

# BLOODHOUND SSC



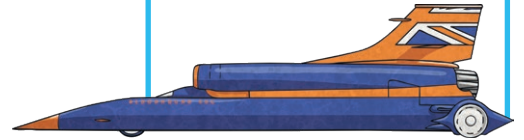
## The Project

- BLOODHOUND SSC is a supersonic car, which a specialist team of engineers and scientists have created using a range of cutting-edge technology in the attempt to build the fastest car in the world.
- It is a mixture of aircraft and car engineering. The team aim to beat the current World Land Speed Record of 763.035 mph (achieved by Andy Green in Thrust SSC, 1997).

BLOODHOUND SSC will cover one mile in a speedy 3.6 seconds!

## Objectives of the BLOODHOUND SSC Project

- Inspire the next generation about science, technology, engineering and mathematics. These are known as STEM subjects.
- Share a unique development program worldwide.
- Set a new World Land Speed Record of 1000mph.



### Did You Know?

The driver of the BLOODHOUND SSC is Andy Green. He was the driver of supersonic car, Thrust SSC. He is also a jet fighter pilot in the RAF and has flown the Tornado F3 on operations in the Balkans and the Middle East. Due to his work in the RAF, he is used to going at super speeds. His body will go through some extreme reactions whilst driving the supersonic car but they will be similar to those he has already experienced as a pilot.

## Objectives of the BLOODHOUND SSC Project

	Measurement	Interesting Fact
Weight	7.5 tonnes	This is equal to the weight of a small truck.
Length	13.4m	13.4m is equal to the length of a badminton court.
Speed	1000mph	1000mph is faster than the speed of a bullet leaving a gun.
Wheels	95kg per wheel	They are made from an aluminium and zinc combination.

**Did You Know?** Supersonic means the car will travel faster than the speed of sound.

## Design of BLOODHOUND SSC

The land speed record event will take place in the Hakskeen Pan Desert in South Africa.

A car that is designed to beat the land speed record needs a lot of power. For this reason, the car has three engines: a jet engine, rocket cluster and a Jaguar Supercharged V8 engine.

Due to the weight of the car, and the desert surface, the design of the desert wheel is very important. They have to carry the weight of the car and not fall apart when spinning approximately 170 times per second. It is also very important that they do not sink into the surface of the Hakskeen Pan and they must have enough grip to stop the car from sliding.

## Record requirements

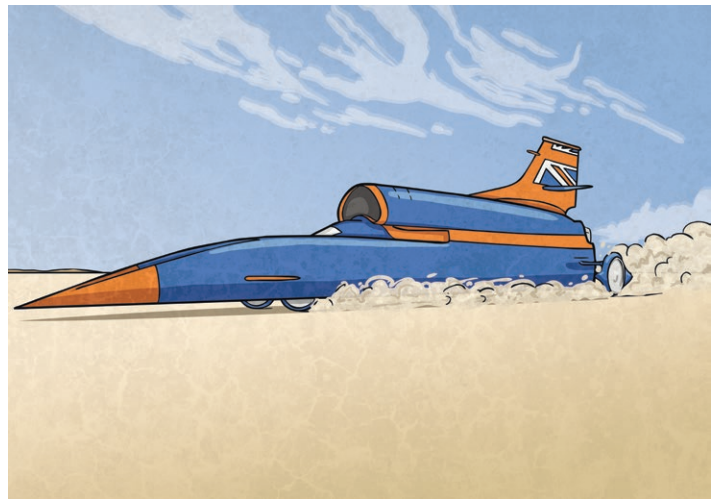
To qualify for the status of land speed world record, there are certain rules which must be followed.

- The vehicle must be in constant contact with the ground.
- The power and steering system must be constantly controlled by the driver on board the vehicle.
- The vehicle must pass through the measured mile (or km) in opposite directions, twice, and an average speed will be recorded.
- The attempt must not go over 1 hour.

## Braking

To bring a car travelling at 1000mph to a standstill, the braking system involves a series of steps. If normal brakes were used, they would simply burn when applied at that speed.

By opening two airbrakes either side of the car (in front of the rear wheels), the car will slow by 60mph every second. At 600mph, the car may also use parachutes to slow down. At 200mph, the wheel brakes can then slow the car to a halt.





