

## Area of Operation **VI** - Task **B**

# Turns (Instrument)

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#### Key References:

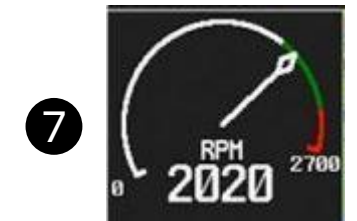
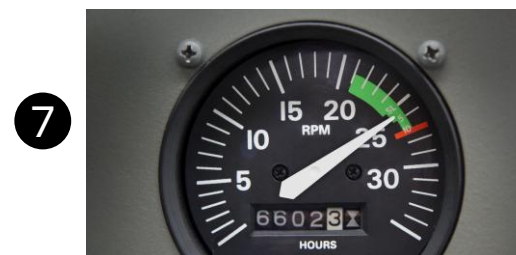
- Instrument Flying Handbook

# 1. Introduction

- **What:** Attitude instrument flying is the control of an aircraft's spatial position by using instruments rather than outside visual references
- **Why:** Attitude instrument flying is the basis for flying under IMC
- **Attitude Instrument Flying:**
  - **Your Senses Cannot be Trusted** → human perception is misleading without visual references
  - **Do not fly VFR into IMC** → If it happens, you should make an 180° turn and return to visual conditions
  - **Trust your Instruments** if no visual conditions
- **Standard (ACS):**
  - ➔ ○ Altitude **±100ft**, Heading **±10°**, Airspeed **±10 kts**, Bank **±5°**



## 2. Instruments Overview



# 3. Learning Method: Control & Performance

**Attitude + Power → Drives Performance**

## 1. Control

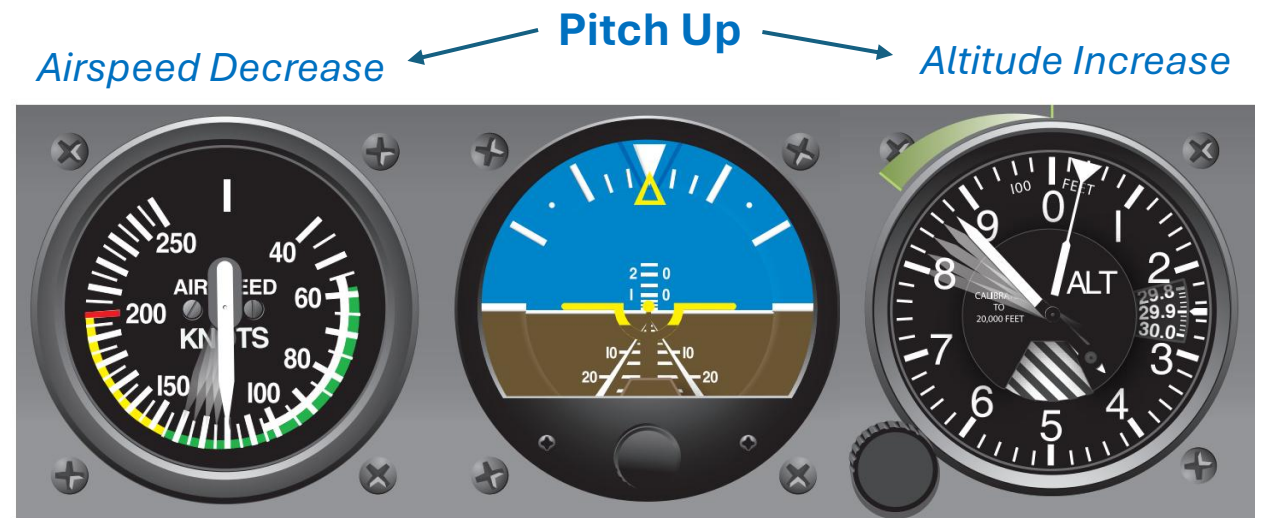
- Attitude Indicator (Pitch + Bank)
- Power Indicator (Tachometer/Manifold)

## 2. Performance

- Airspeed Indicator
- Altimeter
- Vertical Speed Indicator
- Heading Indicator
- Turn Coordinator

## 3. Navigation

- Course, Range, Glide Slope → GPS, VOR, DME, ILS



## 4. Learning Method: Primary & Supporting

- **Primary Instrument** → the one that gives **the most pertinent information** for a particular maneuver
  - **Pitch:** Attitude Indicator, Altimeter, Airspeed Indicator, Vertical Speed Indicator
  - **Bank:** Attitude Indicator, Heading Indicator, Turn Coordinator
  - **Power:** Airspeed Indicator, Tachometer
- Primary and Supporting instruments changes depending on the maneuver

Maneuver		Pitch		Bank		Power	
		Primary	Supporting	Primary	Supporting	Primary	Supporting
Straight and Level	Adjusting Speed	Alt	Attitude, VSI	Heading	Attitude, TC	Tachometer	Airspeed
	Maintain					Airspeed	Tachometer
Climbs/Descent	Entry	Attitude	Airspeed, Alt, VSI	Heading	Attitude, TC	Tachometer	
	Maintain Speed	Airspeed					
	Maintain Rate	VSI	Air, Att, Alt				
Turns	Entry	Alt	Attitude, VSI	Attitude	TC, Heading	Airspeed	Tachometer
	Maintain			TC	Attitude, Hdg		

