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Area of Operation **VIII** - Task **D**

Straight Descents and Descending Turns

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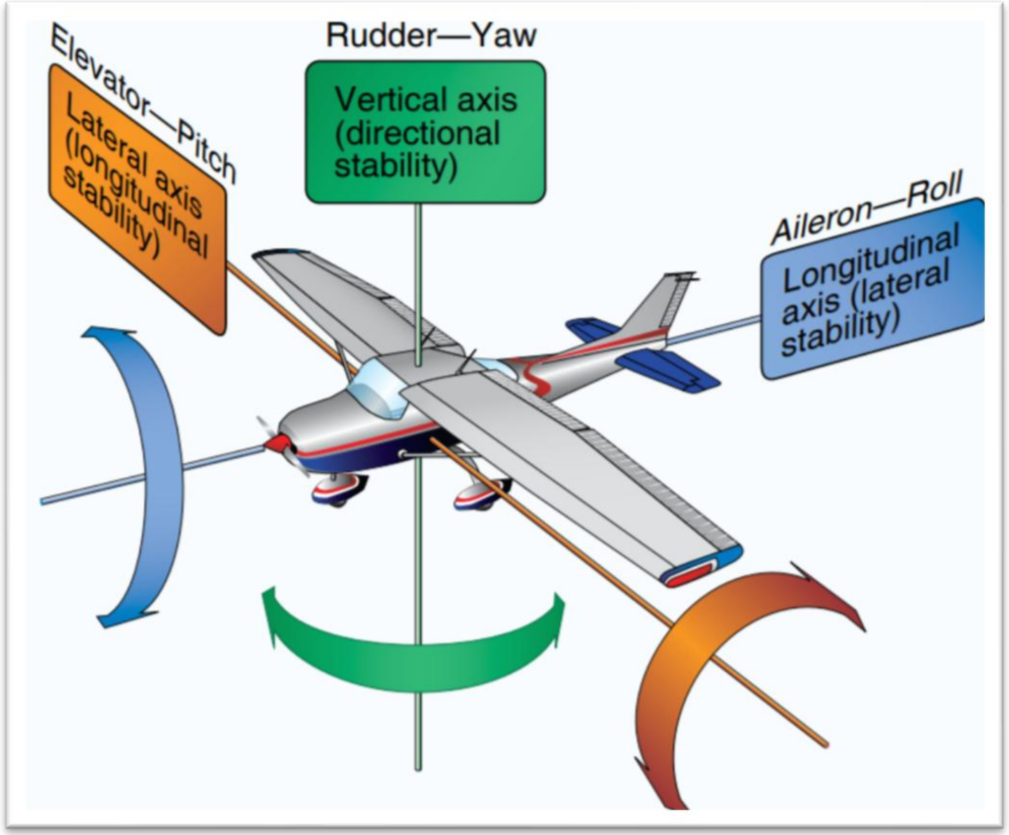
Key References:

- Airplane Flying Handbook

1. Introduction

- **What**: A descent is made when the aircraft is put in a configuration which will result in a loss of altitude
- **Why**: Part of the fundamentals, basis for all flying and maneuvers
- **Primary Flight Controls**:
  - Pitch – Controlled by the **Elevator** (Yoke)
    - *Back pressure pitches up*
    - *Forward pressure pitches down*
  - Roll – Controlled by the **Ailerons** (Yoke)
    - *Right roll → Right aileron deflects UP*
    - *Left roll → Left aileron deflects UP*
  - Yaw – Controlled by the **Rudder** (Pedals)
    - *Right pedal → Rudder deflects to the Right*
    - *Left pedal → Ruder deflects to the Left*



Standard (ACS):

- PPL(*): Level off Alt **~~±200ft~~** 100, Hdg **~~±20⁰~~** 10^0, Airspeed **~~±10~~ kts** 5

