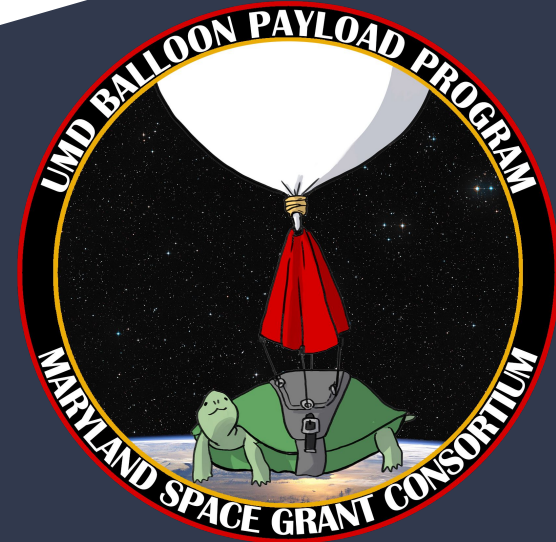


How Things Fly

Brought to you by the UMD Balloon Payload Program



What is an Aerospace Engineer?

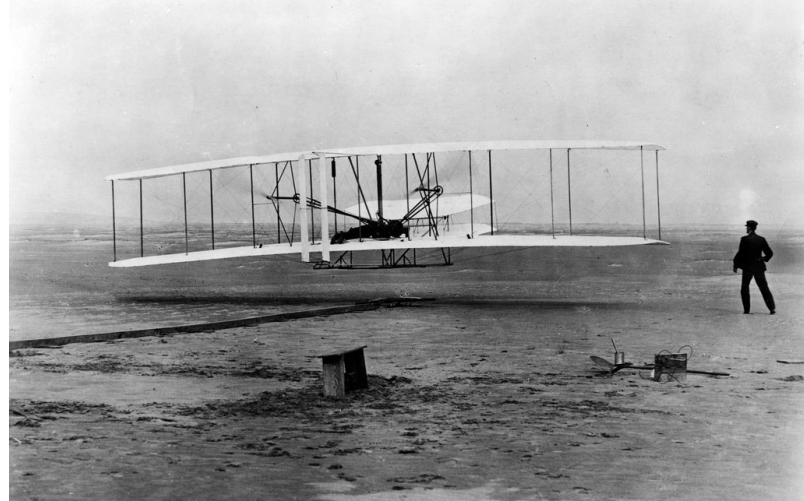
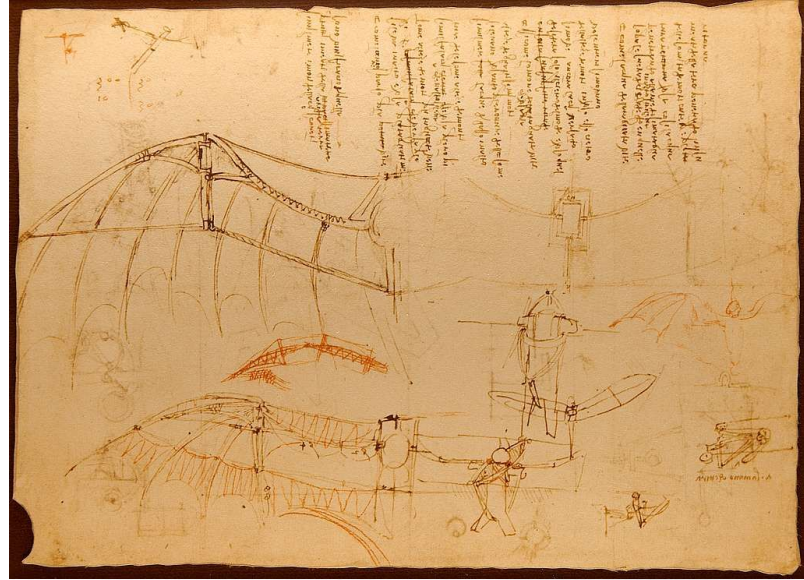




Some of my favorite views in the world! Who else has flown before?

How long have humans been flying?

