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# Chandelles

Commercial Flight Maneuver

# Background

- From the French *chandelle* for candle
- French pilots in WWI described *monter en chandelle* (to climb vertically) for an attack and evasive maneuver
- A maximum performance 180° turn with a climb

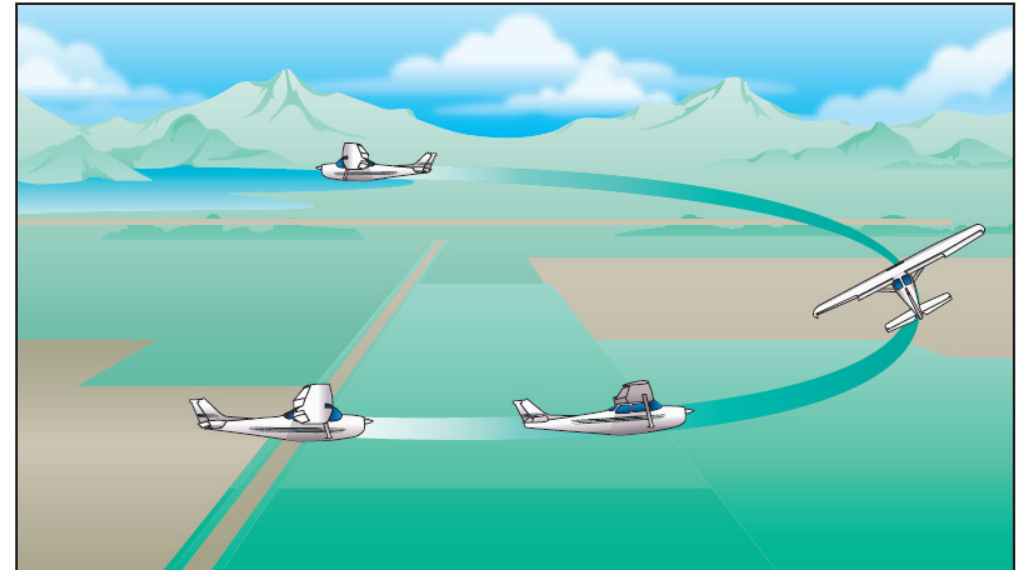
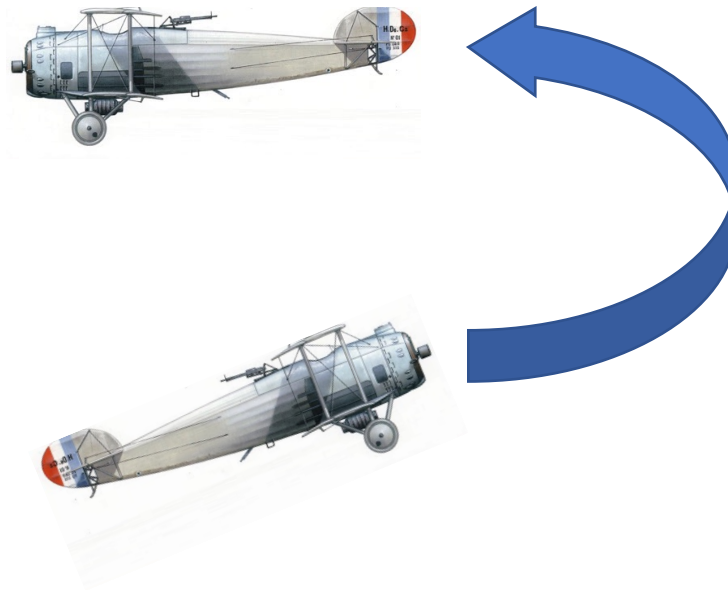


Figure 9-3. Chandelle.

# Objectives

- Achieve a maximum performance climbing turn from straight-and-level flight to 180° wings level, nose high at Minimum Controllable Airspeed (MCA)
- Continue developing the skills of energy management and flight by visual references
- Maintain coordination and orientation
- Appreciate the dynamic factors of the maneuver (changing pitch and bank) and how they relate to energy

# Steps Overview

- Prepare for maneuvering (clearing turns, communication, etc.)
- Pick a 90° reference point off the left wing
- Smoothly roll into 30° of left bank
- Smoothly apply full power
- Begin gradually pitching up, achieving matching pitch up attitude at the 90° reference point
- Maintain attitude while slowly rolling out bank
- Place the right wing on the 90° reference point when aircraft has made a full 180° turn
- Repeat in the other direction



# Steps Overview

- Prepare for maneuvering (clearing turns, communication, etc.)

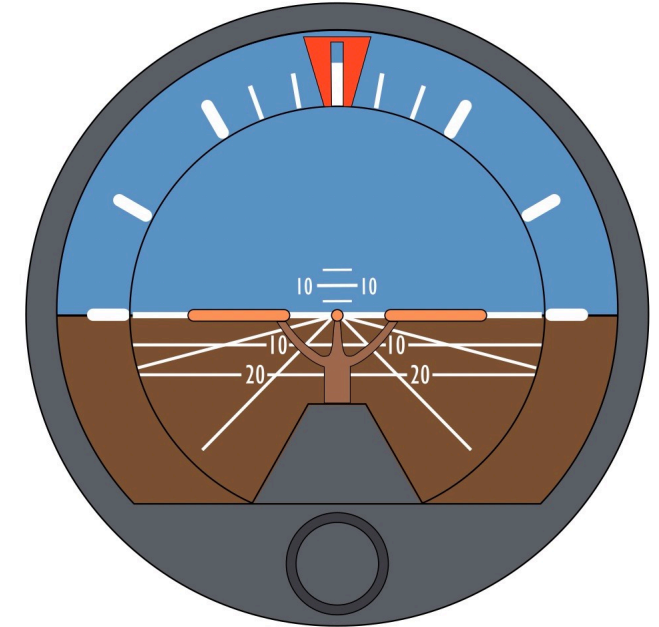
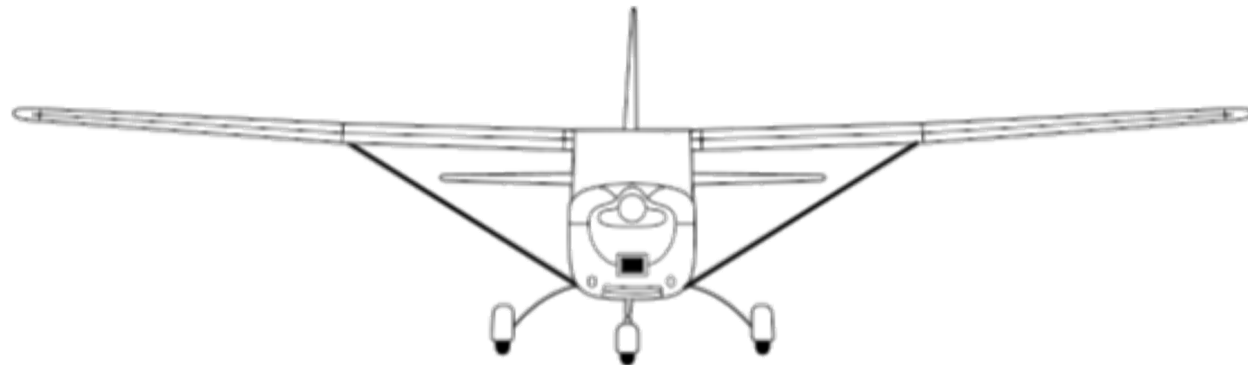
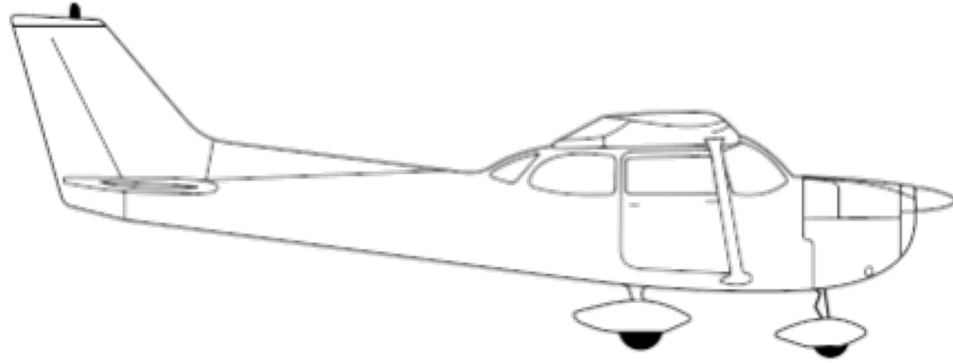
Constant Bank  
Changing Pitch

