VICTORIA FLYING CLUB

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- Bookings, Questions

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Stalls

- Review Slow Flight
- Definition and Motivation
- **Power-Off** and **Power-On Stalls**
- **Accelerated**, **Approach** and **Departure Stalls**
- Summary and Questions
- Pre-Flight Briefing

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Review Slow Flight

- *Attitude plus power equals performance!*
- Mentally enter a slow flight in landing configuration from cruise flight and state all observations and required actions.
- What particular observation applies to the control inputs compared to normal cruise flight?
- Mentally recover from a slow flight in landing configuration and state all observations and required actions.

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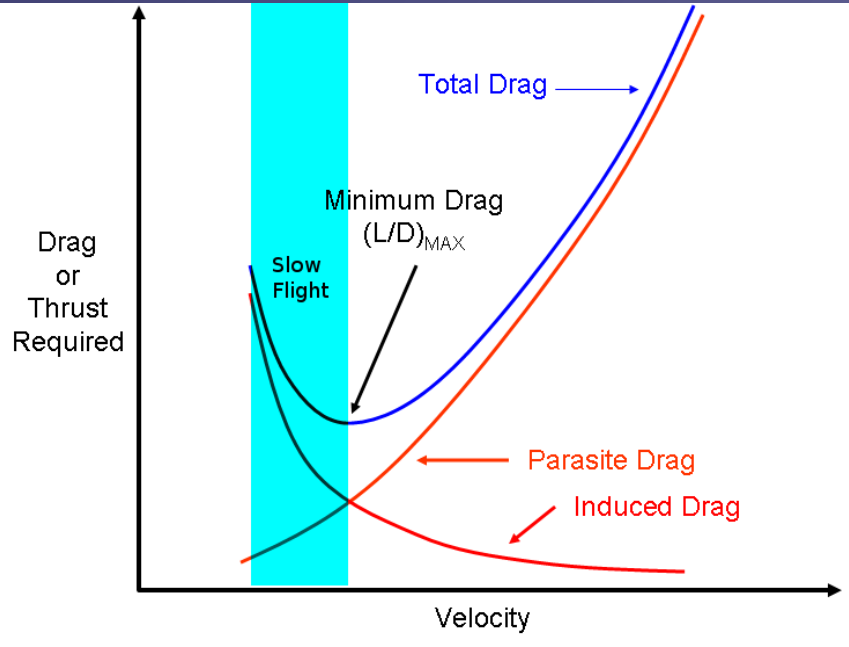
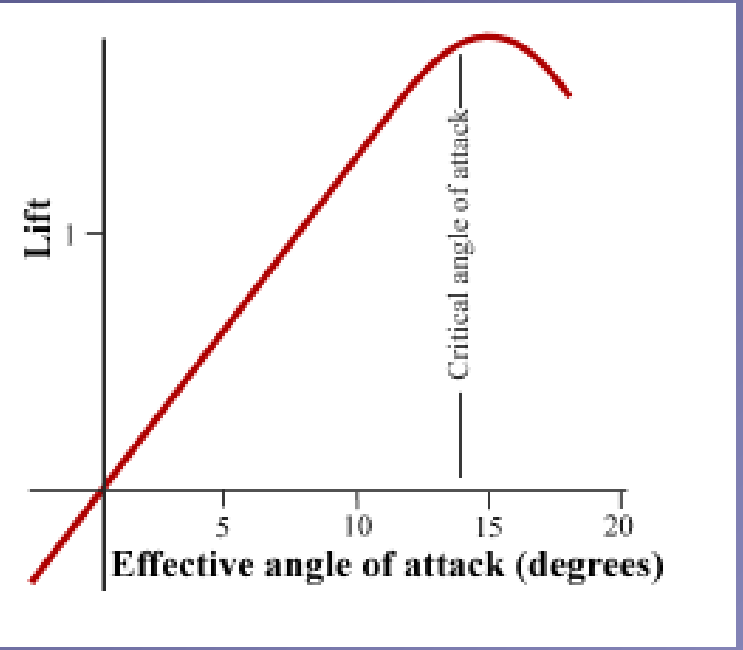
Definition and Motivation