# Questions

1. Look at the beginning of the text sub headed 'The Project'. Write two facts about BLOODHOUND SSC.

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2. Which word means the same as the word 'mixture'? Tick one.

equal

combination

hodgepodge

medley

3. Tick true or false for the following statements.

	True	False
BLOODHOUND SSC will travel at about the same speed as a bullet being fired.		
BLOODHOUND SSC is smaller in length compared to a badminton court.		
BLOODHOUND SSC is the same weight as a small lorry or truck.		
Each wheel is made from aluminium and zinc.		

Rewrite any false statements so that they are true.

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4. Rewrite one of the objectives of the project in your own words.

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5. Read the section sub-headed 'Did You Know?' Suggest two reasons to explain why Andy Green has been chosen to be the driver of BLOODHOUND SSC.

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6. Explain why different braking strategies have to be used to slow down BLOODHOUND SSC compared to a normal car.

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7. What is your opinion of the rules for the land speed world record? Choose one rule and explain why you think it has been included and whether you think that the rule is fair.

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8. Do you think the BLOODHOUND SSC will be successful? Explain your answer as fully as you can.

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# Answers

1. Look at the beginning of the text sub headed 'The Project'. Write two facts about BLOODHOUND SSC.

**Accept any two of the following: it is a supersonic car /designed by a specialist team /it is designed to be the fastest car in the world /designed to beat the world land speed record /it covers 1 mile in 3.6 seconds / it is a combination of aircraft and car engineering / it aims to beat the current world record (763.035) set by Andy Green in 1997.**

2. Which word means the same as the word 'mixture'? Tick one.

equal

combination

hodgepodge

medley

3. Tick true or false for the following statements.

	True	False
BLOODHOUND SSC will travel at about the same speed as a bullet being fired.		✓
BLOODHOUND SSC is smaller in length compared to a badminton court.		✓
BLOODHOUND SSC is the same weight as a small lorry or truck.	✓	
Each wheel is made from aluminium and zinc.	✓	

Rewrite any false statements so that they are true.

**BLOODHOUND SSC will travel faster than a bullet being fired.**

**BLOODHOUND SSC is equal in length to a badminton court.**

4. Rewrite one of the objectives of the project in your own words.

**Children's answers will vary but must link to one of the three objectives given.**

5. Read the section sub headed 'Did You Know?' Suggest two reasons to explain why Andy Green has been chosen to be the driver of BLOODHOUND SSC.

**(Accept any two answers) Andy green has been chosen to be the driver of**

**BLOODHOUND SSC because: he is used to travelling at fast speeds being a jet**

**fighter pilot /he has been used to being in risky situations /he knows what to expect**

**because he drove Thrust SSC in 1997 /he has had training as a pilot which will help him deal with the changes to his body when driving BLOODHOUND SSC.**

6. Explain why different braking strategies have to be used to slow down BLOODHOUND SSC compared to a normal car.

**BLOODHOUND SSC needs different braking strategies to brake compared to a normal car because normal brakes would burn because of the speed. The car will need to use airbrakes and parachutes to help it stop.**

7. What is your opinion of the rules for the land speed world record? Choose one rule and explain why you think it has been included and whether you think that the rule is fair.

**Answers will vary, however, children's answers must be backed up with evidence from the text. For example, I think it is fair that the vehicle must be controlled by the driver because people might cheat and get robots to drive the cars which is not really fair.**

8. Do you think the BLOODHOUND SSC will be successful? Explain your answer as fully as you can.

**Children's answers will vary but their answer must be supported by the text.**



## The Project

BLOODHOUND SSC is a supersonic car which a dedicated team of highly expert and experienced engineers, designers, mathematicians and scientists have created, using a range of cutting-edge technology, in the attempt to build the fastest car in the world.

Supersonic means the car will travel faster than the speed of sound.

It is a mixture of aircraft and car engineering. The team aims to beat the current British World Land Speed Record of 763.035 mph, achieved by Andy Green in Thrust SSC, 1997.