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Changing Bank  
Constant Pitch

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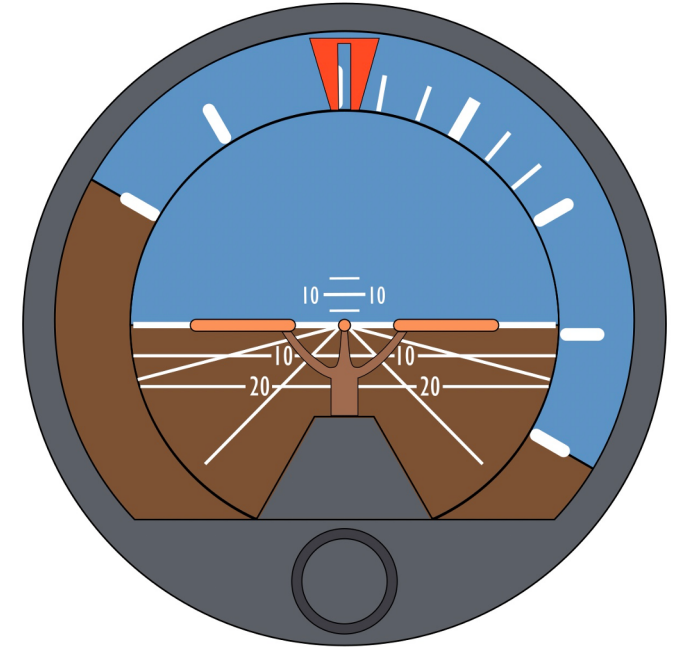
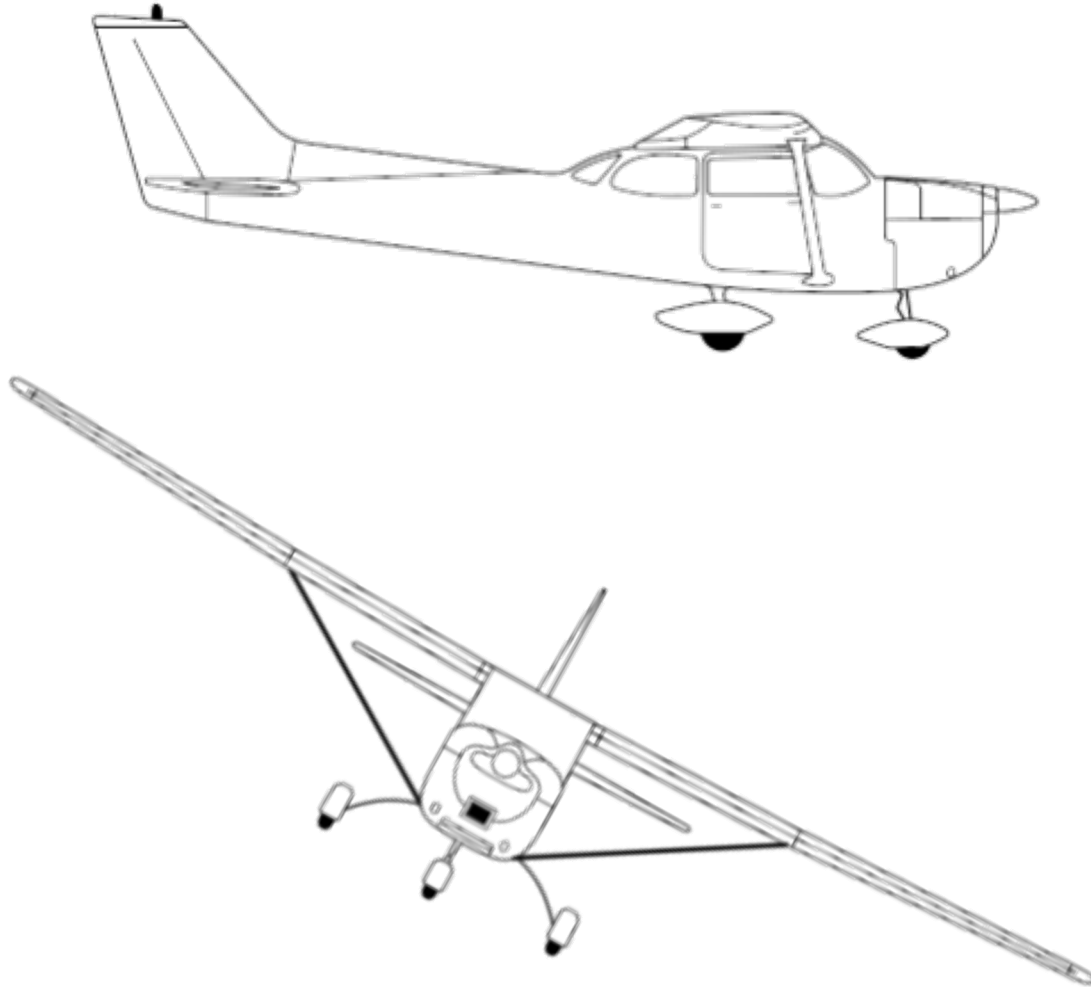
# 1. Trim for Maneuvering Speed







