

Open Systems and Advanced Manufacturing Technologies

Unit 1 – The Understanding and Appreciation of Rocket Science

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Coursework evidence folder

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Coursework Checklists

|  |  |  |  |
| --- | --- | --- | --- |
| 1: Understanding the basic physical forces involved with rocket flight | 2: Applying aspects of construction and development for rockets | 3: Building, testing and launching a rocket with further development | 4: Investigating further applications and exploratory topics |
| **Section 1** – Forces (1.1 and 1.3) | [ ]  | **Section 6** – Materials Table (2.1 and 2.2) | [ ]  | **Section 10** – Design and Evaluate own rocket (3.1) | [ ]  | **Section 14** – Rockets for science (4.1, 4.3, 4.4, 4.5) | [ ]  |
| **Section 2** – Physical issues (1.2) | [ ]  | **Section 7** – Materials and forces (2.3) | [ ]  | **Section 11** – Predictions and test plan (3.2) | [ ]  | **Section 15** – Forces and Materials in Space (4.2) | [ ]  |
| **Section 3** – Environmental issues (1.4) | [ ]  | **Section 8** – Rocket Milestones (2.4) | [ ]  | **Section 12** – Creating a basic rocket (3.3) | [ ]  |  |  |
| **Section 4** – Designs (1.5) | [ ]  | **Section 9** - Materials and my rocket (2.5) | [ ]  | **Section 13** – Launching (3.4, 3.5, 3.6) | [ ]  |  |  |
| **Section 5** – Simulations (1.6) | [ ]  |  |  |  |  |  |  |

# SECTION 1 – Candidates should be able to describe a number of forces that act on rocket design and candidates should be able to explore more forces and environmental factors which will affect successful flights.

## Coursework Evidence 1.1, 1.3

Complete the table below describing all 4 forces to be considered with all rocket launches

|  |
| --- |
| Force |
|  |
| Description of force |
|  |
| How can it affect the rocket launch and flight? |
|  |
| How is this force overcome to launch? |
|  |
| Has this force caused an issue on any previous documented launches? |
|  |

|  |
| --- |
| Force |
|  |
| Description of force |
|  |
| How can it affect the rocket launch and flight? |
|  |
| How is this force overcome to launch? |
|  |
| Has this force caused an issue on any previous documented launches? |
|  |

|  |
| --- |
| Force |
|  |
| Description of force |
|  |
| How can it affect the rocket launch and flight? |
|  |
| How is this force overcome to launch? |
|  |
| Has this force caused an issue on any previous documented launches? |
|  |

|  |
| --- |
| Force |
|  |
| Description of force |
|  |
| How can it affect the rocket launch and flight? |
|  |
| How is this force overcome to launch? |
|  |
| Has this force caused an issue on any previous documented launches? |
|  |

# SECTION 2 – Candidates should be able to add some more detail to their list of forces and give some more concrete examples.

## Coursework evidence 1.2

Using the simulation online at <https://www.sciencelearn.org.nz/embeds/25-rocket-launch-simulation> complete several launches, documenting how the changes in inputs affect the outputs. (add to the table and complete as many tests as you think is effective – compare with peers)

|  |  |  |
| --- | --- | --- |
|  | INPUTS | OUTPUTS |
| Test No | Mass (weight)  | Thrust | Thrust time | Drag ON/OFF | Mass Change ON/OFF | Max Height | Max Speed | Time to reach max height |
|  |  |  |  |  |  |  |  |  |
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# SECTION 3 – Candidates should be able to make judgements about suitable flight times and places based on their understanding.

## Coursework evidence 1.4

Using the table below as a guide explaining how environmental aspects and location/time can affect where you launch from

|  |
| --- |
| What would be a suitable time to launch a rocket? |
|  |
| Where in the world has the best launch site and why? |
|  |
| What possible conditions could there be that may stop a launch? |
|  |
| What possible conditions could there be that could affect the rocket whilst flying? |
|  |

# SECTION 4 – Candidates should be able to use their knowledge of forces and environmental elements to come up with some designs.

## Coursework evidence 1.5

Insert in this section screenshots or photos of the designs you have created and annotate elements to show how it meets the forces and environmental issues

|  |  |  |
| --- | --- | --- |
| Rocket Design Number | Insert screenshot or picture of your design | How has your design considered the forces and environmental factors |
| **Design 1** |  |  |
| **Design 2** |  |  |
| **Design 3** |  |  |

# SECTION 5 – Candidates should be able to use simulation software and applications effectively

## Coursework evidence 1.6

Insert in this section evidence of the simulations you have undertaken in Kerbal – use the rocket from one of your test flights and add evidence below of the launch and the changes you made with the effect on the rocket and launch

|  |
| --- |
| Describe your rocket: |

Document the simulations you run in the table below but remember to DESCRIBE in the table not bullet point

|  |  |  |  |
| --- | --- | --- | --- |
| Test Number | Change Made | What affect it had | What next? |
|  |  |  |  |
|  |  |  |  |
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# SECTION 6 – Candidates should be able to identify a number of materials that could be used for rocket construction and candidates should be able to create a table of properties with comments.

