

Nova's Stargazing Forces: The Physics of Flight

Learning objective: To understand the effects of air resistance, friction, and gravity on moving objects.

Read the passage below carefully. Use your scientific knowledge to answer the questions, ensuring you justify your reasoning where required.

Nova the barn owl loves to glide silently through the night air. To stay airborne, Nova must constantly battle invisible forces. Gravity, the force that pulls everything towards the centre of the Earth, tries to bring her down to the forest floor. To counter this, Nova spreads her wings to create lift. As she moves, air particles collide with her feathers; this is called air resistance, a type of friction that acts in the opposite direction to her movement. If Nova pulls her wings tight to her body, she becomes more aerodynamic, reducing air resistance and allowing her to dive with greater speed. When she lands on a branch, the force of friction between her talons and the wood keeps her steady. Without these complex interactions, Nova would find it impossible to navigate the night sky. Whether she is soaring gracefully or perching to observe the stars, Nova relies on the delicate balance of forces to remain in control. Even a tiny shift in wing position changes the drag she experiences, proving that physics is always at work in the wild.

Word bank: air resistance · friction · gravity · aerodynamic · unbalanced force · terminal velocity

1. Identify two forces mentioned in the text that act against Nova's movement. (2 marks)

2. What does the text suggest happens to Nova's speed when she pulls her wings close to her body? (2 marks)

3. Explain why air resistance is described as a type of friction. (3 marks)

4. Compare and contrast the effect of gravity on Nova while she is flying versus when she is perched on a branch. Justify your answer. (4 marks)

5. Do you think flight would be more or less difficult for Nova if there were no air resistance? Explain your opinion. (3 marks)

Draw: Draw a diagram of Nova the owl in flight. Use arrows to label the forces acting upon her: Gravity (pointing down), Lift (pointing up), and Air Resistance (pointing against her direction of travel).



Extension challenge: Imagine Nova needs to carry a heavy twig to her nest. Write a short paragraph explaining how this additional mass would change the forces acting on her. What might happen if the twig is not aerodynamic?