SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Models & Inventions

Year 9-10

Felix Lister
Xander Neeskens

Brighton Secondary School

0068 - 027

Report for Olliphant Science awards entry 2021 – The Falcon Heavy
By Xander Neeskens and Felix Lister

This model rocket was made to demonstrate multiple scientific principles that are utilised by the real Falcon Heavy and all rockets to this day, Newton's three laws of physics.

Newtons First law of inertia satiates that objects in or not in motion will only change by an external force. A rocket stationary on a launching pad can only lift off if an unbalanced force is created. In the engines at the bottom of the ship, a chemical reaction between Kerosene and liquid oxygen provides the necessary thrust to propel the vehicle upward.

Newton's second law of motion (F = ma) states that force is equal to mass multiplied by acceleration. The force of a rocket leaving the atmosphere is equal to the mass of the rocket multiplied by the thrust generated by the engines.

When rockets fly to space, a significant amount of air pressure in the atmosphere lessens the total thrust that the vehicle possesses. As stated in Newton's third law, every action has an equal and opposite reaction. This directly relates to a rockets thrust capability because as it launches to space, air pressure changes the speed that the rocket can travel, slowing it down.

The model of The Falcon Heavy entry consists of two main parts; the physical model of the rocket and a trifold piece of card further explains the purpose of the parts of the rocket. The physical model was created through the use of 3D-Printers that are located at our school.. No adult help was needed for the construction but supervision was required when we 3D printed and spray painted and hot glued to secure fallen pieces.

The largest problem with the model of The Falcon Heavy was errors occurring with the 3D-Printers almost every time a print was attempted. The two major errors that would occur consisted of prints malfunctioning and/or pieces falling off of the salvageable parts. The malfunctioning of the 3D-Printers were systematic errors and just occurred randomly. The other error, parts breaking off was solved by scaling up the model. However, the Merlin Engines located at the bottom of the rocket will always inevitably fall off as the rocket couldn't be scaled up further to a suitable size due to constraints.

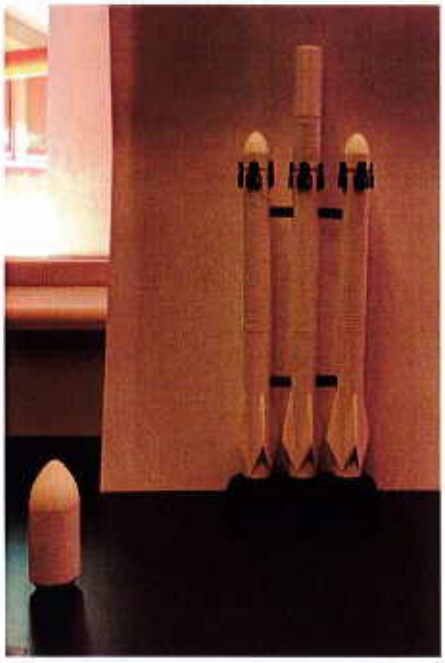
The model of The Falcon Heavy can be interacted with by separating the modules and sections of the rocket to however the user would like it. The interactive features allow the user to get a better understanding of the importance of each part of the rocket.

*Note, the second stage of the rocket (the large engine) is very fragile, be careful when using.

Dismantling the rocket…

1.

2.



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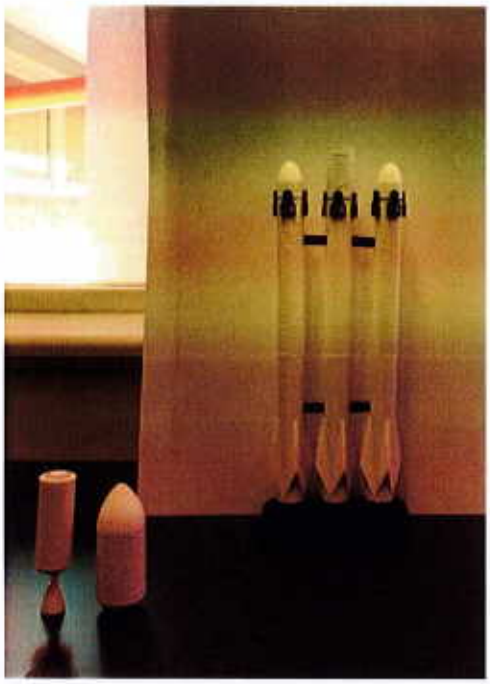

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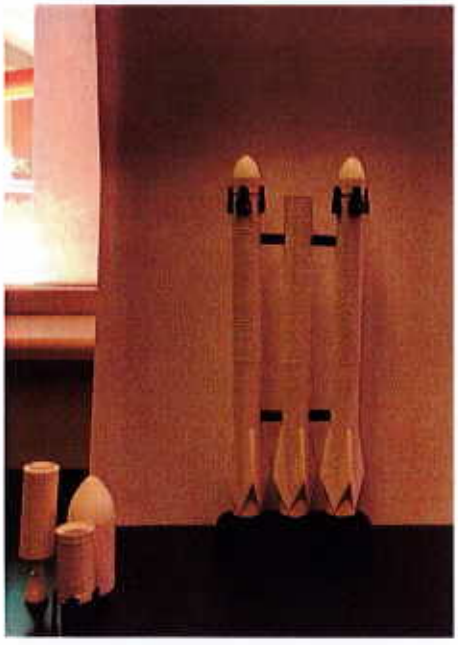