- *Lower* **limit** of the slow flight range
- Any angle of attack *beyond* the **critical angle of attack** at which any further increase leads to *less* **lift** and *more* **drag**
- *Imminent* – **stall warning**, **bottom of arc**, **buffet**
- *Fully Developed* – nose or wing drop

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Safety Considerations

- *High* **nose-up attitude** maneuver
- *Limited* forward visibility
- **HASEL**, recovery at or above ***2000 ft AGL***
- Maintain good **lookout** during maneuver
- **Yaw** is to be controlled *precisely* with **rudder**
- Remain **coordinated** at all times (depending on stall type)
- Consider **utility category** for **wing drop** stalls

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Entering a Power-Off Stall

- Perform **HASEL** checks and continue **lookout** during the maneuver
- Reduce **power** to *idle*, **decelerate** and control **yaw**
- Apply **elevator** back-pressure *as required* to increase **nose-up attitude** controlling **yaw** with **rudder** *while* maintaining **altitude**
- Extend **flaps** *in stages* to desired degree in **white arc**

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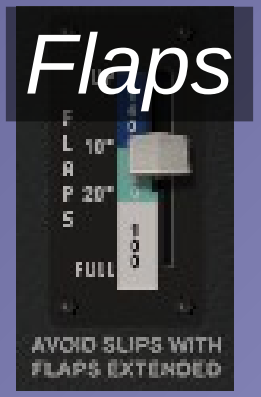
Recovering a Power-Off Stall



- Release **elevator** back-pressure to lower the nose *immediately*
- Apply *full* **power** controlling **yaw** with **rudder** to remain **coordinated**
- **Accelerate** past the slow flight range and recover **altitude** (*Vx*)
- Retract **flaps** *in stages* to up in **white arc**
- Establish **cruise attitude** and **accelerate** to **cruise airspeed**
- Reduce power to **cruise power** setting and finally **trim**

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Entering a Power-On Stall

- Perform **HASEL** checks and continue **lookout** during the maneuver
- Apply **elevator** back-pressure to increase and *hold* **nose-up attitude** controlling **yaw** with **rudder**
- Extend **flaps** *in stages* to desired degree in **white arc**

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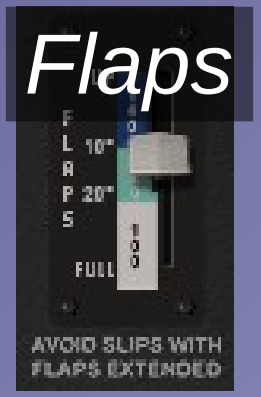
Recovering a Power-On Stall



- Release **elevator** back-pressure to lower the nose *immediately*
- Apply *full* **power** controlling **yaw** with **rudder** to remain **coordinated**
- **Accelerate** past the slow flight range and maintain **altitude**
- Retract **flaps** *in stages* to up in **white arc**
- Establish **cruise attitude** and **accelerate** to **cruise airspeed**
- Reduce power to **cruise power** setting and finally **trim**

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Power-On versus Power-Off Stall

- *Slightly lower* **stall speed** and *higher* **pitch attitude**
- *More* **directional control** and **coordination** required
- **Ailerons** are even *less* effective
- *More* **rudder** and **elevator** effectiveness (slipstream)
- *More pronounced* **change** in **pitch attitude**

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Imminent and Fully Developed Stalls

- Stall **recovery** in normal flight operations should be performed *as early as possible* – during the **imminent stall**
- Recover at the *first indication* of **stall warning**, **bottom of arc** or **buffet**
- Fully developed stalls are practiced to develop **proficiency** in **recognition** and **recovery** *only*

