UNIT 1 LESSON PLANS

LESSONS 1-26

Contents

Unit 1 Lesson Plans

Course	Open Systems and Advanced Manufacturing Technologies
Unit	Unit 1 - The Understanding and Appreciation of Rocket Science
Learning Aim	**1: Understanding the basic physical forces involved with rocket flight**

Lesson 1 & 2 – Course Introduction

Lesson Overview	Learners will gain an understanding of the qualification and the structure as well what NASA does
Learning Objectives	To understand the course requirements To understand the four unit structure To describe the missions of NASA
Lesson duration	2 hours

Starter	Introduction to unit – the dingbat will be on the screen to ask if they are able to decipher the topic by the images = answer is 'Rocket'	Powerpoint slide 1

Main	• Overview of all topics in the qualifications – rockets, micro satellites, artificial intelligence and unmanned vehicles
	• Overview of the expectations of the qualification – the units, exam and how it is graded
	• TASK – Who is NASA? What do they do? Find 5 facts about NASA **(fact sheet for pupils to use enhancing literacy skills)** – *extension = what does the extension .gov mean and why does this site have it. (**means a government website and cannot be purchased by anyone thus making it a reliable source of information)***
	• TASK – NASA's missions - In groups of 2/3 look at one of the missions NASA is currently involved in. They will look at all elements and produce a presentation that they will deliver to the rest of the class
	  ○ What is the mission?
	  ○ What materials are involved?
	  ○ What rockets / space stations / satellites are involved?
	  ○ Key facts / data gathered from the mission
		Powerpoint NASA Fact sheet

Plenary	Peer assessment opportunity – what have you learnt from each others presentations – write a fact on the worksheet	Worksheet
Homework	History of Rockets – literacy comprehension	Worksheet

Lesson 3 – Forces and Flight

Lesson Overview	Introduce forces in rocket launches and look at flight
Specification Covered	1.1 I can describe the physics involved in rocket flight 1.3 I can explain principles of forces which make flight possible.
Learning Objectives	To identify the forces on rockets To describe how flight is achieved To describe the 3 laws of the Newton's Law of Motion
Lesson duration	1 hour

Starter	What can fly? Create a mind map – aim to show the wide range of animals as well as man made crafts	PowerPoint

Main	• Video of a rocket launch to introduce the topic
	• What forces can you think of that would affect the rocket launch?
	Can be on earth or space
	• Introduce the terms of the four forces – weight, drag, thrust and lift
	• Question - A small ball, scrunched up paper and a pen
	  ○ Which will go higher if thrown?
	  ○ Will that change if someone else throws it?
	  ○ ***Can be extended to a practical experiment***
	• TASK – Complete the worksheet from the PowerPoint
	  ○ Fill the gaps on force - Thrust,
	  ○ Describing key terms – gravity, thrust, air resistance and weight
	  ○ Complete 3 laws of Newton's law of motion
	• TASK – What can fly? – Worksheet of animals and objects and pupils to research and complete how each flies
	Extension - adding any off their lists from starter with research of how they fly.
		PowerPoint
		Worksheets

Plenary	Fill in the missing words on the forces diagram – lift, drag, weight, thrust	PowerPoint
Homework	• Rocket Parts – starting to think about what parts build a rocket – bring in a bottle for next lesson (1.5 litre plastic fizzy drink bottle for each group)	Worksheet

Lesson 4 – Water Bottle Rockets

Lesson Overview	Students make a water bottle rocket. They investigate the variables that affect the height and distance travelled by the rocket.
Specification Covered	1.2 I can describe the physics involved in rocket flight 1.4 I can explain principles of forces which make flight possible.
Learning Objectives	To identify the different elements/forces when launching a water bottle rocket To create and launch a water bottle rocket
Lesson duration	1 hour

Starter	Watch the video of a water bottle rocket launch	Video
Main	• Recap the forces • Look at requirements for launch / creation ○ Nose cone, fins, extra mass, stability • Create the rockets • Launch the rockets • Discuss the different rockets and how a slight design change can impact on the launch and flight/height achieved	PowerPoint Worksheet
Plenary	What have they learnt from today's launches	PowerPoint
Homework	Research a previous rocket launch and outline the mission, whether it was successful and the rocket used	

