraft Control

Airspeed became the primary reference for aircraft control because it was the first aerodynamic parameter that could be measured reliably in the cockpit. However, it does not directly represent the aerodynamic state of the wing. It correlates with lift only under specific conditions, such as

steady, unaccelerated flight at a given weight and configuration. During maneuvering flight, where load factor and energy state change, airspeed cannot uniquely reflect lift demand or proximity to the aerodynamic limit.

Angle of attack provides a direct solution where the use of airspeed is limited. Because it reflects lift demand, it provides a consistent indication of aerodynamic margin across changes in weight, configuration, and maneuvering load. The historical reliance on airspeed therefore reflects instrumentation constraints rather than the physics of flight. Early airplanes had no practical means of measuring AOA directly, although aviators understood its importance. The Wright Company patented an incidence indicator in 1913, and the first Flyer used a simple airflow string to sense the relative wind. However, reliable cockpit instrumentation for measuring AOA did not yet exist for tractor-configured airplanes.

The pitot–static system, by contrast, was simple, robust, and inexpensive. As instrumentation improved, airspeed indicators became standard equipment and the pilot’s primary performance reference. Certification standards evolved accordingly: aircraft performance data, stall speeds, and approach speeds were defined in terms of indicated airspeed under specific conditions, typically maximum gross weight and one-g flight. Pilot training followed the same structure, with target speeds for takeoff, climb, approach, and landing embedded in procedures, checklists, and operating handbooks.

Airspeed is a reliable reference to aerodynamic margin only in coordinated, unaccelerated (1 g) flight. As load factor increases, stall occurs at higher airspeeds even though the critical angle of attack remains unchanged. This relationship is illustrated in Figure 2.

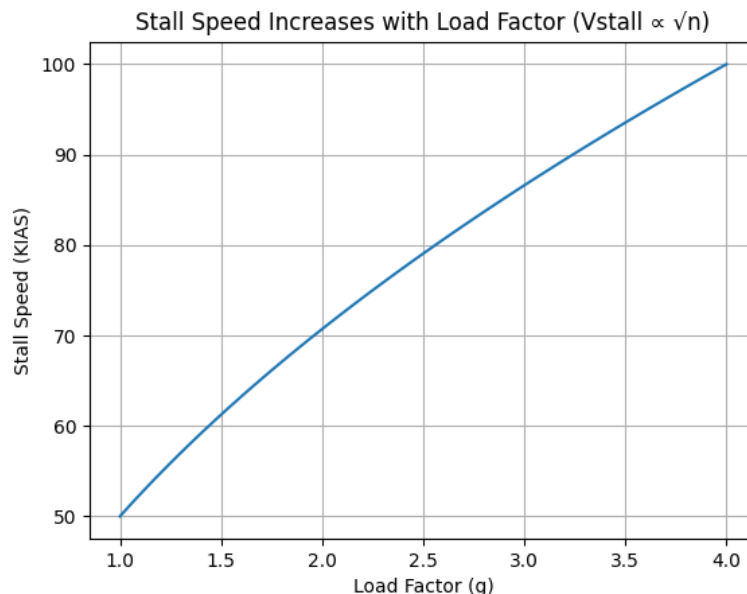


Figure 2. Stall speed as a function of load factor. Stall speed increases with load factor according to a square root relationship. While the airspeed at stall increases as load factor increases, the critical angle of

attack remains unchanged. This illustrates that airspeed alone does not reliably indicate aerodynamic margin during maneuvering flight.

The limitation of using airspeed carries directly into pilot technique. The aircraft's response to pitch and power changes across the flight envelope with airspeed, angle of attack, and intended flight path. Without a consistent framework, pilots must learn multiple control strategies and determine which one best applies in a given situation. This increases training burden and leads to inconsistent control inputs—particularly when margins are limited and time to recover is short. ***Loss-of-control events often result not from a single error, but from a breakdown in the pilot's mental model of how pitch and power affect the aircraft's aerodynamic and energy state.***

The ability to measure AOA with modern technology removes the original limitation that made airspeed the default reference. With that constraint removed, aircraft control can be based on angle of attack—the parameter that directly reflects lift demand and margin from stall. Without a direct AOA indication, pilots cannot see proximity to the aerodynamic limit. This is not a new concept, but a return to the variable the wing responds to. The limitations of airspeed-based control are most apparent in operations requiring precise margin control where AOA has been adopted as a primary reference.

