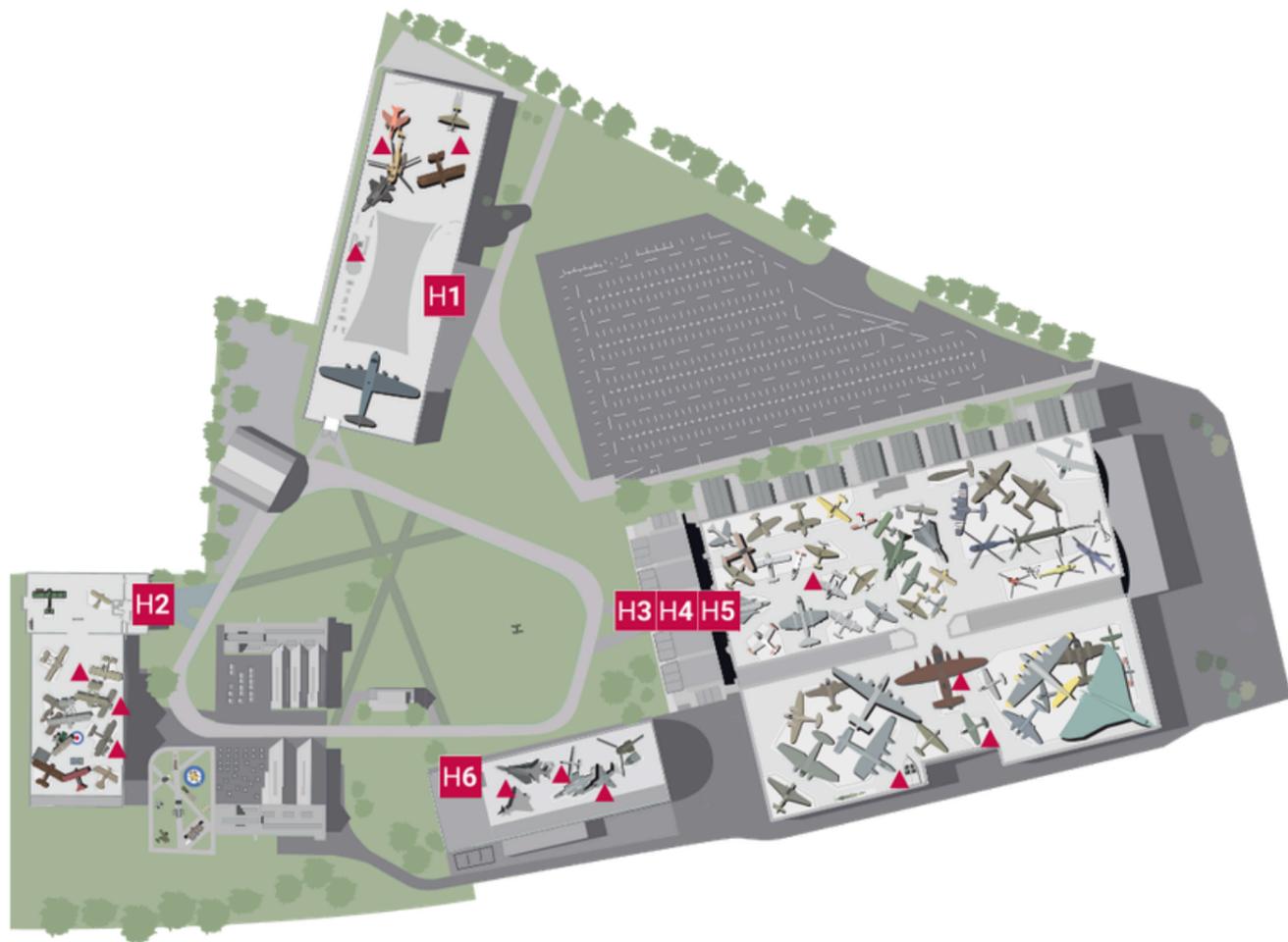


# Amazing inventions

## Teacher pack

For British Science Week 2020, we are highlighting some interesting and useful inventions and engineering solutions that were used or developed by the RAF that have changed how we fly or sometimes how we live.





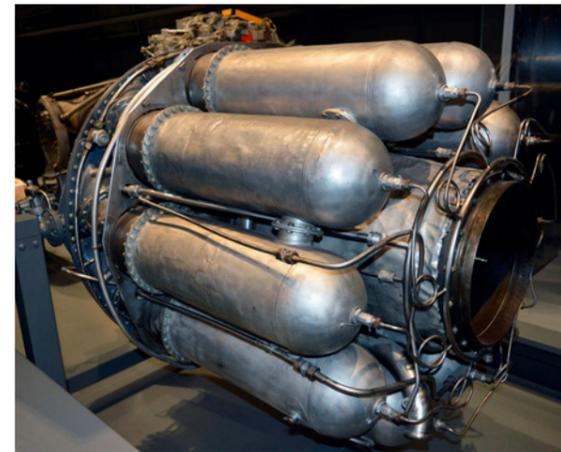
# Map

## Instructions

Use the map to help you explore some of the amazing inventions and engineering solutions that were invented, developed or used by the RAF. Many of these are even used in our everyday lives.

