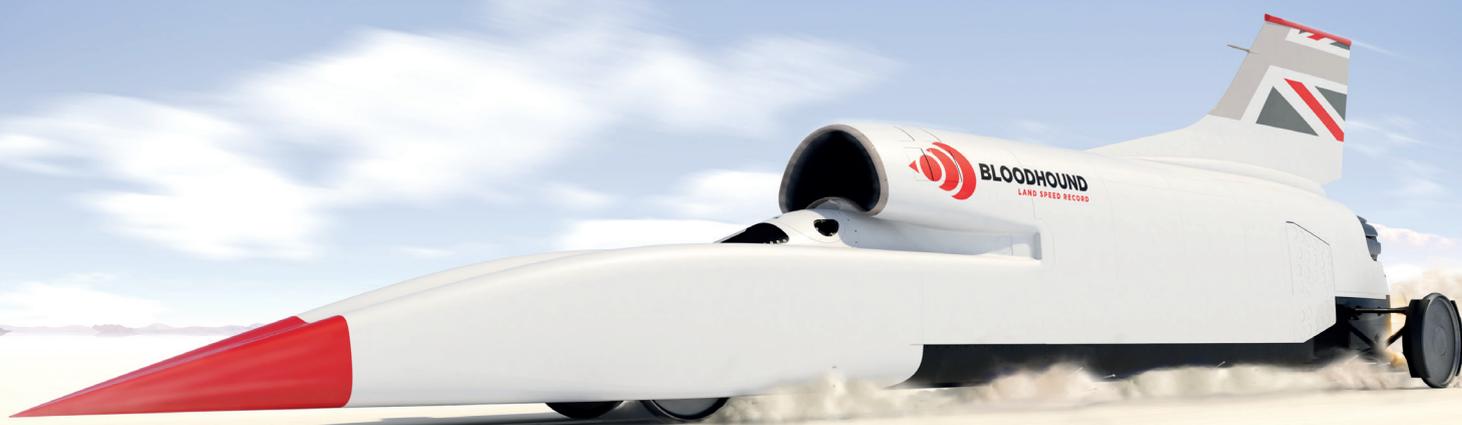


# DESERT WHEELS

KEY STAGE 3 STEAM PROJECT



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ALUMINIUM FEDERATION

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**BLOODHOUND**  
E D U C A T I O N

# WHO ARE WE?

Welcome to our Desert Wheels key stage 3 project. Here's a quick guide to who Bloodhound are, what the project is about and what you are able to achieve.

## About Bloodhound Education

Bloodhound Education is a registered charity which provides exciting, hands-on science, technology, engineering and maths (STEM) activities for students aged 7 upwards, as well as resources for teachers and parents to support learning in the classroom. It takes the excitement of real engineering into schools through engineering challenges, projects and workshops, using links to projects like Bloodhound LSR (Land Speed Record).