Why Military Aviation Transitioned to Angle of Attack

Operational environments that demand precise control of aerodynamic margin realized the limitations of airspeed as a primary reference. In these conditions, pilots must manage lift demand and energy state simultaneously, often under rapid changes where indirect cues such as airspeed and attitude are insufficient to maintain consistent performance.

Carrier landing represents one of the most demanding aerodynamic control problems in aviation. The pilot must fly a precise glide path to a moving deck while maintaining strict control of aerodynamic margin, often with changing weight, configuration, and energy state. Under these conditions, airspeed does not reliably indicate proximity to the aerodynamic limit. Angle of attack addresses this directly: maintaining a target AOA preserves aerodynamic margin for a given configuration, independent of weight or maneuvering. This establishes a stable reference condition—AOA sets the aerodynamic state of the wing, while power controls flight path. Modern operational use of AOA as a primary reference was developed from these requirements. The same relationship applies in general aviation, where the approach and landing task requires simultaneous control of flight path, configuration, and energy, resulting in a stable approach. The use of AOA provides a direct and consistent reference, independent of airspeed.

In operational terms, the pilot's objective is to control the airplane's flight path. As AOA increases, lift demand increases and the energy required to sustain the flight path also increases. Energy is managed through power and expressed as a combination of airspeed and altitude. If sufficient power is available, the maneuver can be sustained; if not, the airplane will decelerate, descend, or both.

A similar requirement exists in air combat maneuvering. Pilots must balance lift production with the ability to sustain maneuver capability with the energy available. Increasing AOA in a turn

improves performance but also increases drag and rapidly consumes energy. Beyond a certain point, the maneuver becomes unsustainable as AOA increases toward stall. Operational experience showed that managing this condition with airspeed alone is inefficient and imprecise, particularly during aggressive maneuvering. By contrast, AOA provides a direct, real-time indication of lift demand, allowing pilots to achieve the desired balance between maneuver performance and energy required.

These operational demands led to the widespread adoption of angle-of-attack indexers and audio cues in military aircraft. Pilots learned to interpret deviations from the reference condition as fast, on-speed, or slow. This framework allowed them to manage aircraft control and energy simultaneously without relying on delayed or indirect cues.

One operational principle emerged repeatedly from this experience: when control margins shrink, pilots must reduce AOA. Reducing AOA decreases both lift demand and drag, restoring aerodynamic margin and improving the energy state. In practical terms, pilots describe this action as *unloading the wing*. Unloading immediately improves controllability and restores energy, providing time and margin to recover from an unstable condition. This principle—***unload for control***—is now deeply embedded in military flight training. It reflects a fundamental aerodynamic truth: as an aircraft approaches its limits, the fastest way to restore control is to reduce lift demand on the wing. AOA makes this possible. These same principles are not unique to high-performance aircraft and apply directly to general aviation.

The difference lies not in the physics of flight, but in the operating environment. General aviation airplanes typically fly at low altitude, moderate airspeeds, and relatively low power-to-weight ratios, where energy margins are often limited. During takeoff, climb-out, approach, and landing, the airplane operates in a portion of the flight envelope where aerodynamic margin can change rapidly, and recovery options may be constrained by altitude.

Unlike high-performance aircraft with substantial excess thrust, many light airplanes cannot easily overcome the rapid increase in drag that occurs when AOA becomes excessive. This is most evident during traffic pattern operations. Maneuvering during takeoff, climb-out, approach, and landing involves turning flight, configuration changes, and adjustments in power and flight path close to the ground. These actions can simultaneously increase load factor and drag while reducing available energy. Under these conditions, small increases in AOA rapidly reduce aerodynamic margin.

The same aerodynamic principle that proved essential in carrier operations and air combat maneuvering therefore applies directly to general aviation. The difference lies not in the physics of flight, but in whether the pilot has clear information about the aerodynamic state of the wing when it matters most.

