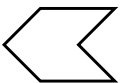




Basic Attitude Instrument Flight

Control & Performance

THE BACKSEAT PILOT



Overview

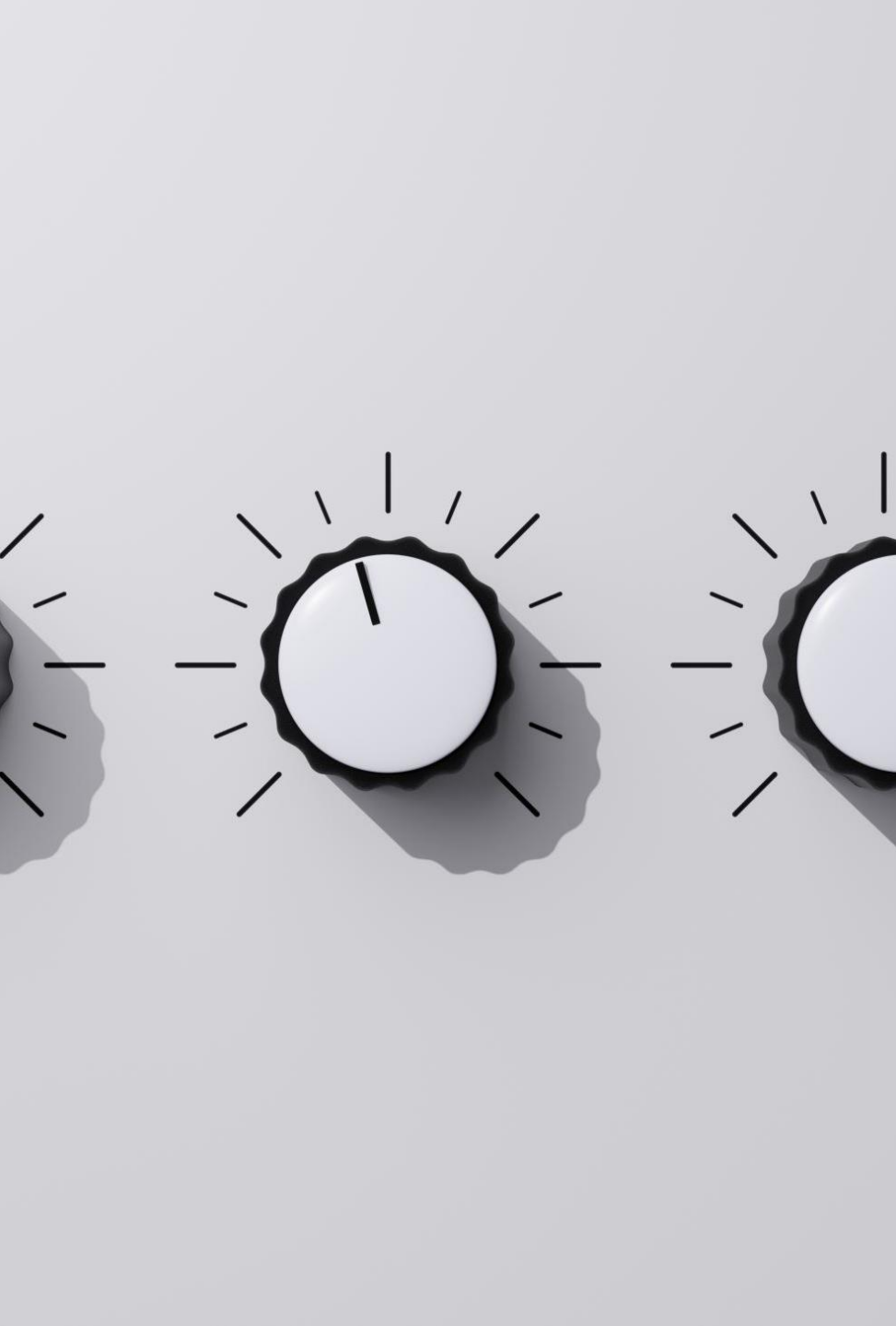
- **What**
 - Control of an aircraft's spatial position by instruments rather than outside references
- **Why**
 - IFR flight is dependent on flying without visual references

Content

- Control & Performance
- Establish, Trim, Crosscheck, Adjust
- Straight-and-Level Flight
- Constant Airspeed Climbs & Descents
- Constant Rate Climbs & Descents
- Turns to Headings

Control & Performance

- Pitch + Power = Performance
- 3 Categories of Instruments
 - Control: Attitude Indicator & Power Indicators
 - Performance: Altimeter, Airspeed, VSI, Heading, Turn Coordinator
 - Navigation: VOR, GPS, etc.
- Procedural Steps
 - Establish
 - Trim
 - Crosscheck
 - Adjust