## What is Bloodhound LSR

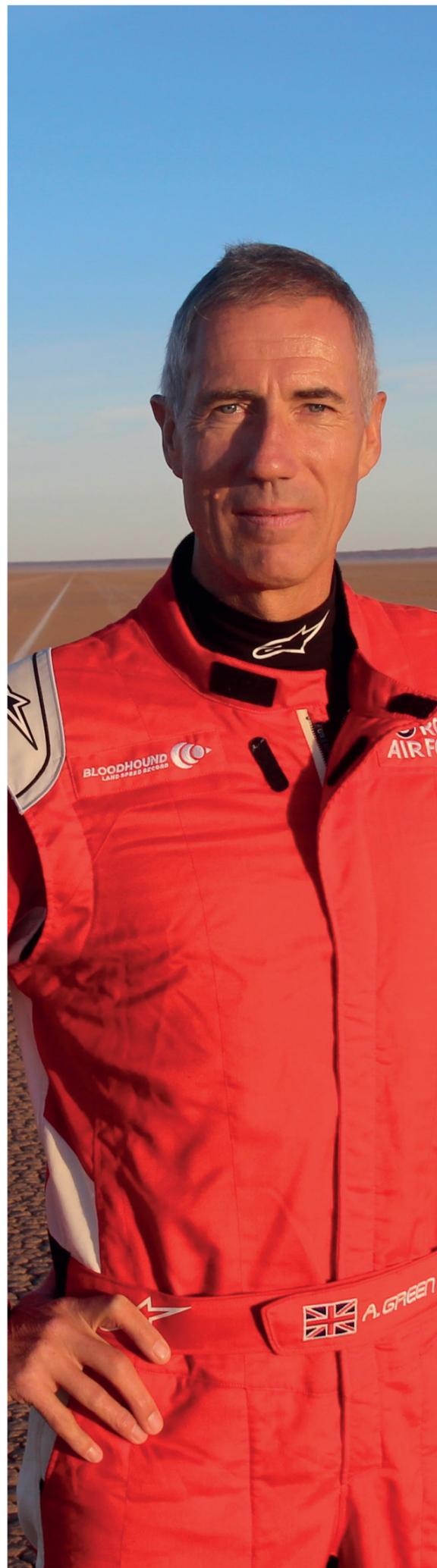
This is a UK-based project aiming to break the world land speed record using the most advanced straight-line racing car ever built with the objectives of:

- Building a car to beat the land speed record of 763mph – faster than the speed of sound.
- To push boundaries to make engineers think in new ways and develop new technology.
- Inspire a new generation into the exciting world of engineering in order to build a better future.

## About this project

This STEAM project is inspired by the Bloodhound Land Speed Record. The aim of the project is to use science, technology, engineering, arts and maths to design and build wheels for a model car which can then be tested on a simulated desert track.

The teams will be required to design and test wheels for the model car created from aluminium. Aluminium has many benefits including the fact it is an excellent heat & electricity conductor. It can reflect 95% of the solar energy it absorbs, making an aluminium roof more energy efficient. It also acts as a heat sink for computers and LED lights where heat needs to be rapidly drained away.



## Ideas of when to run the project

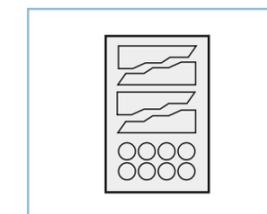
You will be able to run this project as:

- An extra-curricular activity
- Full day whole school project
- Full day whole class project
- Half term project
- Transition events
- Open days/evenings
- Homework challenge

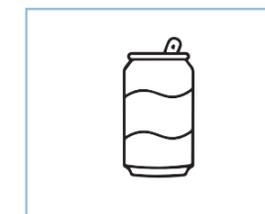
## Aims of the project

- For young people to fully immerse in a real-world problem-solving challenge
- Team building activities
- Use of collaborative structures
- Engage reluctant learners
- Encourage those under-represented in these areas.

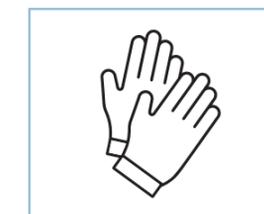
## What you need to complete the project



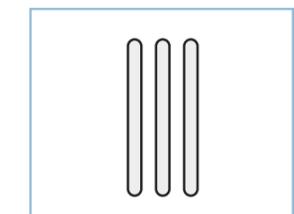
**MODEL CAR TEMPLATE**  
(IN THIS ACTIVITY PACK)



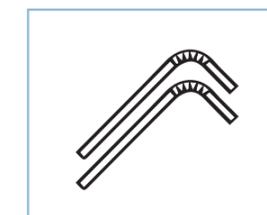
**ALUMINIUM CANS**  
MAKE SURE THESE ARE NOT  
MAGNETIC – CLEAN AND NOT  
CRUSHED



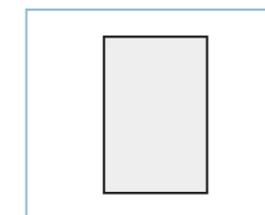
**CHILDREN'S GARDENING  
GLOVES**  
RUBBERISED ARE IDEAL SO THE  
CHILDREN CAN USE SCISSORS  
EASILY WHEN WEARING THEM



