

Area of Operation **XII** - Task **D**

Turns to Headings (Instrument)

Content

1. Introduction
2. Instruments Overview
3. Learning Method: Control & Performance
4. Learning Method: Primary & Supporting
5. General Procedure
6. Crosscheck and Interpretation
7. Turns to Headings
8. Standard Rate and Compass Turns
9. Common Errors



Key References:

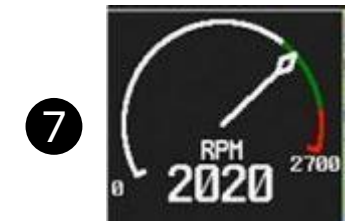
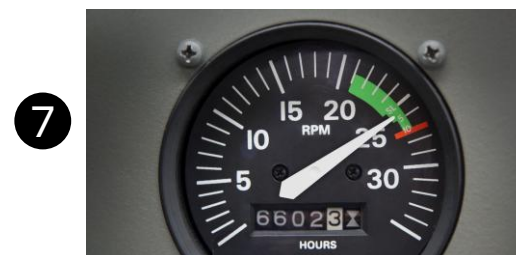
- Airplane Flying Handbook
- Instrument Flying Handbook

1. Introduction

- **What:** Attitude instrument flying is the control of an aircraft's spatial position by using instruments rather than outside visual references
 - **Why:** If inadvertently flying into weather, the pilot should exit that situation while flying w/o visual references
 - **Basic 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
 - Danger:
 - Low ceilings
 - Low or deteriorating visibility
 - Night VFR without visual references
 - VFR when temp/dew point are close (risk of fog)
 - **Trust your Instruments** if no visual conditions
- ➡ **Standard (ACS):**
- PPL: Altitude **±200ft**, Hdg **±10°**, Airspeed **±10 kts**



2. Instruments Overview



3. Learning Method: Control & Performance

Attitude + Power → Drives Performance

1. Control

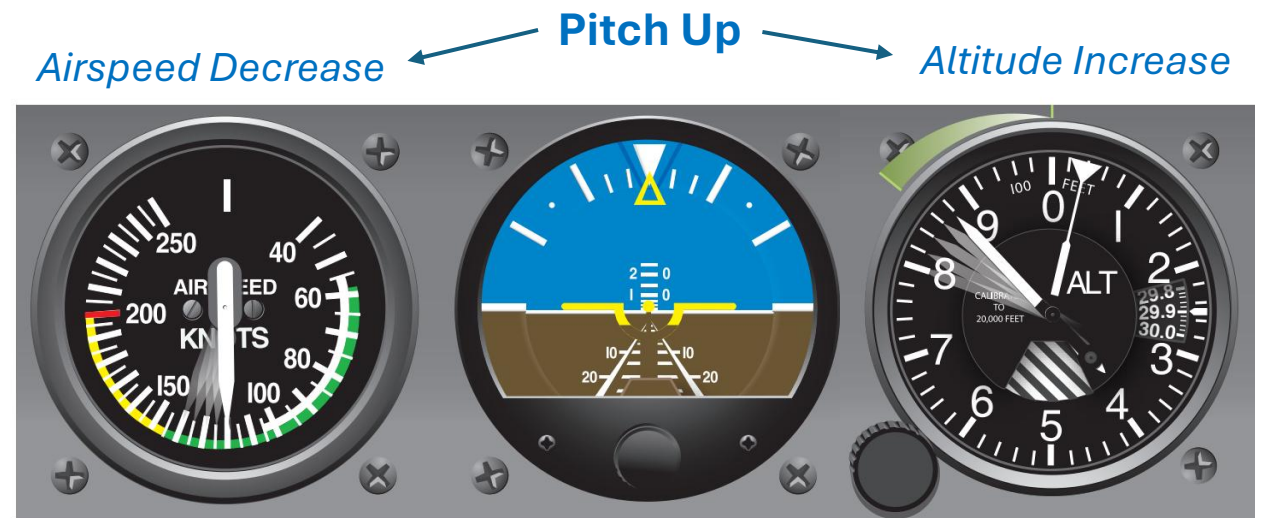
- Attitude Indicator (Pitch + Bank)
- Power Indicator (Tachometer/Manifold)

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	Secondary	Primary	Secondary	Primary	Secondary
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

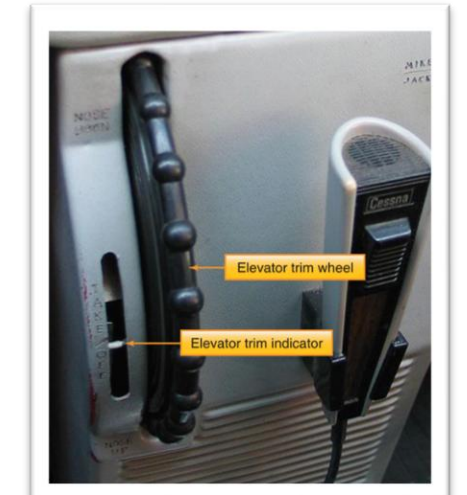
- Attitude Indicator for **Pitch + Bank**
- Throttle for **Power**