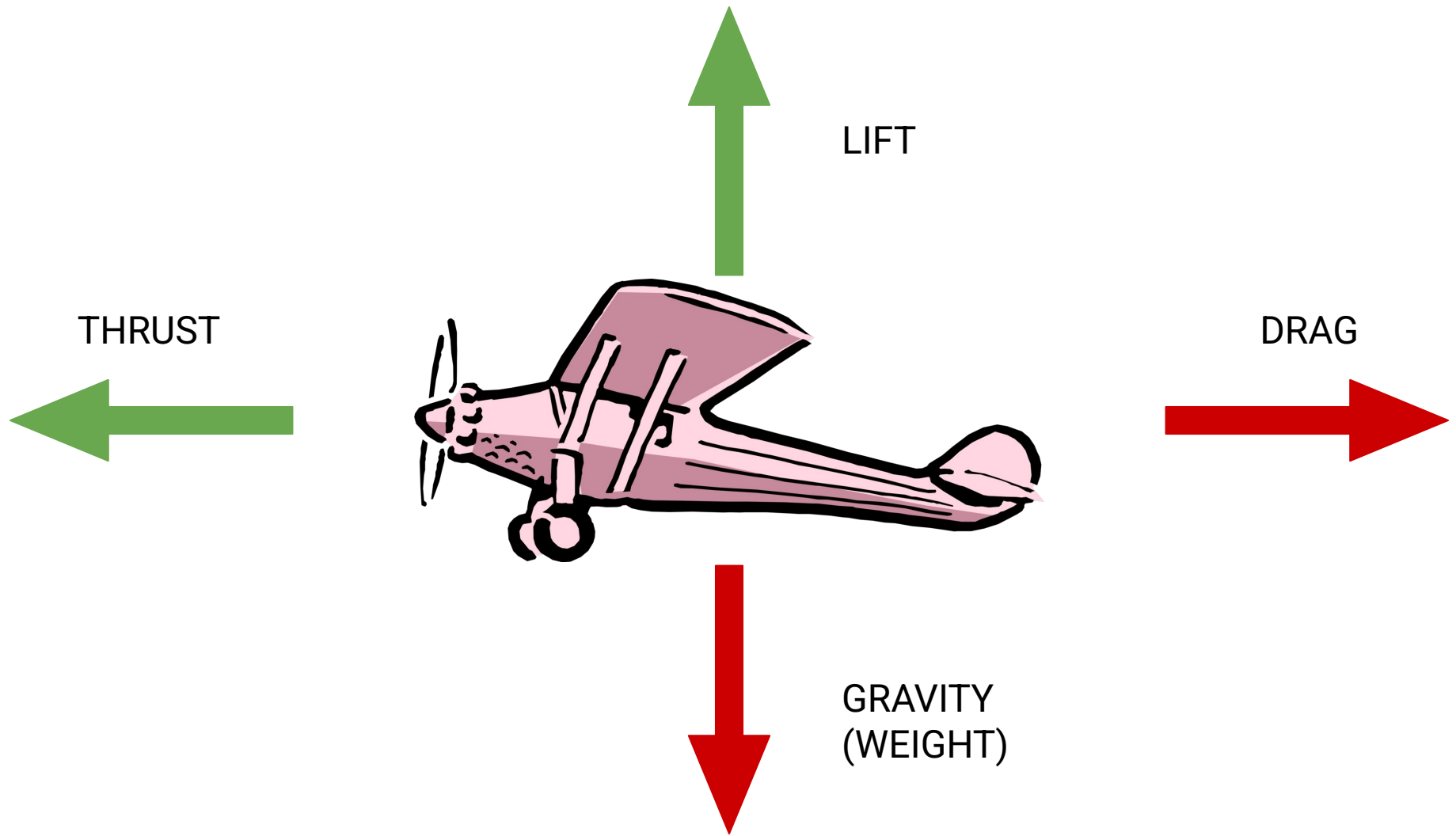
- First heavier than air powered flight, flew December 17th, 1903
 - Brothers Wilbur and Orville Wright flew for 12 seconds at Kitty Hawk, North Carolina
- Leonardo da Vinci was designing flying machines as early as the 1490s!





The real pros of flying - birds!

How can we get
humans to fly?



How do these forces **help us**, and how
do they **hurt us**?



Thrust

- Makes the plane go forwards
- Created by the plane's engines
 - Two main types of engine, jet and propeller engines



Lift

- Makes the plane go **up** and keeps it **in the air**
- Created by the **wings**
 - The **shape** of the wings forces the air to push the plane up



