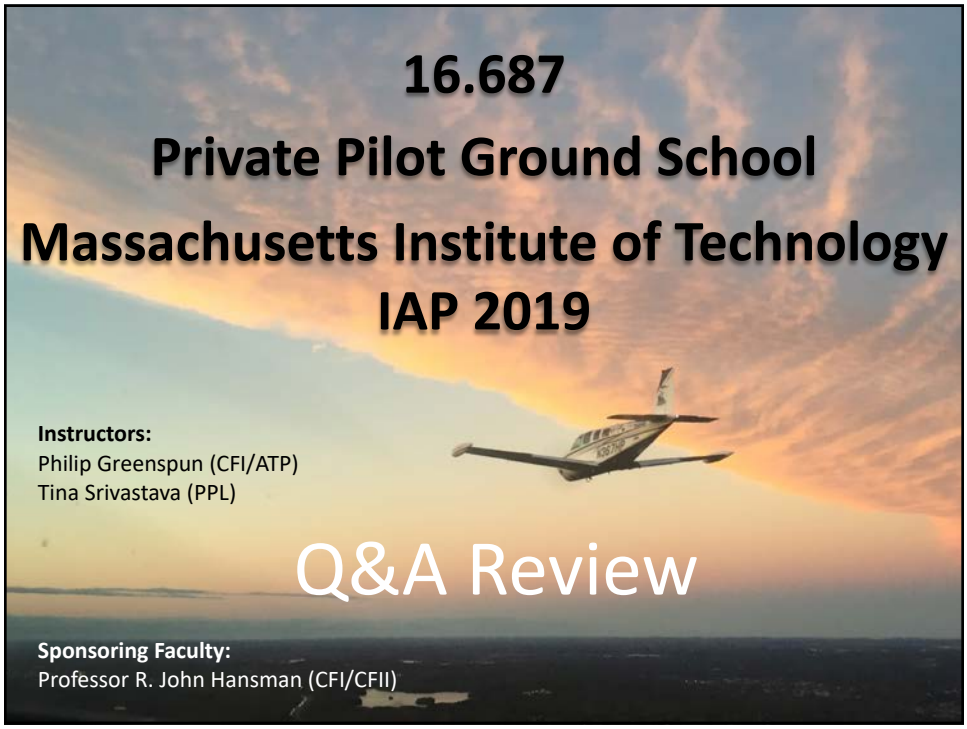

Gyroscopic Procession

- https://www.youtube.com/watch?v=XHGKIzCcVa0&feature=youtu.be
  - Starts at 6:06
- https://www.youtube.com/watch?v=cquvA_IpEsA

Mechanical Computer

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- https://www.youtube.com/watch?v=s1i-dnAH9Y4

Classroom Logistics

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- Attendance is required – sign in is being passed around here and in overflow room
- You will have approximately one week to complete the final exam, the link will be distributed at the end of the class

Review

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- Coordinated vs. Uncoordinated
- Adverse Yaw
- P-Factor
- Parasitic Drag

The Flight Controls

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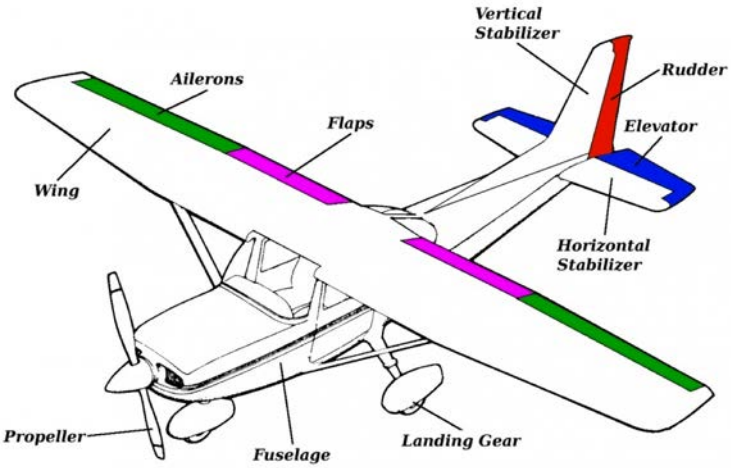
Elevator (pitch); Ailerons (roll); Rudder (yaw)



Slip/Skid Indicator

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Coordinated Flight

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- Coordinated flight occurs whenever the pilot is proactively correcting for yaw effects associated with power (engine/propeller effects), aileron inputs, how an airplane reacts when turning, etc.
- The airplane is in **coordinated** flight when the airplane's nose is yawed directly into the relative wind and the ball is centered in the slip/skid indicator.