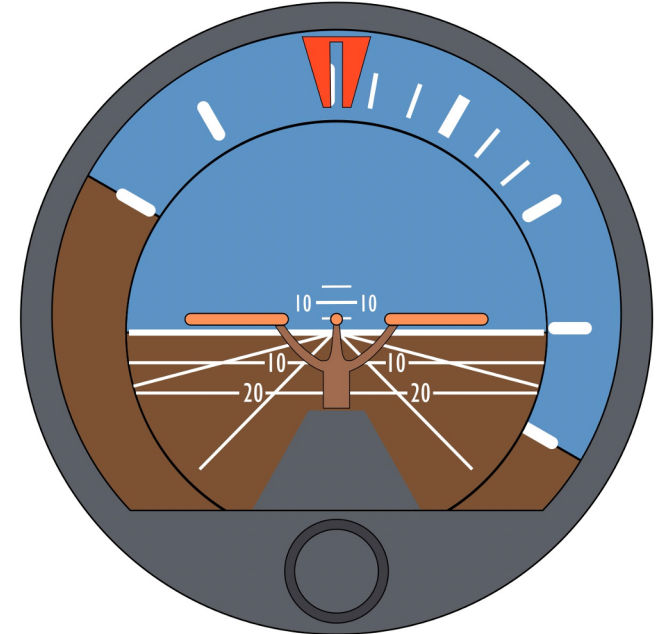
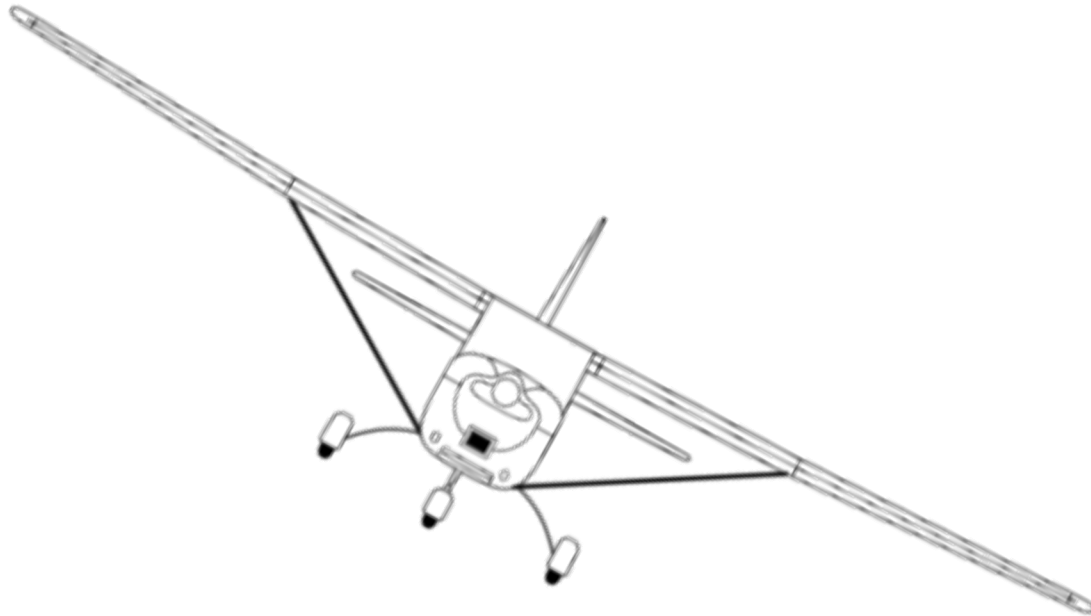
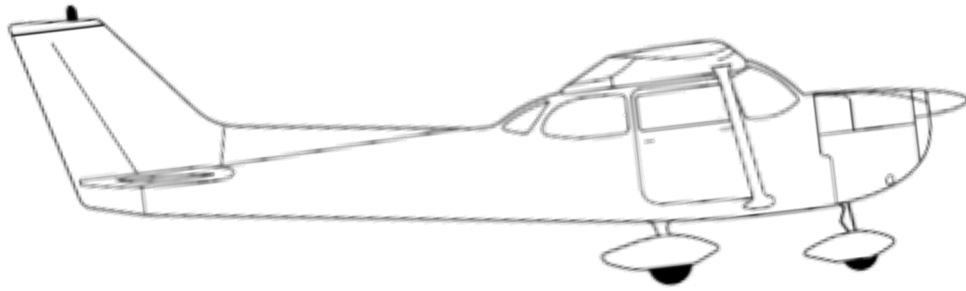
## 2. Smoothly Roll into 30 ° of Bank



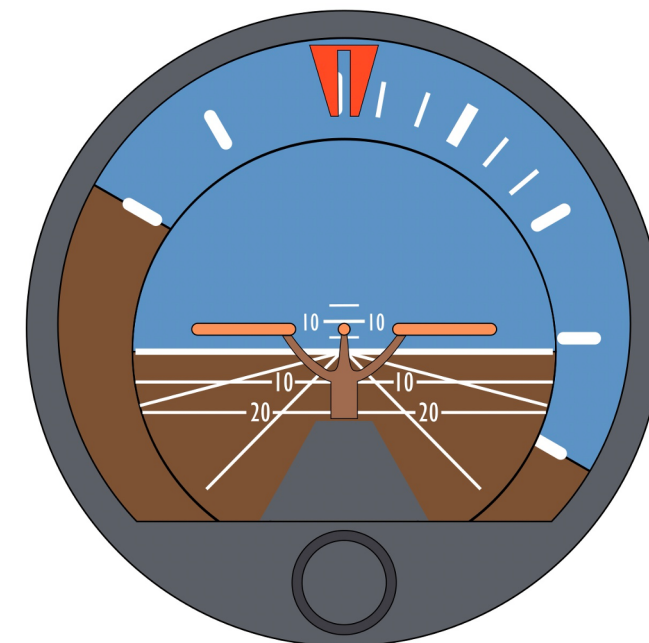
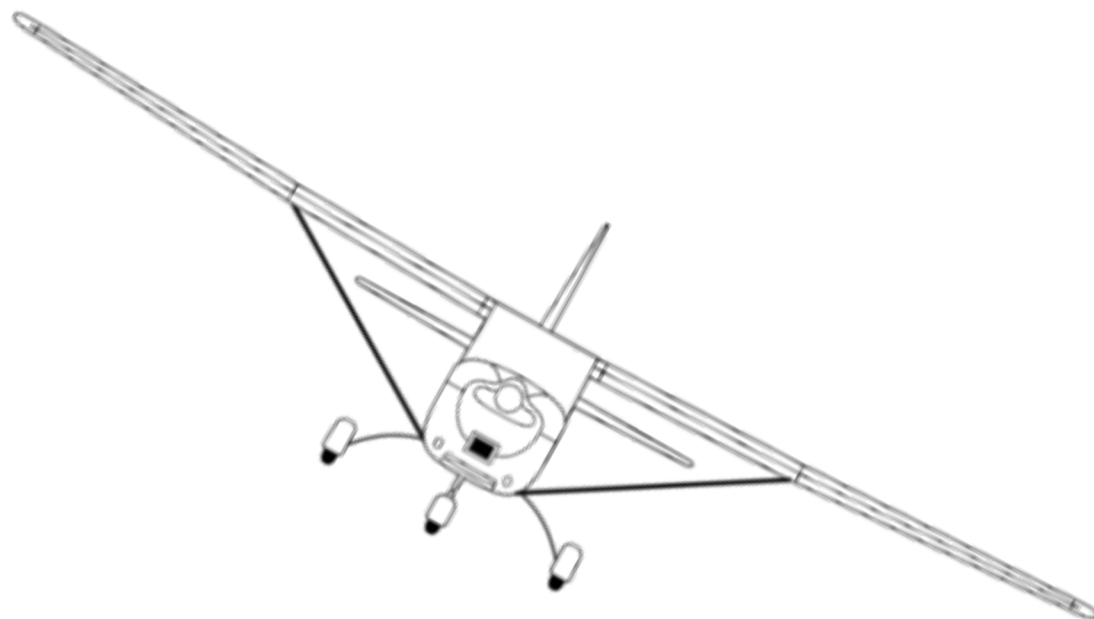




