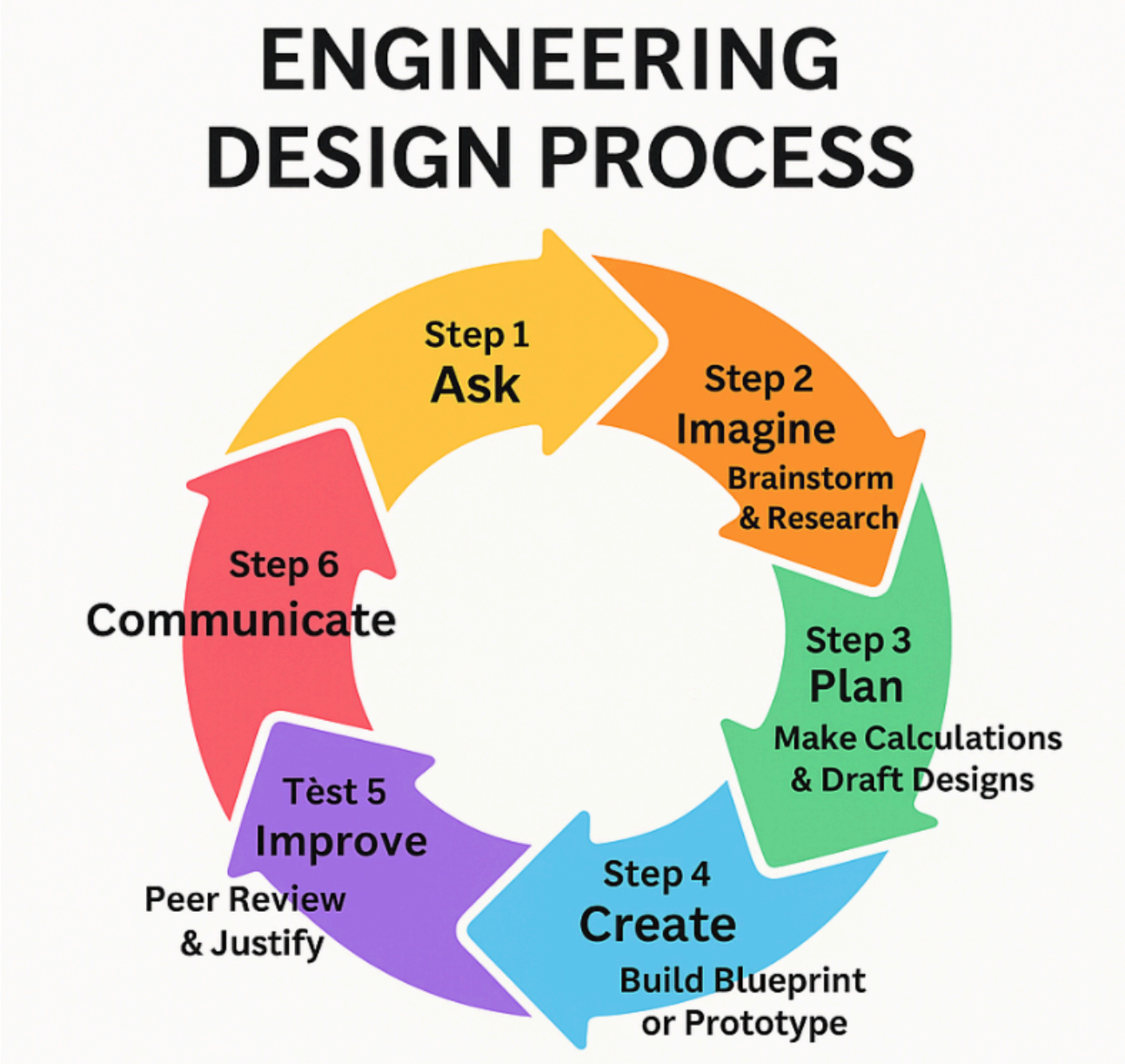
Design a Flying Dragon Using the Engineering Design Process

Engineering Design Process Student Journal

Project Title: _____

Designed by: _____



Step 1: ASK – Define the Problem

Your Challenge: Design a biologically realistic, flight-capable dragon based on scaling laws and flight mechanics.

Guiding Questions:

- What is the weight of your dragon (circle one)?
  ☑ 500 kg ☑ 1,000 kg ☑ 2,000 kg

- What is the purpose of your dragon? (e.g., rescue, stealth, gliding, battle)

Dragon's Mission:

Flight Challenges: (at least two)

1.

2.