# 5. General Procedure

## 1. Establish

- Attitude Indicator for **Pitch + Bank**
- Throttle for **Power**

## 2. Trim

- Trim until control pressures are neutralized
- Do not attempt to control pitch using trim, use yoke first, then add Trim to release pressure

## 3. Crosscheck & Adjust

- Crosscheck the performance instruments to determine if the desired performance is being obtained
- Repeat/correct it until almost no control inputs are needed
  - ✓ Restrict pitch changes to 1 bar or ½ bar width movements
  - ✓ Use a bank angle that approximates the degrees to turn, not to exceed 30°





# 6. Crosscheck and Interpretation

- **Crosscheck:** Continuous logical observation of instruments for attitude and performance information
  - Most popular: “Select Radial Crosscheck” → **Attitude indicator** is the **Hub** and is checked before each instrument
- **Interpretation:** Based on what you see, understand what is happening w/ the aircraft and take proper actions



Glass Cockpit



Classic 6-Pack

# 7. Turns to Heading

- ① Adjust **power** (as needed) and adjust the airplane **attitude** (bank wings + slight pitch up + rudder)
- ② Verify performance instruments (scan all). **Primary** instruments will mostly be used to **Maintain Turn**

## Establish

- Per above

## Trim

## Maintain Pitch

- Pitch = Nose slightly up
- Altitude = Constant
- VSI = 0
- Airspeed = Constant Cruise

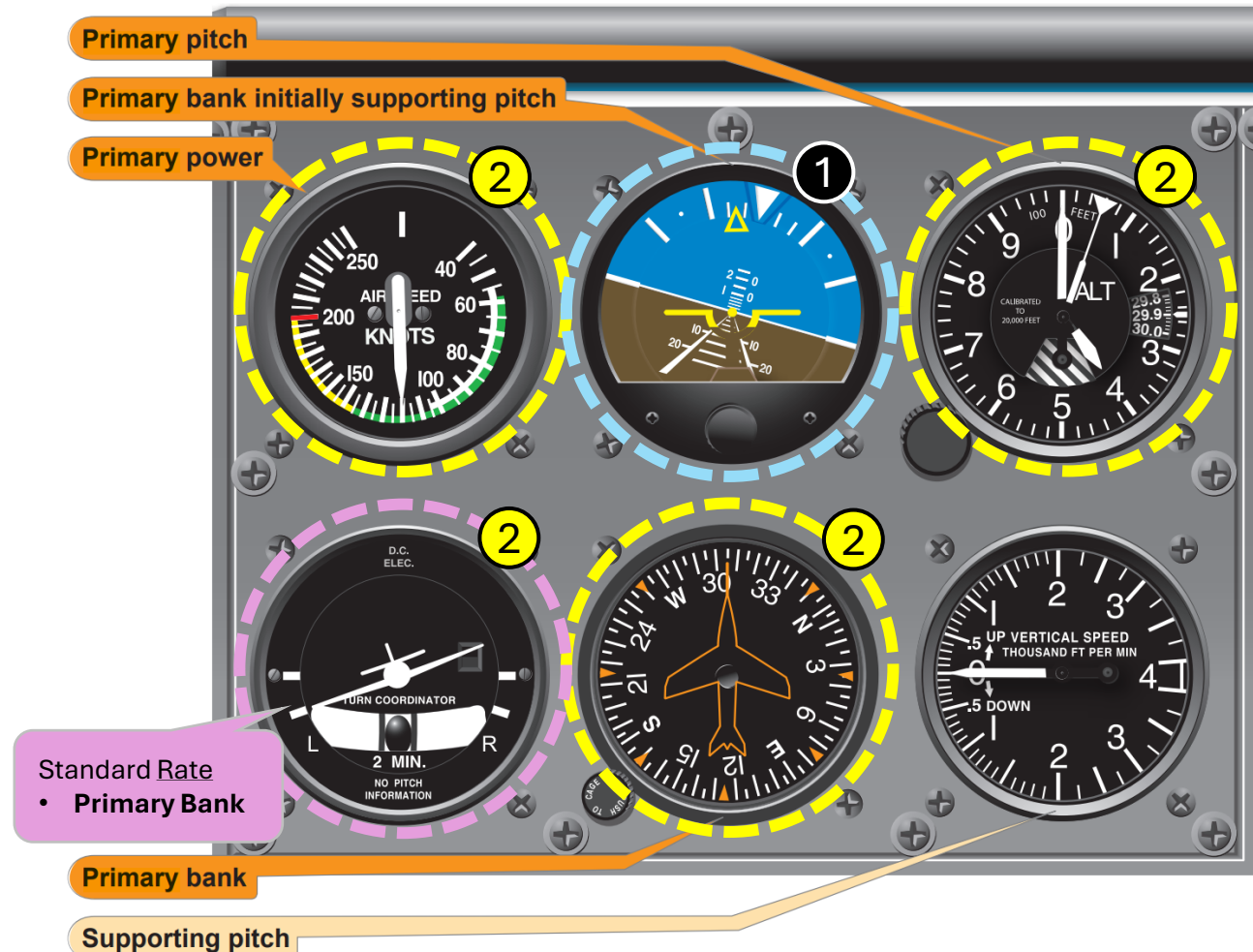
## Maintain Bank

- Bank = Wings banked
- Heading = Turning to heading
- TC = Coordinated (standard rate if desired)