### 3. Smoothly Apply Full Throttle



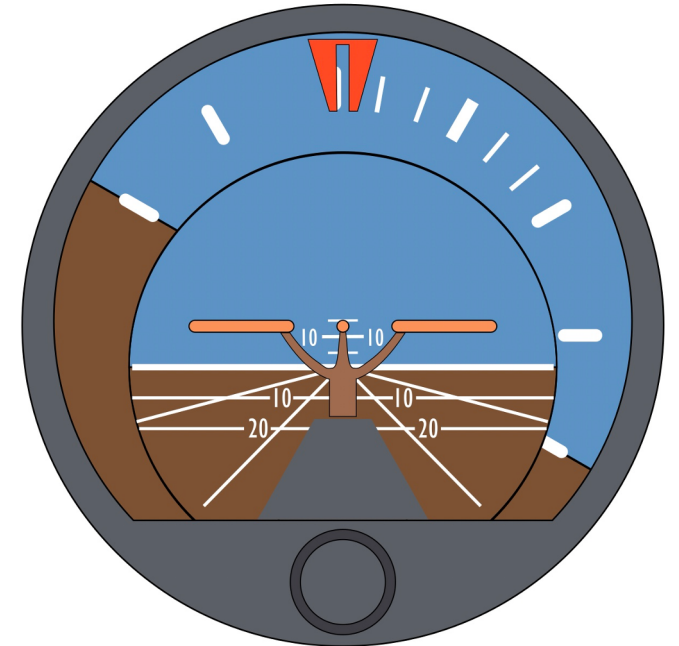
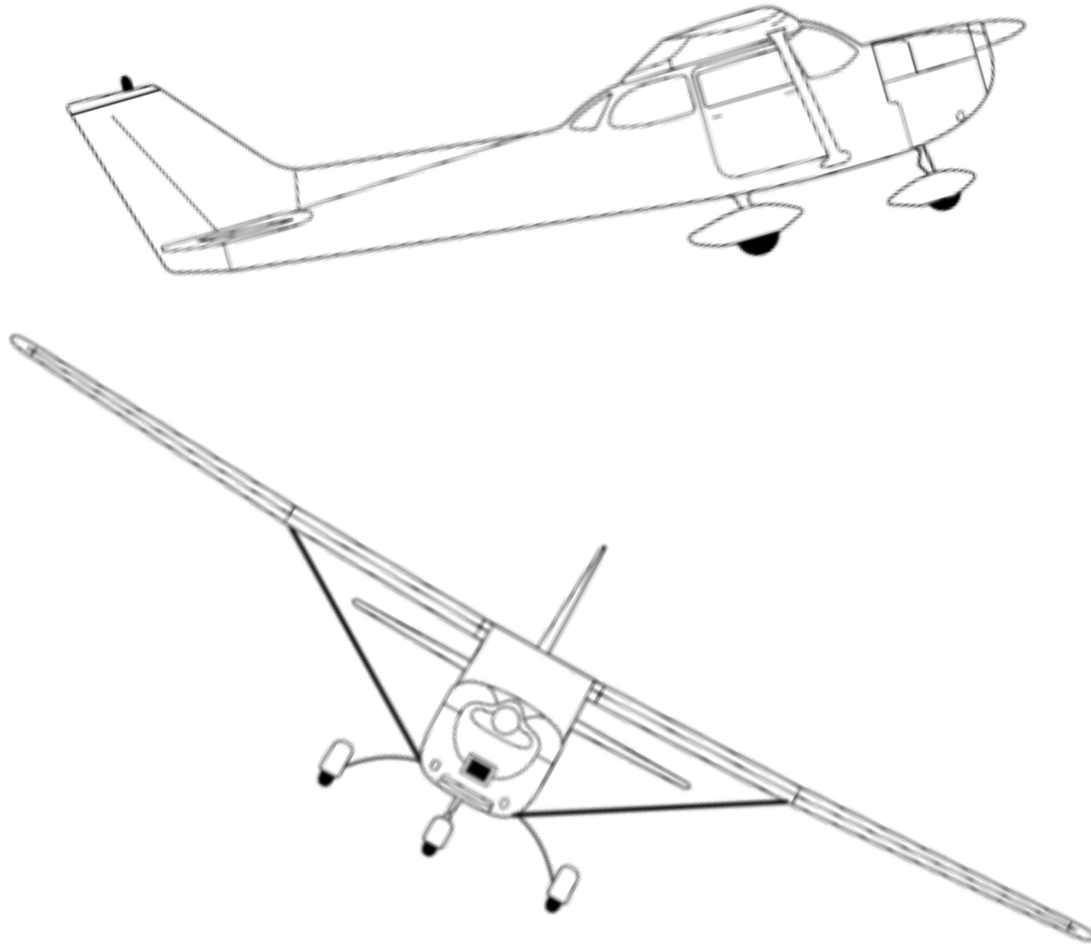
## 4. Gradually Increase Pitch







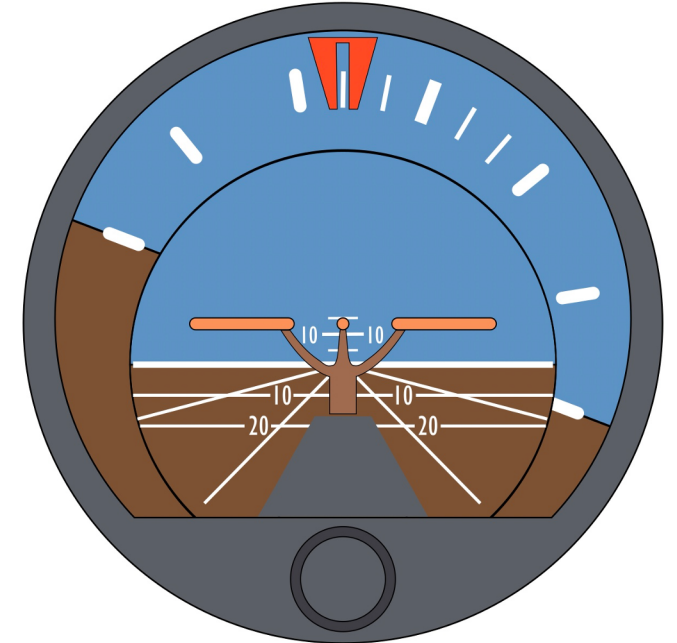
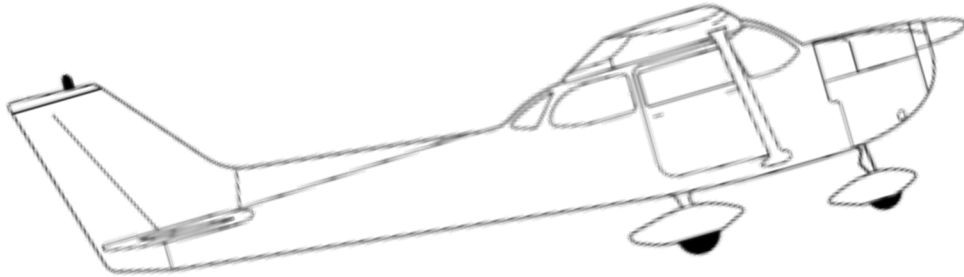
## 5. Increase Pitch through 90°