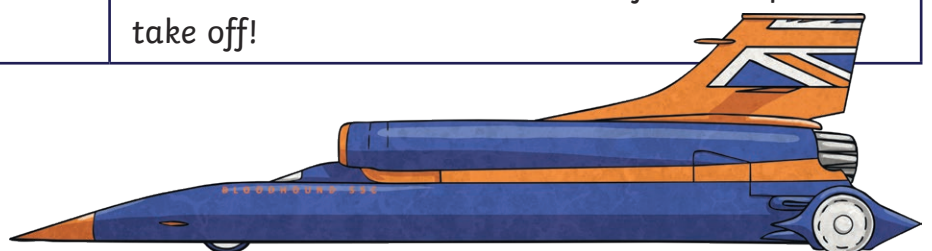
## Mission Statement of the BLOODHOUND SSC Project

The project aims to create a unique, high-technological project, focused around a 1000mph World Land Speed Record. BLOODHOUND SSC aims to share this engineering adventure with a global audience and inspire the next generation by bringing science, technology, engineering and mathematics (STEM) to life in the most exciting way possible.

BLOODHOUND SSC will cover one mile in a speedy 3.6 seconds!

## BLOODHOUND SSC statistics

	Measurement/ Material	Interesting Fact
Weight	7.5 tonnes	This is equal to the weight of a small truck.
Length	13.4m	13.4m is equal to the length of a badminton court.
Speed	1000mph	1000mph is faster than the speed of a bullet leaving a gun.
Wheels	95kg per wheel	They are made from an aluminium and zinc combination.
Monocoque	Carbon fibre	This material is the same as that used in racing cars.
Engine Sound	140 decibels	This is louder than the sound of a 747 plane at take off!



## The Engines

The Car has three engines:

Jet Engine	Rockets	Jaguar Supercharged V8 Engine
<p>Engines need thrust to generate enough power to get the car up to speed as quickly as possible.</p> <p>The jet engine will provide half of the thrust. It is an engine normally used in a Eurofighter Typhoon plane.</p>	<p>A cluster of hybrid rockets will be used when the car is going at 1000mph. They are hybrid rockets which means they are lower in cost and better for the environment. They will provide most of the thrust needed when the car is travelling.</p>	<p>This is needed to drive the rocket oxidiser pump. This pump provides the rocket with high test peroxide which keeps the rocket fuelled at 40 litres every second!</p>

## Finding a Suitable Location for a Land Speed Record

Finding the right location for an event like this is a challenge. A car travelling at 1000mph needs an environment free from plants and living creatures. The ground that the car will travel on needs to be even, hard and as smooth as possible. The area also needs to be 12 miles long and 1500m wide. The team did not want to build a track especially for the event as this would raise more environmental issues.

The car is going to run on a dried lake bed in South Africa, called Hakskeen Pan. It is a bit like an apple crumble – it has a hard crust on top and softer layer underneath. In South Africa, there are only two seasons, wet and dry, so BLOODHOUND have to time their visit carefully. It is the flattest place on Earth. Over the 12-mile track, the land drops by just 40cm, making it flatter than a snooker table. Over 300 people have had to clear the track by hand. Anything larger than a pea has been removed.

## Record requirements

To qualify for the land speed world record, there are certain rules which must be followed.

- The vehicle must be in constant contact with the ground.
- The power and steering system must be controlled by the driver onboard the vehicle.
- The vehicle must pass through the measured mile (or km) twice, in opposite directions, and an average speed will be recorded.
- The attempt must not go over 1 hour.





# Questions

1. In 'The Project' section, what do you learn about the team who have built BLOODHOUND SSC?

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2. Define 'cutting-edge technology'.

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3. Tick true or false for the following statements.

	True	False
The car's wheels are made from carbon fibre.		
BLOODHOUND SSC is roughly the same length as a badminton court.		
A 747 plane will not be as loud as the BLOODHOUND's engine.		
The car will travel one mile in 4 seconds.		
Carbon fibre is also used to make racing cars.		

Rewrite any false statements so that they are true.

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4. Summarise the three main points of the mission statement.

- 1)
- 2)
- 3)

5. Write three alternative words for 'inspire'. You may use a thesaurus.

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6. Choose two factors that needed to be considered when searching for a suitable location for the land speed record and explain why you think they had to be considered.

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7. What are the benefits of using a hybrid rocket?

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8. There are rules that must be followed when attempting to beat the land speed record. Each rule is there for a reason. Pick two and suggest why the rule is needed.