Step 2: IMAGINE – Brainstorm & Research

Use this space to list flight ideas, inspirations, and real-world comparisons:

Students brainstorm ideas and research:

- Real flying animals and aircraft for inspiration

- Wing shapes (bird, bat, glider)
- Control systems (tail fins, rudders, prosthetics)
- Materials (membrane, feathers, metals, lightweight composites)

Optional tools/resources:

- NASA beginner aeronautics pages
- Videos of gliders, birds, and bats in flight
- Sketchbooks or design templates

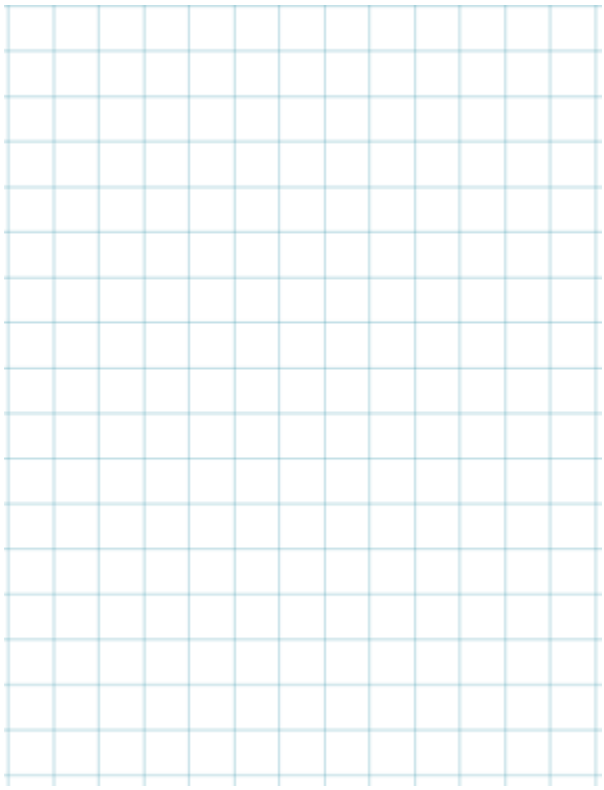
Inspirations:

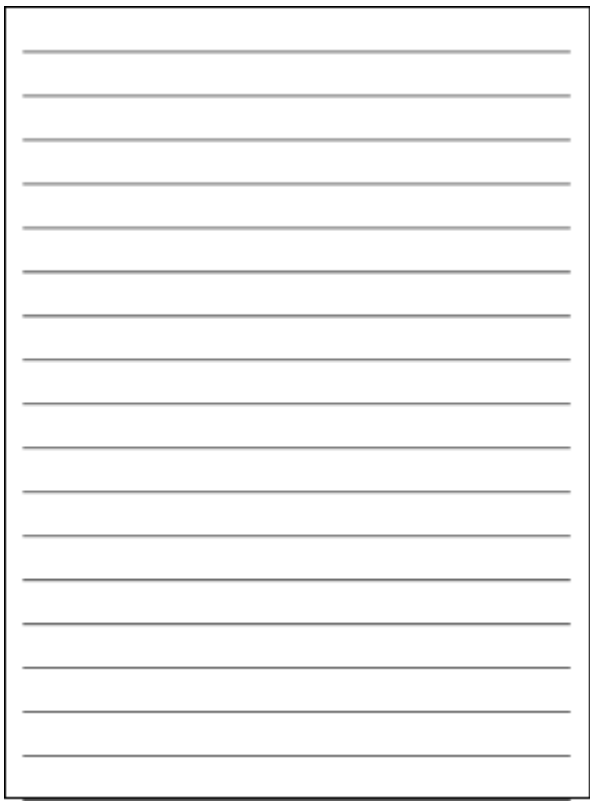
- Animal or aircraft models: _____
- Wing shapes/materials to explore: _____

Special Features to Consider:

- Membranes, tails, folding wings, cooling systems, etc.

Sketch early ideas or describe them:





Step 3: PLAN – Make Calculations & Draft Designs

A. Wing Area Calculation (Use Scaling Law):

Reference Animal:

Mass of Reference Animal: _____ kg

Wing Area of Reference Animal: _____ m²

Your Dragon's Mass: _____ kg

Formula:

$$\text{Wing Area}_{\text{Dragon}} = \text{Wing Area}_{\text{Reference}} \times \left(\frac{\text{Dragon Mass}}{\text{Reference Mass}} \right)^{2/3}$$

Your Calculation: Wing Area (in m²):

B. Convert Wing Area to ft² (1 m² = 10.764 ft²):

Wing Area (in ft²):

