Pre-visit activities for schools classes aged 11- 14

Prior to your visit for your Destination Space workshop you may wish to do some of these activities with your pupils. None of these are compulsory but doing some or all of them will help to give your pupils the necessary background information to get more out of the workshop. Some of the activities are only applicable to certain parts of the workshop. Please speak to your presenter in advance to find out which parts you will be doing.

Find out about the ISS

- Information about the ISS can be found here: http://www.nasa.gov/mission_pages/station/main/index.html

Find out about Tm Peake

- A message from Tim Peake: http://www.nationalstemcentre.org.uk/elibrary/resource/10630/tim-peake
- Biography: http://www.esa.int/Our_Activities/Human_Spaceflight/Astronauts/Timothy_Peake

Preparing for their activities:

Combustion

Students will see an exciting demonstration of fuel combustion, releasing energy (heat & light). This represents the reaction occurring in a rocket engine. Pupils may find it useful to have prior knowledge of combustion, e.g. the fire triangle, or chemical equations.

Resources:

- KS3 resources from Gloucestershire Fire and Rescue service: http://www.glosfire.gov.uk/schools_tres_ks3.html
- Identifying the products of combustion: http://www.nuffieldfoundation.org/practical-chemistry/identifying-products-combustion
- Combustion of iron wool, showing increase in mass: http://www.nuffieldfoundation.org/practical-chemistry/combustion-iron-wool
- Combustion of hydrogen in air: http://www.nuffieldfoundation.org/practical-chemistry/combustion-hydrogen-air

- Exploding hydrogen balloon: http://www.nuffieldfoundation.org/node/1701
- Candle in bell jar: http://www.nationalstemcentre.org.uk/dl/f840c1ce96979023fff2a2e6ca3002f9cf1ad507/28553-ISMS-40.pdf
- Burning money: http://www.nationalstemcentre.org.uk/elibrary/resource/11163/burning-money
- Burning fossil fuels: http://www.nationalstemcentre.org.uk/elibrary/resource/6802/burning-fossil-fuels

Newton's third law

Students will see a demonstration of Newton's third law, the principle behind basic rocket propulsion. Some prior knowledge of this may be useful.

Resources:

- Newton's third law explanation animation: https://www.youtube.com/watch?v=r9yuR7ezqf4
- Newton's third law lecture and demonstrations: https://www.youtube.com/watch?v=Xx9kiF00rts (skip to 3 mins 40 secs to see this demonstrated on a skateboard with a fire extinguisher)
- With trolleys: http://www.nuffieldfoundation.org/practical-physics/action-and-reaction-trolleys
- With trolleys (advanced): http://www.nuffieldfoundation.org/practical-physics/skateboard-forces
- With a metre rule: http://www.nuffieldfoundation.org/practical-physics/action-and-reaction-metre-rule

Robotic arms

Your students may experience an activity in which they use a robotic arm to achieve a task. They may benefit from some prior knowledge of the use of robotics on-board the space station.

Resources:

- Information about Canadarm2, one of two robotic arms used on the ISS: http://www.nasa.gov/mission_pages/station/structure/elements/mss.html & http://science.nasa.gov/science-news/science-at-nasa/2001/ast18apr_1/
- Canadarm2 game: http://www.asc-csa.gc.ca/eng/multimedia/games/canadarm2/default.asp
- Canadian astronaut Chris Hadfield using the Canadarm2: https://www.youtube.com/watch?v=K7NvsxcoDKo

Solar panels

Your students may experience an activity in which they need to position a solar panel for maximum efficiency. They may benefit from some prior knowledge about how solar panels are used on the ISS and how they are orientated. The direction of the ISS solar panels must be constantly adjusted so they are pointing at the Sun as the ISS passes over the day side of the Earth (taking approximately 45 minutes). The ISS relies on battery power as it glides over the night side of the Earth (another 45 minutes).

Resources:

- ISS solar panel information: https://www.nasa.gov/mission_pages/station/structure/elements/solar_arrays.html#.VegiCfn6FuI
- Time lapse showing movement of solar panels: https://www.youtube.com/watch?v=gtLs8hW46oI

Carbon dioxide

Your students will complete an activity whereby they need to remove carbon dioxide and test whether this has been done successfully. Removal of carbon dioxide on board the ISS is essential as even a relatively small increase in carbon dioxide levels can have detrimental effects. This is especially important when astronauts are asleep. Since in microgravity warm air does not rise as it does on Earth, exhaled air remains close by. Carbon dioxide would eventually build up to toxic levels in a bubble around the astronaut's head.

Resources:

- Generating, collecting and testing for gases: http://www.nuffieldfoundation.org/practical-chemistry/generating-collecting-and-testing-gases
- Density of carbon dioxide: http://www.nuffieldfoundation.org/practical-chemistry/density-carbon-dioxide
- Breathing easy on the ISS: http://science.nasa.gov/science-news/science-at-nasa/2000/ast13nov_1/

Making circuits

Students will have an opportunity to build a circuit, but not in the conventional way. Prior knowledge about building circuits may be useful.

Resources:

- The problem circuit: http://www.nuffieldfoundation.org/practical-physics/problem-circuit

- Investigating current and charge: http://www.nuffieldfoundation.org/practical-physics/current-and-charge
- Investigating potential difference: http://www.nuffieldfoundation.org/practical-physics/potential-difference
- Investigating resistance effects: http://www.nuffieldfoundation.org/practical-physics/resistance-effects