Establish

- **Control Instruments establish Pitch (and bank) and Power**
 - Set approximate pitch, bank, and power settings for the desired performance
- **Pitch & Bank**
 - Attitude Indicator
 - Pitch is adjusted by precise amounts in relation to the horizon
 - Bank is adjusted by precise amounts in relation to the bank scale
- **Power**
 - Use throttle adjustments & reference the power indicators
 - Set approximate throttle position, then fine tune the setting

PITCH + POWER = PERFORMANCE

Trim

- Trim for hands off flight
 - Trim the pitch to relieve the required control pressures
 - Wheel forward = nose down / forward control pressure
 - Wheel backward = nose up / back control pressure
 - Don't fly with the trim

PITCH + POWER = PERFORMANCE



Crosscheck

- The continuous and logical observation of instruments for attitude & performance information
- Necessary to monitor the instruments and make appropriate changes
- Different Crosscheck Techniques
 - Select Radial Crosscheck (Most Common)
 - Inverted V Crosscheck
 - Rectangular Crosscheck

Select Radial Crosscheck



Source: Instrument Flying Handbook, FAA

Inverted V Crosscheck

- Attitude indicator to the turn coordinator
- Attitude indicator to the VSI
- Back to the attitude indicator



Rectangular Crosscheck

- Move your eyes across the top 3 instruments
- Drop down and scan the bottom 3 instruments
- Gives equal weight to each instrument, regardless of the maneuver
- Increases time to return to a maneuver's critical instrument



Crosscheck

- **Crosscheck & Bank**
 - Once established, check the Heading Indicator and Turn Coordinator to ensure desired performance
- **Crosscheck & Pitch**
 - Once established, check the Altimeter, VSI, and Airspeed Indicator to ensure desired performance

Crosscheck Common Errors

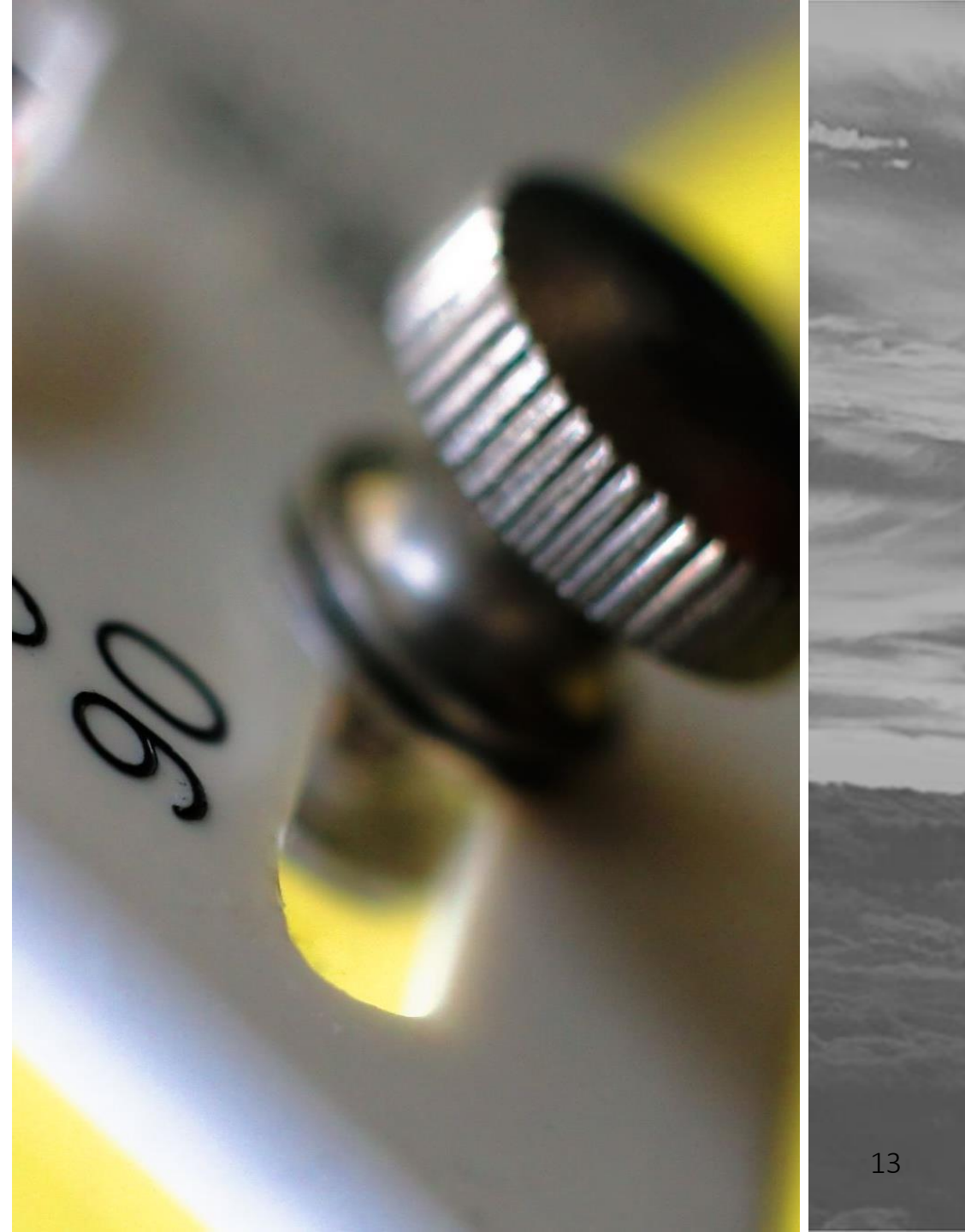
- **Fixation**
 - Staring at a single instrument
 - Ex. Bank during a turn or Altimeter during a climb/descent
 - Other pertinent instruments drop out of the crosscheck
- **Omission**
 - Omitting an instrument from the crosscheck
 - Pilot can forget to look at it, or not realize it's important to the maneuver
- **Emphasis**
 - Emphasizing a single instrument instead of the necessary combination of instruments
 - The pilot may naturally rely on the instrument most understood



