

A large commercial airplane is shown in flight against a clear blue sky. The plane is white with dark accents on the tail and engines. The text "HOW DO PLANES FLY?" is overlaid in large, white, stylized letters. The word "HOW" is in a bold, rounded font, while "PLANES" and "FLY?" are in a more outlined, sans-serif font. The background image shows the side of the plane with windows and the word "Airbus" visible on the fuselage.

HOW DO PLANES FLY?

● OBJECTIVE

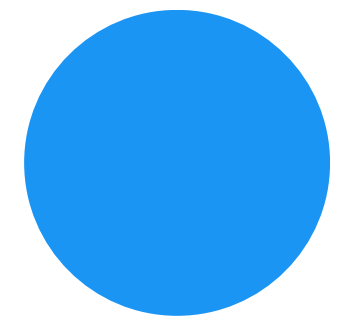
By the end of today's lesson, students will use Freeform to analyze and respond to 3 case studies involving AI and flights. Students will also synthesize the laws of flight (Lift, Weight, Drag, and Thrust) through use of an online AI flight construction simulator, measuring three successful flights.



BIG IDEA - HOW DO PLANES FLY?

ESSENTIAL QUESTIONS - HOW CAN AI BE USED TO EVALUATE AVIATION CONDITIONS? HOW IS FLIGHT SAFETY EVALUATED THROUGH USE OF AI? HOW CAN AI MEASURE THRUST, LIFT, WEIGHT, AND DRAG OF MY AIRPLANE CONSTRUCTION

CHALLENGE - USE AI TO CONSTRUCT YOUR PLANES USING THE FORCES OF FLIGHT

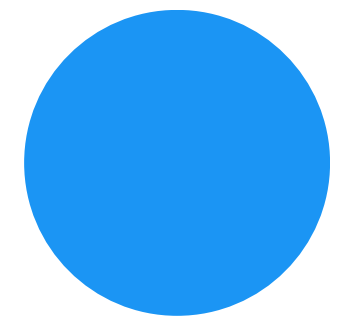




THE FOUR FORCES

Every plane in flight is acted upon by four fundamental forces

- The four forces are: Thrust, Lift, Drag, and Weight
- These forces must be carefully balanced
- Balance allows a plane to take off, cruise, and land safely



THRUST

What Is Thrust?

- Thrust is the forward force that pushes a plane through the air
- Produced by engines or propellers that push air backward
- Without thrust, a plane can't generate lift

How Engines Work

- Jet engines compress air, mix it with fuel, and ignite it
- Hot gases blast out the back, pushing the plane forward
- Propeller engines spin blades to push air backward for the same effect



Moving Forward

- Thrust must overcome drag to move forward
- More thrust than drag = plane accelerates
- Equal thrust and drag = steady speed

How Wings Work



LIFT

- Air flows over and under wings as the plane speeds up
- Wing's curved shape (airfoil) makes air move faster on top
- Faster air = lower pressure above the wing
- Higher pressure below pushes the wing up — that's lift!
- Try it: Blow across the top of a paper strip and watch it rise

What is Lift?

- Lift is the upward force that pushes a plane into the sky
- Acts opposite to weight (gravity)
- Without enough lift, a plane can't fly

Air moves faster over the curved top of a wing
Creates lower pressure on top
Higher pressure below pushes the wing upward

DRAG

Drag is the force that slows a plane down by pushing back against it as it moves through the air. Think of it like air resistance — the faster a plane flies, the more drag it experiences. Drag acts in the opposite direction to thrust, meaning the engines must work harder to overcome it.

Air Resistance

Drag pushes **AGAINST** the direction of motion. Streamlined shapes reduce drag. More speed = more drag force acting on the plane.



● WEIGHT & GRAVITY

- Weight is the downward force from gravity pulling the plane toward Earth
- Lift must overcome weight for a plane to fly
- Heavier planes need more lift from engines and wings



Try This:

- Hold a heavy book in one hand and a pencil in the other
- Feel how gravity pulls harder on the heavier object
- Planes experience this same pull — engineers manage weight so lift can do its job

RECAP: BALANCING THE FORCES



Force	Direction	Cause	Role in Flight
Thrust	Forward →	Engines or propellers pushing air backward	Moves the plane forward through the air.
Lift	Upward ↑	Air moving faster over the curved wing surface	Pushes the plane up, countering gravity.
Drag	Backward ←	Air resistance pushing against the plane	Slows the plane down as it moves forward.
Weight	Downward ↓	Gravity pulling the plane toward Earth	Must be overcome by lift for the plane to fly.



AI & FLIGHT CASE STUDY #1

Case Study Article





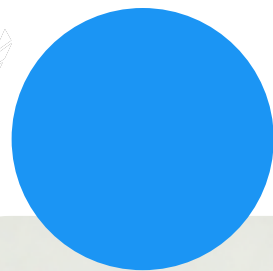
AI & FLIGHT CASE STUDY #2

Case Study Article



AI & FLIGHT CASE STUDY #3

Case Study Article



GROUP DISCUSSION AND FINDINGS

Your Group Freeform
Link

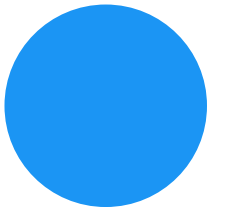


PUT YOUR
THEORY TO
AI TEST

How Things Fly.
Simulator



**3 SUCCESSFUL FLIGHTS
“SR. PILOT STATUS”**



**2 SUCCESSFUL FLIGHTS
“JR. PILOT”**



**1 OR LESS
“FLIGHT SCHOOL STUDENT”**

