Careers In Space

Teacher Answer Guide

Australian Centre for Career Education

A collaboration between
The Australian Centre for Career Education
and The Australian Space Agency

Australian Space Agency

Acknowledgements

The Australian Centre for Career Education acknowledges the Traditional Owners of Country throughout Australia and pays respect to Aboriginal and Torres Strait Islander people as custodians who have cared for this land, and its waters for over 60,000 years.

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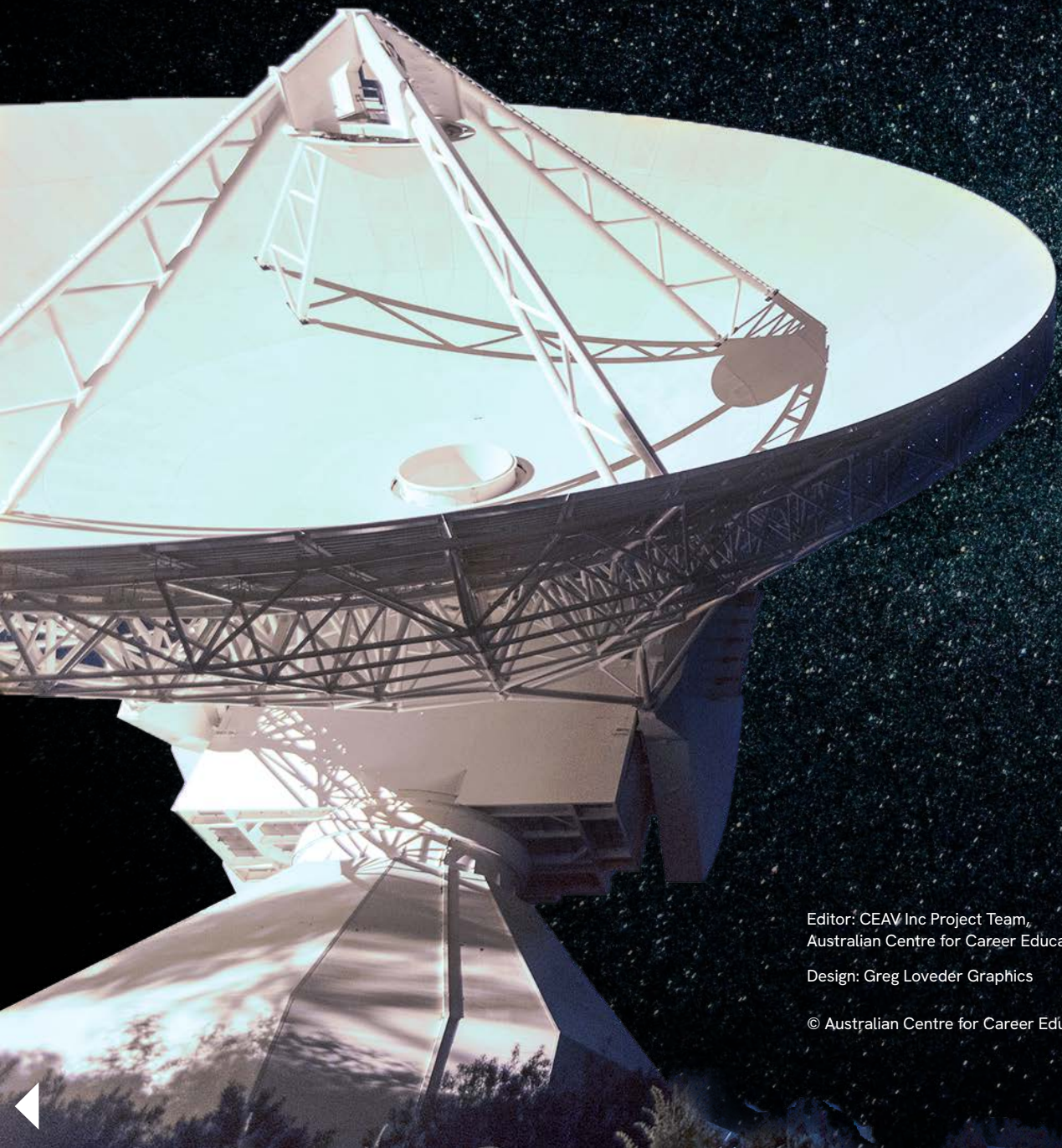

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2b. Space Career Case Stories

Head to www.ceav.vic.edu.au/resources/industry-resources/careers-in-space to see extended case stories from everyone mentioned in this book.