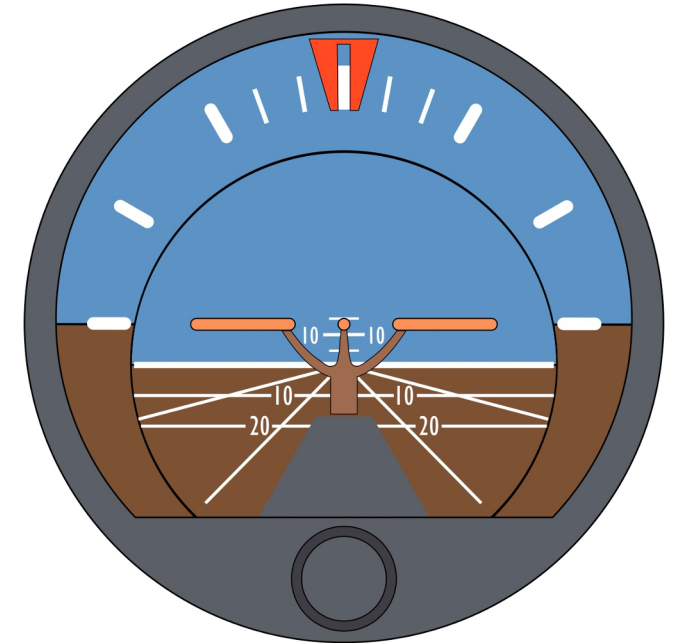
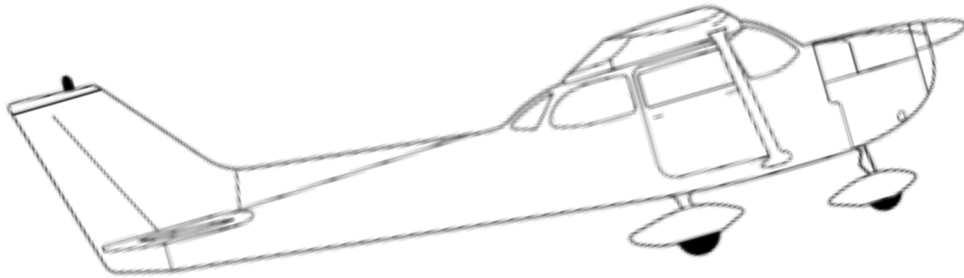
## 6. Hold Pitch, Decrease Bank







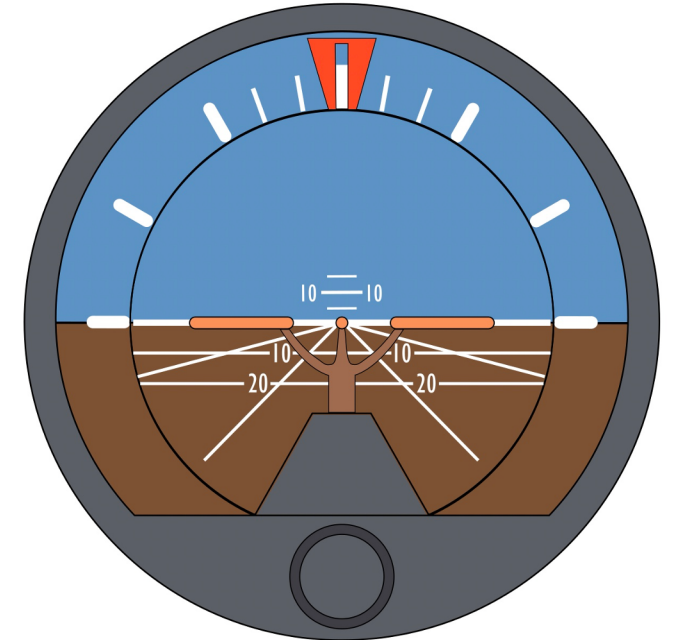
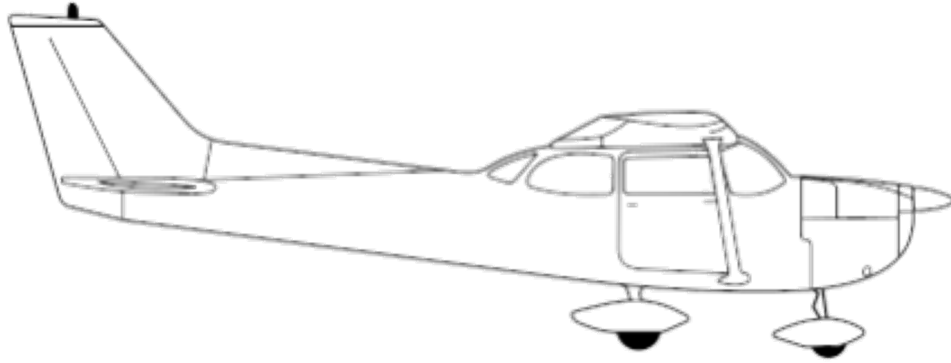
## 7. Wings level at 180°







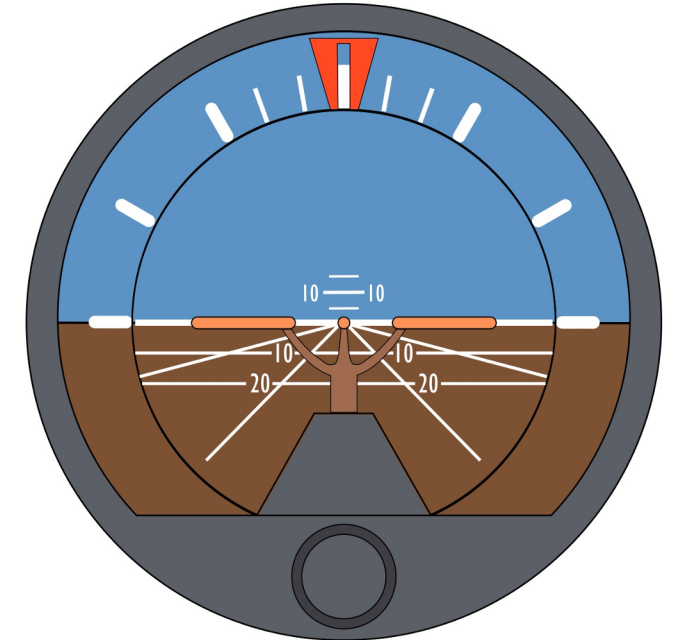
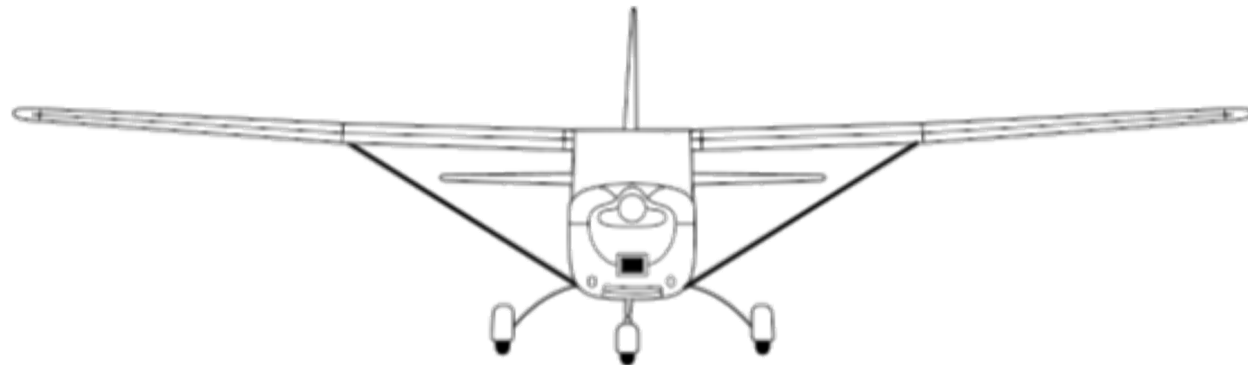
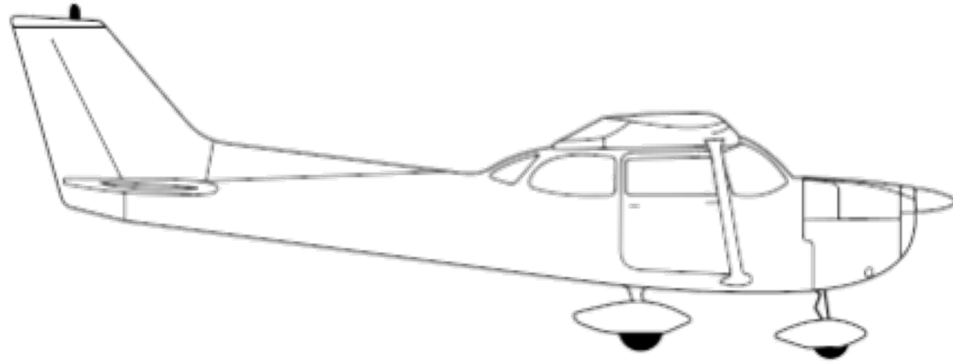
## 9. Pitch for Cruise