Angle of Attack as the Common Language of Aircraft Control

The pilot controls flight path by controlling (AOA) with pitch and power. Increasing AOA raises lift demand and the power required to hold that path. Available power sets the outcome: with enough, the maneuver is sustained; without it, the airplane trades energy—losing airspeed,

altitude, or both. The overall relationship is driven by induced drag: as AOA increases, drag rises and power required increases, linking the aerodynamic state of the wing directly to energy. Pilots recognize this as the “back side of the power curve,” illustrated in Figure 3.

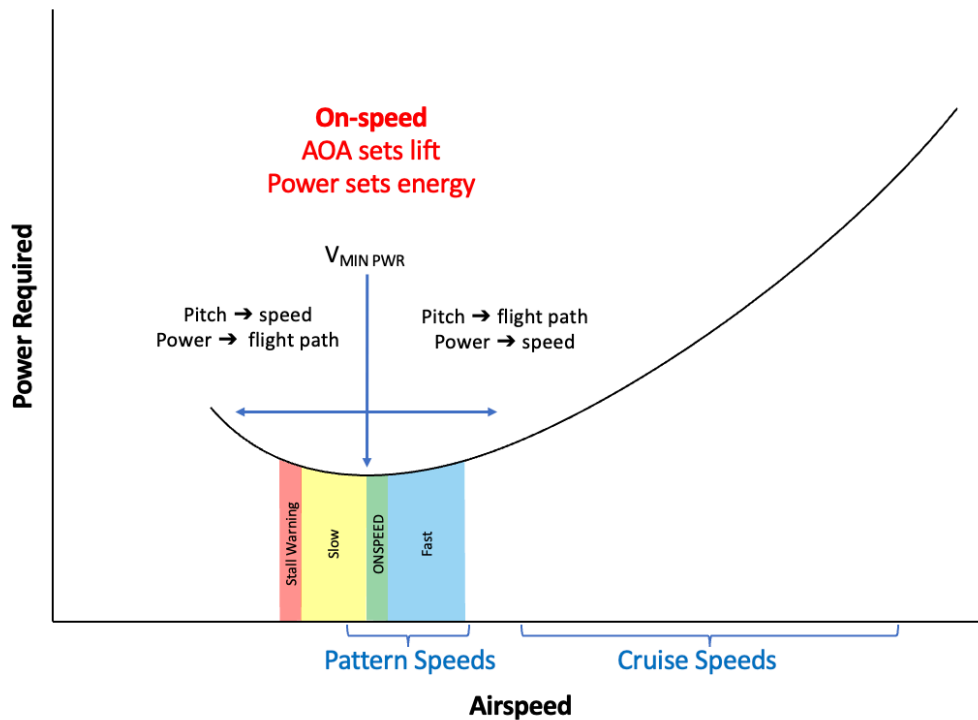


Figure 3. Power required vs. airspeed (1 g, level flight). As airspeed decreases, increasing angle of attack creates induced drag which requires more power. The minimum-power point defines a change in control response. The left of this point is the backside, where pitch primarily affects airspeed and power sets flight path. To the right of this point, pitch primarily affects flight path and power sets airspeed. The on-speed condition provides a practical reference linking lift demand (AOA) to the aircraft’s energy state.

If sufficient power is available, the aircraft can sustain the commanded AOA; if not, it must decelerate, descend, or both. This defines the boundary between an achievable and unachievable flight path, which is illustrated in Figure 4.

Figure 4 presents the “power” envelope as the intersection of AOA and power limits, with dashed lines indicating constant load factor. As available power increases, the achievable flight envelope expands; as power decreases, it contracts, even though the underlying AOA relationships remain unchanged. As load factor increases, the wing must produce more lift, driving both AOA and power required higher. At lower g, the aircraft is AOA-limited: the stall boundary is reached before available power is exhausted. As load factor increases, required power rises more rapidly and the envelope contracts until the limiting factor shifts—by about 2 g in this example, maximum power is reached before the critical AOA. Thus, AOA sets the commanded aerodynamic condition, while power determines whether it can be sustained. Although Figure 4 illustrates load factor, the envelope also varies with gross weight, density altitude, and configuration. These shifts affect achievable performance but do not alter the underlying AOA

relationships. Note that the values shown in this figure are representative and illustrate general relationships; actual performance varies by aircraft, configuration and density altitude.