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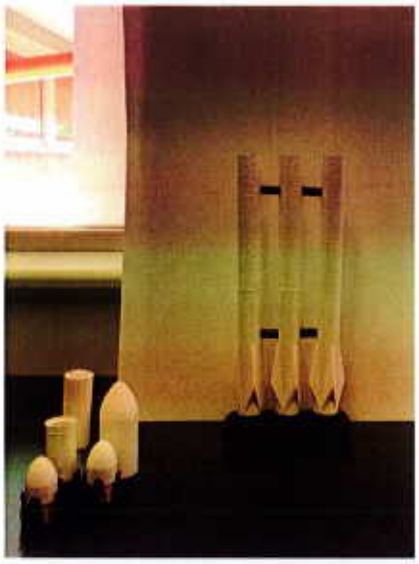

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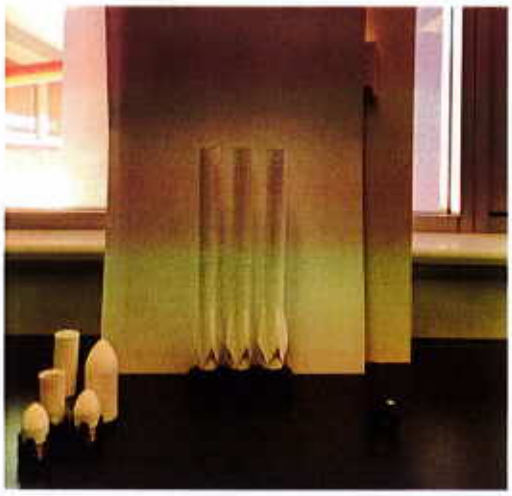

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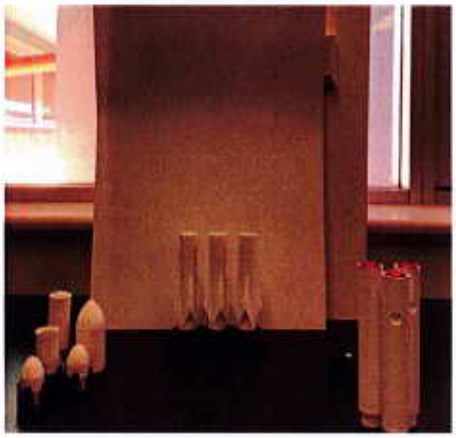

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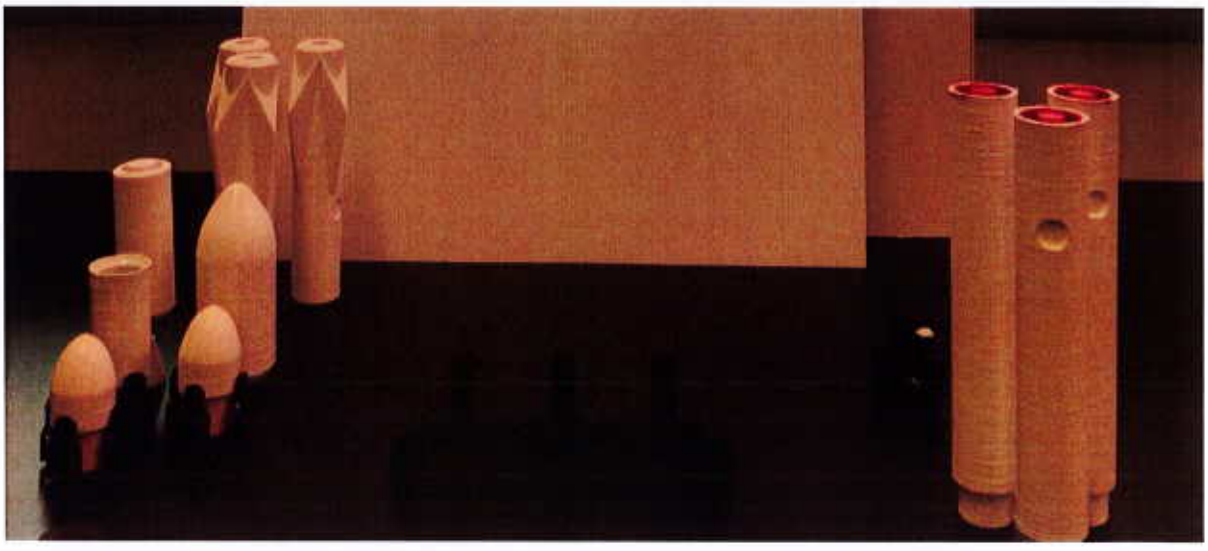

OSA RISK ASSESSMENT FORM

for all entries in (✓) ☑ Models & Inventions and ☐ Scientific Inquiry

This must be included with your report, log book or entry. One form per entry.

NAME: Felix Lister and Xander Neeskens ID: 0068-027

SCHOOL: Brighton Secondary School

Activity: Give a brief outline of what you are planning to do.

Create a model Falcon Heavy rocket. This model is being 3D printed and is interactive

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead?
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.

Risks	How I will control/manage the risk
• Being burned by the 3D printers • Being burned by the hot glue gun • Injection of the spray paint	• Only handle when the printer is cool. • Only handle when safe and don't touch the heated glue. • Wear a mask to protect face when using

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): Felix Lister and Xander Neeskens

SIGNATURE(S): Felix

☑ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

TEACHER'S NAME: MARIA GAZOULIS

SIGNATURE: M. Gazoulis DATE: 10/8/21