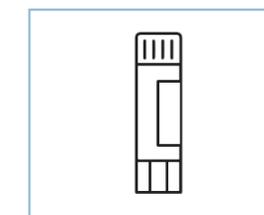
**GARDEN STICKS OR  
DOWELS**  
2 FOR EACH TEAM



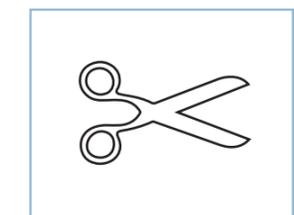
**PAPER STRAWS**  
2 PER TEAM OF FOUR



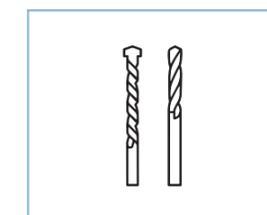
**CARD OR CEREAL BOXES  
FOR THE MODEL CAR KITS**  
1 PER TEAM



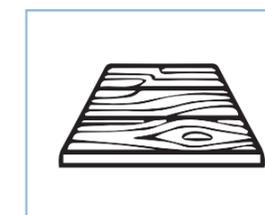
**GLUE STICKS**



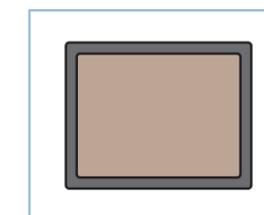
**SCISSORS**



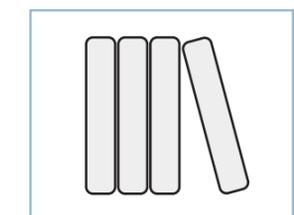
**METAL DRILL BITS**  
SLIGHTLY SMALLER DIAMETER  
THAN THE GARDEN STICKS



**WOODEN PLANK OR  
SIMILAR FOR THE CAR  
RAMP**  
ABOUT 30CM WIDE X  
50 CM LONG



**ACCESS TO AS SANDY  
AREA, OR A LARGE TRAY,  
SAND AND SOIL TO  
SIMULATE THE DESERT  
SURFACE**



**ACCESS TO A LIBRARY  
OR THE INTERNET FOR  
RESEARCH INTO WHEEL  
DESIGNS**



## BLOODHOUND ON YOUTUBE

Scan the QR code using your phone, tablet or computer to watch all our Bloodhound Education videos on YouTube.

# KS3 CURRICULUM LINKS



**The Desert Wheels project can be used in a variety of ways, across many areas of the curriculum. Here's some of the ways you can incorporate it into your curriculum.**

## **Science**

Enquiry process, forces, energy, materials and matter.

## **Technology**

Design, make, evaluate, technical knowledge.

## **Engineering**

Design and make to solve real world problems.

## **Arts**

Design in the style of a famous artist, explore ideas, evaluate and analyse creative work.