▲ You can find the following objects or stories at these locations

# H1



## Whittle Jet Engine

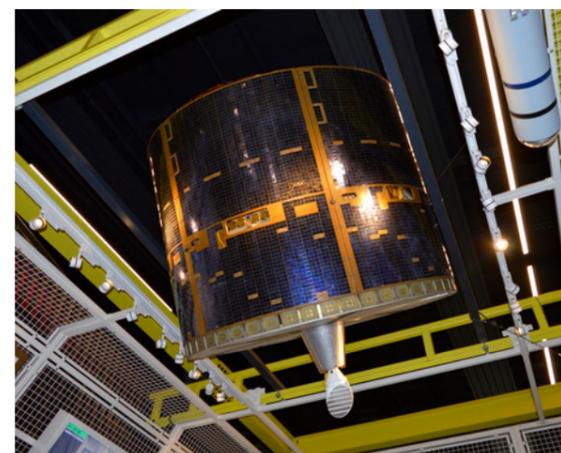
Frank Whittle built and tested the first jet engine in 1937. By 1944 the RAF had its first jet fighter called the Gloster Meteor. Jet aircraft can fly faster, higher and further. Jet engines make travel around the world quicker.



## Spitfire MkV

Having wheels sticking out underneath an aeroplane slows you down. By lifting them up in flight and only folding them down when you need them planes can fly through the air faster.

Folding wheels on a plane are called 'retractable undercarriage'.



## Skynet Satellite

The first satellites were put in to space in the 1950s. Satellites used to be used mainly by the military but now there are lots of uses for satellites from phones and the internet to satellite navigation and photography.



### Ejector Seat

With jet engines aeroplanes got so fast that it became dangerous or even impossible for the crew to climb out in an emergency. Special seats were invented which would use rockets to shoot somebody out of an aeroplane quickly in an emergency. These are ejector seats and are found on most military fast jets today.



### Sopwith Dolphin

When planes started to be used to shoot at other planes a problem was where to put the guns. The best place is at the front but the propeller is in the way. A special device called **synchronisation gear** lets the gun fire through the propeller by timing the bullets to go through the gaps between the spinning blades.

## H3 H4 H5



### Me110

It is important to know where planes are in the sky. During the Second World War this was made possible with the invention of **radar**. During war you can use radar to tell when the enemy is coming, helping to prepare defence and plan attack. In our everyday lives it means Air Traffic Controllers can keep planes apart in the air and avoid crashes.

The Me 110 was a Night Fighter so had its own radar to track planes in the dark.



### Lancaster

The Lancaster bomber had its own radar system. Part of this was called a **Cavity Magnetron**. This releases waves called microwaves to help track aircraft in the air. After the Second World War it was discovered that the heating effect of microwaves from the cavity magnetron were perfect for cooking food. This is where the microwave oven comes from.



### Victor

Aircraft need fuel to fly. When you run out you need to land which means finding an airport for more fuel.

**Air to Air refuelling** was invented to allow some planes to give fuel to other aircraft while still flying. This means you can fly much further without landing.

## H2



### Aircraft Camera

The first use of aeroplanes in warfare was during the First World War. Their main use early on was to look down from above and gather information to help soldiers on the ground. Special cameras that could be used by somebody in an aeroplane were invented to help map the battlefield.



### Heated Insoles

In the early years of flight the only protection from the cold were your thick flying clothes that would cover your whole body. Sometimes these weren't enough so electrically heated clothes were invented that could use electrical wires that would get hot to warm up jackets, boots and gloves. You can get electric blankets today that do the same job to keep you toasty warm in bed.



## Predator

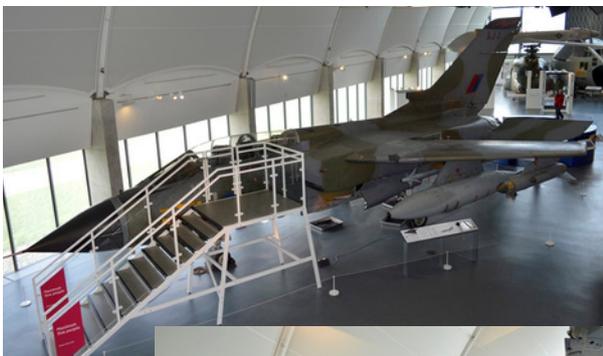
Sometimes it can be dangerous or too expensive to send an aeroplane with people on board to carry out a mission. **Unmanned aircraft** like the Predator (Remotely Piloted Air Systems) can be used to gather intelligence using cameras and sensors. This information can be passed on by satellites to people on the other side of the world.



## Harrier

Usually aeroplanes need a runway to take off and land. This means flying to and from airports.

The Harrier was invented to take off straight up and land straight down. This means it can fly from boats, forest clearings and even car parks. This is called **VTOL (Vertical Take Off and Landing)**



## Tornado

Straight wings mean an aircraft can fly slower. This is useful for take off and landing. Swept back wings mean you can fly much faster but makes getting off the ground and back down much more difficult. The Tornado has a **'Swing Wing'**. The wings are on a hinge so they can be moved straight for take-off and landing but swept back when in the air to travel faster. This gives the best of both worlds.