Hugh Prescott

Role: Embedded Software Engineer

Organisation: Inovor Technologies

Qualifications: Bachelor of Science in Mechatronics, Master of Engineering (Mechatronics)

Employability Skills:

Problem-solving, Creative Thinking, Research, Teamwork, Learning, Collaboration

What does Hugh spend a lot of his time doing?

Hugh spends a lot of his time writing software that tricks the hardware into thinking it's already in space, enabling testing of different scenarios.

What part of the satellite is the Attitude Determination and Control System (ADCS)?

The ADCS is the part of the satellite that lets you control where it's looking when it is in space.

What did Hugh study after finishing school?

Bachelor of Science at The University of Melbourne.

What was Hugh working on when he graduated from University?

Hugh graduated while working on the designs for the ADCS.

What is Hugh's advice for anyone wanting to work in the industry?

Now is the best time to get involved!

What does Hugh see himself doing next and into the future?

He sees himself expanding with Inovor as they begin to work on bigger and more complicated satellites.

Careers in Space

Lachlan Mackie

Role: Mechatronics Engineer

Organisation: Skykraft

Qualifications: Associate Degree in Engineering,
Bachelor of Engineering (Robotics and Mechatronics) (Honours)
Bachelor of Business

Employability Skills:

Problem-solving, Flexibility, Tool Skills, Communication, Technical

What bridging course did Lachlan do at university to get into Engineering?

Associate Degree in Engineering.

How did Lachlan become aware of his current job?

A post on the Melbourne Space Program's Facebook page advertising internships.

What is your understanding of what a Mechatronics Engineer does?

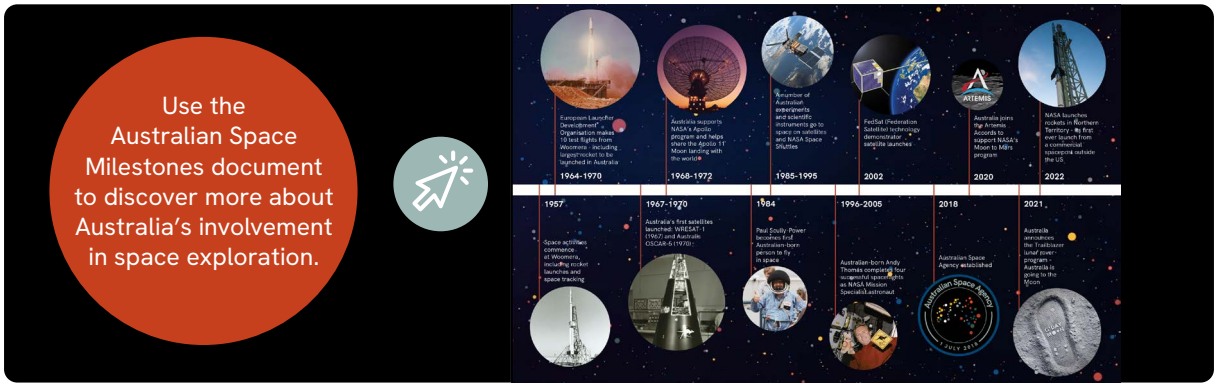
Design, develop and manufacture assigned hardware for satellites.

What are some of the skills required for Lachlan's job?

Problem solving, tool skills, communication & flexibility.

3a. Let's explore Australia's Space History!

Use the Australian Space Milestones document to discover more about Australia's involvement in space exploration.



