Lesson 3

Secondary Effects of Controls

1. Trim
   1. Trim is a system used to reduce the need for the pilot to apply a constant pressure to maintain an attitude
   2. Trim tabs
      1. Adjustable devices located on the trailing edge of control surfaces
      2. Move in the opposite direction of the control surface to “fly” the control surface in the same way that the control surface “flies” the aircraft
   3. Bungee system
      1. Linked to the control column
   4. Ratchet system
      1. Linked to the control column
2. Spoilers and Dive Breaks
   1. Primarily used in glider flying
      1. Main purpose is to increase the rate of descent on approach and allow for “normal” landings rather than excessively shallow ones
   2. Spoilers
      1. Either fold up or extend up from the top of the wing to disrupt airflow and spoil lift
   3. Dive breaks
      1. Either fold down or extend down from the bottom of the wing to disrupt airflow and increase drag
3. Flaps
   1. “High lift device”
   2. Increase the camber of the wing
   3. Increases lift and drag
   4. Allows a slower, steeper approach without stalling
   5. Allows a glider to fly slower in a thermal
   6. Different types of flaps exist
4. Secondary Effects of Controls
   1. Air movement over control surfaces when they are moved causes adverse effects
   2. Yaw produces adverse roll
      1. Yawing causes one wing to move faster than the other, producing more lift and rolling towards the slower wing (in the direction of the yaw).
   3. Roll produces adverse yaw
      1. Rolling creates a situation where the down-going aileron produces more induced drag than the up-going aileron due to its increased camber, and yawing toward the up-going wing (away from the roll).
5. Coordination
   1. Aileron and rudder must be used in combination to turn the aircraft without creating unnecessary drag
   2. Using too much rudder will cause a “skidding turn”
      1. The nose will be pointed inside the turn relative to the flight path, and the aircraft will appear to skid out of it
   3. Using too little (or opposite) rudder will cause a “slipping turn”
      1. The nose will be pointed outside the turn relative to the flight path, and the aircraft will appear to slip into it