



Effects of Airspeeds & Configurations

During OEI Performance

Overview

WHAT

- First-person demonstration of the effects of a feathered versus unfeathered propeller, as well as airspeed, flaps, & gear on single engine performance

WHY

- Safety!
- Understanding the importance of feathering the propeller, removing drag devices, and maintaining V_{YSE}

CONTENT

- Big Picture
- Demonstration
- Hazards



Demonstration Overview

Big Picture

- First Half
 - Critical engine windmilling, full power on the operative engine
 - V_{YSE} & zero sideslip
 - Four Stages: Clean, Approach Flaps, Gear, Landing Flaps
- Second Half
 - Critical engine feathered, full power on the operative engine
 - V_{YSE} & zero sideslip
 - Four Stages: Reverse of the first half
- Airspeed will be varied ± 5 knots from V_{YSE} to show the effects of improper airspeed control
- After each change in configuration/airspeed note:
 - Climb Performance (or lack thereof)
 - Pitch Attitude to Maintain V_{YSE}



Demonstration Overview

Entry Procedure

- Pre-Maneuver Checklist & Clearing Turns
- Select an Entry Altitude
 - Safe altitude in case the engine won't restart
 - ACS: No lower than 3,000' AGL or manufacturer's recommended altitude (whichever is higher)
- Reduce Critical Engine Power to Zero
 - Windmilling propeller
- Establish a Zero Sideslip
 - Trim the aircraft
- Slow to & Maintain V_{YSE}



Demonstration Overview

Propeller Windmilling

- Clean Configuration
 - Apply full power, maintain zero sideslip & V_{YSE}
 - Adjust airspeed ~5 knots above/below V_{YSE}
- Extend the Approach Flaps
 - Maintain zero sideslip & V_{YSE}
 - Adjust airspeed ~5 knots above/below V_{YSE}
- Extend the Landing Gear
 - Maintain zero sideslip & V_{YSE}
 - Adjust airspeed ~5 knots above/below V_{YSE}
- Extend the Landing Flaps
 - Maintain zero sideslip & V_{YSE}
 - Adjust airspeed ~5 knots above/below V_{YSE}



Demonstration Overview

Propeller Feathered

- Landing Configuration
 - Maintain zero sideslip & V_{YSE}
 - Adjust airspeed ~5 knots above/below V_{YSE}
- Retract the Landing Flaps
 - Maintain zero sideslip & V_{YSE}
 - Adjust airspeed ~5 knots above/below V_{YSE}
- Retract the Landing Gear
 - Maintain zero sideslip & V_{YSE}
 - Adjust airspeed ~5 knots above/below V_{YSE}
- Retract the Approach Flaps (Clean)
 - Maintain zero sideslip & V_{YSE}
 - Adjust airspeed ~5 knots above/below V_{YSE}



Demonstration Overview

Recovery

- Restart the Feathered Engine
 - Follow POH procedures
- Increase Power on the Restarted Engine
 - Reduce power on the other engine
 - Maintain control during recovery
 - Adjust trim
- Return to Straight-and-Level, Coordinated Flight



Common Errors

OEI Airspeed & Config Demo

- Inadequate knowledge of the effects of airspeeds above/below V_{YSE} & various configurations on performance
- Improper entry procedures, including pitch attitude, bank attitude, and airspeed
- Improper airspeed control throughout the demonstration
- Rough and/or uncoordinated use of flight controls
- Improper procedures during resumption of cruise flight





Hazards

Hazards

Loss of Control or Stall

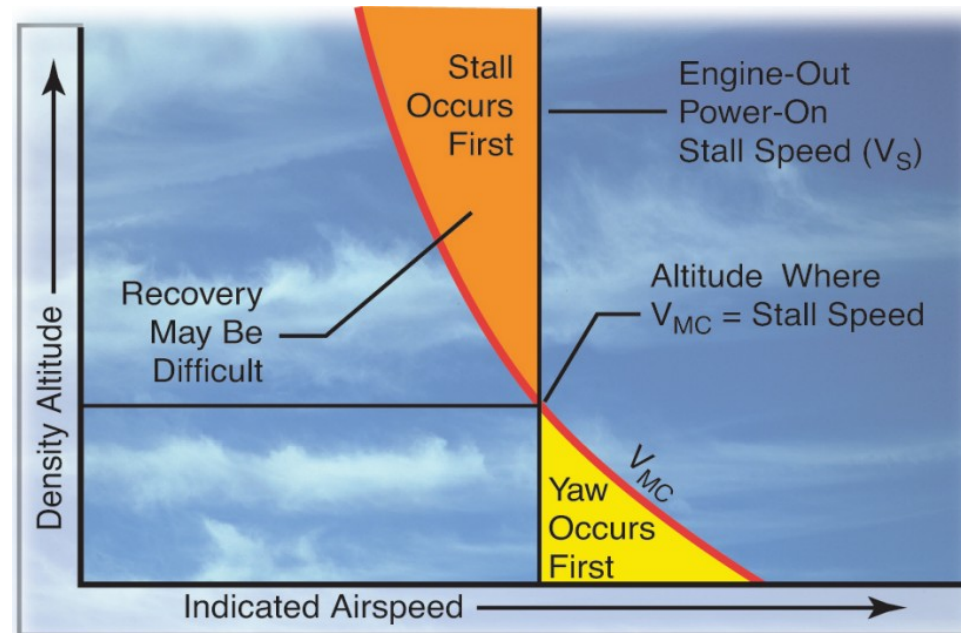
- Recover at the first sign of a loss of control or stall
 - Reduce power & lower the nose
 - Establish V_{YSE}
- A stall with asymmetric power will likely lead to a spin
 - Multiengine aircraft are not required to demonstrate spin recovery



