Tim Peake

Tim Peake was born in 1972, the same year that the last person walked on the Moon. Tim’s interest in space has been a lifelong passion. It started in his childhood, gazing at the stars and wondering about the Universe and he has kept his curiosity since then.

Tim considers himself very fortunate to have been inspired by great teachers and leaders along the way. He graduated in the British Army Air Corps at the age of 20, starting a successful career as a pilot that would take him across the globe. He served for 18 years in the British Army, including tours in Bosnia and Afghanistan.

He received a science degree in flight dynamics from the University of Portsmouth in 2006. He loves outdoors activities and is a rugby fan. Tim is also fascinated by quantum physics and cosmology.

Previous life and work experiences have provided him with notable strengths for his spaceflight adventure. Tim is used to dealing with international partners and respecting cultural differences. Danger and emergency situations have been part of his career.

Time to fly

Tim was selected as an ESA astronaut in May 2009 after completing a year-long selection process. He described the moment as a wild mix of emotions – elation, shock and trepidation. With no guarantee of even getting a spaceflight, Tim put his career as a test pilot to one side.

Since then, though, his life has radically changed. Besides becoming a parent of two little boys, he has been travelling the entire time, living in Germany and the United States. The gamble of choosing space paid off when, in 2013, he was assigned to fly to the International Space Station on a long-duration mission.

Tim embarked on the next phase of his space journey jumping into the assigned crew training flow, a smoothly operating machine that takes International Space Station astronauts through two and half years of intensive preparations to launch.

timpeake.esa.int
@astro_timpeake
Principia

ESA astronaut Tim Peake is set to go into space on a long-duration mission packed with science and education activities. For over five months, his home and workstation will be some 400 kilometres above Earth. He will serve as a flight engineer for Expeditions 46 and 47 to the International Space Station (ISS).

Tim will be launched on a Russian Soyuz spacecraft from Baikonur Cosmodrome in Kazakhstan in December, returning to Earth half a year later. He will share the trip with Russian cosmonaut Yuri Malenchenko and NASA astronaut Timothy Kopra.

A former army helicopter pilot, Tim will travel in the right hand seat of the Soyuz capsule.

Brits in space

Tim Peake will be the first British ESA astronaut to live and work on the International Space Station. Only four other Britons have flown in space, either by securing private funding or having a dual citizenship.

In 1991, Helen Sharman flew to the Mir station funded by a private consortium and became the first British citizen – and the first European woman – in space. Michael Foale, Piers Sellers and Nicholas Patrick flew on the US Space Shuttle as NASA astronauts with American citizenship.

Key data

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<tr>
<th>Launch site</th>
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<tr>
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<td>Spacecraft</td>
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<td>Mission duration</td>
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(Status as of November 2015)
Science out of this world

The Principia mission’s extensive scientific programme consists of dozens of experiments orbiting Earth. Tim will run a set of European experiments covering human research, biology and radiation, as well as demonstrating new technology on the Space Station. He will perform valuable science for Europe in the Columbus laboratory, bringing real benefits to people back on Earth.

Material Science

PLASMA
Plasma is an ionised gas considered to be the fourth state of matter. One of the experiments investigates the creation of plasma-microparticles in weightlessness to simulate how molecules interact in three dimensions.

The science being studied on board the Station is incredibly exciting and has the potential to deliver major breakthroughs in several areas, such as medical treatments, new materials and our fundamental knowledge of the universe.

Tim Peake

Monitoring space environment

SUN
A European facility is continuously measuring our star’s electromagnetic radiation with unprecedented accuracy across a wide part of its spectral range. Attached outside the Station, its spectrometers make observations in the ultraviolet, visible and infrared wavelengths. Scientists want to measure the solar constant to distinguish between solar impact and human influence on Earth’s climate.

RADIATION
Radiation levels in space are higher than on Earth, usually as much as 30 to 50 times stronger. Several passive devices are monitoring radiation in the European Columbus module to prevent health problems on long-duration space missions.

METALS
Super-alloy metals are in high demand to optimise industrial casting processes. A set of experiments will investigate the effects of microgravity on metal microstructures, especially on liquid metals when forming alloys.
asthma, so patients could benefit from the tests developed for this research.

