



Introduction

The Australian Virtual Astronaut (AVA) Challenge is a 9-step STEM design sprint based on challenges facing NASA's Artemis and the Australian space industry. AVA teams will choose from a set of four scenarios and design a solution presented in the form of either a 90-second video pitch or poster. A number of teams will then be selected to pitch their ideas at the Young Space Explorers event in Sydney. The goal of the AVA Challenge is to engage young people in a real space challenge and to inspire them to address the emerging challenges in space and on Earth.

Scenario 6: Telecommunications in Space

High-speed and clear communications underpin our modern society. For the public, this means reliable and swift connectivity, essential for everything from daily communications to emergency response coordination. It empowers individuals and communities with access to information and communication technologies, fostering digital inclusivity as it reduces the tyranny of distance.

Furthermore, satellite networks enhance sovereign capabilities, allowing nations to maintain secure and independent communication channels, crucial for national security and global diplomacy.



Optus Belrose Satellite Facility
Image: Ben Newsome



Illustration of Optus 11 - A Ku-band telecommunications communications satellite. Image: Optus

The Mission Overview

The Telecommunications in Space mission is modelled on the opportunities communications technology from space affords us. In this scenario, students will execute a 9-step design sprint, which includes:

- weekly presentations by mission experts
- curated weekly design exercises

Teams will be invited to develop mission concepts related to telecommunications in space





Team Deliverables

Telecommunications in Space

Teams will develop a 90-second video or poster design that will include:

- Identification of the primary science goal that the mission will investigate derived from the science objectives;
- Outline a telecommunications concept that will meet the planned science objective that will be necessary to execute the science experiment(s);
- Identify the resource(s) outlined in a proposed mission plan; and
- Outline the project plan that will capture the science needed to fulfil the mission's goals and objectives.

Mission Schedule

The Australian Virtual Astronaut (AVA) Challenge missions will be delivered by subject matter experts and will provide relevant information for the team to complete the challenge in a systematic way using the iSTEM Engineering Design Process as a guide.

Step-by-Step Schedule

Run these missions at your own pace. use as little or as much of the AVA resources as needed.

Mission 1: Introduction and Webinar

Mission 2: Define

Mission 3: Identify

Mission 4: Brainstorm

Mission 5: Design

Mission 6: Prototype

Mission 7: Evaluate

Mission 8: Iterate

Mission 9: Communicate

The culmination is submitting your pitch to be judged. Finalists will be invited to pitch at the Young Space Explorers event in Sydney



Age Divisions

The Australian Virtual Astronaut (AVA) Challenge is open to all students from Year 5 to Year 10.

There are three age divisions for judging:

- Stage 3 – Years 5 and 6
- Stage 4 – Years 7 and 8
- Stage 5 – Years 9 and 10 (Eligible for Phase 2)



Science Goals and Objectives

Each team must seek to answer the Artemis Science Goal of **Investigating and mitigating exploration risks to humans**

Teams will then outline a science objective(s) for their telecommunications mission. Teams must seek to answer one or more of the most important science objectives of the NASA Decadal Survey:

Alternatively teams can choose to base their mission on their own objective.
e.g.

- addressing UN SDG Goal 9:
“Build resilient infrastructure, promote sustainable industrialization and foster innovation”
- Novel approaches to laser, microwave & radio communications (or emerging technologies).
- Earth Station improvement concepts.
- New satellite technologies in different orbits; LEO, MEO, GEO, GSO, Polar, SSO and HEO.

Phase 2: - Pitch Session

Teams in Year 9 or 10 will be eligible to be selected for Phase 2. In this phase, teams will be given 3 minutes to pitch their idea to an expert panel at the Young Space Explorers event. If you cannot attend the face-to-face event, teams will pitch to leaders from the space industry and venture capitalists virtually in order to be crowned the overall winners.



Team Deliverables

The team is to prepare a slide deck that will be presented to a panel of experts. The slide deck should:

- Identify the primary science objectives/goals to be solved;
- Show a graphical representation of the design solution;
- Outline any science experiment(s);
- Identify the resource(s);
- Identify the team and describe why it is the best;
- Outline why the teams mission should be chosen.