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

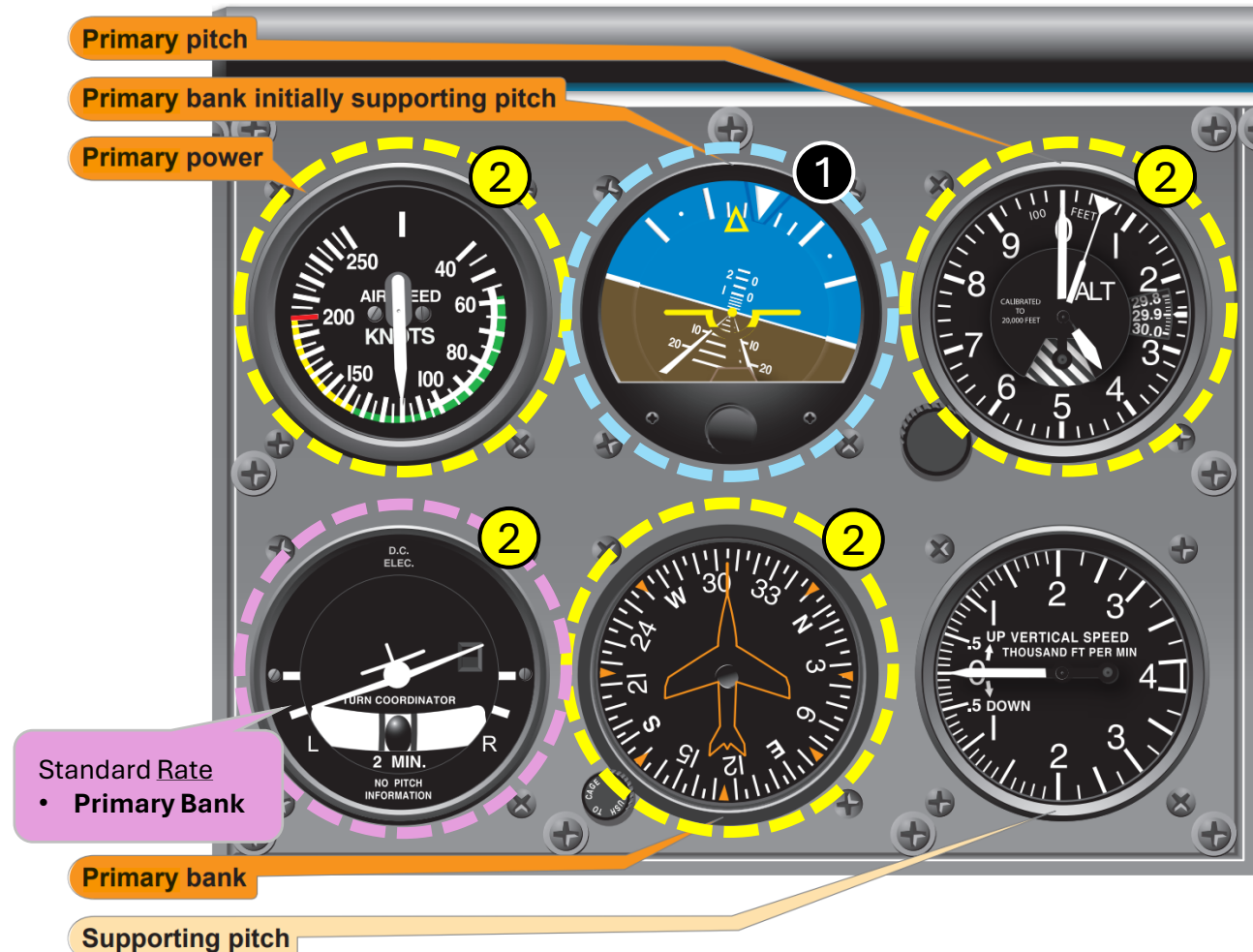
Maintain Bank

- 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

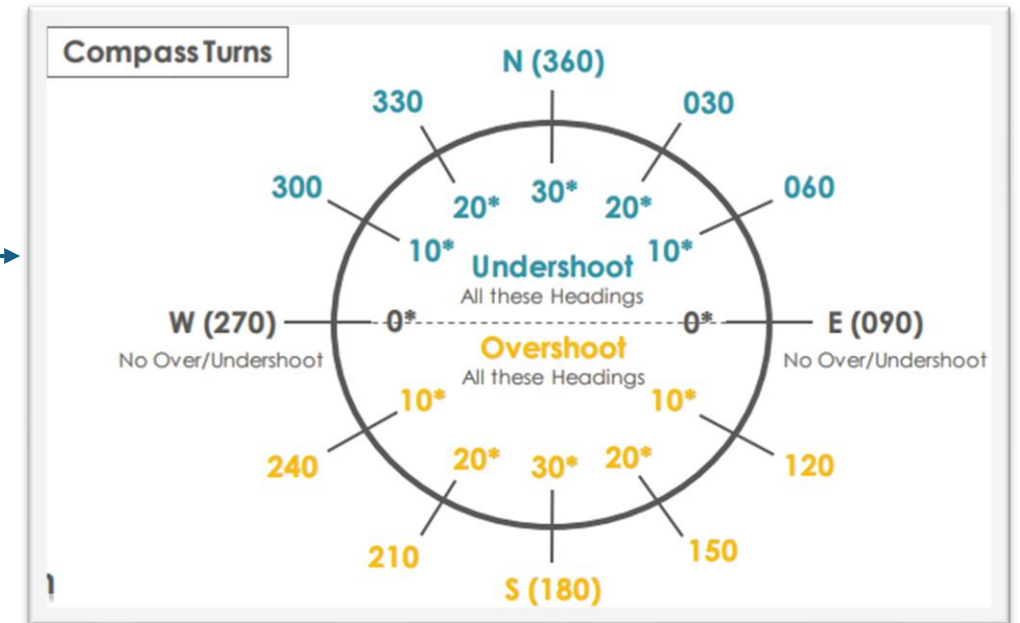
1. Standard Rate Turn

- 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. 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?

