Lesson	National Curriculum Prior Knowledge (KS2)	National Curriculum Links (KS3)
Assembly The life of Reginald Mitchell, the story of the Spitfire and Stoke-on-Trent's role in its story.	**KS2 Programme of Study for History** Pupils should be taught about: • a local history study. • a study of an aspect or theme in British history that extends pupils' chronological knowledge beyond 1066.	**KS3 Programme of Study for History** Pupils should be taught about: • a local history depth study • a study over time, testing how far sites in their locality reflect aspects of national history. Examples (non-statutory) A local history study: • A depth study linked to one of the British areas of study listed above such as Challenges for Britain, Europe and the wider world 1901 to the present day. In addition to the Holocaust this could include - The Second World War and the wartime leadership of Winston Churchill.
History **The Spitfire: How did we get there?** Explore the history of the Spitfire. Discover the changes that were made to the Spitfire's design as the Second World War progressed.	**KS2 Programme of Study for History** Pupil should: • know and understand the history of these islands as a coherent, chronological narrative, from the earliest times to the present day: how people's lives have shaped this nation. • gain historical perspective by placing their growing knowledge into different contexts, understanding the connections between local, regional, national and international history. Pupils should be taught about: • a local history study • a study of an aspect or theme in British history that extends pupils' chronological knowledge beyond 1066.	**KS3 Programme of Study for History** Know and understand the history of these islands as a coherent, chronological narrative, from the earliest times to the present day: how people's lives have shaped this nation and how Britain has influenced and been influenced by the wider world. Gain historical perspective by placing their growing knowledge into different contexts, understanding the connections between local, regional, national, and international history. Pupils should be taught about: • a local history depth study • a study over time, testing how far sites in their locality reflect aspects of national history. Examples (non-statutory) -A local history study: A depth study linked to one of the British areas of study such as Challenges for Britain, Europe and the wider world 1901 to the present day. In addition to the Holocaust this could include - The Second World War and the wartime leadership of Winston Churchill.

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Science **Forces in Flight** **Flight Variables** **Forces in Flight Investigation** Explore the four forces for flight. Investigate forces for flight by creating paper aeroplanes and changing one variable at a time. Investigate forces for flight by flying the paper aeroplanes and observing and measuring the results.	**KS2 Programme of Study for Science** **Forces** Pupils should be taught to: • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • identify the effects of air resistance, water resistance and friction, that act between moving surfaces. • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect. (Wings) Notes and guidance (non-statutory) Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. They should experience forces that make things begin to move, get faster or slow down.	**KS3 Programme of Study for Science** **Motion and Forces** • Forces as pushes or pulls, arising from the interaction between two objects • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces • Moment as the turning effect of a force • Forces being needed to cause objects to stop or start moving or to change their speed or direction of motion. • Balanced forces
Science **Forces in Take Off and Landing** Learn about the forces in Take Off and Landing. Simulate the forces in Take Off and Landing with a BBC Micro:Bit.	**Forces** Pupils should be taught to: • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • identify the effects of air resistance, water resistance and friction,	**KS3 Programme of Study for Science** **Motion and Forces** • Forces as pushes or pulls, arising from the interaction between two objects • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces • Moment as the turning effect of a force

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	that act between moving surfaces. • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect. (Wings) Notes and guidance (non-statutory) Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. Pupils might work scientifically by: exploring falling paper cones or cup-cake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective. They should experience forces that make things begin to move, get faster or slow down.	• Forces being needed to cause objects to stop or start moving or to change their speed or direction of motion. • Forces: associated with resistance to non-contact forces: gravity forces acting at a distance on Earth • Balanced forces
Engineering The Merlin Engine: Understanding the basics of a combustion engine Learn how a combustion engine works. Investigate how a chemical reaction creates movement.	**KS2 Programme of Study for Science** **Forces** Pupils should be taught to: • identify the effects of air resistance, water resistance and friction, that act between moving surfaces. • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect. Notes and guidance (non-statutory) Pupils should experience forces that make things begin to move, get faster or slow down. Pupils	**KS3 Programme of Study for Science** **The particulate nature of matter** • The properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure. Changes of state in terms of the particle model. **Atoms, elements and compounds** • Conservation of mass changes of state and chemical reactions. **Chemical reactions** • Combustion, thermal decomposition, oxidation and displacement reactions. • Reactions of acids with alkalis to produce a salt plus water. **Energy changes and transfers** • Simple machines give bigger force but at the expense of smaller movement

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	should explore the effects of friction on movement and find out how it slows or stops moving objects. Pupils should explore the effects of levers, pulleys and simple machines on movement. determine which designs are the most effective. They might design and make products that use levers, pulleys, gears and/or springs and explore their effects. **Properties and Changes of Materials** Pupils should be taught to: • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	(and vice versa): product of force and displacement unchanged. • Heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference: use of insulators. • Other processes that involve energy transfer: stretching a spring, burning fuels. **Changes in systems** • Comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements. Using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes. **Pressure in fluids** • Pressure measured by ratio of force over area – acting normal to any surface. **Forces and motion** • Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only). Change depending on direction of force and its size. **Matter: Physical changes** • Similarities and differences, including density, between solids, liquids and gases. • Diffusion in liquids and gases driven by differences in concentration. **Matter: Particle model** • The differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density. Atoms and molecules as particles.