STOMACH
Humans lose body mass in space. Tim will measure changes in energy expenditure to derive an equation for an astronaut’s needs on long-duration missions to the International Space Station and beyond.

INNER CLOCK
We all have an inner clock – the circadian timing system. That cycle is disrupted in orbit, where astronauts experience 16 sunrises and sunsets every day. An experiment will look at how long-duration spaceflight affects Tim’s biological clock.

BONES
Astronauts lose up to 1% of their bone mass each month in space. European experiments are looking into developing technologies to counteract bone loss for space travellers and hopefully prevent osteoporosis in large population segments on Earth.

MUSCLES
Living in microgravity leads to the loss of muscle mass, function and motor control. Tim’s feedback and samples of his soft tissue will contribute to identify the root of the problem of maintaining muscle mass in space.

SKIN
Astronauts lose more skin cells and age faster during spaceflight. Samples of Tim’s tissue will give insights on skin physiology in space and, in particular, the skin-ageing process.

IMMUNE SYSTEM
More than half of the space travellers show significant signs of immune dysfunction after long missions. Using brain scans, monitoring breathing and looking at samples of hair, scientists look at how stress affects the immune system.

Biology

HUMAN CELLS IN SPACE
In weightlessness, the internal machinery of the human cell is affected. European experiments will look at cell proliferation and their life cycle in space. These investigations could also be linked to clinical medical research to treat common diseases in the elderly.

SPACE SURVIVAL
Scientists are testing the survival skills of terrestrial organisms in outer space. The Expose-R2 platform houses a variety of organic samples for more than a year outside the Space Station. One of the goals is to evaluate the impact of light and radiation on cells and their molecules.

Human research

HEAD
Tim’s brain will be examined in detail on ground before and after his mission to understand how the neural processes of perception adapt to weightlessness. He will also register any headaches while in orbit.

LUNGS
Dust particles are floating in the Station’s atmosphere. Tim’s lungs and airways will be monitored to detect any lung inflammation. More than 300 million people on Earth suffer from...
Inspiring the next generation

Tim invites students of all ages to share the trip and the excitement of his space adventure. Principia’s large education and outreach programme comprises over 25 activities and teaching resources that will help trigger the interest of students in science, technology, engineering and maths before, during and after the mission.

Biology – Rocket science
About two kilos of rocket seeds, also known as rucola, will orbit the planet at approximately 28 000 km/h and be exposed to the weightlessness and radiation of space. After several months, the rocket seeds will return to Earth and distributed across 10 000 schools in the UK, along with another batch of seeds that did not leave our planet.

Schoolchildren will plant both types of seeds and compare their growth. The pupils will learn whether space travel impacts growth and whether humans could one day produce their own food in space.
Mission-X – Keep on running
Mission-X fever is spreading across the planet. Future space explorers will get on their marks and invade gyms to train like astronauts for the 2016 challenge. ‘Mission-X: Train like an astronaut’ is an educational programme in which thousands of schoolchildren aged 8 to 12 years old from more than 25 countries do science activities and learn how to get fit.

Computing – Astro Pi
Primary and secondary schools in the UK are turning to the ‘Raspberry Pi’ mini computer to take advantage of its flexibility. Two of these credit card-sized computers called Astro Pi will go to the Station equipped with a host of sensors and gadgets. Students can devise and code their own apps or experiments to run in space.

There is huge scope for fun science and useful data gathering using the ‘Astro Pi’ sensors on board the International Space Station.

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Space science – Watch and learn
Tim will record videos from the International Space Station demonstrating the phenomena that mentors find hard to show during their earthbound lessons. The experiments will help students to better understand Newton’s three laws of motion and the idea of gravitational forces – the inspiration behind Tim’s mission name, Principia.

Calling occupants of interplanetary craft
Space technology is not all high-tech. Radios operated by amateur enthusiasts can be used to communicate with the International Space Station. As he flies above the United Kingdom, Tim will talk to children using handheld-radios over ARISS, the Amateur Radio on the International Space Station.