Hazards

Loss of Control or Stall

- V_{MC} decreases with altitude while stall speed remains the same
- The altitude where $V_S = V_{MC}$ and above is extremely dangerous
 - Departure from controlled flight can be sudden



Hazards

Configuring the Airplane

- Performance is significantly decreased with excess drag
- Essential to remove drag, and feather the propeller for max performance
 - Maintain Control, Full Power, REDUCE DRAG, Identify, Verify, Fix or FEATHER
- Zero Sideslip & V_{YSE}
 - Very important to single engine performance



Hazards

Distractions

- They're dangerous
 - Remove them from view
 - If a person, explain the situation & ask them to stop
- Don't fixate on the problem at the expense of flying the airplane
 - Maintain airspeed & zero sideslip
- Aviate, Navigate, Communicate
 - Focus on flying, especially with an inoperative engine



Hazards

SA & Disorientation

- Maintain Situational Awareness & Orientation
 - Starts with preflight planning – Know your options & have a plan
 - Know where you are, what's coming next, & stay ahead of the airplane
 - If SA or orientation is lost, admit it, and fix it
- In an engine failure, slow down & follow the procedures
 - Avoid startle response
 - Maintain Control, Full Power, Remove Drag, Identify, Verify, Fix or Feather
- Disoriented: Get the aircraft to a safe attitude, airspeed, and altitude
 - Zero side-slip at V_{YSE} , never below V_{MC}
 - Recover if below V_{MC}
- Ask for Help when it's Needed
 - ATC, Guard, other pilot/passengers, etc.



Hazards

Task Prioritization

- #1 Task: Safely flying the airplane
- Divide attention between the aircraft, scanning, & communicating
 - No responsibility should take full attention for more than a short period
 - Verify aircraft performance often & consistently during any checklists
- Understand what needs to be accomplished and when
 - Use standard operating procedures & checklists
- Recognize when you're behind and find a way to catch up
 - “Attack the closest alligator”
- Safety first!
 - Aviate, Navigate, Communicate



Hazards

Collision Avoidance

- Scanning
 - Series of short regularly spaced eye movements
 - Continue to scan while OEI
- Communication
 - Flight Following: Inform ATC & declare an emergency
 - Not with Flight Following: Situation permitting, contact Guard and/or ATC
 - Uncontrolled Field: Clearly communicate intentions & location
- Operation Lights On
 - Turn on landing lights below 10,000' MSL
- Right-of-way rules
 - Aircraft in distress has the right-of-way
 - Be cautious



Hazards

Terrain

- Be aware of & plan for hazardous terrain along your route
- Study the Charts
 - Terminal charts & chart supplement
 - IFR/VFR chart altitudes
 - Use Maximum Elevation Figures and other data
- Performance Data
 - Ensure the single engine service ceiling clears all terrain along the route
 - Ensure the aircraft matches the performance assumptions
- Minimum Safe Altitudes
 - Anywhere: Altitude allowing emergency landing without undue hazard
 - ACS: Complete all SE tasks above 3,000' AGL
 - Congested: 1,000' above the highest obstacle within 2,000'
 - Uncongested: 500' from the surface (500' from people/property)



Hazards

Obstacles & Wire Strikes

- Be familiar with any obstacles nearby airports
 - NOTAMs & Terminal Procedures
- Antenna Towers
 - Can extend over 1,000' to 2,000' AGL
 - Supporting guy wires can extend 1,500' horizontally
- Overhead Wires
 - Transmission lines often span runway departures and landmarks pilots follow
 - Lakes, highways, railroad tracks, etc.



Hazards

Low Altitude Maneuvering

- A small problem at high altitude can be a big problem at low altitude
- Be aware of, and avoid obstructions near the airfield
- Low Altitude & VMC
 - Maintain a zero-sideslip
 - Stay at or above VYSE
 - In the case of a loss of control, recover promptly
 - Reduce power
 - Lower the nose
 - Establish VYSE
- Fly First!



Hazards

Low Altitude Maneuvering

- Controlled Flight Into Terrain (CFIT)
 - Avoidance starts on the ground with proper planning & decision making
- Recommendations
 - Don't attempt to fly into IMC
 - Fly above minimum safe altitudes
 - Verify ATC clearances & proper altitude
 - Maintain SA vertically and horizontally
 - Comply with appropriate regulations
 - Be extra cautious in unfamiliar areas
 - Use current charts & reference all available information
 - Use appropriate checklists
 - Know your aircraft & its equipment
 - **Verify single engine performance is compatible with the route**





Questions?