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9. Do you predict the BLOODHOUND SSC will be successful? Explain your answer using evidence from the text.

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# Answers

1. In 'The Project' section, what do you learn about the team who have built BLOODHOUND SSC?

**Answers will vary but may include: the team are very specialised /the team have been working in these subject areas for a long time /that they are hardworking (dedicated reference) and knowledgeable in STEM subjects.**

2. Define 'cutting-edge technology'.

**Cutting-edge technology means advanced technology, the latest available.**

3. Tick true or false for the following statements.

	True	False
The car's wheels are made from carbon fibre.		✓
BLOODHOUND SSC is roughly the same length as a badminton court.		✓
A 747 plane will not be as loud as the BLOODHOUND's engine.	✓	
The car will travel one mile in 4 seconds.		✓
Carbon fibre is also used to make racing cars.	✓	

Rewrite any false statements so that they are true.

**The wheels are made from a combination of aluminium and zinc.**

**The monocoque is made from carbon fibre.**

**BLOODHOUND SSC is equal in length to a badminton court.**

**The car will travel one mile in 3.6 seconds.**

4. Summarise the three main points of the mission statement.

**Children's answers will vary but may include:**

**1) Create a vehicle to beat the land speed record and reach 1000mph.**

**2) Inform the world about the project.**

**3) To inspire the next generation to get involved with science, technology, engineering and mathematics.**

5. Write three alternative words for 'inspire'. You may use a thesaurus.

**Answers will vary. Possible suggestions: encourage, motivate, influence.**

6. Choose two factors that needed to be considered when searching for a suitable location for the land speed record and explain why you think they had to be considered.

**Accept any two: free from plants/free from living creatures /ground needs to be even/hard/smooth/flat as possible/area 18km long/1500m wide. Children will explain why their chosen points are important.**

7. What are the benefits of using a hybrid rocket?

**The benefits of using a hybrid rocket is that it is cheaper and better for the environment.**

8. There are rules that must be followed when attempting to beat the land speed record. Each rule is there for a reason. Pick two and suggest why the rule is needed.

**Answers will vary. Possible suggestions:**

- The vehicle must be in constant contact with the ground.  
**So that a team doesn't build a vehicle that flies, which would mean it is no longer a land speed world record.**
- The power and steering system must be constantly controlled by the driver on board the vehicle.  
**So that a computer or robot couldn't be used to operate the vehicle.**
- The vehicle must pass through the measured mile (or km) twice, in opposite directions, and an average speed will be recorded.  
**So that the competition is fair and everyone goes the same distance the same amount of times.**
- The attempt must not go over 1 hour.  
**So that there is no danger of some teams taking as long as they like and rebuilding parts of the car which would not be fair for other competitors.**

9. Do you predict the BLOODHOUND SSC will be successful? Explain your answer using evidence from the text.

**Answers will vary but must be supported by evidence from the text.**



## The Project

BLOODHOUND SSC is a supersonic car which a specially chosen team of engineers, designers, mathematicians and scientists - hugely respected for their expertise and experience - have created using a range of cutting-edge technology. Their aim: to build the fastest car in the world!

The car has been built using a combination of aircraft and car engineering. The record attempt is aiming to beat the current British World Land Speed Record of 763.035 mph, achieved by Andy Green in Thrust SSC, 1997.

### Did You Know?

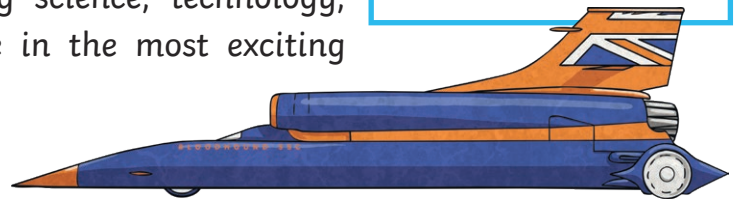
Supersonic refers to something that travels faster than the speed of sound!

## Mission Statement of the BLOODHOUND SSC Project

The project aims to create a unique, high-technological project, focused around a 1000mph Land Speed Record attempt. BLOODHOUND SSC aims to share this engineering adventure with a global audience and inspire the next generation by bringing science, technology, engineering and mathematics (STEM) to life in the most exciting way possible.