Lesson 5 – How flight has changed and what could go wrong

Lesson Overview	Students will research how flight has changed and create their own timeline of launches – highlighting where launches have gone wrong
Specification Covered	1.3 I can describe the physics involved in rocket flight 1.5 I can explain principles of forces which make flight possible.
Learning Objectives	To understand what could go wrong on a rocket launch To create a timeline of the Apollo Program To understand how rockets / launches change over time
Lesson duration	1 hour

Starter	"Houston we have a problem" watch a video clip from the film Apollo 13 to start discussion of rocket launches and potential failures	PowerPoint Video

Main	• Discuss and look at Apollo Program and NASA
	• What could go wrong on a rocket launch?
	• https://www.timetoast.com/
	• Sign up and create a timeline on the Apollo Program
	• Research each of the missions and outline
	  ○ Launch dates
	  ○ Successful or not? What went wrong if unsuccessful?
	  ○ What changes did they make following the mission to the next?
	  ○ What was the mission?
	  ○ Manned or Unmanned?
		PowerPoint
		Internet access

Plenary	What key facts have you learnt from the timelines about the Apollo Program	PowerPoint
Homework	Choose a mission that went wrong and research what happened and what effect this had on future launches / rocket designs	

Lesson 6 – Simulations

Lesson Overview	Students will complete their own simulations and launch rockets online by adjusting the forces to achieve different heights
Specification Covered	1.2 I can identify and explain limitations on rocket flight created by physical elements
Learning Objectives	To understand the importance testing a rocket prior to launch To test rocket launches by adjusting the forces
Lesson duration	1 hour

Starter	What is a physical element? – ask pupils what they think are the physical elements and discuss weight and thrust by revisiting their homework to look at failed missions and see if anyone found anywhere these were the reason for the failures	PowerPoint and homework
Main	• Why is it important to thoroughly test a rocket before the actual launch? • Discuss and look at list and add any to build knowledge of the importance of testing • Introduce the simulation tool - online flash tool and hand out worksheet – challenge is to adjust the physical elements weight (mass) and thrust to try and get the rocket higher. • Discuss the detail of the worksheet (on slide 6 too) the adjustable sections and defininitions to ensure understanding • Complete the worksheet adding the details of their simulations and the heights achieved • On slide 7 there is a graph built in for bringing everyone back together to share the best height they achieved – right click on the graph and select 'edit data' to add the data to excel and build the graph	PowerPoint Worksheet
Plenary	Plenary – look at the graph and find the highest the rocket achieved and complete the table on slide 8 with the details of the rocket launch	PowerPoint
Homework	NASA word search on keywords – building literacy	Worksheet

Lesson 7 – Paper Aeroplanes

Lesson Overview	Students will create and test a series of paper aeroplane designs to look at the importance of design and testing
Specification Covered	1.2 I can identify and explain limitations on rocket flight created by physical elements
Learning Objectives	To consider how design can affect the flight To understand how forces affect a paper aeroplane To test and gather data from a flight effectively
Lesson duration	1 hour

Starter	Give all pupils a piece of paper and they have 2 minutes to make a paper aeroplane, then stand at one end and throw them to see how far they go. • What was different between all your aeroplanes? • What as similar? • What impacted on the distance they travelled? • What could be done different? Aim to discuss the difference in designs and similar common designs, the difference in who threw them and how much thrust they put into the throw and also how different paper/card (i.e. weight) would impact the distance.	PowerPoint Paper
Main	• All get into groups of 2 or 3 • There is a folder of paper aeroplane designs and the pupils are to choose one and make it and test it • Different paper weights (GSMs) will allow testing of the weight of the aeroplane as well as the person throwing and thrust behind it. • Worksheet is to accompany the testing to allow the pupils to think the task through and make sure they are considering the key aspects • In order to gather the data it would be useful for a number of the designs to be created within the classroom • There needs to be a tape measure in each group so the distance can be measured • The slide is available again to add the data of the distance travelled for each design allowing data gathering as well as analysis to determine the better design and importance of experimenting with designs	Tape measure Worksheet PowerPoint
Plenary	Which design went the furthest? What have you learnt from this task?	PowerPoint
Homework	Creative writing - Write an entry in an astronaut's diary. Think about what it might feel like to travel into space and what things you might experience. Remember that your opinions will vary depending on the time period your astronaut is from.	Worksheet