In what year did the Australian Space Agency commence operations?

The Australian Space Agency commenced operations on 1 July 2018.

Explain the role of the Australian Space Agency and some of its primary responsibilities:

The Australian Space Agency is responsible for the nation's civil space activities. Some of its primary responsibilities include the following:

- Coordinating Australia's domestic space sector, fostering national collaboration, and driving the growth of the space industry.
- Advancing Australia's space capabilities by developing international partnerships and attracting investments.
- Promoting the application of space technologies in various sectors, such as communications, agriculture, health, and environmental management.
- Supporting research and development initiatives, education, and workforce development in space-related fields.

When and how did Australia contribute to the Apollo lunar program?

Between 1968-1972, Australia hosted the largest number of NASA tracking stations outside the US, including the famous Honeysuckle Creek tracking station. These stations played a crucial role in supporting many NASA space programs. During the historic Apollo 11 Moon landing, Honeysuckle Creek played a pivotal role in transmitting the first television pictures of Neil Armstrong setting foot on the Moon. The Parkes Radio Telescope, also known as "The Dish", supported several Apollo missions, including providing most of the television from Apollo 11.

Identify two major milestones in Australia's space history and explain their importance and in what year they occurred.

1. Milestone: Australia's first satellite launch - WRESAT-1 in 1967

Importance: The flight made Australia one of the earliest nations to launch its own satellite. It showcased Australia's technological capabilities.

2. Milestone: Australia's collaboration with NASA's Artemis Accords in 2020

Importance: By joining the Artemis Accords, Australia demonstrated its commitment to international cooperation in NASA's lunar exploration plans. This partnership positions Australia to play a vital role in future Moon missions and fosters scientific and technological advancements in the country.

3b. Katherine Bennell-Pegg

Hear about the fascinating and inspiring journey of Katherine Bennell-Pegg, the first Australian-born female trained as an astronaut, as she prepares to embark on an extraordinary training program

What did Katherine like to do when she was young?

Look up at the stars and explore what was out there.

What did Katherine refuse to do in high school?

Write down any more career choices other an astronaut.

In what country, and where, will Katherine train as an astronaut?

In Germany, at the European Astronaut Centre.

Unlike previous astronauts, what will Katherine get to do?

Train under the Australian flag.

What percentage of Australia's STEM workforce are women?

Approximately 27% of the Australian STEM workforce is female. In the Space sector itself, research indicates that around 20% of the workforce is female, as noted in the Fast Facts.

What is Katherine most excited about?

Showing what she can bring to the Human Spaceflight ecosystem and what Australian researchers and scientists can do on the world stage.

Katherine calls astronauts the "ultimate operators". What do they do?

Operate hundreds of experiments.

4a. Andreas Antoniades

Role: National Director
Organisation: Saber Astronautics
Qualifications: Bachelor of Electrical Engineering (Honours), Bachelor of Business (Management)

Employability Skills:
Management, Problem solving, Communication, Leadership

How did Andreas initially join Saber Astronautics?

As a part-time electronics engineer for a defence innovation project.

What led to Andreas being offered a role at Saber Astronautics?

Showing his satellite groundstation control prototypes.

What additional responsibilities did Andreas take on as Saber Astronautics grew?

Business-related tasks, growth strategy, presentations, and international representation.

What is an essential skill required in the space industry according to Andreas?

A solid understanding of core maths, physics, and chemistry.

4b. Ben Martin

Role: Electronics Technician
Organisation: Inovor Technologies
Qualifications: Advanced Diploma of Electronics and Communications Systems Engineering

Employability Skills:
Adaptability, Time Management, Technology, Problem-solving, Logical

What are some of Ben's daily tasks?

Manufacturing printed circuit boards, functional and final testing of the printed circuit boards, design the hardware and software for an in-house tester for solar cells.

What was Ben's first job while studying?

At a local electronics manufacturer assembling and testing products.

How long has Ben been working in the manufacturing industry?

15 years.

