

ACTIVITY 6.1 RE-ENTRY

From Chapter 6 of the Principia Space Diary

<http://principiaspacediary.org/activities/re-entry>

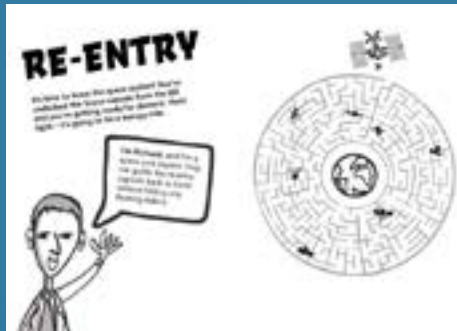
LEARNING LEVEL

KS1, KS2, P1-5

CURRICULUM LINKS & DIFFERENTIATION IDEAS

View detailed curriculum links for England, Scotland, Northern Ireland and Wales, plus differentiation ideas for your region and year level.

principiaspacediary.org/curriculum-planner/



Resources Required

- Computers with internet access

Background to this Activity

Getting back to Earth (i.e. “re-entry”) is one of the most complicated and dangerous parts of the mission.

If you are keen to understand the detail, watch the ESA video provided for a full explanation and first-hand accounts from astronauts who have taken this journey. A simplified explanation of re-entry is as follows:

- A week or so before returning, the astronauts and mission control do drills to make sure everyone knows what they have to do. They also test the Sokol spacesuits to make sure there are no leaks.
- On the day of re-entry, astronauts board a special spacecraft called a Soyuz capsule. This is attached to the ISS and the process of detaching the Soyuz is called ‘undocking’. (In Chapter One we learned about “docking” when Tim arrived at the ISS).
- The Soyuz is undocked and the astronauts burn the engines to get the spacecraft on the right orbital path. It then orbits the earth once and passes by the ISS on a different orbit so they don’t collide.
- The Soyuz crosses into the Earth’s atmosphere and picks up speed as it heads toward Earth. The astronauts start to feel G-forces as the speed increases. There is huge pressure on their bodies as they start to experience the force of gravity again.
- About 30 minutes before landing, at an altitude of about 140km, the Soyuz breaks into 3 parts. The middle part, where the astronauts are, is the only part that will return to Earth. The other parts will disintegrate in the Earth’s atmosphere.
- Parachutes shoot out of the Soyuz to reduce the speed and the impact as the spacecraft hits the ground. The astronauts are strapped in extremely tight and protected by shock absorbers but the

landing is still very rough! Emergency crew are on hand to help the astronauts out of the Soyuz.

Re-entry is meticulously planned but it does have many risks. The main ones are: floating space debris, heat, g-forces and landing off course. See the extension notes at the end of this chapter for more about each of those.

Running the Activity

This activity is about encouraging students to think about the complexity of re-entry and the hazards it presents to the capsule crew. Make a list of some of the difficulties astronauts may face as they attempt to come home. The maze represents the journey home complete with space debris to navigate around. Guide the re-entry capsule back to Earth without hitting any floating debris.

Students can further develop their understanding of re-entry by:

- Asking students to create their own landing craft using eggs, parachutes, bubble wrap etc.
- Students can create their own thermal heat shield using activities on: <http://www.spacetoeearthchallenge.org.uk/materials-how-smart-materials-are-used-resources/>.
- Look at a map of Kazakhstan and identify where you think would be a good landing site for the capsule.

Questions for the Class

- What do you think are the main dangers of re-entry?
- How do you think astronauts might feel in the lead up to returning to Earth? Would there be more than one emotion?
- What would be the first things you would want to do when you returned?
- Why do astronauts need to be carried away in chairs and with blankets after they have landed?