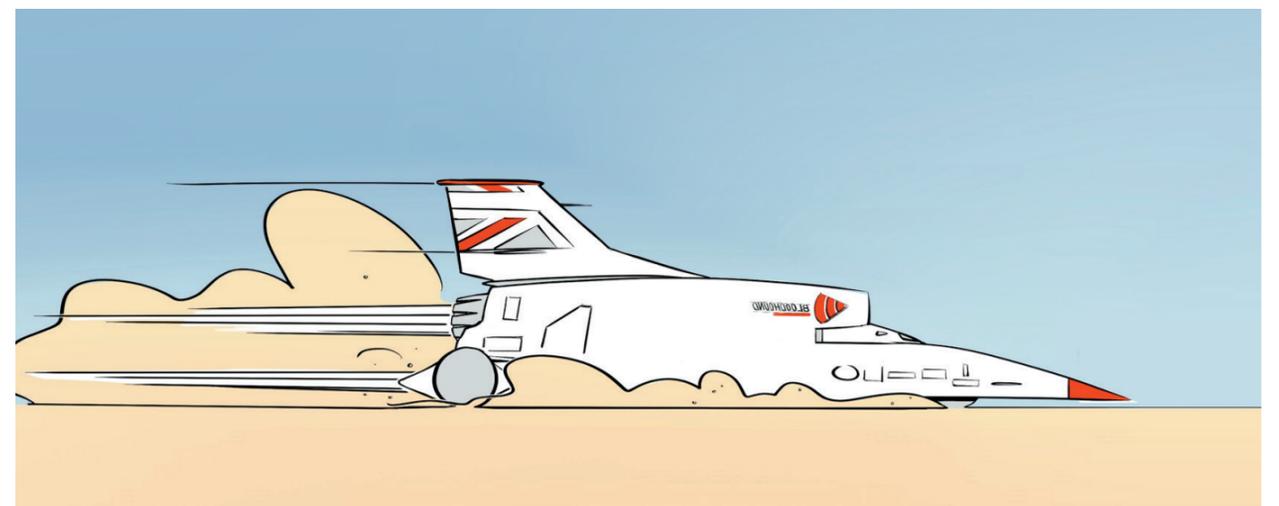
## **Maths**

Working mathematically, shapes, variables, problem solving, mathematical reasoning.

# HOW DO YOU BUILD THE FASTEST WHEELS ON EARTH?

**The wheels need to be for the Bloodhound LSR team - they are inviting you to become part of the team for the project!**

They need to spin over 10,000 times a minute without breaking, over a dry lake bed, at up to 1,000 miles per hour. The wheels have a pointed profile to help them dig into the desert surface for grip. It's now your role to build a prototype! Are you up for the challenge?



## DESIGNING THE WHEELS

Find out more about how the wheels are designed by scanning the QR code using your phone, tablet or computer.

# HOW THE PROJECT WORKS

**Follow these steps and learn how to build your prototype Bloodhound LSR car and investigate which wheels perform the best!**



## Step 1

Place young people into teams to complete the project. Ideally, they will work in teams of four, you would be able to assign each member of the team a job role to complete the project within their team

Introduce teams to BLOODHOUND LSR by watching the videos via the QR codes.

Have a discussion, have any of the young people heard of the project? Do they know the purpose of BLOODHOUND LSR? (to test new technologies, encourage innovation, and inspire a new generation into STEAM careers).

## Step 2

Start the project by setting the young people a homework task linking to 'reduce, reuse, recycle'. The first challenge is for them to collect clean (not crushed) aluminium cans, cereal boxes and paper straws.

This could become a whole school and community recycling initiative in which a collection point would be created for people to place the cans ready to use for the project. Young people could design posters and adverts

to encourage people to contribute to the project plus give a presentation in assembly and write an article for the school newsletter explaining the need for the can collection and the importance of recycling in the community.

## Step 3

Young people now help test the cans with a magnet to make sure they're not steel (Do not use STEEL cans as they are hazardous to work with, they are more elastic meaning they are harder to manipulate and more likely to cause cuts.



## Step 4

Using the library or iPads research metal wheel designs. Looking for inspiration? Research how metal wheels are designed and used on the Mars Rover vehicles.

## Step 5

Design the wheels making sure the young people are closely supervised to cut and shape the aluminium cans into wheels. They should keep the gloves on at all times, including clearing up the waste - which can then be recycled.



## Step 6

Build a model Bloodhound Car using the template for each team (following the instructions later in this pack). For this step you will require: cereal box cardboard, scissors, a sharp pencil, two garden sticks and two straws to form the basis car chassis.

## Step 7

### Create your own model Hakskeen Pan Race Track

Set up a simple ramp over a sandy area, or spend time mixing soil, sand and water in a tray allowing it evaporate into an authentic Hakskeen Pan surface.



## Step 8

### Test the Wheels

Encouraging the teams to use the interactive design process, of prototyping, testing, analysing and refining to design the fastest wheels possible.