What is Ben's current position at Inovor Technologies?

Electronics Technician.

What does Ben suggest you do if you're passionate about Engineering?

Knuckle down, learn as much as you can at school, TAFE or University and follow your dreams.

4c. Chloe Leclerc

Role: Chief Marketing Officer
Organisation: Fleet Space
Qualifications: Master's Degree in International Business

Employability Skills:
Multilingual, Research, Written & Verbal Communication, Leadership, Collaboration, Technology

Where did Chloe's career journey begin?

Communications at the AIRBUS Aviation manufacturing plant in China.

What is one of the key strengths of Chloe and her team?

Within her team there are individuals from various backgrounds and experiences, each bringing their own valuable perspectives. This diversity of thought enables them to think outside the box and approach challenges from different angles.

What are the five skill sets Chloe requires for her role?

Strategic thinking, Creativity, Communication, Leadership & Adaptability.

What advice does Chloe give for anyone thinking about working in the industry?

Go ahead, dive in, and be a part of this incredible journey. The possibilities are endless.

4d. Daniel Floreani

Role: Director
Organisation: CyberOps
Qualifications: Science Degree, Engineering Degree and a PhD

Employability Skills:
Multilingual, Research, Written & Verbal Communication, Leadership, Collaboration, Technology

How many years at university did it take Daniel to get his PhD?

10 years.

What company did Daniel establish?

CyberOps.

What is Daniel's company responsible for?

Providing quality analysis of systems.

What skills does Daniel value for his business?

Technical skills and very good interpersonal skills.

4e. Mandi Dimitriadis

Role: Director of Learning
Organisation: Makers Empire
Qualifications: Education Degree

Employability Skills:
Communication, Technical, Problem-solving, Collaboration

What were the career steps Mandi took to get to her current job?

Teaching in the Government system, experience as a Museum Educator, curriculum consultant, working in state-wide curriculum and pedagogy roles, joining an Ed Tech company as the Director of Learning.

What are Mandi's day to day duties in her current role?

Helping school students and their teachers learn in exciting ways, developing learning programs based on 3D modelling, 3D printing, design thinking, problem-solving, assisting with creating in-app challenges.

What does Mandi love most about her current role?

Being able to reach so many young people around the world and inspire them to reach for the stars.

How many years has Mandi worked as an educator and what are her qualifications?

30 years, with a Degree in Education.

4f. Nick Manser

Role: Satellite Systems Engineer
Organisation: SmartSat CRC
Qualifications: Bachelor of Computer and Information Science and a Master of Computer Science

Employability Skills:
Technology, Learning, Communication, Problem-solving

Nick's work days are always different, but what are the two constants?

The only things that are constant each day are collaborating with his peers and learning something new.

How did Nick acquire knowledge and experience in satellite communications and space systems engineering?

Nick learned on the job as a graduate researcher, immersing himself in the technology, seeking guidance from experts, and asking questions.

What motivated Nick to join the SmartSat CRC and contribute to building South Australia's satellite?

Nick joined SmartSat CRC to help build South Australia's satellite, Kanyini, which collects data to improve lives and tests AI algorithms in space.

4g. Tom Grace

Role: Space Weather Forecaster
Organisation: Bureau of Meteorology
Qualifications: Doctorate in Nanotechnology

Employability Skills:
Analytical, Written & Verbal Communication, Time Management,

What is the main skill that is required to be a space weather forecaster?

To be able to analyse lots of data, sometimes with missing information, to produce a forecast that you are confident about.

What does Tom enjoy about science communication roles?

Tom enjoys taking complicated science data and presenting it in a way that is interesting, engaging, and understandable.

What does Tom sometimes monitor that can disrupt communications on Earth?

Solar flares.

4h. Zandria Farrell

Role: National Manager, Space. National Security and Space Program
Organisation: Bureau of Meteorology
Qualifications: Bachelor of Archaeology (Honours), Chemistry for conservators, Post Grad in Environmental Management and the International Space University's Southern Hemisphere Space Studies Course

Employability Skills:
Technology, Strategic Thinking, Interpersonal Skills, Written and Verbal Communication Skills

What were some of the different career interests that Zandria had in Year 10?

