

Area of Operation **VI** - Task **A**

Straight and Level Flight (Instrument)

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Key References:

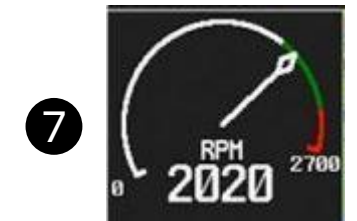
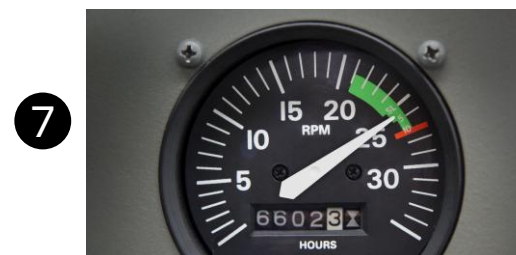
- Instrument Flying Handbook

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

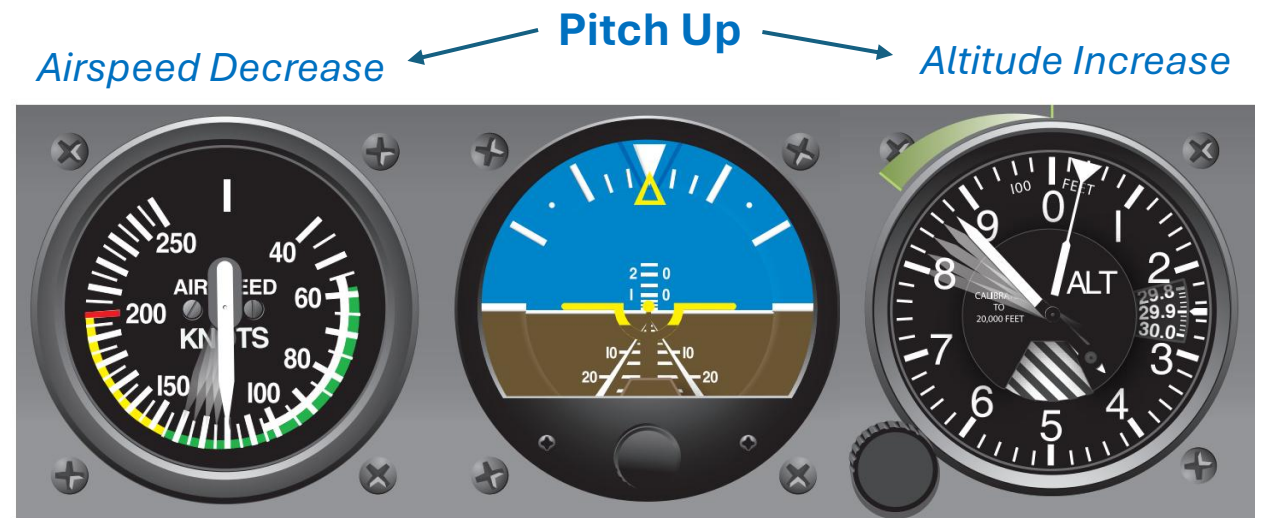
- Attitude Indicator (Pitch + Bank)
- Power Indicator (Tachometer/Manifold)

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

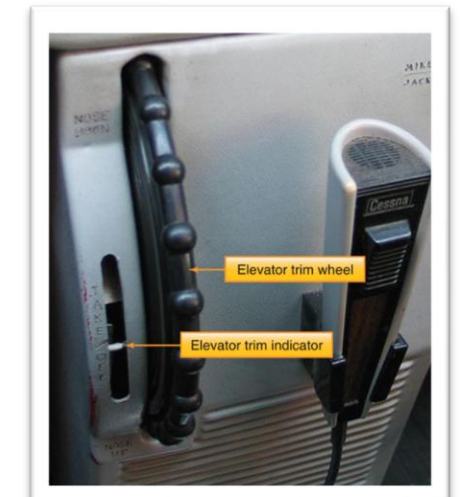
- Attitude Indicator for **Pitch + Bank**
- Throttle for **Power**

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. Straight and Level Flight

- ① Apply desired **power** (**cruise power**) and adjust the airplane **attitude** (**nose on the horizon and wings level**)
- ② Verify performance instruments (scan all). **Primary** instruments will mostly be used to **maintain straight/level**

Establish

- Per above

Trim

Maintain Pitch

- Pitch = On Horizon
- Altitude = Constant
- VSI = 0
- Airspeed = Constant Cruise

Maintain Bank

- Bank = Wings level
- Heading = Constant
- TC = Coordinated

Cross check & Adjust



8. 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
- Make pitch corrections by reference to the rate of change instruments

• Bank

- Primary: **Compass**
- Supporting: Turn Coordinator (if avail)
- Straight: Keep the mini-plane level
- Turns: Use timed standard rate turns on the magnetic compass



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. Faulty trim procedure

Questions?