Lesson 8 – Launching

Lesson Overview	Students will look at different launch sites and how environmental issues can affect a launch
Specification Covered	1.4 - I can explain environmental factors which will make flight possible
Learning Objectives	To describe the importance of suitable weather conditions in a launch To understand the importance of a suitable launch site To identify the physical and environmental issues on previous launches
Lesson duration	1 hour

Starter	What is the map of? The map shows the main rocket launch sites and if t can be seen on the screen shows the number of launches within the colours and key	PowerPoint

Main	• What is important to a launch site? Aim to get the pupils to think about large open spaces with little population due to the impact of a launch. Possibly start to think about the weather conditions within the country of launch
	• Can you name any launch sites? Main one most know is Kennedy Space Centre
	• Launch sites and weather
	  ○ Why is weather important to consider when looking for a launch site?
	  ○ A launch site has a set of guidelines
	  ○ Detailed weather patterns are looked at
	• Look at the impact of lightning and why weather is so important to avoid prior to and within a launch
	• Task 1 – Pupils to use the world map to annotate where the main launch sites are and add any details of extreme weathers issues in the launch area
	• Task 2 – Create a report about the launch sites and think about where in the world they are and the what weather conditions are in these areas as well as the extreme weather conditions in that area, and research the weather conditions in the area and what would need to be considered if you launched a rocket from there.
		PowerPoint
		Worksheet

Plenary	Where would you launch a rocket from and why?	PowerPoint
Homework	Research the V2 Rocket and create a fact sheet on it	

Lesson 9 – Missions – Success or Failure

Lesson Overview	Students will look at a range of missions and detail the mission objectives and look at launch failures and determine what went wrong – physical or environmental
Specification Covered	1.4 - I can explain environmental factors which will make flight possible
Learning Objectives	To understand the reasons for a successful rocket launch To determine the failure of a launch as physical or environmental
Lesson duration	1 hour

Starter	Look at homework and the history of the V2 rocket What did they find out? Watch video clip of launches – showing failures and success	Video clip PowerPoint
Main	• Is there such a word as failure? Do they not learn from the launch issue and rectify to improve overall? All launches are tested thoroughly in order to ensure successful missions • Task 1 - Nasa's top 10 missions - Using the worksheet and links the pupil will need to research the NASA missions and detail what the mission was. The second section of the worksheet then looks at a selection of rocket launch fails and the pupil will need to find out what went wrong and determine which were physical issues and which were environmental issues • Look at air temperature with a mini experiment using a hair dryer and paper aeroplane – what affect does the air temperature have between hot and cold and also the wind speed	PowerPoint Worksheet Paper aeroplane Hair dryer
Plenary	What is a physical issue? What is an environmental issue?	PowerPoint
Homework	What materials are needed to build a rocket	Worksheet

Lesson 10 and 11 – Rocket Shape and designs

Lesson Overview	Students will look at rocket shapes and materials used in order to create own basic designs
Specification Covered	1.5 I can explain how to incorporate an understanding of physical forces into the final designs.
Learning Objectives	To understand the importance of different designs To create rocket designs considering materials and forces
Lesson duration	2 hours