BLOODHOUND SSC will cover one mile in a speedy 3.6 seconds!

## BLOODHOUND SSC statistics



	Measurement/ Material	Interesting Fact
Weight	7.5 tonnes	This is equal to the weight of a small truck.
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Speed	1000mph	1000mph is faster than the speed of a bullet leaving a gun.
Wheels	95kg per wheel	They are made from an aluminium and zinc combination.
Monocoque	Carbon fibre	This material is the same as that used in racing cars.
Engine Sound	140 decibels	This is louder than the sound of a 747 plane at take off!
Rocket	3000°C	Astonishingly, this is twice the temperature of a volcano!

# Designing the Fastest Car in the World

## The Engines

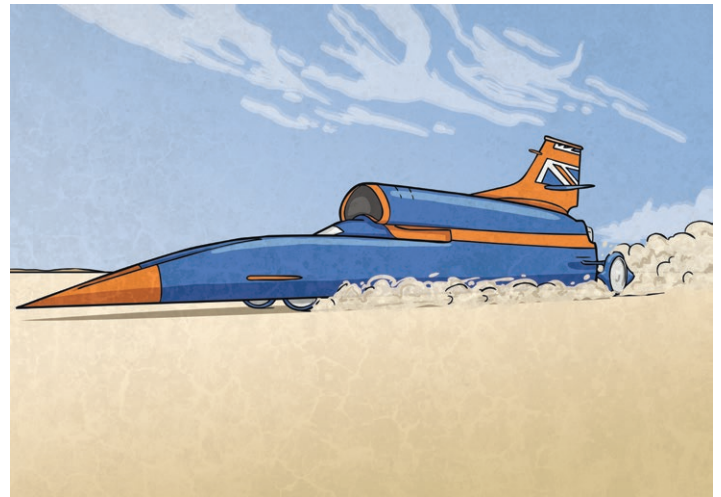
The Car has three engines:

Jet Engine	Rockets	Jaguar Supercharged V8 Engine
<p>Engines need thrust to generate enough immediate power to get the car up to 650mph as quickly as possible.</p> <p>The jet engine will provide half of the thrust. It is an advanced military engine normally used in a Eurofighter Typhoon plane.</p>	<p>A cluster of hybrid rockets will be used when the car is going faster than 650mph. They are hybrid rockets which means they are lower in cost and better for the environment. They will provide most of the thrust needed when the car is travelling.</p>	<p>This is needed to drive the rocket oxidiser pump. This pump provides the rocket with high test peroxide which keeps the rocket fuelled at 40 litres every second!</p>

## Aerodynamics

It is vital that when building something like a supersonic car, that aerodynamics – the force effect on objects travelling through air – is considered. When any object is moving at any speed, it disturbs the space ahead of it by forming sound waves. These waves carry information to the air molecules warning them that something is coming. If an object travels faster than the sound waves, they don't have time to send the information, so they 'bunch up' right in front of the object. This forms a sonic boom shockwave, which is heard when something breaks through the sound barrier.

Special tests have been carried out to understand the effect of the shockwaves and the pressure they add to the car.



## Finding a Suitable Location for a Land Speed Record

Finding the right location for an event like this is a challenge. A car travelling at 1000mph needs an environment free from vegetation and any living inhabitants. The ground needs to be even, hard and as smooth as possible. They also need the area to be 12 miles long and 1500m wide. The team didn't want to build a race track especially for the event as this would have ecological implications.

Thankfully, a computer program which analysed satellite images of the world could find suitable sites. This programme returned thousands of possibilities, but with the help of computer maps and narrowing the search down using a range of criteria, a location was finally found: Hakskeen Pan, South Africa. The car will run on this dried lake bed. It is a bit like an apple crumble – it has a hard crust on top and softer layer underneath.

In South Africa, there are only two seasons, wet and dry, so BLOODHOUND have to time their visit carefully. It is the flattest place on planet Earth. Over the 12-mile track, it drops by just 40cm making it flatter than a snooker table. Over 300 people have had to clear the track by hand. Anything larger than a pea has been removed.