# 10. Repeat in Other Direction



# Summary

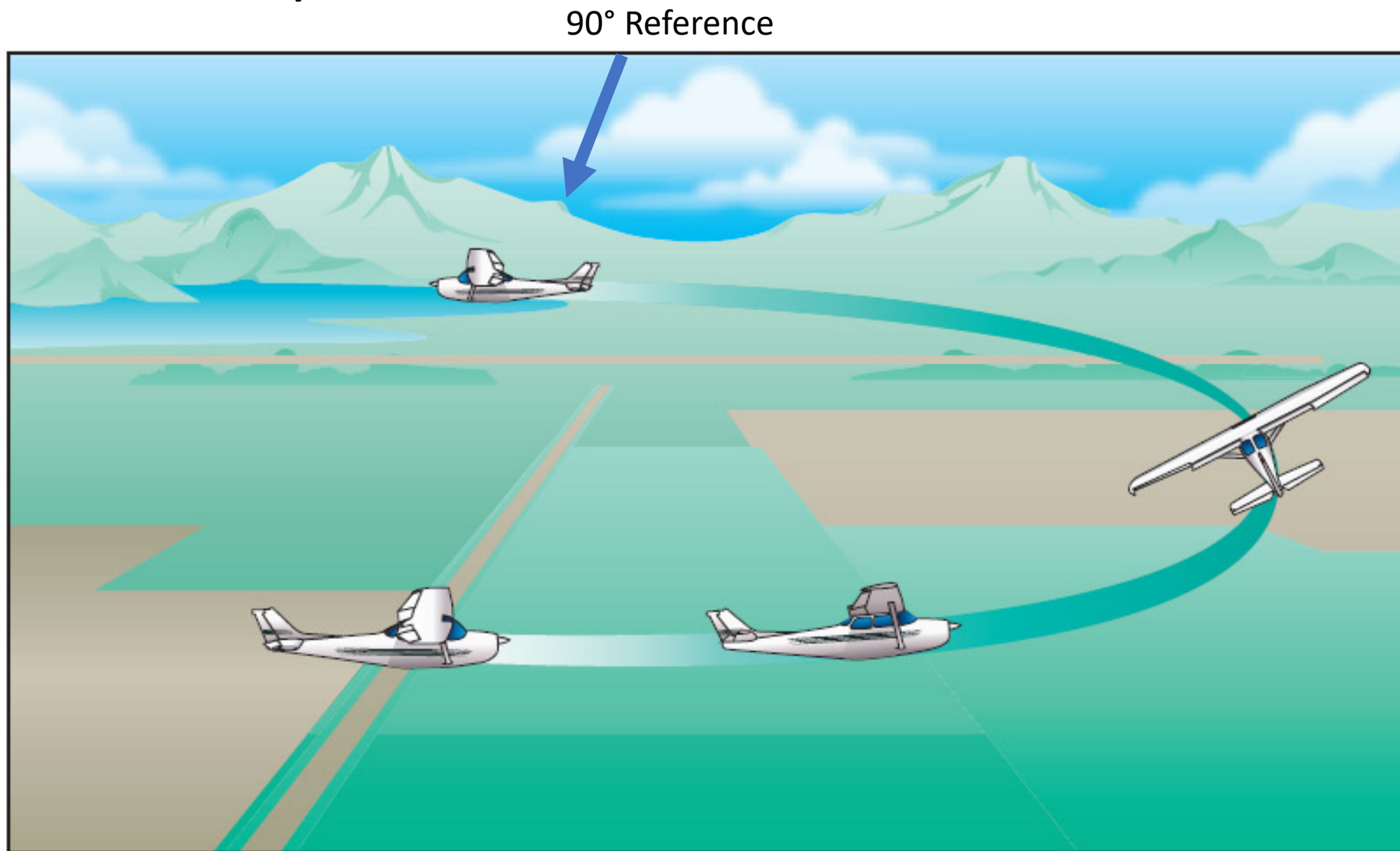


Figure 9-3. Chandelle.