Starter	What were the forces? What materials are used in rockets?	PowerPoint

Main	• Look at different materials used – list on PowerPoint but could be strengthened with examples of these to allow pupils to understand
	• Look at rocket coating and the importance for re-entry
	• Look at rocket diagram and parts
	• Task1 – links to previous task and using the worksheet complete the diagram by putting the rocket parts in the right place - ***Extension*** - Annotate the possible materials that would be used for that part
	• Task2 - **What shape is a rocket? Does this change?** Research the different rockets launched and what affect the different shapes had and what you thought of them. Research and complete the worksheet
	• For the remainder of this lesson and next they will need to come up with a couple of designs for a rocket (coursework)
	  ○ *Candidates should be able to use their knowledge of forces and environmental elements to come up with some designs.*
	  ○ They will need to annotate how their choices help against the forces and environmental elements
		PowerPoint
		Worksheets x2

Plenary	Show your designs to the person next to you and ask them: 1. What could be improved? 2. Is anything missing? 3. Are my explanations clear enough?	PowerPoint
Homework	Who was Robert H Goddard and what did he do? Complete the profile page with a picture, key facts and description of what he invented	Worksheet

Lesson 12 – Introduction to Kernal

Lesson Overview	To introduce the pupils to Kerbal and the basics of rockets
Specification Covered	1.6 I can use simulation to minimise problems in my final tests
Learning Objectives	To identify key elements within Kerbal To launch a rocket To test different components
Lesson duration	1 hour

Starter	What do you need to launch a rocket? • Nose – the top cone of a rocket? • Where will the pilot sit? • Do you need fins? • Where will the fuel go? • Parachute?	PowerPoint Discussion

Main	• Explain that Kerbal is a piece of software where you can:
	  ○ build a rocket using different parts
	  ○ launch a rocket into space
	  ○ achieve orbit
	  ○ visit planets
	  ○ control a rocket in space and take off/land
	  ○ complete missions
	• Pupils to open Kerbal and complete the toolbar worksheet to help understand the interface and where parts are located.
	• Pupils to open and follow the instructions to build, launch and orbit a rocket
		PowerPoint
		Worksheet
		Kerbal

Plenary	What happened to the rocket and the pilot?	Discussion
Homework	Newton's 3 laws worksheet	Worksheet

Lesson 13 – Working on a mission with Kernal

Lesson Overview	All students to experiment with the missions to see what the software does
Specification Covered	1.6 I can use simulation to minimise problems in my final tests
Learning Objectives	To test different rockets To experiment with different parts To launch and control a selection of rockets
Lesson duration	1 hour but can be longer depending on how many missions completed

Starter	Look at homework of the 3 laws and discuss to ensure understanding ***Watch video linking this theory and shows the effects of the 3 laws in space - https://www.youtube.com/watch?v=KvPF0cQUW7s&feature=youtu.be***	Homework PowerPoint
Main	All pupils to follow the Kerbal missions to understand the different elements of Kerbal looking at: • How to build different rockets, • How to control different rockets • How to adjust and edit a rocket • To look at and work out what went wrong with different controls and launches • To start to think about the parts they may use and the type of rocket they will use. • Start to make notes on the rockets that worked • Complete mission logs for each mission completed • Can be completed individually or in pairs to help understanding and discussion • Worksheet on navball symbols available to be completed	PowerPoint Worksheet Kerbal Navball symbol worksheet
Plenary	Discussion on missions completed – what went well and what went wrong - Share mission logs / peer discussion or class	
Homework	Create a fact file (1 x A4) on the main facts on the SPACE RACE – this will help in later lessons	Worksheet available as start

Lesson 14 – Testing a rocket in Kernal

Lesson Overview	To start to create their rocket or adjust a previous rocket
Specification Covered	1.6 I can use simulation to minimise problems in my final tests
Learning Objectives	Candidates should be able to use simulation software and applications effectively To develop a rocket and test the outcome of any changes
Lesson duration	1 hour

Starter	What would happen if …… Think about one of your rocket launches from previous lessons What if you changed a part – what affect would that have? ***Main aim is for pupils to understand the need to test different components and settings in order to achieve a better design/launch***	PowerPoint
Main	Pupils are to use the lesson to gather evidence of the simulations they have undertaken in Kerbal – use the rocket from one of your test flights and add evidence of the launch and the changes made with the effect on the rocket and launch This part is coursework and it is important that the pupils use a rocket and show development by testing different parts or settings and screenshot the changes and describe the effects on the rocket and launch	PowerPoint Coursework booklet
Plenary	Discussion / self assessment / peer assessment opportunities	
Homework	None as next few lessons are on coursework – can be used for any elements that need strengthening or focused on	Research / revision