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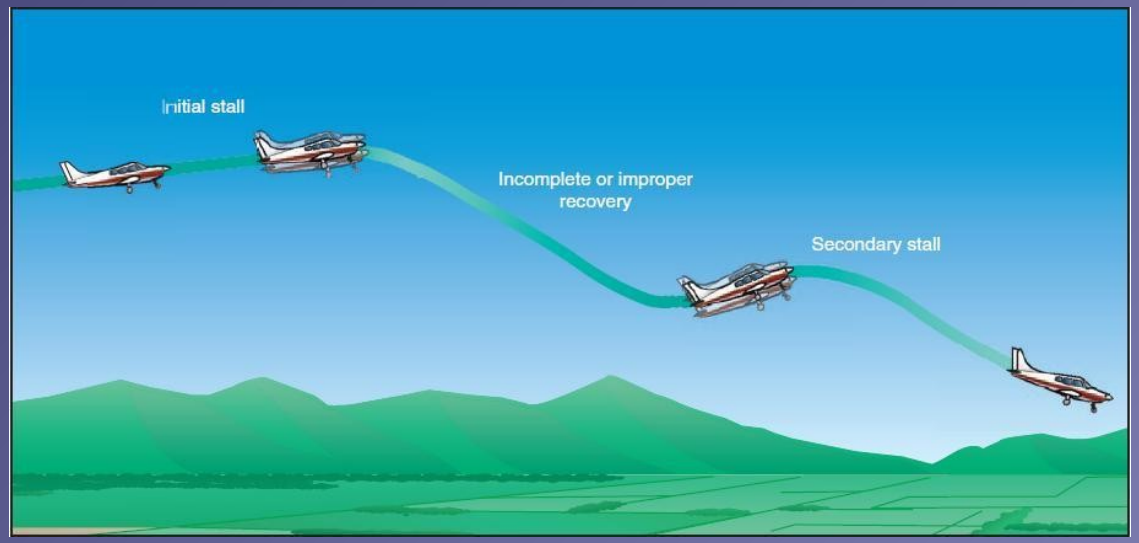
Accelerated Stall



- *High* **load factors** and *abrupt* **elevator** back-pressure may lead to a stall at *any* **airspeed** and **attitude**
- *Only* the **critical angle of attack** needs to be exceeded
- An incorrect stall recovery may lead to a **secondary stall**
- *High* **airspeed** and *significant* **buffet** may result

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Approach / Turning Stall

- Establish a power-off descending turn
- Increase bank attitude with *high* **rate of turn** (potential skid)
- Inner **wing** may **stall** *first* and drop
- Release **elevator** back-pressure lowering nose, apply *opposite* **rudder**, then *neutralize*, **wings level** and *ease out* of dive applying **power**