Each team drops their car off a ramp onto a desert surface, measuring the distance travelled and the time taken to calculate the speed of the car. Make sure each team is managing their variables. Emphasise the importance of keeping everything the same to make it fair. Encourage each team to come up with their own testing methodology, or follow the simple method featured in the activity pack. Ideas to think about: Were the wheels fast, strong and stable? How would each team improve the design?



# REFLECT ON YOUR LEARNING

What did you learn? Have time for reflection by having a class discussion, plan a poster, or record a news report detailing what the class discovered about designing and testing the wheels.

# LET'S GET STARTED!

# BUILD YOUR MODEL CAR

*It's time to build your model Bloodhound LSR car using the template on the next page.*

To make it fair, each team has the same model test car.

## **Step 1**

Print out the template then glue onto card - a cereal box works well.

## **Step 2**

Cut carefully along the green dotted line, then score along the black lines.

## **Step 3**

Apply glue to the striped blue sections then fold into shape, hold with paperclips, or weigh it down until dry.

## **Step 4**

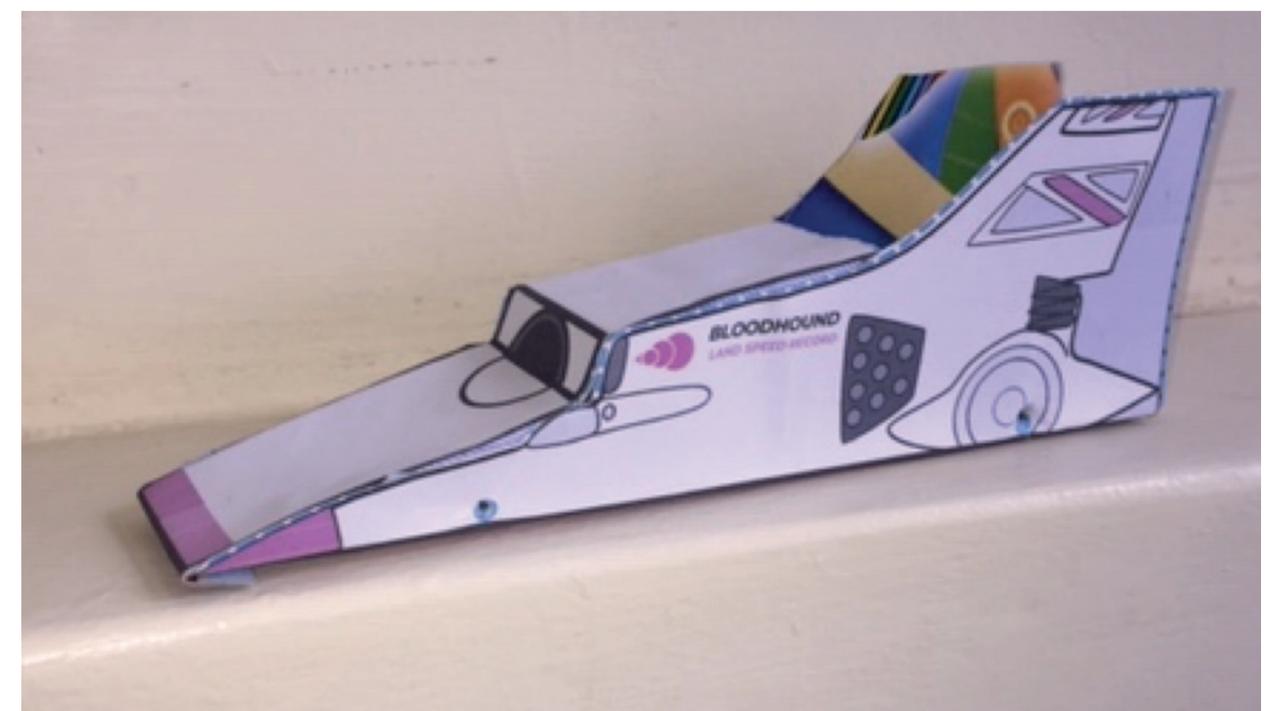
Use a sharp pencil to punch through the axle holes.