In Year 10, Zandria had aspirations to become a scientist, geologist, inventor, and National Geographic photographer.

How did Zandria's wide range of interests impact her career decision-making process?

Zandria's diverse interests made it challenging for her to choose a specific career path, as she found herself drawn to many different fields and activities.

What motivated Zandria to apply for a role at the Australian Space Agency?

Zandria's desire to engage in interesting and meaningful work, as well as her curiosity about STEM subjects since childhood, led her to apply for a position at the Australian Space Agency.

How did Zandria's initial role at the Bureau of Meteorology contribute to her current position as National Manager, Space?

Zandria's initial role at the Bureau of Meteorology as the Space Industry Lead for Space Weather, propelled her to her current position as National Manager, Space, allowing Zandria to develop expertise in space weather and establish the Bureau's spaceflight support capability.

7b. Andrea Henderson

Role: National Manager, National Security & Space Operations (acting)

Organisation: Bureau of Meteorology

Qualifications: Graduate Diploma in Meteorology, Graduate Certificate in Management, Bachelor of Science with First Class Honours (Mathematics)

Employability Skills:

Leadership, Communication, Problem-solving, People Management Skills, Strategic Thinking, Project Management & Financial Management

How did Andrea's involvement with the World Meteorological Organization (WMO) lead to her interest in space weather services?

Andrea's work with the WMO on aviation meteorological services made her realise the importance of space weather services in ensuring safety for aircraft, which sparked her interest in the field.

What are some of the main responsibilities of Andrea as the National Manager of National Security and Space Operations?

Andrea's responsibilities include ensuring operational products meet customer needs, managing relationships with the National Security and Space communities, overseeing investigations into weather-related incidents, and creating a safe and inclusive workplace.

What does Andrea find most rewarding about working in a scientific organisation?

Andrea finds the variety of specialist science areas, the encouragement from senior leaders, and the opportunity to collaborate with exceptional STEM professionals most rewarding in her role.

How did Andrea navigate challenges related to gender and work-life balance in her career?

Andrea faced challenges in male-dominated environments, but received support while balancing her career with family responsibilities by maintaining networks and utilising flexible work arrangements.

7c. Dancy Chan

Role: RF Engineer
Organisation: Inovor Technologies
Qualifications: Diploma in Electrical and Electronic Engineering and an Electrical and Electronic Degree

Employability Skills:
Practical, Communication, Methodical, Persistent, Analytical, Logical

What qualifications did Dancy gain at University?

Electrical and Electronic Degree.

What subjects did Dancy love at high school?

Maths, physics and anything science.

What are some of Dancy's responsibilities as a RF Engineer?

RF frontend for satellite and ground station architecture and design, and technical problem solving.

What are some of the skills required for a RF Engineer?

Soldering for reworking electronics, understanding RF design, able to operate RF equipment such as a spectrum analyser, RF power meter, vector network analyser, signal generator.

What are some of the attributes suited for the industry?

Methodical, persistent, analytical, logical and like to work in a combination of office and field settings.

7d. Sarah Cirillo

Role: Mission Systems Engineer
Organisation: Inovor Technologies
Qualifications: Bachelor of Mechanical Engineering & Bachelor of Finance

Employability Skills:
Technical, Problem-solving, Collaboration, Communication, Attention to Detail, Project Management

What is Sarah's Job title?

Mission Systems Engineer.

What were a couple of factors that lead Sarah to apply for her current job?

Ready for a change in career, explore new opportunities.

What are the responsibilities of a Mission Systems Engineer?

Designing and developing the complex systems that are critical for the success of space missions.