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/airplane_handbook/media/06_afh_ch4.pdf

Yaw

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- An airplane will yaw not only because of incorrect rudder application but because of adverse yaw created by aileron deflection; engine/prop effects, including p-factor, torque, spiraling slipstream, and gyroscopic precession; and wind shear, including wake turbulence.

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/airplane_handbook/media/06_afh_ch4.pdf

Adverse Yaw: Aileron Deflection

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- If we want to roll left
  - Yoke turns to the left
  - Left aileron goes up, right aileron goes down
  - Right wing develops more lift, therefore more drag
  - Airplane yaws in opposite direction to roll

Left Turning Tendencies

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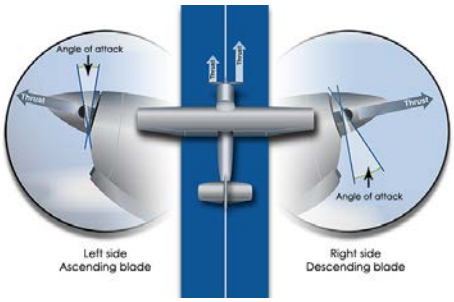
- P-Factor/Asymmetrical Thrust
  - When airplane has a high angle of attack (climb or slow flight), the descending right propeller blade creates more thrust than the ascending left blade
  - The center of thrust moves to the right
  - Difference in thrust creates left yaw



https://aviation.stackexchange.com/questions/312/whats-p-factor-and-why-does-it-occur

P-Factor Explained

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- The left yaw tendency is caused because the right descending propeller blade has a higher angle of attack and is therefore generating more lift than the left ascending propeller blade when the airplane is climbing or in slow flight. Since the center of thrust moves to the right, this creates a left yaw tendency.
- If the prop axis is aligned with the flow in cruise flight when the wing is at a low angle of attack it will be misaligned with the incoming flow at high angles of attack. The apparent angle of attack at the prop blade is the combination of the external flow and the prop rotation. The misalignment has a tendency of increasing angle of attack on the down side rotation and decreasing the apparent angle of attack on the up side.

Drag

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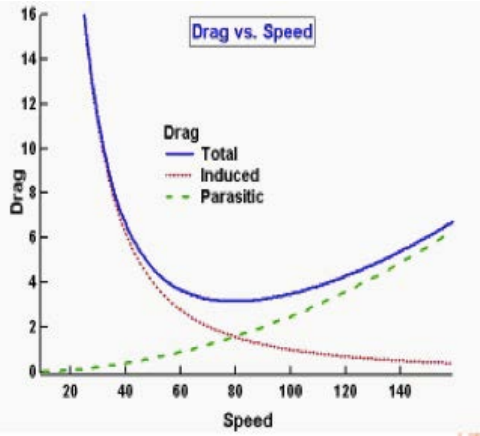
- Parasitic Drag
  - Produced by aircraft as it moves through air
  - Increases with square of airspeed
  - Skin friction, form drag, interference drag
- Induced Drag
  - Drag created by lift
  - Increases at high Angle of Attack/Lower Airspeed
  - Highest at slow speed in landing configuration
- See: PHAK: 5-6



Source: Pilot's Handbook of Aeronautical Knowledge (PHAK) by FAA. This image is in the public domain.

The Best-laid Plans

Day 2 (Wednesday)

Meteorology
** **Break** **
Comms, Radar, ATC
Aircraft Ownership
** **Lunch Break** **
IFR
Performance
Weather data
** **Break**
Human Factors
Aerobatics with Marc Nathanson

Day 3 (Thursday)

Flight Planning
** **Break** **
Seaplanes
sUAS (drones) with Michael Holzwarth
Night flying
Multi-engine and Jets
** **Brazilian Air Force Lunch** **
Weight and Balance
Weather Minimums and Parting words
** **Break** **
App Planning & Engineering with Tyson Weihs

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