## **Step 5**

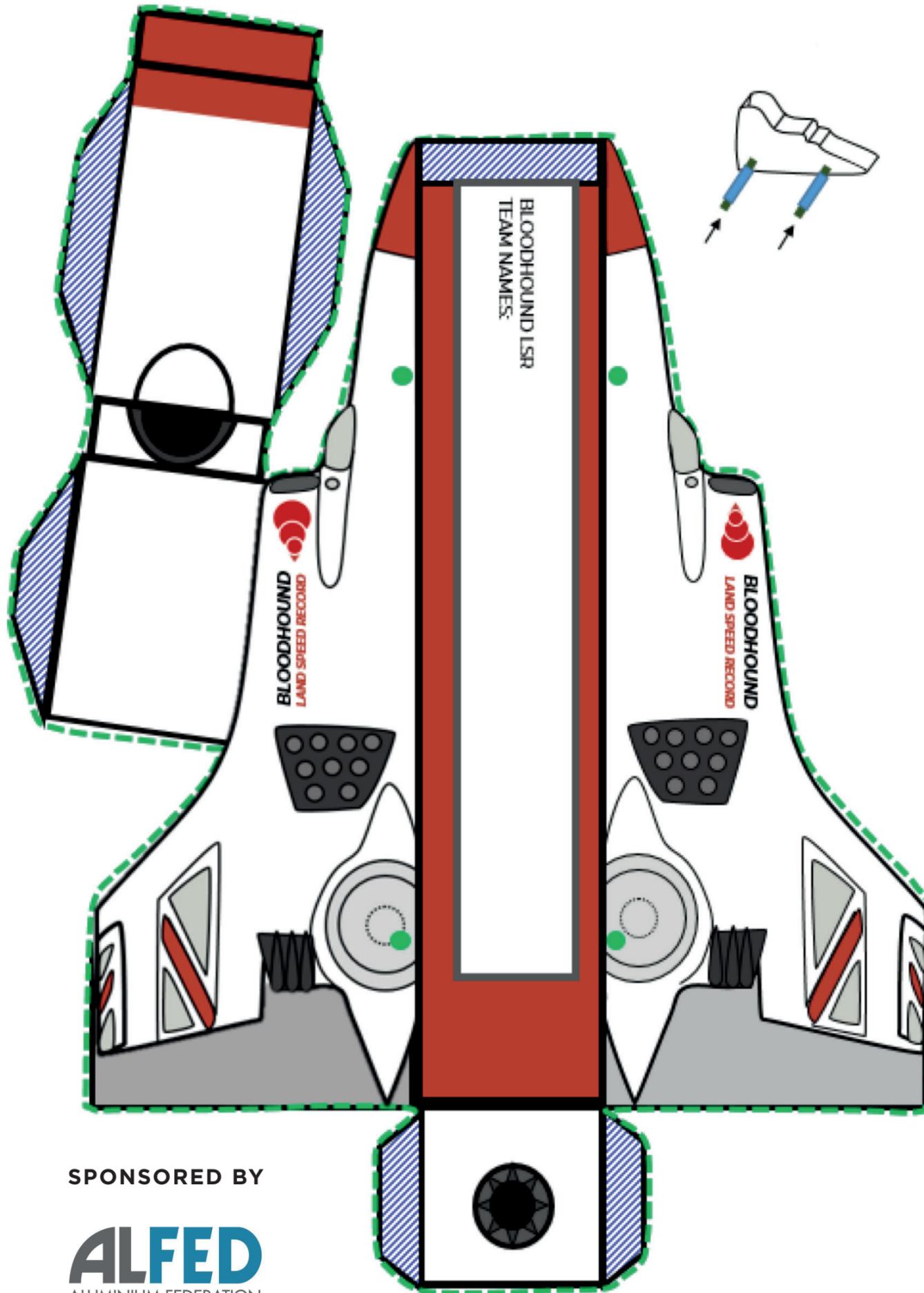
Measure and cut the garden sticks (2 x 12cm lengths) and straws (2 x 7cm) lengths for the axles.