Lesson 15-16 – Coursework Tasks

Lesson Overview	Students will complete the coursework tasks for section 1
Specification Covered	1.1 I can describe the basic physical forces involved in rocket flight. 1.2 I can identify and explain limitations on rocket flight created by physical elements 1.3 I can explain principles of forces which make flight possible. 1.4 I can explain environmental factors which will make flight possible 1.5 I can explain how to incorporate an understanding of physical forces into the final designs. 1.6 I can use simulation to minimise problems in my final tests
Learning Objectives	To understand the importance materials in a rocket To experiment with different rocket designs To analyse the rocket launches
Lesson duration	2 hour

Starter	Recap key aspects of forces	PowerPoint
Main	• Look at checklist for completing coursework • Using the coursework frame – complete sections 1-5	
Plenary	Self assessment against checklist and setting SMART targets	
Homework		

Lesson 17 – Materials and Rockets

Lesson Overview	Students will look at the materials in a rocket in more detail
Specification Covered	2.1 I can identify materials used in the construction of rockets and explain why they are useful. 2.2 I can describe the properties of materials that make them suitable for rockets
Learning Objectives	To understand the importance materials in a rocket To identify materials needed in a rocket To describe why certain materials need to be used in a rocket
Lesson duration	1 hour

Starter	Matching task on forces and Newtons 3 laws	Worksheet PowerPoint
Main	• Look at list of materials • Introduce task – look at software options • Research and create a mood board / poster on all materials • Include the name of the materials and the advantages and disadvantages of each one. • Think about temperature effect on the material	PowerPoint
Plenary	Crack the code – keyword 'lightweight'	PowerPoint
Homework	Create a logo for your own Rocket	

Lesson 18 – Pencil Rockets

Lesson Overview	Students will create pencil rockets and launch the to look at different materials
Specification Covered	2.1 I can identify materials used in the construction of rockets and explain why they are useful. 2.2 I can describe the properties of materials that make them suitable for rockets
Learning Objectives	To understand the importance materials in a rocket To experiment with different rocket designs To analyse the rocket launches
Lesson duration	1 hour

Starter	• What is the hardest part about going into space? • Why is this? • So how does something huge and heavy like a spacecraft manage to break away from Earth's gravity? • What is a rocket? • How does it work? • Where do these gases come from? • For something to burn what do you need? • But there is no air in Space! So how do the fuels burn?	PowerPoint

Main	• They will be launching pencil rockets in groups of 2 and use the handout guide on how to create the pencil rocket
	  ○ Think about design
	  ○ Think about the materials you will use
	  ○ Think about how you will measure the distance travelled
	  ○ Think about what you learn from this and how it can help your rocket designs
	• ***There are two options – simple pencil rockets for limited resources and space and a more advanced option where a launch aspect is created also.***
		PowerPoint
		Handouts

Plenary	DISCUSSION: What is similar and different between the pencil rockets and the water rockets? What have you learnt from doing both these tasks?	PowerPoint
Homework		

Lesson 19 – Coursework

Lesson Overview	Students will complete the coursework task for 2.1 and 2.2 in booklet (section 6)
Specification Covered	2.1 I can identify materials used in the construction of rockets and explain why they are useful. 2.2 I can describe the properties of materials that make them suitable for rockets
Learning Objectives	To describe the different materials To describe the suitability of the material in a rocket
Lesson duration	1 hour

Starter	What is important when considering materials for a rocket?	PowerPoint

Main	• Pupils to use research and previous lessons content to complete the coursework task in the booklet (section 6) describing the different materials
	  ○ Titanium
	  ○ Carbon
	  ○ Silicon
	  ○ Aluminium
	  ○ Magnesium
	  ○ Nickel
	  ○ Chromium
	  ○ Yttrium
	  ○ (nick-RAL-ly)
	  ○ Carbon Fiber
	• Also describe the suitability of these materials within a rocket – looking at temperature, weight, strength,
		Coursework Booklet
		PowerPoint