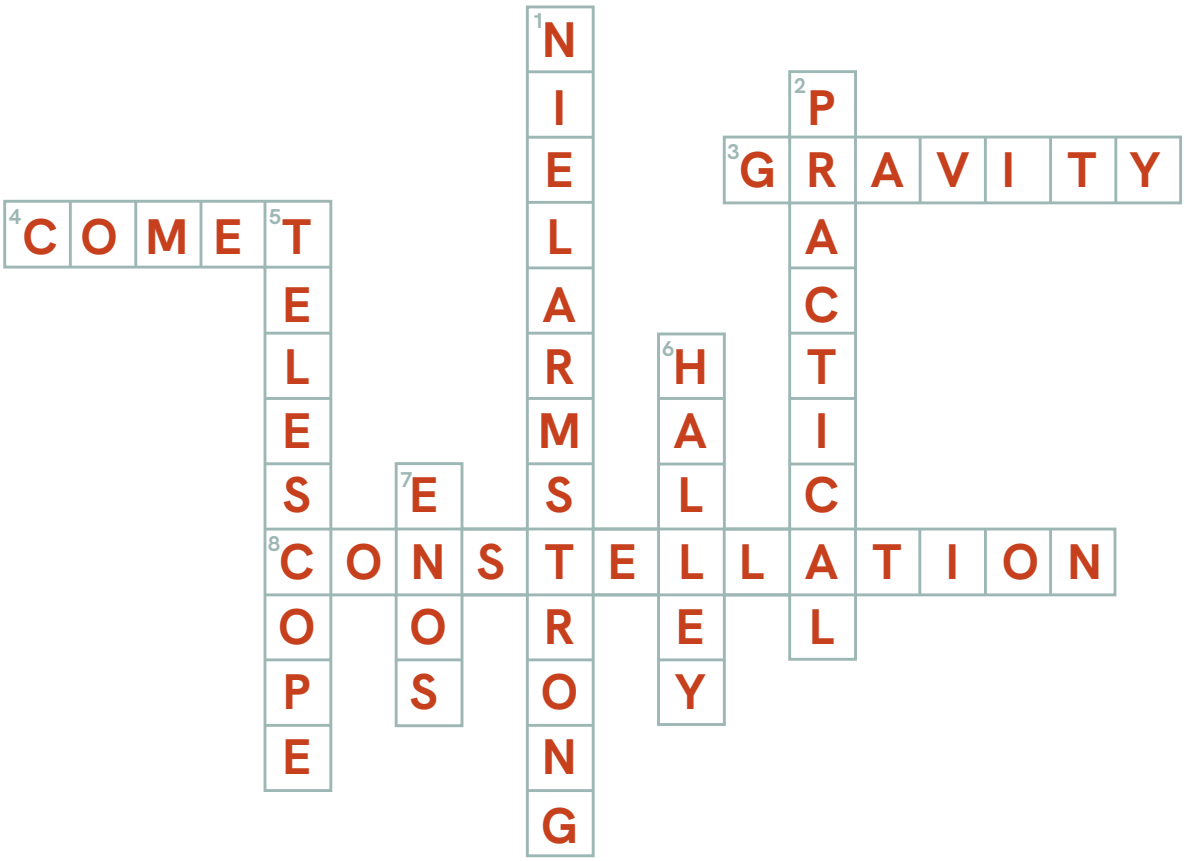
What kind of skills are essential for Sarah's role?

Strong foundation in systems engineering, problem-solving, strong communication, attention to detail, project management skills.

8. Crossword

Instructions:

1. Use the below clues to fill in the words
   (***Tip:*** look through the Careers in Space Workbook to find interesting facts)
2. Words can go across or down
3. Letters are shared when the words intersect