# Questions

1. Look at the first two paragraphs of the text. How would you describe the BLOODHOUND team?

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2. Summarise the main features of the BLOODHOUND SSC. Use as much detail as possible.

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3. Look at the mission statement. Why do you think the BLOODHOUND SSC Project is described as an 'engineering adventure'?

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4. Explain why choosing a location for the land speed record is a challenge.

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5. Why do you think the team needed to use satellite images of the world to find a suitable place to run the car?

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6. There are three engines in the BLOODHOUND SSC. Explain why three are needed and how they work together to make the car the fastest car in the world.

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7. Find and copy the phrase in the 'Aerodynamics' section that shows how important it is to consider aerodynamics when building a car.

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8. Tick to show which statements are facts and opinions.

Statement	Fact	Opinion
The BLOODHOUND SSC's rocket will be twice the temperature of a volcano.		
The BLOODHOUND SSC is the most important car in history.		
The wheels weigh 95kg each.		
A supersonic car goes faster than the speed of sound.		

9. What might be the benefits of this project be? Would there be any negative aspects? Explain your ideas as fully as you can.

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10. Predict whether you think the BLOODHOUND SSC will succeed in breaking the land speed record. Support your answer with evidence from the text.

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# Answers

1. Look at the first two paragraphs of the text. How would you describe the BLOODHOUND team?

**Children's answers may vary. Possible answers include: the team must be highly valued and respected to have been especially chosen /they are very good at their jobs to be working on a project like this /must have a vast amount of knowledge and experiences /able to use new technology.**

2. Summarise the main features of the BLOODHOUND SSC. Use as much detail as possible.

**Children's answers will vary but may include facts such as: The BLOODHOUND SSC is a supersonic car designed to travel at 1000mph, which means it will be faster than a bullet leaving a gun! It has aluminium and zinc combination wheels, each weighing 95kg, and a front section made of carbon fibre like a racing car. The car is 13.4m which is the same as the length of a badminton court, and weighs a staggering 7.5 tonnes which is the same as a small truck. The sound of the engine will be louder than a 747 at take-off.**

3. Look at the mission statement. Why do you think the BLOODHOUND SSC Project is described as an 'engineering adventure'?

**Answers will vary but must make reference to the use of the word 'adventure'. For example: The BLOODHOUND SSC Project is described as an engineering adventure because there are so many new technologies and engineering techniques being used, and nobody knows what the outcome of the project will be.**

4. Explain why choosing a location for the land speed record is a challenge.

**Answers will vary but may include: Choosing a location would be a challenge because so many things need to be considered. There can be no vegetation/people living nearby/the ground needs to be hard/even/smooth/the track needs to be 18km long and 1500m wide.**

5. Why do you think the team needed to use satellite images of the world to find a suitable place to run the car?

**Answers will vary but may include: The team needed satellite images of the world to help because they don't have the time or money to travel the world and check out possible sites for the event. They needed the search narrowed down to possible places quickly so they could carry on with their plans.**

6. There are three engines in the BLOODHOUND SSC. Explain why three are needed and how they work together to make the car the fastest car in the world.

**Children's answers will vary but should make reference to each engine. Three different types of engines are needed to provide the vital thrust to power the car up to supersonic speeds. The jet engine will be used first as this will provide half of the thrust needed to get the car quickly up to 650mph. Then the rockets will be used to get the car to 800 and then later 1000mph. The Jaguar Supercharged V8 engine drives the rocket oxidiser pump which in turn fuels the rocket with 40 litres a second.**

7. Find and copy the phrase in the 'Aerodynamics' section that shows how important it is to consider aerodynamics when building a car.

**It is vital.**

8. Tick to show which statements are facts and opinions.

Statement	Fact	Opinion
The BLOODHOUND SSC's rocket will be twice the temperature of a volcano.	✓	
The BLOODHOUND SSC is the most important car in history.		✓
The wheels weigh 95kg each.	✓	
A supersonic car goes faster than the speed of sound.	✓	

9. What might be the benefits of this project be? Would there be any negative aspects? Explain your ideas as fully as you can.

**Answers will vary but must refer to specific facts from the text.**

10. Predict whether you think the BLOODHOUND SSC will succeed in breaking the land speed record. Support your answer with evidence from the text.

**Answers will vary but children must support their opinion with ideas from the text.**