## **Step 6**

Put each garden stick in a straw, then push through the holes, attach the metal wheels then test them out!



# RESEARCH YOUR WHEELS



*What shapes will help the car go fast?*

*What shapes help the car move over the rough track?*

*How can you stop the wheels breaking?*

*How could you cut and shape the aluminium cans safely?*

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# DESIGN AND MAKE YOUR OWN MODEL HAKSKEEN PAN RACE TRACK

**The Hakskeen Pan is a lake that evaporates and dries out in hot weather.**

Make your own model Hakskeen Pan by mixing sand, clay or soil, adding water and letting it evaporate or simply set up a ramp over a sandy area.



# DESIGN AND MAKE YOUR WHEELS

## SAFETY NOTES

Wear gloves to protect you from sharp edges. An adult could prepare some in advance by drilling a hole in the bottom, then cutting off the top of the cans for the team.



### Step 1

Pinch and nip to make the first hole in the can - avoid stabbing actions.



### Step 2

Cut down strips towards the base of the can.



### Step 3

Fold the flaps over, and drill holes at the ends to thread onto the axles.

## Sample Results Table

Material of wheel	Distance travelled	Time taken	Speed (speed = distance/time)

To achieve more accurate results, why not repeat your readings? Also, don't forget to include your units!

# MY DESERT WHEELS SCIENTIFIC INVESTIGATION

Take notes and detail your findings to help you draw conclusions. You never know what you might find out!

## I AM INVESTIGATING

## KEY WORDS

## EQUIPMENT

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## HYPOTHESIS

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## METHOD

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## CONCLUSION

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## DIAGRAM

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# TAKE IT FURTHER...

**Now you've completed your Desert Wheels project why not use these ideas?**

### **Test your car with wheels made from different materials**

Try rubber, plastic, card or paper. Think about size of the wheels. What other materials would you like to investigate and test? How will you record your results? Why not create a table then compare and contrast the different materials? What worked well, what did not work? Would you be able to combine materials to make the perfect wheel? What other testing would be required?

### **Build another model**

Build another model car using the template to test and record your results allowing you to run the cars against each other on trials.

### **Establish sponsors**

Are you able to establish sponsors for your model car from local companies as an enterprise project to allow you to research and develop your model and testing further? Invite companies into school in a Dragon's Den style pitch meeting plus involve parents/careers on an open evening or assembly to tell them all about your project and seek investment. Create posters for the event and get organising!

### **Set up a challenge**

Set up a challenge with a neighbouring school in your area or another school within your trust testing your model cars against each other. Run this as an extra-curricular event inviting parents/carers in to experience the event after school or why not turn it into an experience day? Compare the makes of your car, each team present their ideas and reasoning for the materials and the build before getting down to testing with prizes for the fastest cars, best presentation, best team work, best design and inventive ideas.

### **Find out more about the Hakskeen Pan testing area**

Investigate the geography and climate of the Hakskeen Pan testing area. Prepare a presentation including all of your findings including the climate, surface area and why it is idea for Bloodhound.

### **Try using a 3d printer**

Do you have access to a 3D printer or would you be able to hire one? If so, why not have a go at creating the wheels and print them in 3d?

### **Research careers**

Research careers linking to the project, how many different careers are you able to find? Create a careers fact file with a different career each page. Think about the whole project from the cleaners and caterers to the designers and the engineers. Why not invite someone from industry in one of these careers into school to talk about what they do and how they got there!

**VISIT  
US!**

Arrange a visit to the Bloodhound Education centre by contacting:  
[enquiries@bloodhoundeducation.com](mailto:enquiries@bloodhoundeducation.com)

# GET IN TOUCH

For more hands-on projects and learning resources go to our website:

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# SHARE YOUR PROJECT

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**#EdWorkshops**

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