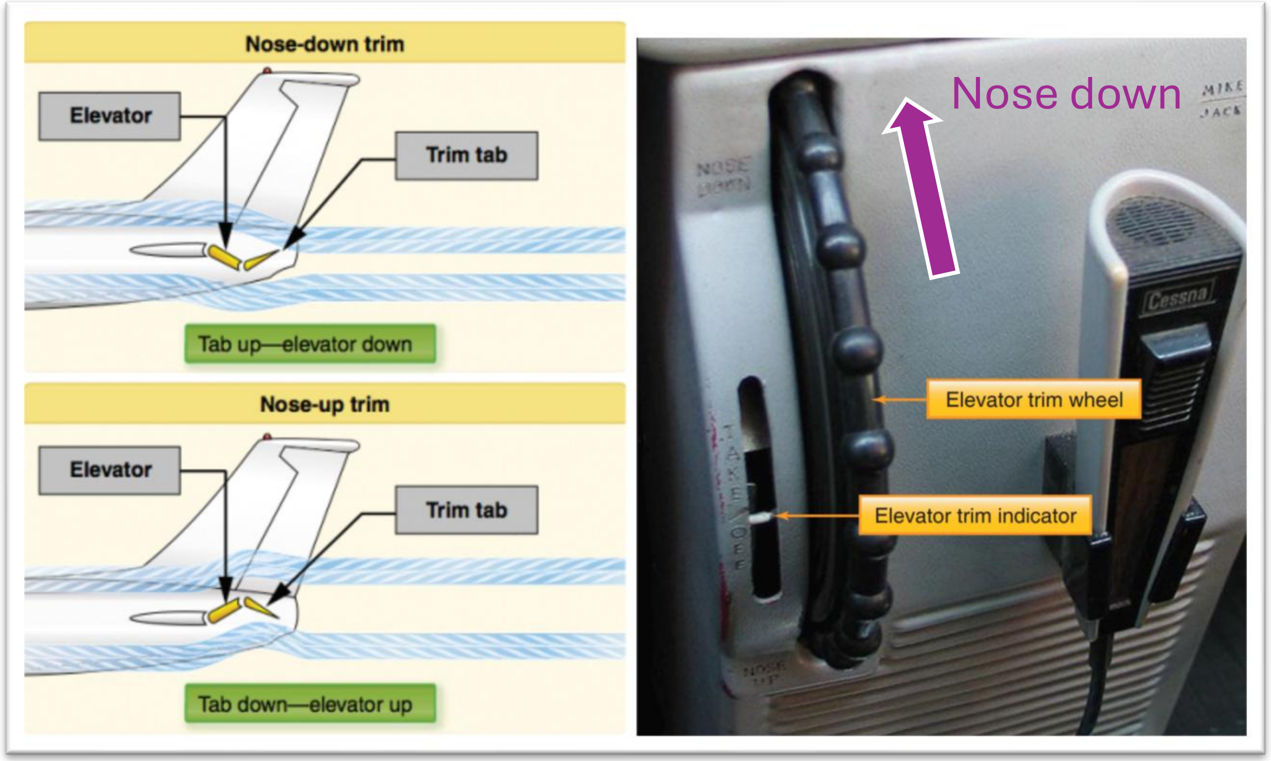
* Basic Instrument

2. Control Pressure

1. **Control should be smooth, light pressure (no jerky movements)**
   - Airplane is stable, require small control inputs → Feels more like “Guiding” versus “Piloting”
2. **Overcontrolling:**
   - White knuckle death grip (overall nervousness)
   - Large flight control movements
   - Tendency to react briskly to any natural disturbance in the aircraft movement
   - How to prevent: **fly with your fingers** and toes, deep breath, relax


3. Trim Technique

1. **Once stable, set pitch and power and let airspeed stabilize**
2. **Add Trim to relieve control pressure**
   - Verify desired performance and repeat/correct it until almost no control inputs are needed
   - If multiple axis → trim <u>Rudder first</u>, then <u>elevator</u>, then <u>aileron</u>
   - Do not attempt to control pitch using trim,
     use yoke first, then add Trim to release pressure



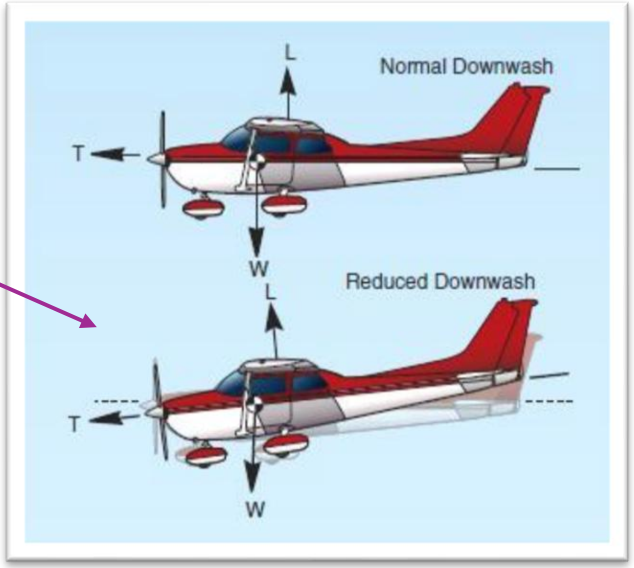
3. Types of Trim
   - <u>Servo</u>: moves opposite to elevator
     (helps deflect the surface) → C172
   - <u>Anti-servo</u>: moves same direction
     (decrease sensitivity)