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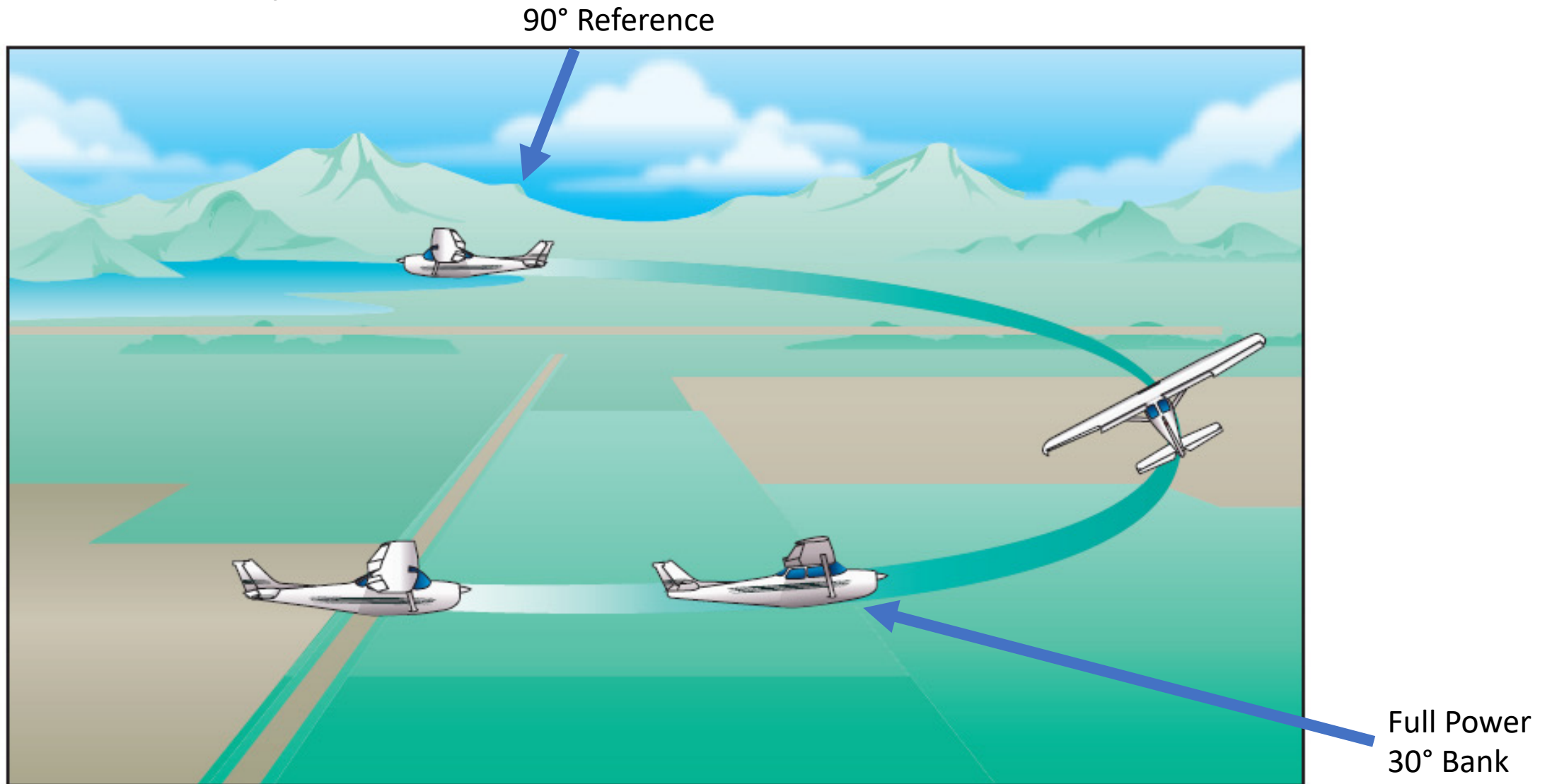


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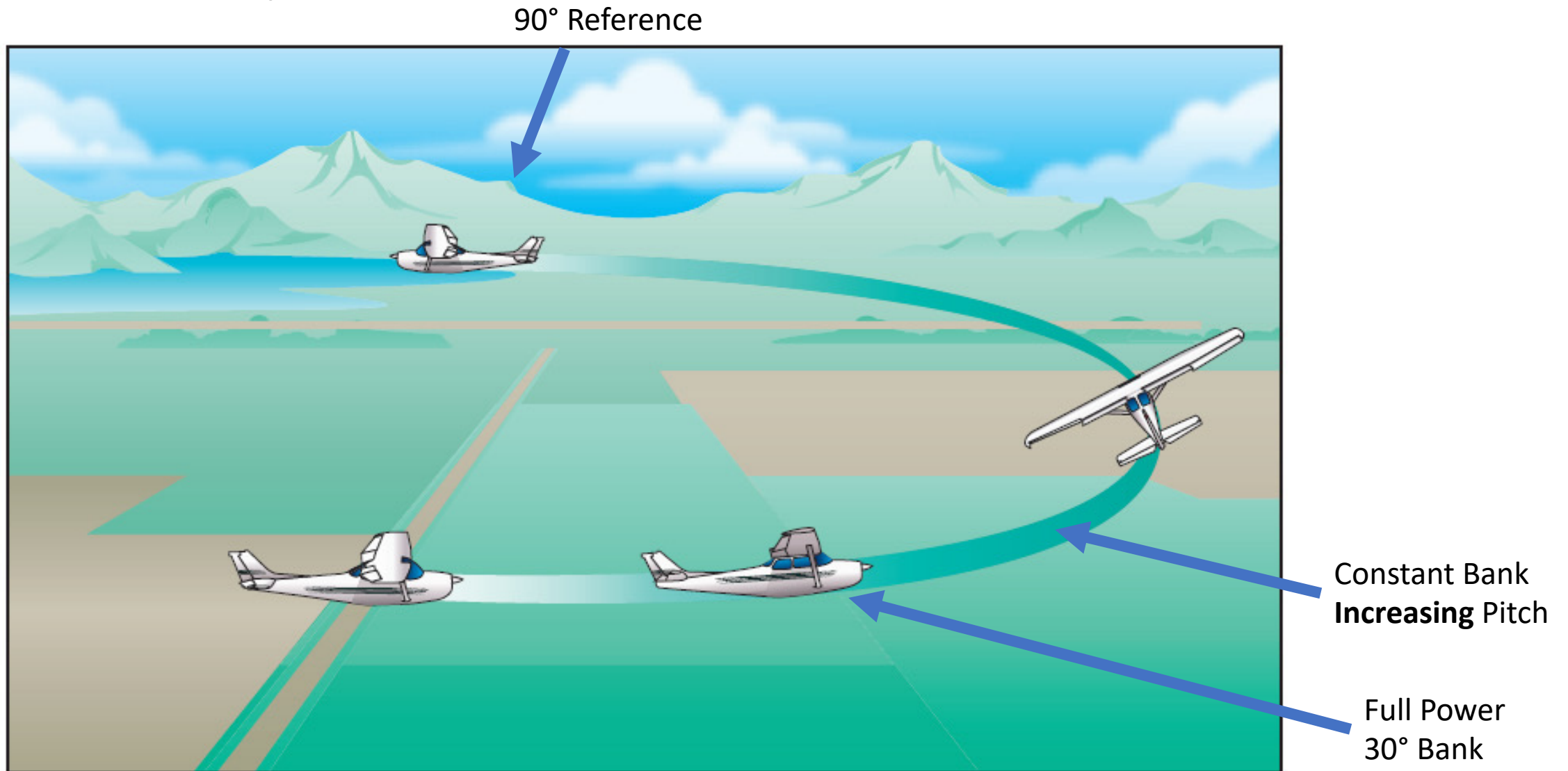