## Cross check & Adjust

## Rollout

- Lead heading by  $\frac{1}{2}$  bank

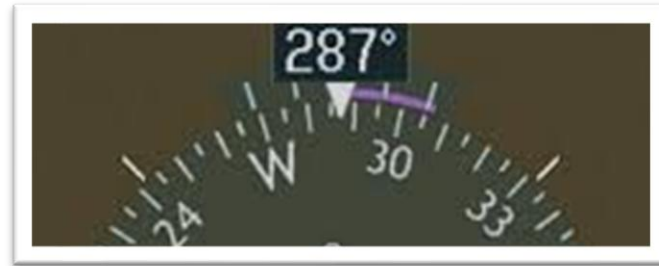




# 8. Standard Rate and Compass Turns

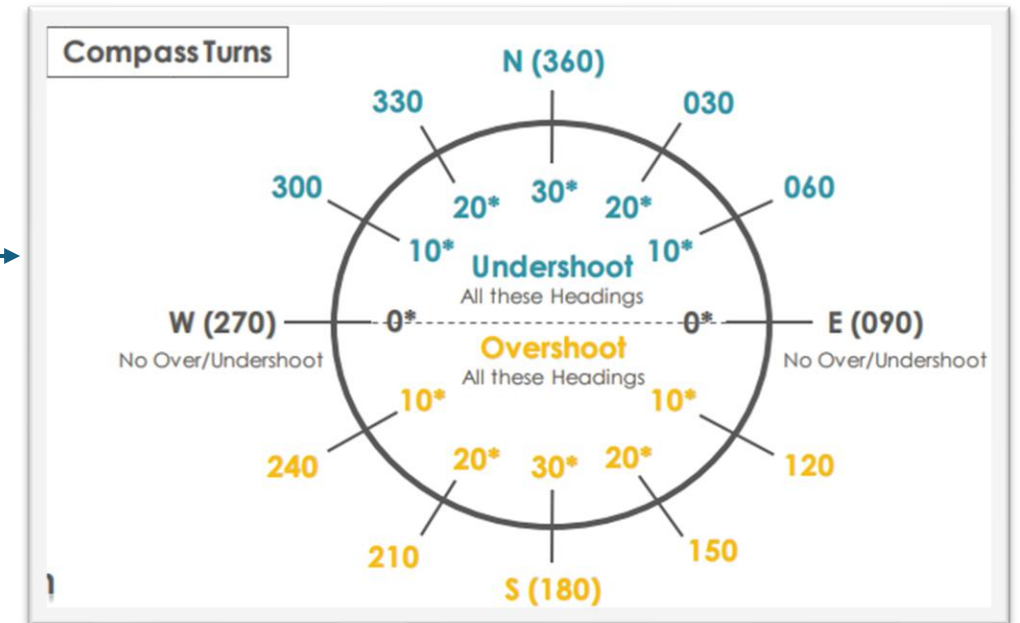
## 1. Standard Rate Turn

- 360° in 2 minutes (1 minute → Turn around 180°)



## 2. Compass Turns

- UNOS → Undershoot North, Overshoot South
- Rule of Thumb =  $15^\circ + \frac{1}{2}$  of the Latitude (IFH 5-13)
  - Example (Turning from N to the right):  
 Desired heading 180°, Latitude 30°  
 Roll out =  $(180 + 30) = 210^\circ$



# 9. Partial Panel

## Loss of Gyroscopic / AHRS Instruments

- Still have Altimeter, Airspeed Ind, Turn Coordinator (if 6-pack), VSI and Magnetic Compass

*If backup available, use backup, otherwise:*

- **Pitch**
  - Primary: **Altimeter**
  - Supporting: VSI, Airspeed Indicator
- **Bank**
  - Primary: **Turn Coordinator** (if available)
  - Supporting: Compass
- **Standard Rate Turn**
  - Establish with the turn coordinator (if avail)
  - For small turns, use timed turns
  - For large turns, use the compass
  - Use altimeter & supporting instruments to maintain altitude



# 10. Common Errors

1. Errors during instrument cross-check
  - **Fixation:** staring at a single instrument
  - **Omission:** skipping an instrument from the crosscheck (e.g. slip/skid indicator)
  - **Emphasis:** spending more time in a single instrument (bias towards a specific instrument)
2. Improper instrument interpretation
3. Improper control applications
4. Failure to establish proper pitch, bank, or power adjustments during altitude, heading, or airspeed corrections
5. Improper entry or rollout procedure
6. Faulty trim procedure

Questions?