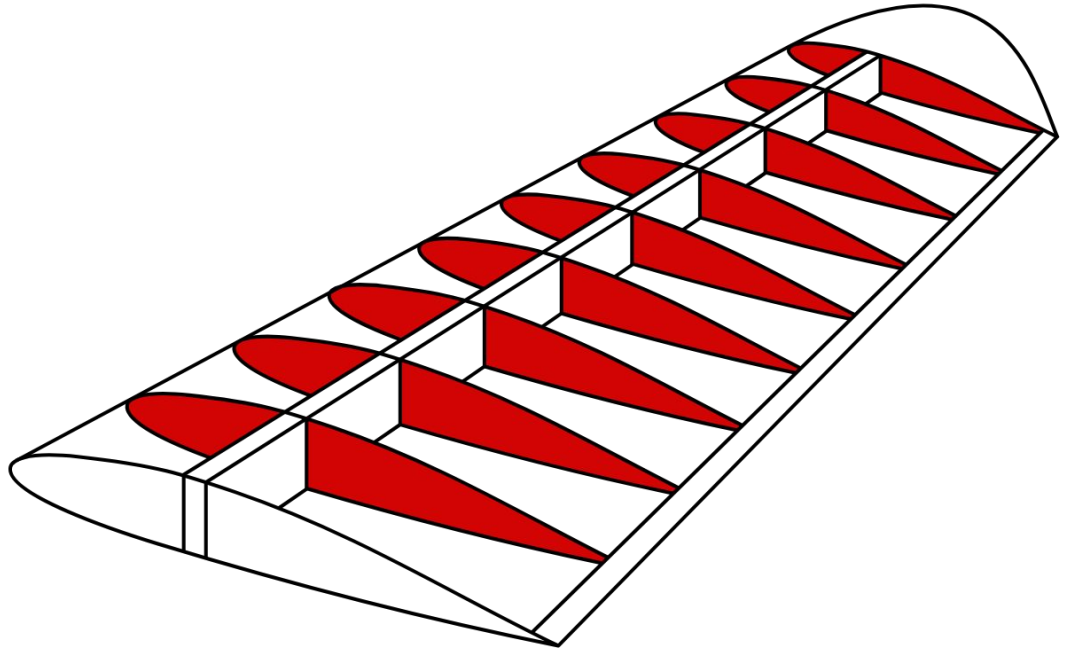
Drag

- Acts backwards on a plane, slowing it down
- Caused by the air bumping into the plane
- Lowered by making the plane aerodynamic
 - Pointy nose to cut through the air
 - Smooth body with few bumps



Gravity / Weight

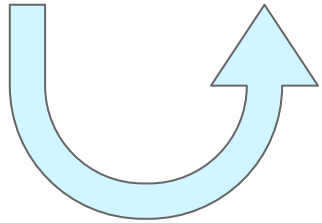
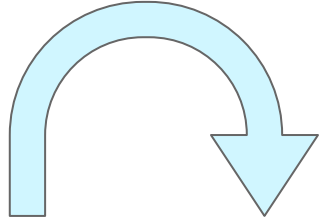
- Acts **down** on plane, trying to get it to come back to Earth
- Caused by **Earth's gravity**
- Engineers lower its effect by lowering the plane's weight
 - This is the inside of a wing - notice all of the **empty space**



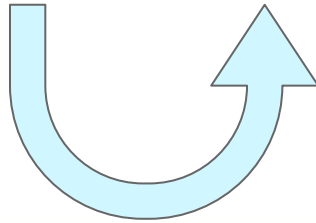
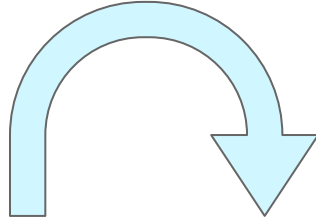
How do we **control** our airplane?



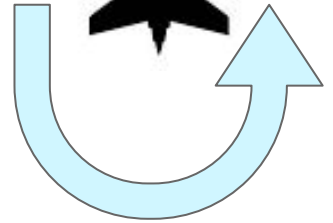
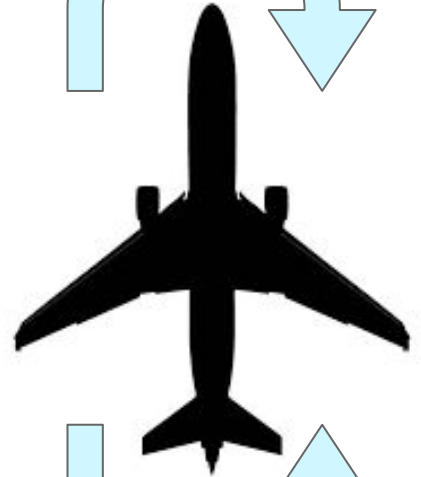
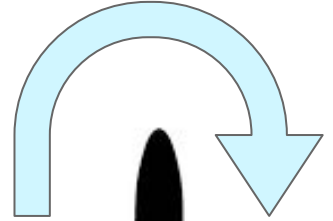
PITCH



ROLL



YAW



Pitch

- Up / Down rotation of the plane
 - Most noticeable during takeoff / landing
- Controlled by the plane's elevators



Roll

- Right / Left rocking motion of the plane
 - Makes one wing point to the sky, one point to the ground
- Controlled by the plane's ailerons