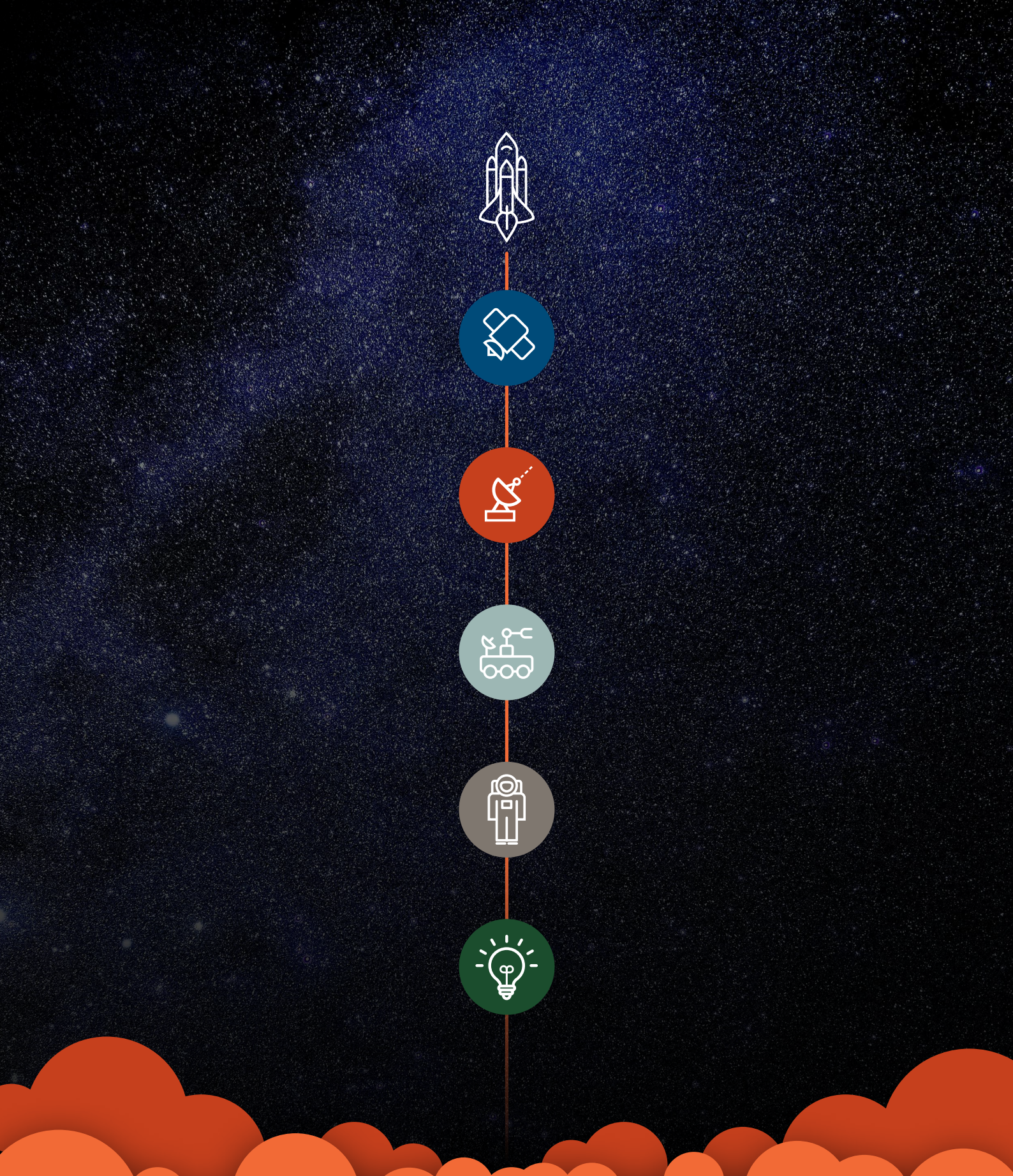


DOWN

1. The first man to walk on the Moon.
2. One of the key skills/strengths a space technician needs (clue: use 'A space for everyone' pdf document).
5. A device used to view distant objects in space.
6. A comet that is visible from Earth every 76 years.
7. Who spent almost three hours orbiting the Earth?

ACROSS

3. The force that holds planets in orbit around the Sun.
4. A small, icy object that orbits the Sun.
8. A group of stars that form a recognisable pattern.



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