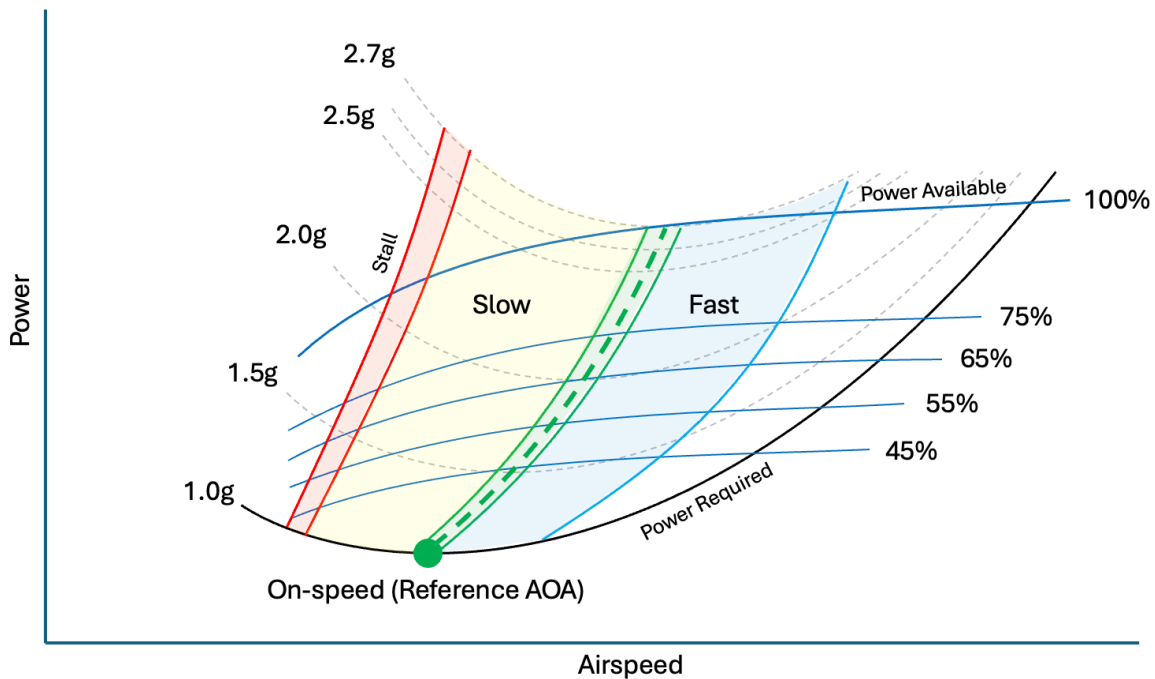


Figure 4. Power setting defines the usable AOA envelope. The stall boundary defines the maximum angle of attack, while power available and power required bound the conditions that can be sustained. At a given AOA, power determines whether the condition is achievable. The on-speed reference AOA provides a consistent control condition across the envelope. Dashed constant load-factor lines illustrate how maneuvering demand shifts the intersection of AOA, airspeed, and power. Regions labeled fast and slow indicate AOA below and above the on-speed reference and their associated energy states.

While Figure 4 expresses these relationships in terms of power and airspeed, pilots experience the same aerodynamic limits during maneuvering flight as changes in load factor. A portion of the V–n diagram (flight envelope) provides a complementary view, showing how stall margin varies with load factor and airspeed. When expressed in this domain, constant angle-of-attack conditions appear as curved bands that preserve a consistent margin from stall across changing maneuvering demand.