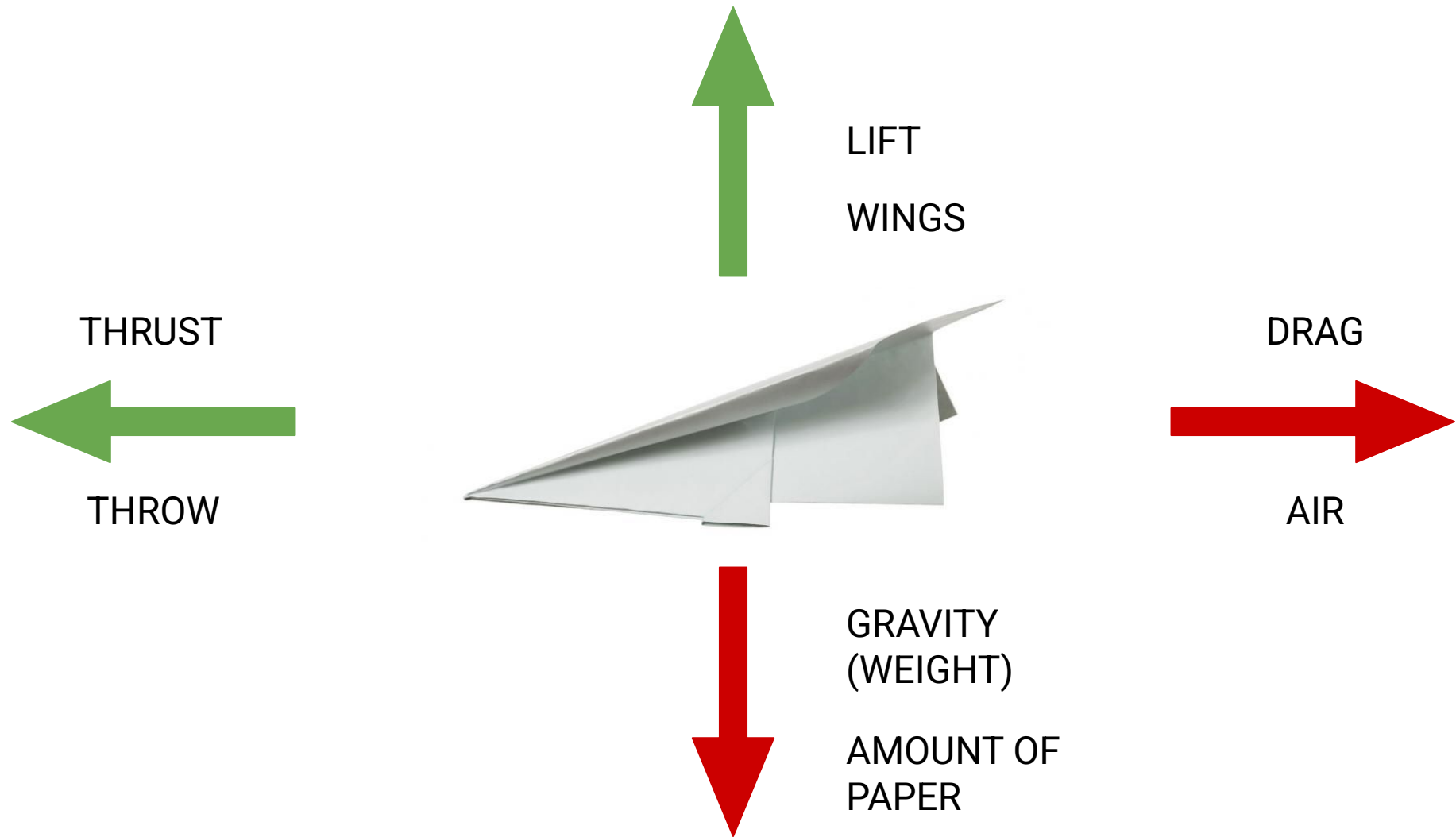
Yaw

- Right / Left turning motion of the plane
 - Similar to how a car turns
- Controlled by the plane's rudder



Now it's your turn!





Follow along with your
first sheet of paper to build
a basic paper airplane

Your Task:
Build a paper
airplane to complete
one (or more!) of
these challenges!

- **Challenge I: Longest Flight**
 - How far can your airplane fly?
- **Challenge II: Accurate Flying**
 - Can your airplane fly through a Hula-Hoop?
 - How far away can you throw it from?
- **Challenge III: Turning**
 - Can you get your airplane to turn? Can it turn all the way around?
- **Challenge IV: Acrobatics**
 - Can your airplane do tricks?
 - Barrel roll? Loop-the-loop?
 - Show us what you can do!

Image Sources (All Creative Commons or Public Domain)

- [Wright Brothers](#)
 - [Da Vinci](#)
 - [Plane clipart](#)
 - [Jet engine](#)
 - [Propeller](#)
 - [Nose](#)
 - [Wing cutaway](#)
 - [Silhouette - Side](#)
 - [Silhouette - Front](#)
 - [Silhouette - Top](#)
 - [Pan-Am Tail](#)
 - [Lufthansa Tail](#)
 - [Paper airplane](#)
- Pictures on slides 3, 10, 16 taken by Carter Scanlan