C. Estimate Wingspan:

(Use formula:

$$\text{Wingspan} = \frac{\text{Wing Area}}{\text{Average Chord}}$$

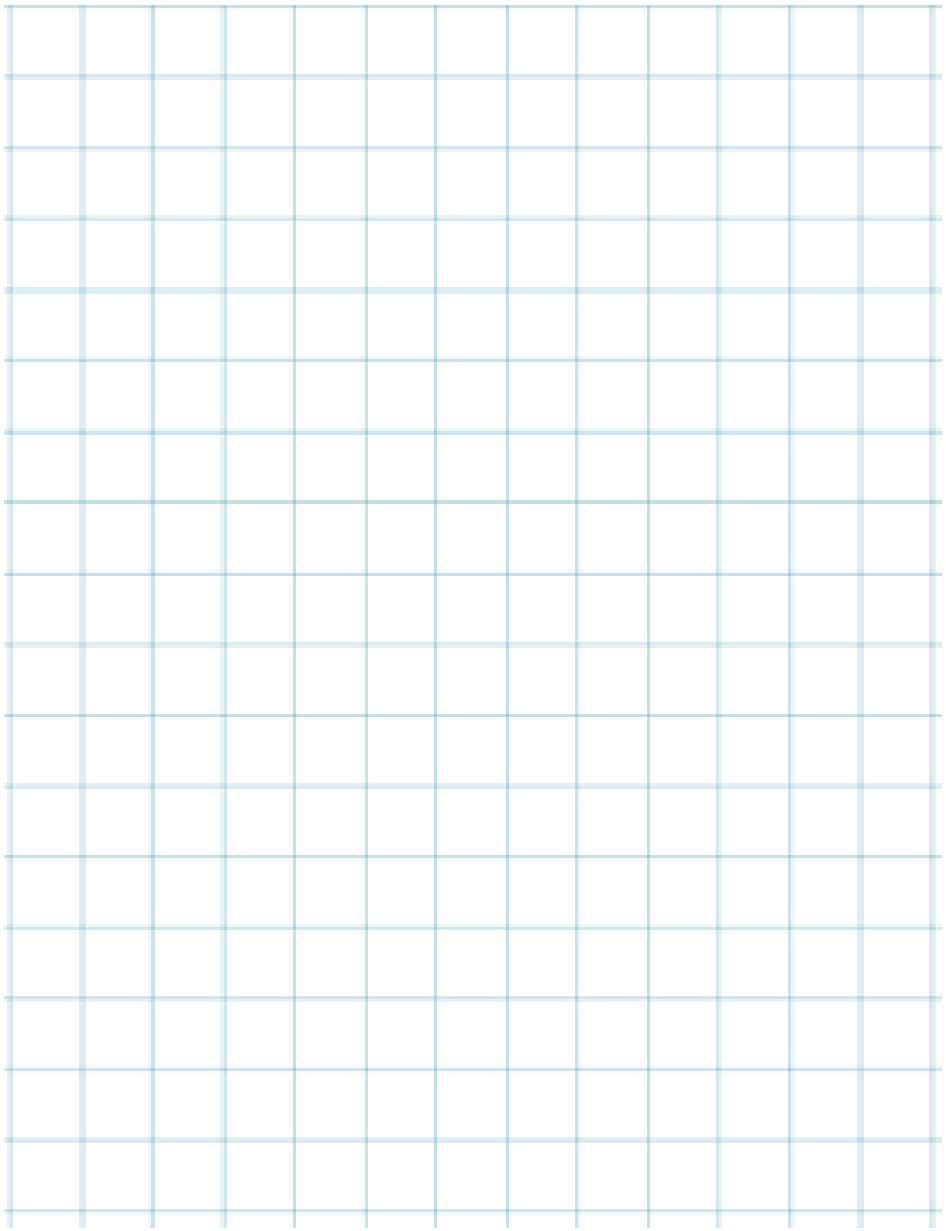
Assumed Chord Length: _____ m Wingspan (in meters): _____

Step 4: CREATE – Build Your Blueprint

Design or sketch your dragon below. Include:

- Wing dimensions & type
- Tail mechanics (if any)
- Label the wing material
- Any unique flight features (prosthetics, stabilizers)

Sketch Title: _____



Step 5: TEST & IMPROVE – Peer Review & Feedback

Peer Feedback Summary:

- Feedback you received:

1.   2.

What I changed or improved in my design:

Step 6: COMMUNICATE – Share & Reflect

Presentation Highlights:

- My dragon's purpose:

- Why wing size works:

- How my design uses real science:

Reflection: What did you learn about animal flight, engineering, or design from this challenge?



Note: Optional Digital Tools use Google Slides, Canva, Tinkercad for prototyping