Plenary	Self check against coursework checklist	Coursework booklet
Homework	What is an orbit worksheet	Worksheet

Lesson 20 – Rocket Mice

Lesson Overview	To launch a rocket mouse using forces
Specification Covered	2.3 I can describe the forces which enable a rocket flight and which determine material selection.
Learning Objectives	To identify the force used To describe how the force can be adjusted To create a rocket and launch mouse
Lesson duration	1 hour

Starter	Show the milk bottle and paper and ask how can we use this to launch a rocket and see what ideas they come up with	Plastic Milk bottle (4 pint) Paper Scissors Cellotape Ribber glove Pens Tape measure
Main	• Show a demo of a completed rocket mouse and show how the force of the power on the milk bottle affects the launch • All pupils to create a mouse and ensure that they have a distinctive element to determine whose is whose when launched • Complete testing worksheet – describing the thrust applied and the height achieved • All pupils create a rocket mouse – in groups measure and launch to document own mouse heights • Can be extended into a competition	
Plenary	Graph of heights achieved throughout the group – discuss whose went highest and why	
Homework	Who was first in space? – worded so it will depend what they look at animals / objects / humans	

Lesson 21 – The atmosphere

Lesson Overview	To research the atmosphere and the effects on a rocket – developing independent learning skills
Specification Covered	2.3 I can describe the forces which enable a rocket flight and which determine material selection.
Learning Objectives	To describe what the atmosphere is To describe how the atmosphere affects material choices To determine the best materials for rocket
Lesson duration	1 hour

Starter	What is the atmosphere? • Video • Discuss what the video showed • Look at definitions and keywords	Discussion Video

Main	• Research the following questions and create a leaflet for new astronauts as a fact file on the topic
	  ○ What is the atmosphere?
	  ○ Why is heat an issue when launching a rocket into space?
	  ○ What and how can distortions affect a rocket?
	  ○ What materials need to be on the outside of a rocket to withstand the launch and atmosphere?
	  ○ What effect does the atmosphere have on the forces?
	  ○ How does gravity affect the rocket?
		Research – internet - fact sheet

Plenary	Peer assessment – swap with another and look at each other's PowerPoint's and give constructive feedback	
Homework	Research question – what forces need to be considered in space? As not all are	

Lesson 22 – Coursework

Lesson Overview	To complete the coursework task to describe how the materials you would use in a rocket are effective against the forces
Specification Covered	2.3 I can describe the forces which enable a rocket flight and which determine material selection.
Learning Objectives	To describe how the materials you would use in a rocket are effective against the forces
Lesson duration	1 hour

Starter	What is a blueprint? – look at a completed one linked to kerbal missions on Sputnik 8K71PS	PowerPoint
Main	• Pupils need to decide on the materials they would use in a rocket and describe why they would - referring to the forces and how the material is suitable for the rocket. • Pupils complete the coursework booklet - ***evidence section 7*** and use one of the following options 1. Use Kerbal and screenshot the rocket and use the parts to describe what materials they are (*you can use templates and edit them from previous lessons)* 2. Use the blueprint to draw out the parts and annotate (describe) the materials and the parts etc on the blueprint or an accompaniment with the blueprint 3. Or a written description of parts, materials and forces	PowerPoint Coursework booklet
Plenary	Self/peer assess	
Homework		

Lesson 23 – The Space Race

Lesson Overview	Pupils to look at the space race and understand how the countries competed to get a rocket into space
Specification Covered	2.4 I can explain historical construction techniques and developments.
Learning Objectives	To describe the key facts of the space race To identify who was in the space race To create an informative news broadcast
Lesson duration	1 hour

Starter	Refer to previous homework and ask what was the space race to see what they already know • Look at some definitions of the space race and discuss the countries involved and the need to be the lead power in space	

Main	• https://www.youtube.com/watch?v=xvaEvCNZymo
	• 'Welcome to the year of the Space Race' news broadcast
	• Put pupils into groups of 2 or 3 and get them to create a script, record their broadcast either video or audio ***(green screen opportunity)***
	  ○ Include as many key facts as possible
	  ○ Try not to be bias towards one country
	  ○ Who won the space race?
	• ***If no software available in school – audacity is free audio recording option***
	• ***Software on Ipads –imovie if available***
	• ***Movie Maker on windows***
		Microphones
		Video cameras
		Green screen
		Software?
		Ipads?