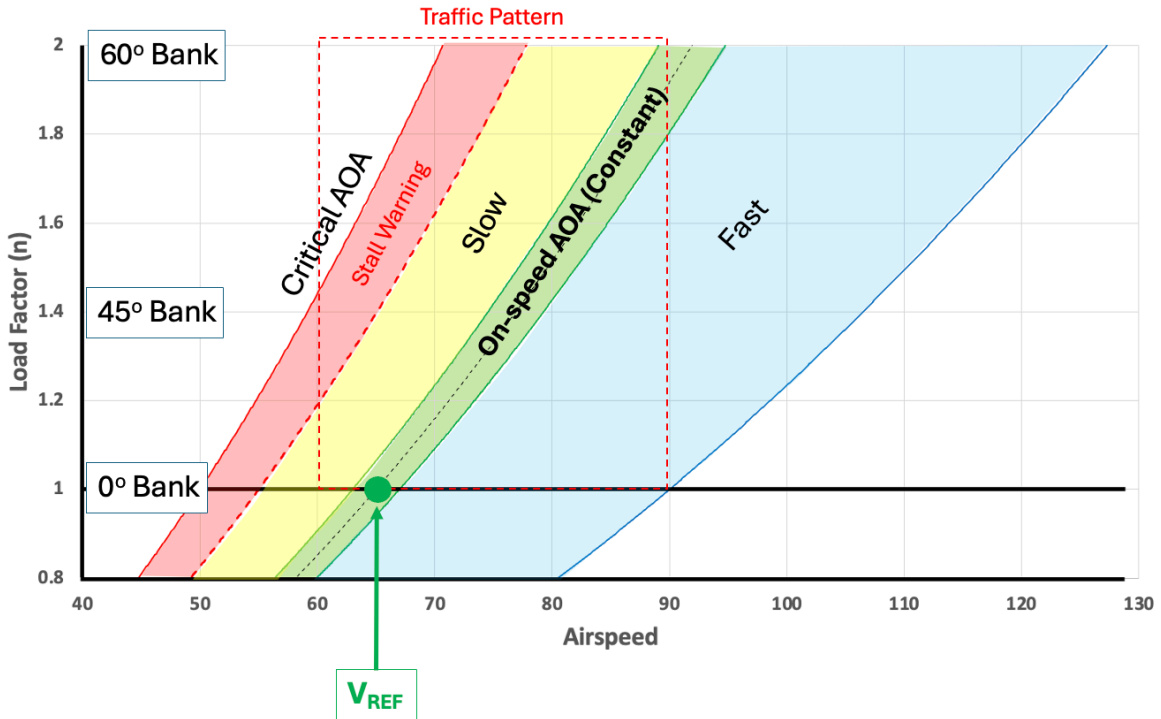


Figure 4b. Traffic-pattern interpretation of angle of attack on the traffic pattern portion of the flight envelope (speed vs load factor). The stall boundary defines the critical AOA limit, increasing with load factor. The on-speed band represents a constant AOA and therefore a constant margin from stall, independent of bank angle or load factor. Regions labeled slow and fast correspond to higher and lower AOA relative to the on-speed reference. The dashed box highlights the typical traffic-pattern maneuvering range, illustrating that AOA provides a consistent control reference across varying bank angles and load factors, while flying with V_{REF} (airspeed) alone does not preserve stall margin.

Fast, On-Speed, and Slow. Operationally, pilots interpret the aerodynamic state of the wing relative to a reference AOA associated with efficient maneuvering and approach performance. This condition is referred to as *on-speed* and is illustrated in Figure 5.

