

ACTIVITY 1.3 FAST-TRACK RENDEZVOUS

From Chapter 1 of the Principia Space Diary

<http://principiaspacediary.org/activities/fast-track-rendezvous>

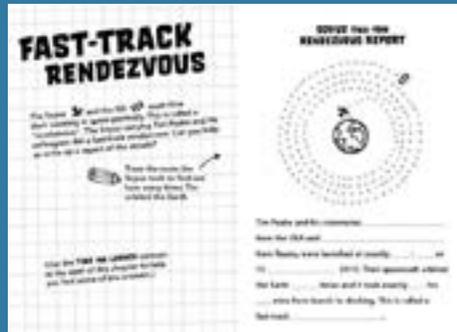
LEARNING LEVEL

KS1, KS2, P1-5

CURRICULUM LINKS & DIFFERENTIATION IDEAS

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Resources Required

- No additional resources required

Background to this Activity

This activity works alongside Time For Launch (Activity 1.1). Children can use the information they researched in that task to fill in the gaps to complete this task.

When transferring astronauts to and from the International Space Station, a capsule must be accurately piloted to dock with the ISS. This is called a 'rendezvous'. A space rendezvous is a complex process because the capsule must catch up to the ISS, which orbits the Earth at 17,500 miles per hour.

In 2015, the Soyuz capsule travelled through space for approximately six hours, before it reached the ISS. The capsule docked at the ISS, allowing Tim and his fellow astronauts to enter the spacecraft.

So how did the Soyuz capsule dock on the ISS? Once the capsule had left the Earth's atmosphere, astronauts fired the capsule's rockets parallel to Earth, to get the capsule in an orbit going around Earth. They had to increase the size of their orbit bit by bit, until they found the ISS's path around Earth. This is called a Hohmann Transfer, and involved firing the Soyuz's engines twice, once on each side of the Earth. Each blast increased the Soyuz's orbit. After a few short correctional burns, the Soyuz caught up to the ISS.

To get the Soyuz capsule on the same orbital path as the ISS, the astronauts performed another Hohmann Transfer right as the capsule passed the ISS. This pushed the Soyuz ahead of the ISS and onto its orbital path. The astronauts then performed a U-turn so they were facing the ISS.

This is quite scary, because the ISS weighs 925,000-pounds. Docking only takes about 30 minutes, but it may take several hours to complete the rendezvous process.

Running the Activity

Children need to find the information to complete the fast-track Rendezvous by filling in the gaps.

Start by reading the background information above to the class – perhaps pointing out that rendezvous is a French word meaning 'meeting'.

Ask students to trace the route of the Soyuz in the activity as it orbits Earth. This will help them to fill in one of the blanks on the activity sheet.

Then ask the children to fill in the remaining blanks by referring to Activity 1.1 Time for Launch and Activity 1.2 8 Minutes to Space in the Space Diary, or researching Tim's docking individually or as a group.

Answers

Tim Peake and his crewmates, Tim Kopra from the USA and Yuri Malenchenko from Russia, were launched at exactly 11:03 on 15 December 2015. Their spacecraft orbited the Earth 4 times and it took exactly 6 hrs 10 mins from launch to docking. This is called a fast-track rendezvous.

Questions for the Class

- Why do you think this is called a fast-track rendezvous?
- Why do you think the Soyuz had to orbit the earth so many times before rendezvousing with the ISS?
- At what time did the Soyuz dock with the ISS? How do you know this? How did you work this out?