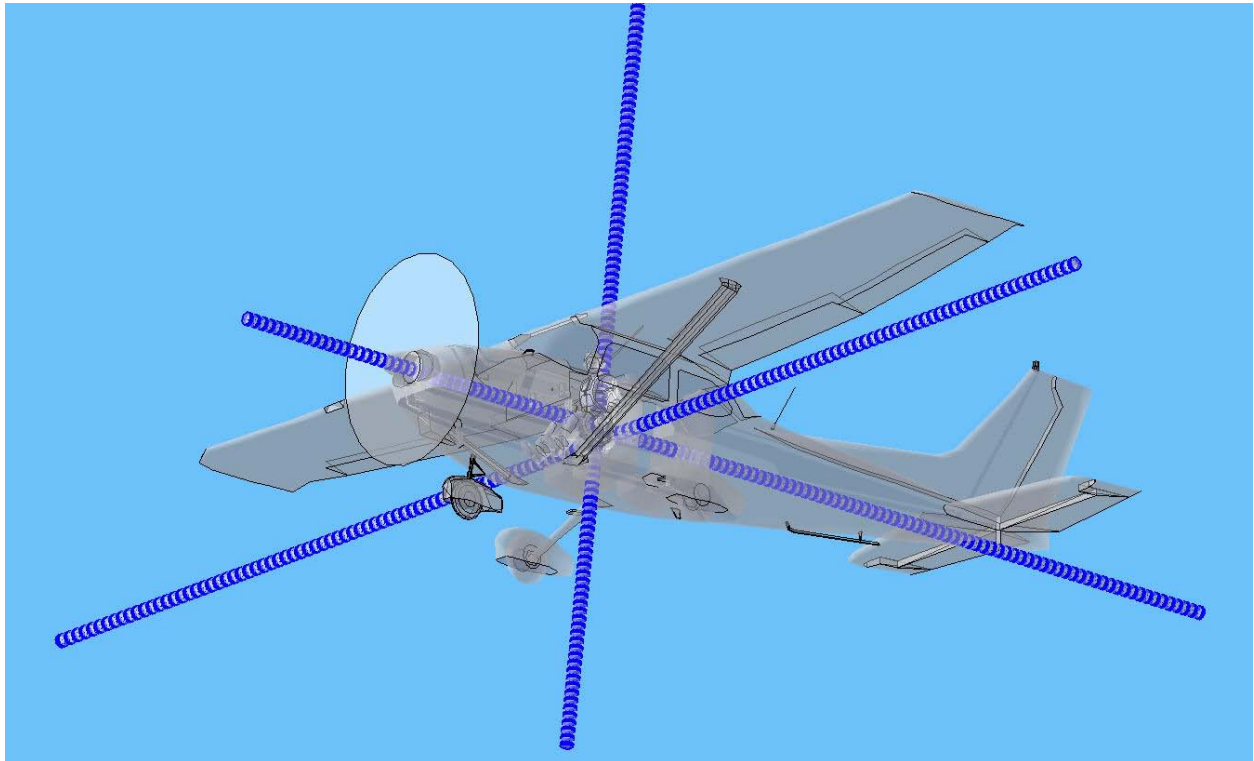


HOW AN AIRPLANE FLIES

The Theory of Flight, Aircraft Controls And Flight Indicators

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This lesson is intended for general reference and education and is not a substitute for the Pilot's Operating Manual of any specific aircraft.