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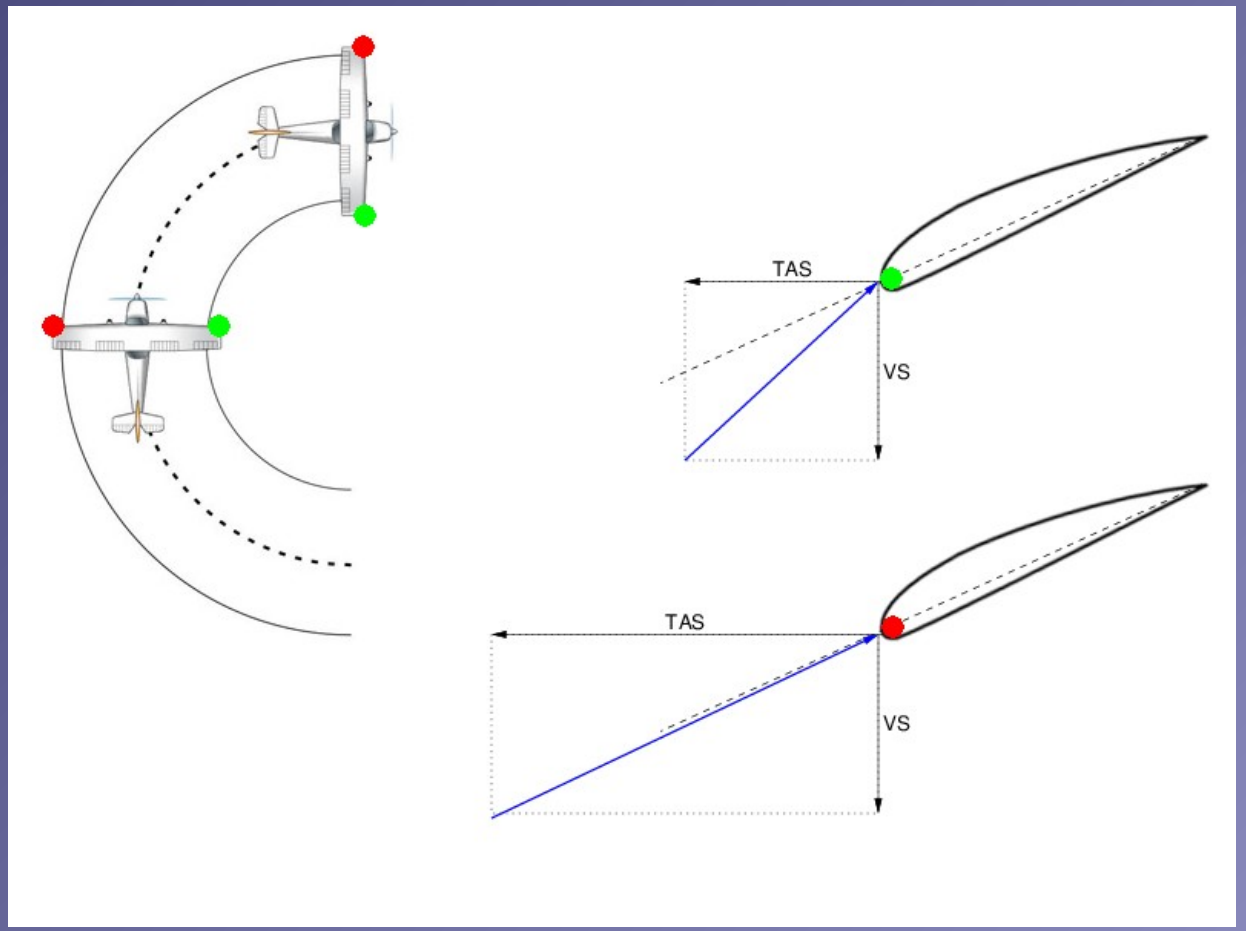
Approach / Turning Stall AoA



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Departure / Turning Stall

- Establish a power-on climbing turn
- Increase nose-up attitude *while* turning
- Outer **wing** may **stall** *first* and drop – *opposite* to the turn
- Release **elevator** back-pressure lowering the nose, apply *opposite* **rudder**, then *neutralize*, **wings level** and *ease out* of dive applying **power**