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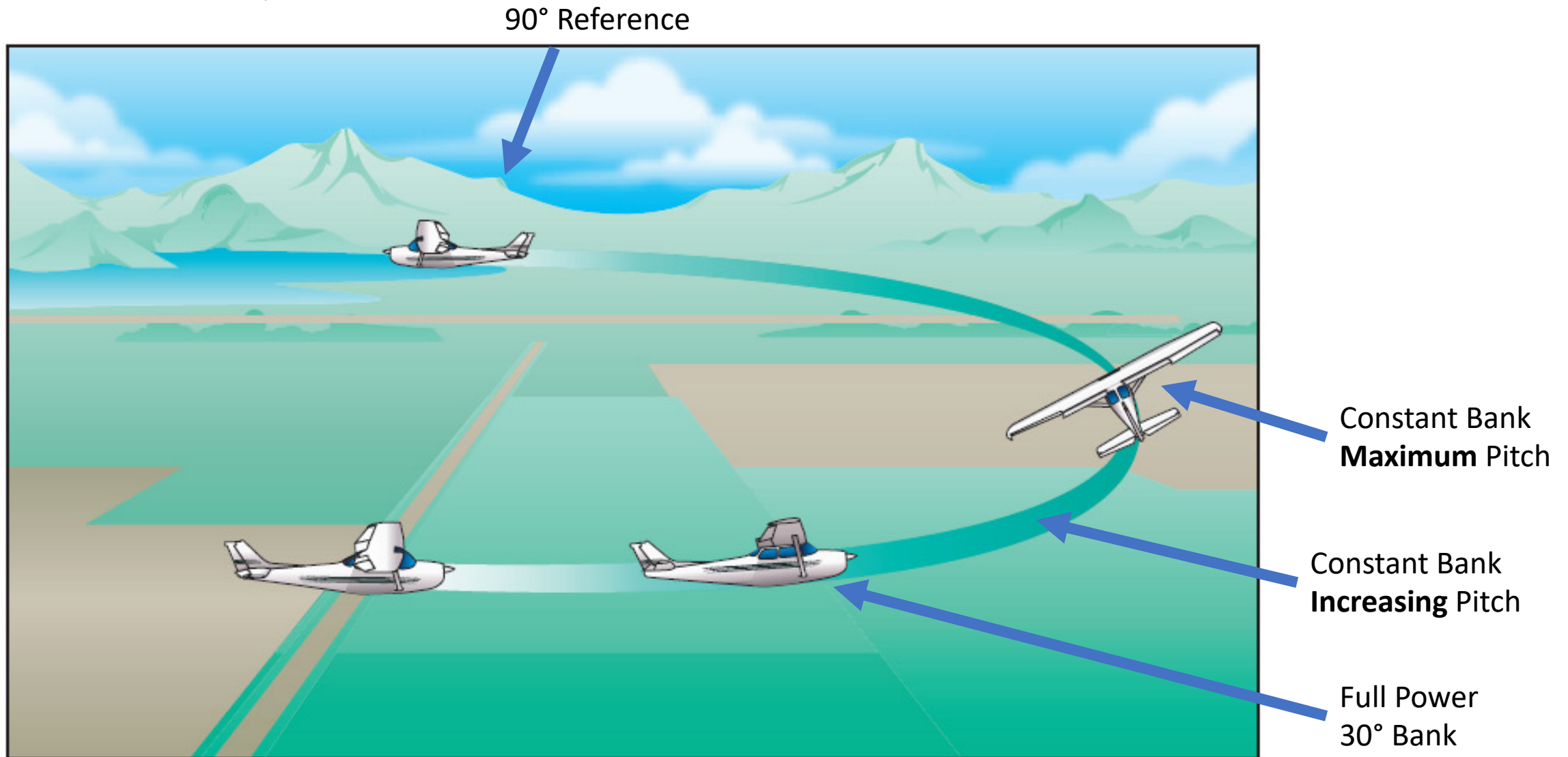


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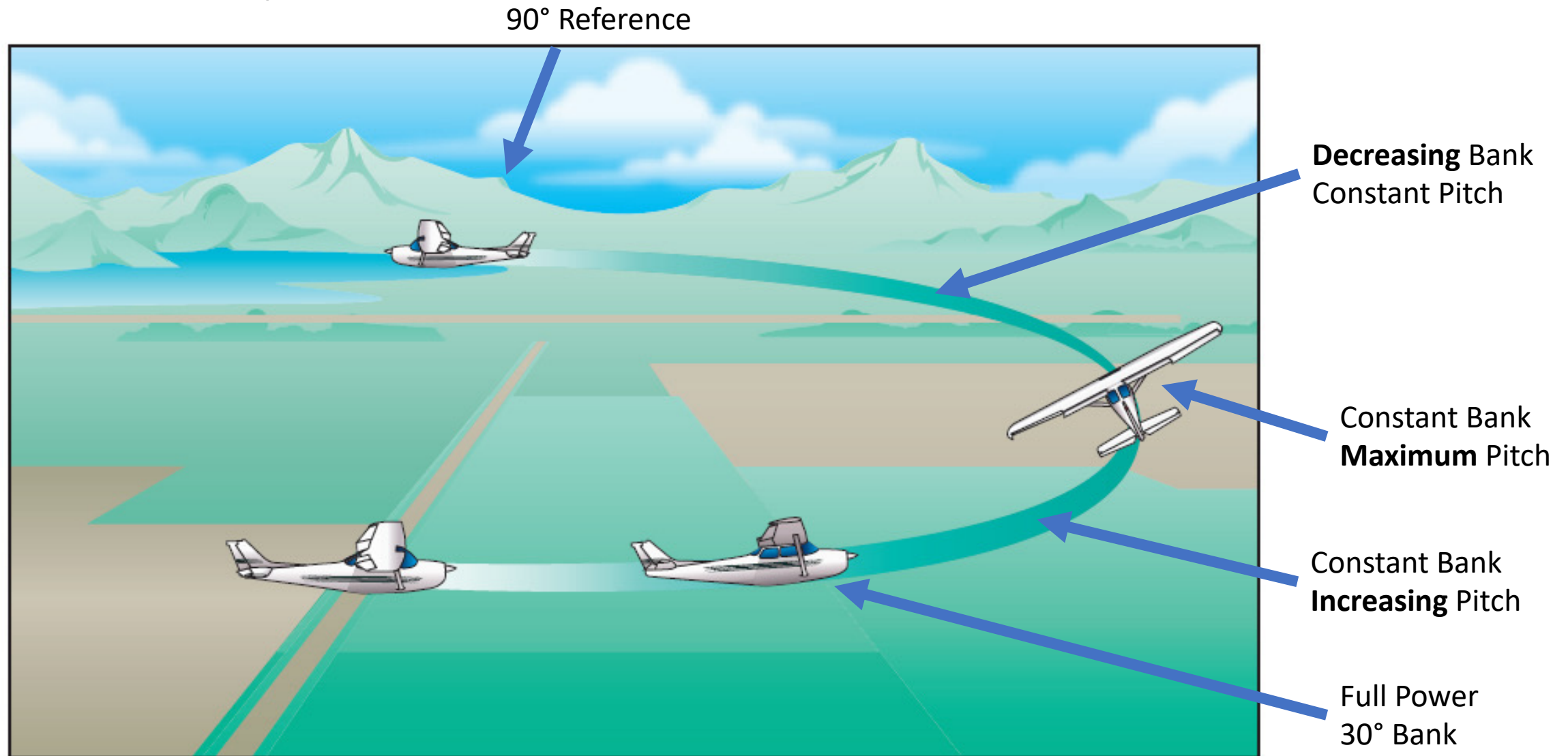


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# Common Errors

- Factors the result in less than maximum performance
  - Overbanking → reaching 180° too quickly
  - Underbanking → stalling before reaching 180°
  - Removing all the bank before 180°
  - Too little pitch → suboptimal climb
  - Too much pitch → stall before 180°
- General Concerns
  - Failure to clear the area or scan for traffic
  - Reliance on instruments
  - Poor coordination (slipping or skidding)



# Completion Standards (per ACS)

- Select an altitude that will allow the maneuver to be performed no lower than 1,500 feet above ground level (AGL)
- Establish the appropriate entry configuration, power, and airspeed.
- Establish the angle of bank at approximately 30°.
- Simultaneously apply power and pitch to maintain a smooth, coordinated climbing turn, in either direction, to the 90° point, with a constant bank and continuously decreasing airspeed.
- Begin a coordinated constant rate rollout from the 90° point to the 180° point maintaining power and a constant pitch attitude.
- Complete rollout at the 180° point,  $\pm 10^\circ$  **just above a stall airspeed**, and maintaining that airspeed momentarily avoiding a stall.
- Resume a straight-and-level flight with minimum loss of altitude

# Questions?