

# AERONAUTICAL ENGINEERING

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## Talking points

### KNOWLEDGE

1. When was the first controlled powered flight?
2. What are the two fields of aerospace engineering?

### COMPREHENSION

3. How do the forces of thrust, lift and drag act on an aircraft?
4. What advantages does the wind tunnel test rig at the University of Bristol have over standard wind tunnel testing?
5. What are the challenges associated with developing and testing long, thin, flexible wings?

### APPLICATION

6. Apart from designing wind turbine blades, where else do you think aeronautical engineering techniques can be applied?

### ANALYSIS

7. What are the motivations for aeronautical engineers to make aircraft more efficient?
8. How does the shape of a wing affect the aircraft as a whole?

### EVALUATION

9. How do you think aircraft design might change in the future, and why?
10. What advantages do you think an apprenticeship would provide for an aeronautical engineer? What advantages would a university degree provide? Which pathway would you prefer to follow, and why?

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## Activity

### Design your own wind tunnel!

Using a fan or hairdryer, can you construct a wind tunnel? Collect model aeroplanes or design and build your own (from paper or other materials) and fly them in your wind tunnel. How does the shape of the aircraft and its wings impact the aircraft's flight performance in the wind tunnel?

The following resources provide suggestions for wind tunnel designs:

- [www.questacon.edu.au/learn-and-play/activities/build-wind-tunnel](http://www.questacon.edu.au/learn-and-play/activities/build-wind-tunnel)
- [www.grc.nasa.gov/www/k-12/WindTunnel/build.html](http://www.grc.nasa.gov/www/k-12/WindTunnel/build.html)

You can also test wing designs in a virtual wind tunnel:

- [www.teachengineering.org/activities/view/cub\\_airplanes\\_lesson02\\_activity1](http://www.teachengineering.org/activities/view/cub_airplanes_lesson02_activity1)

## More resources

- NASA has a wealth of classroom resources related to aeronautical engineering: [www.grc.nasa.gov/www/k-12/TRC/Aeronautics/AeronauticsActivitiesHome2.htm](http://www.grc.nasa.gov/www/k-12/TRC/Aeronautics/AeronauticsActivitiesHome2.htm)
- NASA also has activities about aeronautical engineering on Mars, including a video game where you can practise your computer coding skills while flying a virtual Mars helicopter: [www.nasa.gov/aeroresearch/nasa-aeronautics-on-mars-and-earth](http://www.nasa.gov/aeroresearch/nasa-aeronautics-on-mars-and-earth)
- AIAA is another source of teaching resources related to aerospace: [www.aiaa.org/get-involved/students-educators/k-12-teacher-resources](http://www.aiaa.org/get-involved/students-educators/k-12-teacher-resources)
- The Royal Academy of Engineering has a selection of engineering-themed resources: [raeng.org.uk/education-and-skills/schools/stem-resources](http://raeng.org.uk/education-and-skills/schools/stem-resources)
- This video explains how aerodynamic lift allows aircraft to fly: [www.youtube.com/watch?v=E3i\\_XHIVCeU](https://www.youtube.com/watch?v=E3i_XHIVCeU)