

AERONAUTICAL ENGINEERING TEAM CHALLENGE

DURATION

75-90 minutes

AGE GROUP

12-14 years old

THEME

Aerodynamics, Engineering, and Teamwork



OBJECTIVE

Students will form engineering teams to design, build, and test advanced paper airplanes, focusing on aerodynamic principles, data analysis, and iterative design processes.

MATERIALS (PER TEAM)

- 10 sheets of A4 paper (various weights if possible)
- Tape, glue sticks, and paperclips
- Scissors
- Ruler and protractor
- Digital kitchen scale (for weight measurements)
- Smartphone with a flight time app (or stopwatch)
- Measuring tape
- Laptop/tablet for data recording and analysis (if available)

ACTIVITY BREAKDOWN

INTRODUCTION (10 MINUTES)

- Discuss advanced aerodynamic concepts: lift, drag, thrust, and weight.
- Introduce the engineering design process and importance of data-driven decisions.



TEAM FORMATION AND PLANNING (15 MINUTES)

Form teams of 4-5 students with roles:

- Lead Designer
- Aerodynamics Specialist
- Construction Engineer
- Test Pilot
- Data Analyst
- Teams research airplane designs and create an initial plan.



DESIGN AND CONSTRUCTION PHASE

(25 MINUTES)

Teams build at least two different airplane designs.

- Encourage application of advanced concepts:
- Wing aspect ratio
- Centre of gravity placement
- Control surfaces (ailerons, elevators)

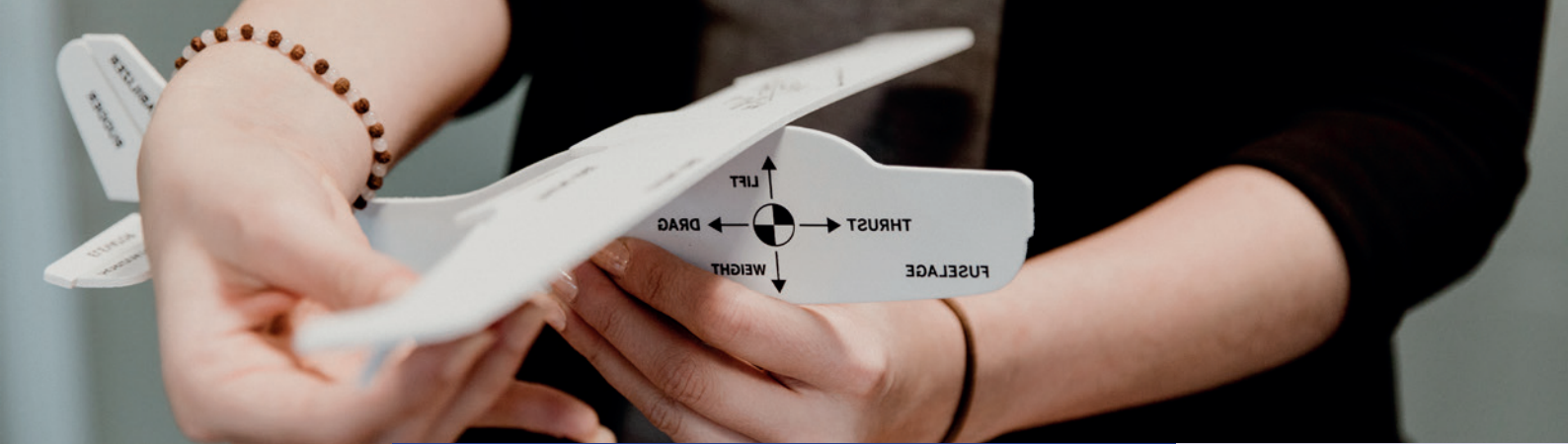
TESTING AND DATA COLLECTION PHASE

(20 MINUTES)

Conduct multiple tests for each design, measuring:

- Distance
- Flight time
- Stability (subjective rating)
- Weight
- Record data in a spreadsheet for analysis.





DATA ANALYSIS AND ITERATION

(15 MINUTES)

- Teams analyse their data to determine the most effective design elements.
- Make data-driven improvements to their best-performing design.

FINAL COMPETITION

(10 MINUTES)

Each team's best plane competes in categories:

- Longest distance
- Longest flight time
- Most accurate (landing on a target)
- Best weight-to-distance ratio

PRESENTATION AND REFLECTION

(10 MINUTES)

- Teams present their design process, data analysis, and conclusions.
- Discuss how iterative design and data analysis led to improvements.



ADVANCED AERODYNAMIC CONCEPTS TO EXPLORE

- Effect of wing shape on lift and drag
- Importance of weight distribution and centre of gravity
- Role of control surfaces in flight stability
- Impact of different paper weights on flight characteristics

EXTENSION IDEAS

- Introduce wind tunnel testing using a fan
- Explore computer-aided design (CAD) for airplane modelling
- Investigate the physics of flight through online simulations



LEARNING OUTCOMES

- Deepened understanding of aerodynamic principles and engineering processes
- Enhanced data collection, analysis, and interpretation skills
- Improved teamwork and communication in a technical context
- Development of critical thinking and problem-solving abilities in design challenges



AeroDiscover

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