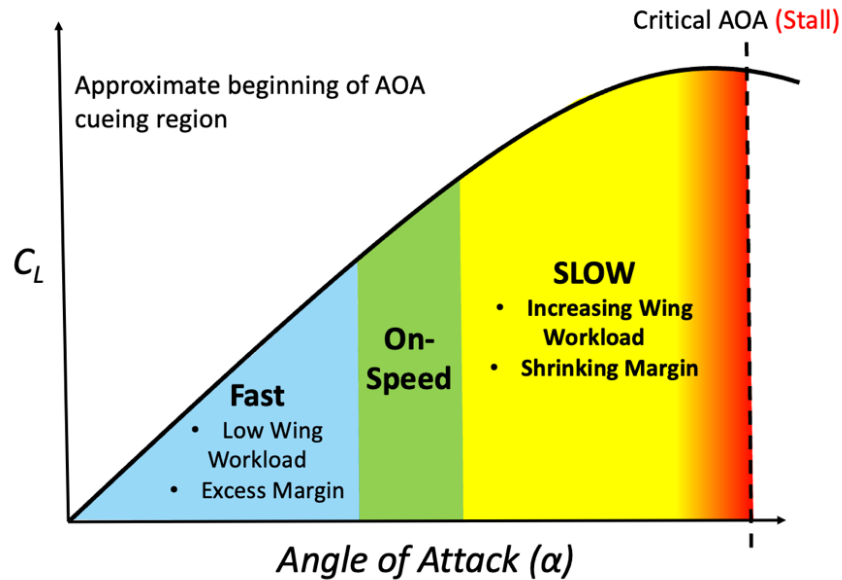


Figure 5. Operational interpretation of angle of attack. As angle of attack increases, lift demand rises to a maximum at the critical AOA, beyond which the wing stalls. The region from the onset of useful AOA cueing to the critical AOA defines the maneuvering regime where aerodynamic margin changes rapidly. Within this range, pilots interpret deviations from the on-speed reference as fast, on-speed, or slow.

Relative to this reference condition, three aerodynamic states emerge:

Fast. The wing is operating at a lower AOA than the reference. Aerodynamic margin is large and excess energy is available, allowing the airplane to accelerate, climb, or increase maneuvering potential.

On-Speed. The wing is operating at the reference AOA where lift demand and available energy are balanced. This corresponds to a narrow AOA band (typically about $\pm 1^\circ$ in general aviation airplanes), not a single value. Within this band, the airplane maintains a stable aerodynamic state with sufficient margin from stall and energy to sustain the desired flight path.

At 1 g, this band corresponds to the familiar VREF range. As load factor increases, maintaining on-speed establishes a maneuvering condition where lift demand is controlled and energy can be balanced with available power. When sufficient power is available, this corresponds to sustained maneuvering; when power is limited, the same reference condition provides the best achievable performance without excessive energy loss.

Slow. The wing is operating at a higher AOA than the reference. Lift demand is high, margin from stall is reduced, and induced drag increases rapidly. The energy required to sustain the maneuver rises sharply and may exceed available power. In this condition,

small increases in AOA can produce large performance penalties, and the airplane will tend to decelerate or descend unless AOA is reduced or power is increased.

These conditions are defined by AOA, not airspeed. Pilots therefore describe themselves as fast or slow relative to on-speed, even though the reference is aerodynamic rather than velocity-based. This usage also preserves high and low for flight path or altitude, reducing ambiguity. In this framework, high and low describe potential energy, while fast and slow describe kinetic energy.

Why Trend Information Matters. Equally important as the instantaneous aerodynamic condition is the direction and rate at which it is changing. As airspeed decreases, AOA increases at an accelerating rate. Near the lower end of the flight envelope, small changes in airspeed correspond to much larger changes in AOA and stall margin. Pilots must know not only the current state of the wing, but whether it is moving toward or away from the desired condition. Trend awareness allows pilots to recognize movement toward fast, on-speed, or slow and make corrective inputs early. *Presented this way, AOA becomes more than a static indication—it becomes a real-time control reference.*

Operational Control Response. AOA provides a direct control cue. If the aircraft is slow (AOA above the reference), reduce AOA—unload the wing—and add power as required. If the aircraft is fast (AOA below the reference), increase AOA to return to on-speed. Power then controls flight path and energy.

A Universal Control Framework. The Fast–On-Speed–Slow framework provides a simple way to link aircraft control with energy management. Rather than memorizing different airspeeds for varying weights, bank angles, and flight conditions, the pilot monitors a single aerodynamic parameter—the lift demand on the wing—relative to the reference condition.

This approach offers several advantages:

- It remains valid across aircraft types and configurations when properly calibrated.
- It automatically reflects changes in weight and maneuvering load.
- It integrates aerodynamic margin and energy management into a single operational concept.

