

# ZERO EMISSION FLIGHT ENERGY CHALLENGE

## Student worksheet

Do you know about gliding?



A time-lapse of a winch launch (Photo cred: Callum McEachen)



An aerotow (Photo cred: Lucy Wootton)

Do you know what a glider can do? It's an awesome way to fly, and glider pilots fly hundreds of kilometres at speeds of over 100kph, just using renewable energy from the sun and the wind. To get into the air, they have to be launched using a winch, a bungee or be towed by a light aircraft.

**Your challenge: Launch and fly a glider and observe how energy is transferred during the flight**

### What you need:

- A4 card and paperclips for the glider
- A launch machine comprised of ramp and a launch bungee – a board, elastic bands, drawing pins – or use the launch machine made as part of a Gliding Design and Technology STEM unit.

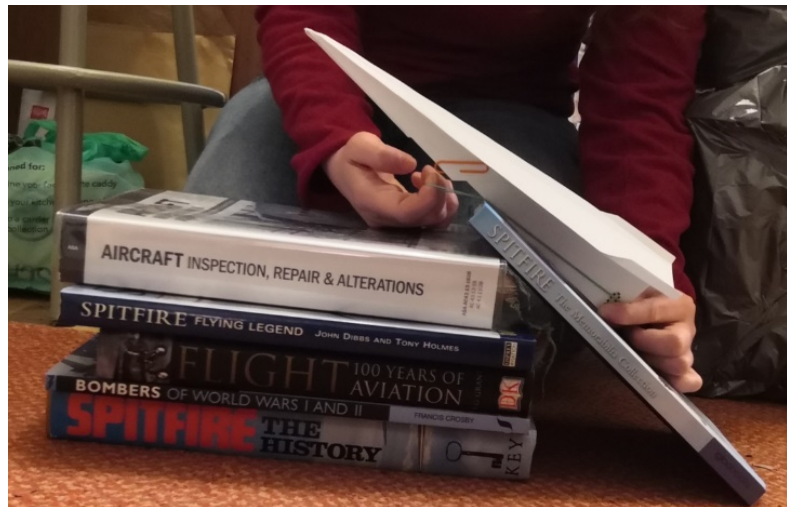
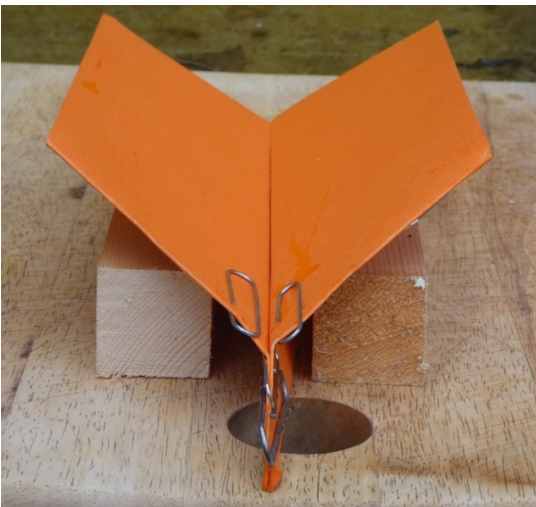
### The Challenge:

1. Make your glider out of card or paper and use paperclips to adjust the nose-weight so it is stable when it flies - **the glider must fly smoothly, not pitch up and stall.** Templates for two 'standard' designs of glider are attached which match the designs shown in the photographs below.
2. Make your launch machine.

## Gliding STEM Resources

3. Launch a glider!
4. Adjust the glider and launch machine until you can repeatedly achieve stable flight. You might need to adjust:
  - the amount of energy transferred to the glider during the launch i.e. how much you stretch the elastic band
  - the angle of the launch ramp
  - the ballast on the nose of the glider
  - the angle of the glider wings to the fuselage.
5. Carefully observe the stages in the flight from start until the glider has landed and stopped.
6. Answer the challenge questions.

If you are not using a launch machine made in another STEM session, the pictures below give you some ideas of how you could make your glider and ramp:



### Challenge Questions

1. What gives the glider energy to start its flight?

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2. List the different energy stores involved during the flight

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## Gliding STEM Resources

3. List the key points in the flight where energy has transferred from one store to another

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4. Why doesn't the glider carry on forever?

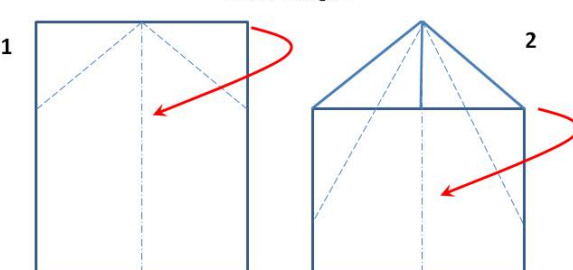
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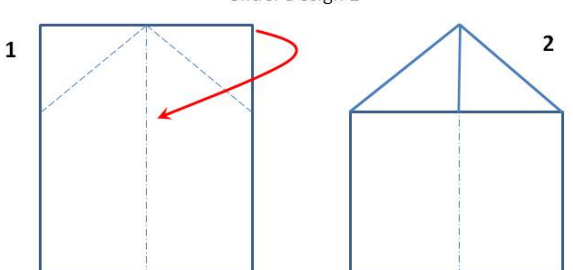
5. Construct an energy transfer diagram for the flight – use a separate sheet of paper.

### Glider Designs:

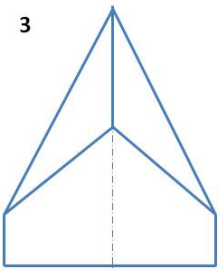
Glider Design 1



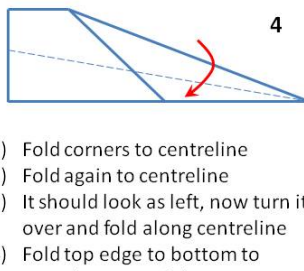
Glider Design 2



3

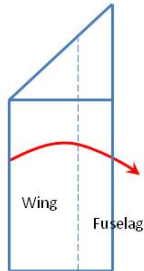


4




1) Fold corners to centreline  
 2) Fold again to centreline  
 3) It should look as left, now turn it over and fold along centreline  
 4) Fold top edge to bottom to complete your glider

3



2-3 cm

4



1) Fold corners to centreline  
 2) Turn it over and fold along centreline  
 3) Fold outside edges to leave a 2-3cm high 'fuselage'  
 4) Now open the wings back up symmetrically either side of the fuselage

***We hope you had fun demonstrating energy transfer and looking at the types of energy used to launch and fly gliders.***

***Try gliding for real at a gliding club near you – did you know that you can fly a glider solo aged 14 once you have completed your training? Find your nearest club at <https://www.gliding.co.uk/club-finder/>***



*glider dumping water ballast*

***Find out more about GLIDING at the links below, all types of AVIATION at [airleague.co.uk](http://airleague.co.uk) & CAREERS at [stem.caa.co.uk/careers-in-aviation-and-aerospace](http://stem.caa.co.uk/careers-in-aviation-and-aerospace)***

***We hope to see you on an airfield soon!***