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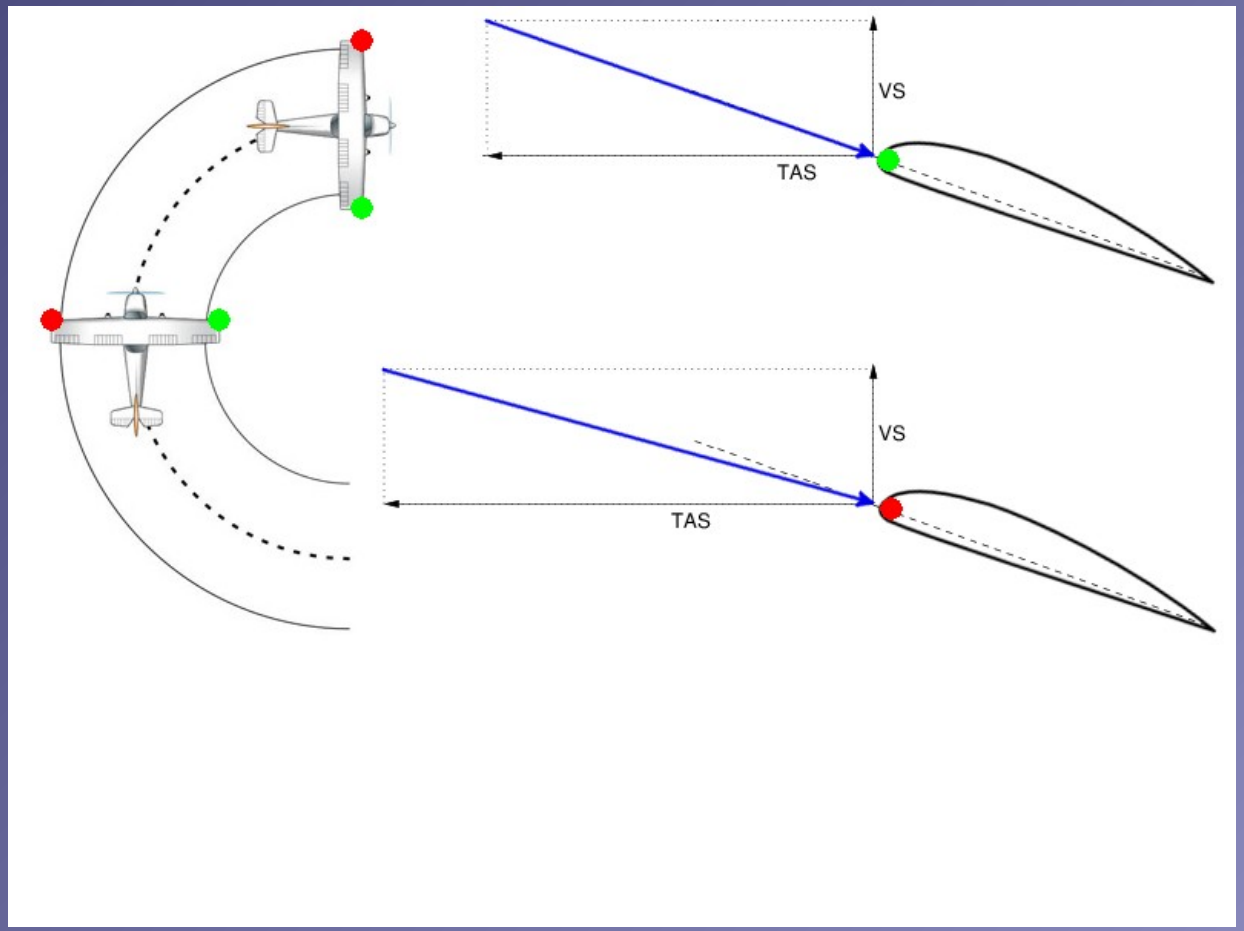
Departure / Turning Stall AoA



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Summary / Quiz

- Define a stall and describe the indications of a stall.
- What airspeed or attitude is required to produce a stall?
- Mentally enter and recover a clean power-off stall from cruise flight and state all observations and required actions.
- Mentally enter and recover a power-on stall with flaps from cruise flight and state all observations and required actions.
- Mentally enter and recover a departure stall and state all observations and required actions.

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Pre-Flight Briefing

- Exercise
- Training Area
- Departure and Arrival Procedures
- Weather Briefing / NOTAMs
- Aircraft and Documents
- Time and Fuel Requirements
- Safety Considerations and Responsibilities

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Additional Materials

- Additional materials for Stalls
- Flight Instructor Guide – Exercise 12, Lesson Plans 5, 6

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Stall Speed Factors

$$V_{S1g} = \sqrt{\frac{L}{\frac{1}{2}\ \rho\ C_{L\ MAX}\ S}}$$

$$V_{S1g\ new} = V_{S1g\ old} \times \sqrt{\frac{new\ wt}{old\ wt}}$$

$$V_{st} = V_{S1g} \times \sqrt{\frac{1}{\cos \phi}}$$

- Derived from basic lift formula
- **Load factor**: actual weight, turbulence, bank angle
- Center of gravity (balance and stability)
- Configuration: landing gear, high lift devices
- Thrust vector and slipstream velocity, compressibility at higher speeds
- Contamination: ice, frost and snow, *heavy* rain
- Equally affect reference speeds depending on stall speed

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Entering a Reduced Power-On Stall

- Perform **HASEL** checks and continue **lookout** during maneuver
- Reduce **power** to *low* power setting (***1500 RPM***)
- Apply **elevator** back-pressure *as required* to increase **nose-up attitude** controlling **yaw** with **rudder** *while* maintaining **altitude**
- Extend **flaps** *in stages* to desired degree in **white arc**