Most importantly, it allows the pilot to manage the wing directly rather than determine its behavior from secondary cues. *With appropriate sensing and cueing, AOA becomes more than an instrument indication—it becomes a practical, standardized language for aircraft control.*

Why Many Existing AOA Systems Do Not Fully Support This Concept

Angle-of-attack indicators have existed for decades, and their availability in general aviation has increased significantly as sensing technology has become smaller, less expensive, and more accessible. This may represent progress, but many installed systems are designed primarily for stall awareness rather than as a continuous aerodynamic reference for aircraft control and energy management.

Design Objective: Stall Warning vs. Aerodynamic Awareness. Most general aviation AOA systems were developed to meet a specific regulatory or operational objective: providing earlier or more intuitive warning of an impending stall. This focus concentrates indicator sensitivity near the approach-to-stall region, where warning cues are most critical. Consequently, much of the display resolution and calibration effort is devoted to the final portion of the lift curve. When most of the indication is concentrated near stall, it becomes difficult to interpret the aircraft's aerodynamic state across the broader operating envelope. In practice, this limits the usefulness of the indication when the aircraft is operating in the fast or energy-rich portion of the lift range, making it difficult to use the system as a continuous control reference.

Limited Calibration Across the Lift Range. Another limitation arises from calibration strategy. Many systems are calibrated primarily at stall reference points, such as stall angle or approach-to-stall conditions. While this ensures appropriate warning margins, it does not ensure that the indication represents the aerodynamic behavior of the wing across the full usable lift range. Without calibration spanning a broader portion of the lift curve for each aircraft design, the indication may not consistently reflect the relationship between aerodynamic state and lift demand under all flight conditions.

Variability Introduced by Field Calibration. Many AOA systems rely on aircraft-specific field calibration procedures that establish reference points such as stall angle, approach-to-stall, or even zero-g conditions through flight testing. While this allows adaptation to individual aircraft, it can introduce variability that affects operational consistency. Calibration quality may depend on installer experience, flight test conditions, and interpretation of the procedure. As a result, identical systems in similar aircraft may produce different cueing or reference points. This variability complicates the development of a standardized operational interpretation of AOA. For AOA to function as a common control reference—particularly within a Fast-On-Speed-Slow framework—pilots must be able to rely on consistent aerodynamic cueing from aircraft to aircraft.

Sensitivity to Maneuvering Flight. Some AOA systems rely on indirect or derived parameters, such as airspeed-based models or simplified aerodynamic assumptions. These approaches may perform adequately during stabilized, wings-level flight but may not accurately represent the true aerodynamic state during maneuvering, climb, descent, or varying load factors. Under these conditions, the indication may appear to represent AOA but does not fully correspond to the actual aerodynamic loading of the wing.

Lack of a Standard Operational Interpretation. Different systems use varying scales, color conventions, and cueing philosophies. Without a common operational language linking AOA to aircraft control and energy management, pilots may treat the indication as an occasional advisory rather than a primary aerodynamic reference. As a result, much of the safety and performance potential of AOA remains underutilized.

The Path Forward. Supporting a standardized aerodynamic control framework requires AOA systems that allow pilots to determine the aerodynamic state of the wing across the usable lift range and interpret it relative to the desired reference condition. In practical terms, this requires:

- A clear reference condition corresponding to on-speed
- Indications that allow the pilot to determine whether the aircraft is fast or slow relative to that reference
- Reliable operation across maneuvering flight conditions
- Clear trend information indicating movement toward or away from the desired condition

When these elements are present, AOA becomes more than a stall-warning enhancement—it becomes a practical reference for managing aircraft control and energy state. This enables the Fast–On-Speed–Slow framework described earlier. Establishing this framework as a training and operational standard would allow general aviation to fully realize the safety and performance benefits AOA has already demonstrated in other sectors of aviation.

Integration with Pilot Training and Aircraft Operations

The standardized angle-of-attack framework described above does not replace existing performance references or operating procedures. Instead, it provides a primary aerodynamic reference that complements airspeed information. Airspeed remains essential for planning takeoff distance, climb performance, range, and compliance with operating limitations. These uses remain unchanged.