## Coursework evidence 2.1 and 2.2

Complete the table below describing the materials and the suitability for use in creating a rocket – think about weight, temperature, location on the rocket and strength

|  |  |  |
| --- | --- | --- |
| Material | Description | Suitability for a rocket and where it would go |
| Titanium |  |  |
| Carbon |  |  |
| Silicon |  |  |
| Aluminium |  |  |
| Magnesium |  |  |
| Nickel |  |  |
| Chromium |  |  |
| Yttrium (nick-RAL-ly) |  |  |
| Carbon Fiber  |  |  |

# SECTION 7 – Candidates should be able to show an understanding and appreciation of how materials are chosen for different purposes.

## Coursework evidence 2.3

Use the space below to describe how the materials you would use in a rocket are effective against the forces – what materials would you use and why?

|  |  |  |
| --- | --- | --- |
| *Material* | *Where would it be used?* | *Why is this good or bad against the forces?* |
|  |  |  |
|  |  |  |
|  |  |  |
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# SECTION 8 – Candidates should be able to show an understanding of the main milestones of rocket development.

## Coursework evidence 2.4

Use the space below to describe the milestones in rockets and how this has impacted on today’s rockets and launches (***describe the key historical developments i.e. first rocket, the space race and how this has impacted the world today***

|  |
| --- |
|  |

# SECTION 9 – Candidates should be able to use their understanding in determining the best materials for test rockets.

## analized1.gifCoursework evidence 2.5

Use the space below to paste in a diagram/print screen of your rocket and label the materials you have chosen to use and explain why you chose them and the outcome of the simulations in Kerbal.

# SECTION 10 – Candidates should be able to use their understanding of forces and materials to design a basic rocket and evaluate their design

## Coursework evidence 3.1

Using the space below add screenshots of the rocket template you chose in Kerbal and the stages of development – the changes you made to the rocket and why

|  |  |  |
| --- | --- | --- |
| *Rocket Screenshot* | *Changes made and why* | *Evaluation*  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# SECTION 11 – Candidates should be able to explain the main purpose of test procedures and show a basic understanding of possible outcomes of those tests.

## Coursework evidence 3.2

Now they have the final design – what tests should be undertaken – thinking about forces and materials

|  |  |  |
| --- | --- | --- |
| Test | Expected outcome (prediction) | Actual outcome and improvements made |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# SECTION 12 – Candidates should be able to carry out simple tasks and instructions to build a rocket for flight.

## rocket-1717160_960_720.pngCoursework evidence 3.3

You are going to design and build your own basic rocket – your teacher will have the parts to use. Use the space below to show the design and the development of the building of your rocket.

# SECTION 13 – Candidates should be able to describe the key factors to a successful launch and be aware of the dangers, Candidates should be able to participate in the choice and checking of a launch site, Candidates should be able to launch their own rocket.

## Image result for nasaCoursework evidence 3.4, 3.5

Use the space below to complete your NASA report for launching - Report to include – health and safety considerations, legal aspects, procedure to be undertaken, local guidelines, venue options, checklists, times etc

## Coursework evidence 3.6

Use the space below to complete a mission report on the launch of your rocket and proposal for future developments following launch.

# SECTION 14 – Candidates should be able to demonstrate a wider understanding of the use of rockets and their place in science and engineering, Candidates should be able to show an understanding of the main uses for rockets currently, Candidates should be able to think of areas of research that rockets could help with, Candidates should be able to present and discuss their ideas to an audience.

## Coursework evidence 4.3

Use the space below to describe the range of uses for rockets and their limitations – including seeds in space project, satellites, good and bad use of rocketry, deeper space

## Coursework evidence 4.1 and 4.4

Use the space below to write your written report on the investigation on military, science and research, communication, spaceflight, rescue, hobby, sport and entertainment use of rockets

## Coursework evidence 4.5

Use the space below to screenshot the slides of your presentation and document the feedback you gained after presenting your rocket design

|  |
| --- |
| Your screenshot of presentation of design |
|  |
| What feedback did you receive for your designs and what improvements were suggested? |
|  |

# SECTION 15 – Candidates should be able to discuss the characteristics of space in terms of the forces they have explored and materials.

## Coursework evidence 4.2

Use the space below to write your conclusion to this unit – include your final conclusion on materials and forces, what is required in a rocket when launched and in space, materials and the effect of radiation exposure and temperature, forces and the effect of gravity.