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		Matter: Energy in matter • Changes with temperature in motion and spacing of particles. Internal energy stored in materials
Engineering Powerful Propellers: How the Spitfires' Propeller works. Find out how the Spitfire's Propeller works. Create a model propeller using an electric circuit. Investigate the relationship between power (voltage/potential difference) and the speed of the propeller car in m/s.	**KS2 Programme of Study for Science** **Electricity** Pupils should be taught to: • associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit • compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches • use recognised symbols when representing a simple circuit in a diagram **Forces** Pupils should be taught to: • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.	**KS3 Programme of Study for Science** **Electricity and Electromagnetism** **Current electricity** • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative) **Magnetism** • The magnetic effect of a current, electromagnets, D.C. motors (principles only). **Motion and Forces** • Describing motion • Speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) **Forces and motion** • Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) • Change depending on direction of force and its size. **KS3 Programme of Study for D&T** • **Make:** Select and use specialist equipment. • **Evaluate**: Analyse the work of past and present professionals and others to develop and broaden their understanding. • **Evaluate:** Test, evaluate and refine their ideas

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		• **Evaluate**: Understand developments in design and technology, its impact on individuals, society, the responsibilities of designers, engineers, and technologists. • **Technical Knowledge**: Understand and use the properties of materials and performance of structural elements to achieve functional solutions. • **Technical Knowledge:** Understand how more advanced mechanical systems used in their products enable changes in movement and force.
Engineering Tilling Shilling Systems Engineer Learn about Systems Engineering and how Tilly Shilling used Systems Engineering to fix the Spitfire's fatal flaw. Challenge your students to apply their understanding of pressure to the Merlin Engine's Carburettor.	**KS2 Programme of Study for Science** **States of Matter** Pupils should be taught to: • Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). **Properties and Changes of Materials** Pupils should be taught to: • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning. **KS2 Programme of Study for D&T** Pupils should be taught to: • **Evaluate:** Understand how key events and	**KS3 Programme of Study for Science** **Pressure in fluids** • Atmospheric pressure, decreases with increase of height as weight of air above decreases with height • Pressure in liquids, increasing with depth; upthrust effects, floating and sinking • Pressure measured by ratio of force over area – acting normal to any surface **Physical changes** • Diffusion in liquids and gases driven by differences in concentration • The difference between chemical and physical changes. **KS3 Programme of Study for D&T** • **Evaluate:** Analyse the work of past and present professionals and others to develop and broaden their understanding • **Evaluate:** Test, evaluate and refine their ideas • **Evaluate**: Understand developments in design and technology, its impact on individuals, society, the responsibilities of designers, engineers, and technologists. • **Technical Knowledge:** Understand how more advanced mechanical

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	individuals in design and technology have helped shape the world. • **Technical knowledge:** Understand and use mechanical systems in their products	systems used in their products enable changes in movement and force.
Engineering Tilly Shilling's Engineering Challenge Using the Systems Engineering approach create a prototype to solve a simple problem and explain how the problem has been solved.	**KS2 Programme of Study for D&T** Pupils should be taught to: • **Design:** Generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design. • **Evaluate:** Understand how key events and individuals in design and technology have helped shape the world. • **Technical knowledge:** Understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages]	**KS3 Programme of Study for D&T** • **Design**: identify and solve their own design problems and understand how to reformulate problems • **Evaluate:** Analyse the work of past and present professionals and others to develop and broaden their understanding. • **Evaluate**: Test, evaluate and refine their ideas • **Evaluate:** Understand developments in design and technology, its impact on individuals, society, the responsibilities of designers, engineers, and technologists. • **Technical Knowledge:** Understand how more advanced mechanical systems used in their products enable changes in movement and force.
STEM Project Design and Technology Why do Engineers have to be excellent at failing? In this extra-curricular STEM project your students will have the chance	**KS2 Programme of Study for D&T** Pupils should be taught to: • **Design:** Students should be taught to use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups • **Design:** Generate, develop, model and	**KS3 Programme of Study for D&T** • **Design:** identify and solve their own design problems and understand how to reformulate problems • **Design:** Students should be taught to develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools • **Make:** Students should be taught to select from and use specialist tools, techniques, processes, equipment and machinery precisely.

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to take part in a range of activities that will develop skills as an engineer. Your students will learn how and why the Spitfire improved over time, begin to understand why failure is part of the design process and explore why flight must become more sustainable in the future.	communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design. • **Make**: Select from and use a wider range of tools and equipment to perform practical tasks. [for example, cutting, shaping, joining and finishing], accurately • **Evaluate:** Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work. • **Evaluate**: Understand how key events and individuals in design and technology have helped shape the world. • **Technical Knowledge: U**nderstand and use mechanical and electrical systems in their products.	• **Evaluate:** Analyse the work of past and present professionals and others to develop and broaden their understanding. • **Evaluate:** Investigate new and emerging technologies. • **Evaluate:** Students should be taught to test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups. • **Evaluate:** Understand developments in design and technology, its impact on individuals, society and the environment and the responsibilities of designers, engineers, and technologists. • **Technical Knowledge**: Understand how more advanced mechanical systems used in their products enable changes in movement and force. • **Technical Knowledge:** Understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with light, sound and movement as inputs and outputs]

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