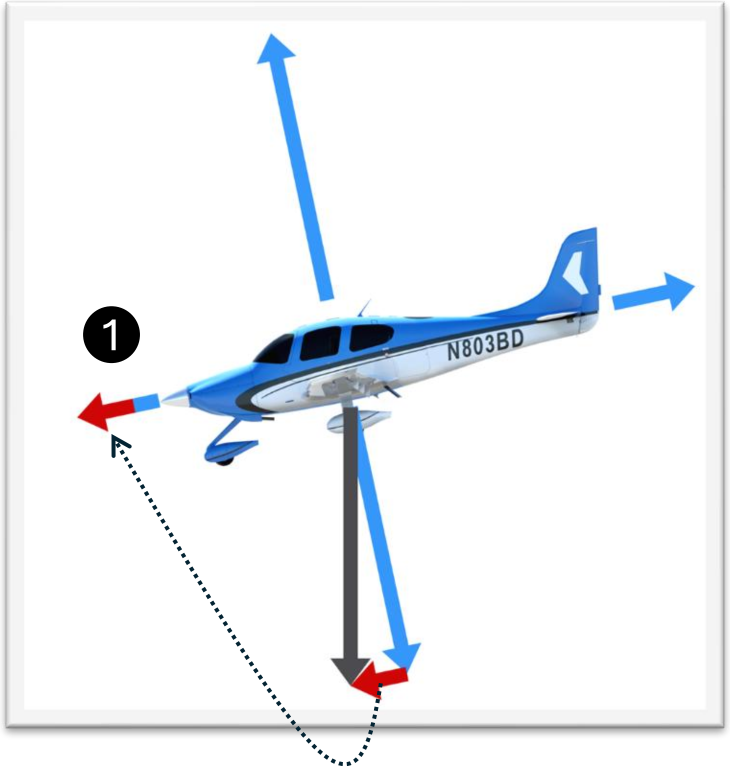
4. Integrated Flight Instruction

- Use **Outside References + Flight Instruments** to obtain and maintain desired performance
- **Basics**
  - 90% Outside, 10% Inside
  - Use outside references to fly
  - Validate the airplane's attitude and performance inside on the instruments
- **Corrections**
  - When a correction is necessary, apply it in reference to the natural horizon
  - Verify the new attitude and performance on the instruments
  - Trim the controls to maintain the new attitude and continue crosschecking

5. Physics of the Descent

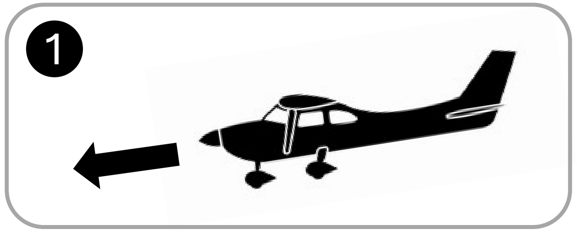
- **Establishing the Descent**:
  - Pitch down: AOA and lift decreases, airplane starts to pick up airspeed and lose altitude
  - Power is reduced: "forward component" of the weight compensates drag, thus thrust must be lower 1
  - Once the climb is established, AOA and lift return to level flight values and forces are again in equilibrium
- **Effects of Downwash**
  - Large reduction in power reduces the effectiveness of the horizontal stabilizer
  - Nose will pitch down
  - *Don't develop bad habits of controlling pitch by power!*





6. Types of Descents

- **Partial Power Descent** 1
  - Normal method of losing altitude
  - Airspeed and power setting recommended by the manufacturer
- **Descent at Minimum Safe Airspeed** 2
  - Nose-high, power assisted descent often used for short field approaches
  - Steeper than a normal descent angle
- **Emergency Descent** 3
  - Described in the POH
  - In general, high airspeed procedure in a specific configuration
- **Glide**
  - Maneuver in which the airplane loses altitude in a controlled descent with little or no power



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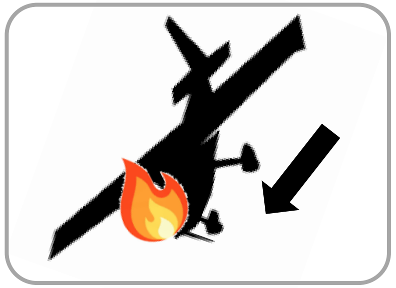

7. Descent Procedure

- **Entering a Straight Descent**
  - Gently decrease power and maintain altitude to slow to descent speed (slowly increase back pressure)
  - Just prior to descent airspeed, lower the nose to the descent pitch attitude on the natural horizon
    - **If Descending Turn** ➔ establish bank in relation to the natural horizon after or while lowering the nose
  - Crosscheck the instruments. Once stable, trim to relieve control pressures

- **Maintaining a Straight Descent**
  - Power is constant, Ailerons keep the wings level (to maintain heading) or proper constant bank (if descending turn)
    - A change in bank often necessitates a change in pitch to maintain airspeed in descending turns
  - Airspeed is controlled with elevator pressure (pitch up to slow down, pitch down to speed up)
  - Use rudder as needed (if needed) for coordination. Crosscheck the instruments for desired performance

- **Returning to Straight-and-Level**
  - Initiate the level off at approximately 10% of the rate of climb (500 fpm = 50’ prior to desired altitude)
  - Smoothly increase power to the cruise power setting, and **gently raise the nose**
  - Verify straight-and-level site picture, cross check with instruments, trim the airplane

8. Common Errors

1. Failure to cross-check and correctly interpret outside and instrument references
2. Application of control movements rather than pressures
3. Uncoordinated use of flight controls
4. Faulty trim procedure
5. Failure to clear engine and to use carburetor heat, as appropriate

Questions?