- 002 How an airplane flies. The theory of flight. Aircraft controls and flight indicators. (Dub with music)
(advance to 003)(001aIntroMixdown.mp3 Randolph Searight)
- 003 Today we will talk about how an airplane flies. We'll also talk about the theory of flight, and some basic aircraft controls and indicators that the pilots use and reference to help them fly safely. (advance to 004)
(003mono.mp3)
- 004 There are four **aerodynamic forces** at work when we engage in flight. They are: (004aMono. mp3)
 Lift (004bLiftMono. mp3)
 Drag (004cDragMono. mp3)
 Thrust, and (004dThrustMono. mp3)
 Weight (advance to 005) (004eWeightMono. mp3)
(OR 004monoCombo.mp3)
- 005 **Lift** is a force that holds the airplane in the air. Most of the lift of an airplane comes from its wings although other areas of the fuselage provide or contribute to lift as well. (advance to 006)
(005mono.mp3)
- 006 **Drag** is a force that resists the motion of an object moving through the air. You experience this when you stick your hand out of a moving vehicle. Drag is the **Friction** which occurs when two objects such as the air and your hand are passed together. (advance to 007)
(006mono.mp3)
- 007 **Thrust** is a force that must be created in an airplane to generate motion either by rockets, engines, or a propeller. Energy is required in order for there to be motion. The airplane will always move in the opposite direction than that of the thrust created.
(advance to 008) (007mono.mp3)
- 008 **Weight** is a measurement of how much force **gravity** exerts on a body or an object. (advance to 009) (008mono.mp3)
- 009 Now, an Airplane flies straight and level only when the **thrust** of the airplane is **equal** to the **drag** and when the **lift** is **equal** to the **weight** of the craft and its contents. (advance to 010) (009mono.mp3)

- 010 Here are the airplane's **Flight surfaces** that affect the flying characteristics of the airplane:
The pilot's feet and hands control each of these surfaces through the use of cables, linkages, motors and hydraulics.
- The **Wing** has **Ailerons** outboard, and **Flaps** inboard.
(advance to 011) (010mono.mp3) Mix with video:010.avi.
- 011 Note how the ailerons move in opposite directions to one another; (011aMono.mp3)
- however... the flaps are synchronized when they move up and down. (011bMono.mp3)
- The **Horizontal Stabilizer** has an **Elevator**...
(011cMono.mp3)
- and, the **Vertical Stabilizer** has a **Rudder**.
(011dMono.mp3) (OR 011monoCombo.wav)
Mix with video:011.avi.
- 012 Now let's pause for a question:
- Select the group of forces which are at work when we engage in flight:
- "A" Lift
Drag
Thrust, and
Weight (advance to 013)
- "B" Weight
Length
Drag, and
Thrust, or (advance to 014)
- "C" Drag
Weight
Capacity, and
Lift (advance to 014) (012mono.mp3)
- 013 "A" is correct! (advance to 016) (013mono.mp3)
- 014 Sorry. That is incorrect. Let's review this one again... (return to 004) (014mono.mp3)

- 016 As an airplane moves about the air, it does so in three axis or planes. We'll use the word "Axis" to avoid confusion. Here are the three Axis and the Flight Control that affect it: (advance to 017) (016mono.mp3)
- 017 **Vertical Axis**, Left and Right Turn called: "Yaw Control" and is controlled by the pilot's feet by stepping on the **Rudder Pedals**. (advance to 018) (017mono.wav)
Mix with video: 017.avi.
- 018 **Lateral Axis** affects Climb and Dive. This is called: "Pitch Control". The **Elevator** affects this and is moved when the pilot pushes or pulls on the **Steering Yoke**. When the Steering Yoke is pulled back, the Elevators tilt up and the Nose of the aircraft is pitched upwards. (advance to 019) (018mono.wav) Mix with video: 018.avi.
- 019 **Longitudinal Axis** is the Left and Right Roll. "Roll Control" is performed by the **Ailerons**. The ailerons are located on each wing and they act in opposite directions from one another. When the pilot turns the steering yoke to the right, the right wing aileron goes up, and the left one drops down. (019aMono.mp3)
- This action, reduces lift on the right wing while increasing lift on the left. The aileron that moves up deflects the thrust upwards and causes the aircraft's wing to dip down on that side, and subsequently the aircraft rolls to that side. The aileron that moves down deflects the thrust downward and causes that wing to push up. (advance to 020) (019bMono.mp3)
(OR 019monoCombo.wav) Mix with video: 019.avi.
- 020 This concludes this test of How An Airplane Flies. (stop program) (020mono.wav) Dub with background music: 023ending.wav.