Adjust

- **Correct for errors found in the crosscheck**
 - Make small, precise changes to pitch, bank & power
 - Pitch: ½ to 1 bar width movements
 - Bank: Bank angle = degrees to turn, or standard rate
 - Power: Fine tune
- **Repeat**
 - Trim to relieve control pressures
 - Continue crosscheck
 - Adjust for errors and performance changes

PITCH + POWER = PERFORMANCE



Straight-and-Level Flight

Pitch + Power = Performance

Nose on the horizon + Cruise power = Straight-and-Level

| Control | | Performance | |
|---------|--------------|--------------------|---------------------|
| Pitch | On Horizon | Altimeter | Constant |
| Bank | Wings Level | VSI | 0 fpm |
| Power | Cruise Power | Airspeed Indicator | Constant |
| | | Heading Indicator | Constant |
| | | Turn Coordinator | Level / Coordinated |

ESTABLISH

TRIM

CROSSCHECK

ADJUST

Constant Airspeed Climb

Pitch + Power = Performance

10° Nose Up + Full Power = Constant Airspeed Climb

| Control | | Performance | |
|---------|-------------|--------------------|---------------------|
| Pitch | 10° Nose Up | Altimeter | Climbing |
| Bank | Wings Level | VSI | Positive Climb |
| Power | Climb Power | Airspeed Indicator | Constant |
| | | Heading Indicator | Constant |
| | | Turn Coordinator | Level / Coordinated |

ESTABLISH

TRIM

CROSSCHECK

ADJUST

Constant Airspeed Descent

Pitch + Power = Performance

3° Nose Down + Descent Power = Constant Airspeed Descent

| Control | | Performance | |
|---------|---------------|--------------------|---------------------|
| Pitch | 3° Nose Down | Altimeter | Descending |
| Bank | Wings Level | VSI | Negative Climb |
| Power | Descent Power | Airspeed Indicator | Constant |
| | | Heading Indicator | Constant |
| | | Turn Coordinator | Level / Coordinated |

ESTABLISH

TRIM

CROSSCHECK

ADJUST

Constant Rate Climb

Pitch + Power = Performance

5-10° Nose Up + Full Power = Constant Rate Climb

| Control | | Performance | |
|---------|---------------|--------------------|------------------------|
| Pitch | 5-10° Nose Up | Altimeter | Climbing |
| Bank | Wings Level | VSI | Desired FPM |
| Power | Climb Power | Airspeed Indicator | Varies with climb rate |
| | | Heading Indicator | Constant |
| | | Turn Coordinator | Level / Coordinated |

ESTABLISH

TRIM

CROSSCHECK

ADJUST

Constant Rate Descent

Pitch + Power = Performance

1-3° Nose Down + Descent Power = Constant Rate Descent

| Control | | Performance | |
|---------|----------------|--------------------|--------------------------|
| Pitch | 1-3° Nose Down | Altimeter | Descending |
| Bank | Wings Level | VSI | Desired FPM |
| Power | Descent Power | Airspeed Indicator | Varies with descent rate |
| | | Heading Indicator | Constant |
| | | Turn Coordinator | Level / Coordinated |

ESTABLISH

TRIM

CROSSCHECK

ADJUST

Turns to Headings

Pitch + Power = Performance

Wings Banked / Nose Slightly High + Cruise Power = Turn to Heading

| Control | | Performance | |
|---------|----------------|--------------------|----------------------|
| Pitch | 1-2° Nose High | Altimeter | Constant |
| Bank | Wings Banked | VSI | 0 fpm |
| Power | Cruise Power | Airspeed Indicator | Constant |
| | | Heading Indicator | Turning |
| | | Turn Coordinator | Banked / Coordinated |

ESTABLISH

TRIM

CROSSCHECK

ADJUST



Questions?