The Pilot’s Control Task. In operational terms, aircraft control reduces to two tasks:

1. Control angle of attack to manage lift demand and margin from stall.
2. Adjust power to manage energy and flight path.

AOA establishes the aerodynamic condition of the wing, while power determines whether that condition can be sustained.

Application in Routine Operations. During approach and landing, maintaining on-speed AOA establishes the desired aerodynamic condition while power controls flight path. Because AOA reflects lift demand directly, this preserves consistent margin from stall regardless of weight or configuration. During maneuvering flight, deviations from on-speed provide immediate indication of wing workload. A fast condition indicates excess energy and available margin; a slow condition indicates increasing lift demand, reduced margin, and potential energy deficit. In the slow regime, AOA must be reduced and power adjusted as required to sustain the maneuver.

Integration with Existing Training. The Fast–On-Speed–Slow framework does not replace existing procedures but provides a direct aerodynamic reference for executing them. Airspeed targets correspond to specific AOA values that define margin from stall. Using AOA as the reference allows the pilot to maintain this condition directly, while power manages energy and flight path.

Conclusion

General aviation lacks a standardized operational interpretation of angle of attack. The Fast–On-Speed–Slow framework provides a consistent reference for managing margin from stall and energy state across all aircraft types and all configurations. By anchoring control to the aerodynamic behavior of the wing rather than airspeed and attitude-based cues, this approach improves precision, reduces workload, results in more stabilized approaches, and enhances safety in phases of flight where aerodynamic and energy margins are most limited. Establishing this standard provides general aviation with a consistent, universal aerodynamic reference for control and energy management.

Appendix A: Relationship between On-speed and L/Dmax

This appendix provides additional technical context for the relationship between the on-speed reference condition and the aerodynamic condition corresponding to maximum lift-to-drag ratio (L/D_{MAX}). This material supports implementation and calibration considerations but is not required for operational use of the Fast–On-Speed–Slow framework.

Angle of attack provides a direct measure of lift demand on the wing, while normalized lift (CL/CL_{MAX}), expressed as lift fraction, provides a useful way to compare aerodynamic states across configurations and aircraft types.

For steady flight at a given weight:

$$Lift = Weight = Cl \frac{1}{2} \rho V^2 S$$

At the stall condition:

$$Weight = Cl_{max} \frac{1}{2} \rho V^2 S$$

Dividing these relationships yields:

$$Cl / Cl_{max} = (V_s / V)^2$$

where:

- V_s is the stall speed for the given configuration and weight
- V is the current airspeed

This relationship provides a practical way to relate airspeed-based references to aerodynamic lift fraction.

For a typical approach condition, $V_{REF} \approx 1.3 V_s$. Substituting:

$$\frac{C_L}{C_{L_{max}}} = \left(\frac{V_s}{V_{ref}} \right)^2 \approx \frac{1}{(1.3)^2} \approx 0.59$$

Thus, the on-speed condition corresponds to approximately 60% of maximum lift. Because lift coefficient is a direct function of angle of attack, this lift fraction corresponds to a specific AOA, linking the on-speed condition directly to a consistent aerodynamic state of the wing.

The condition corresponding to L/D_{MAX} varies with configuration:

- In clean configurations, L/D_{MAX} typically occurs at a lower lift fraction (typically 40-50% for a GA aircraft)
- As flaps are deployed, the lift coefficient at L/D_{MAX} increases
- In landing configurations, L/D_{MAX} may approach or coincide with the on-speed condition

The operational implication is that on-speed provides a consistent reference condition for maneuvering and approach, while L/D_{MAX} remains configuration-dependent. These conditions should not be treated as interchangeable, particularly in clean configurations where they may differ.

For systems that incorporate aerodynamic cueing:

- On-speed serves as the primary operational reference
- L/D_{MAX} may be used as a secondary, configuration-specific reference
- Cueing should preserve consistent operational meaning (fast, on-speed, slow) across configurations rather than relying on a fixed aerodynamic condition

This separation allows the Fast–On-Speed–Slow framework to remain consistent and universal while accommodating real aerodynamic variation across aircraft and configurations.