Plenary	Share the News – peer feedback on news broadcasts	
Homework	How has space travel affected our daily lives?	

Lesson 24 – Coursework – historical milestones

Lesson Overview	Complete coursework task on explaining the historical milestones that have impacted on rockets today
Specification Covered	2.4 I can explain historical construction techniques and developments.
Learning Objectives	To explain historical construction techniques and developments.
Lesson duration	1 hour

Starter	Discuss homework findings – what has been developed following space travel? • What did you find out from homework? • How has space travel affected our daily lives?	PowerPoint

Main	• https://spinoff.nasa.gov/Spinoff2008/tech_benefits.html
	• Space exploration has created new markets and new technologies that have spurred our economy and changed our lives in many ways.
	• Look at table of advancements in:
	  ○ health and medicine,
	  ○ transport,
	  ○ public safety,
	  ○ consumer,
	  ○ home and recreation,
	  ○ environmental and agricultural resources and
	  ○ computer technology
	• Explain coursework task - To explain historical construction techniques and developments. *Candidates should be able to show an understanding of the main milestones of rocket development*
	• **Use the space to describe the key historical developments i.e. first rocket, the space race and how this has impacted the world today**
	• *Complete the coursework booklet section 8*
		PowerPoint Link for more details Coursework booklet

Plenary	Complete checklist	
Homework		

Lesson 25 – Setting up your rocket

Lesson Overview	All pupils to set up in Kerbal the rocket they are going to launch
Specification Covered	2.5 I can identify the materials needed for my test rocket and explain their suitability
Learning Objectives	To describe the material choices against design To create a possible rocket design with clear material choices
Lesson duration	1 hour

Starter	Weight Equals Money – why is weight so important with launching a rocket? Discuss	PowerPoint
Main	• Introduce the term aerodynamics • Look at diagram created in lesson 22 and look at the materials chosen – highlight the materials chosen and explain why • Using Kerbal look at the parts you would need and costings of the rocket – using Kerbal will be able to look at costs and work out how much to build their design • Create a shopping list using the worksheet – document the part, material choices, cost (according to Kerbal) • Total up -	PowerPoint
Plenary	Look at - The giant rocket NASA is building to carry astronauts to Mars and other destinations in deep space may cost $500 million per launch when it's flying regularly, space agency officials said Tuesday (Sept. 11). – quote and discuss if worth it and extend to what is most expensive?	PowerPoint
Homework		

Lesson 26 – Simulations rocket

Lesson Overview	To build and simulate the design chosen
Specification Covered	2.5 I can identify the materials needed for my test rocket and explain their suitability.
Learning Objectives	To test designs To refine materials
Lesson duration	1 hour

Starter	Why do we test – how can a focus group be used?	PowerPoint
Main	• Pupils are to look at possible designs and materials they have chosen so far and can build/test this in Kerbal • The testing will help refine the design possible choices – materials can be edited on the coursework in order to develop the design • Testing/design development worksheet available to complete to help pupils refine the designs • Self-assessment opportunities • Complete section 9 - paste in a diagram/print screen of their rocket and label the materials you have chosen to use and explain why you chose them and the outcome of the simulations in Kerbal. Can use table worksheet to show this in the coursework with diagram/screenshots?	PowerPoint Worksheet
Plenary	Peer Assessment	PowerPoint Worksheet
Homework	Homework is to look at composites in relation to rocket materials and research the following: • Micro-composites • Piezoelectric • Carbon-Carbon • Metals How has NASA's development of materials helped industry?	Worksheet