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 1: Growing Food in Space

Background - Magnitude.io

Magnitude.io is a founding member the AVA challenge and CEO Ted Tagami is a regular contributor to the content. The mission of Magnitude.io is to cultivate generations of brilliant scientists, engineers, and leaders through stellar STEM experiences igniting curiosity, inquiry, and ingenuity. Through Magnitude.io students conduct authentic research in space with programs such as the ExoLab project. ExoLab is an experiment platform that brings together classrooms and the International Space Station in a collaborative investigation of the effects of microgravity on living things.

Background - ExoLab-10 Carbon Farmer

ExoLab-10 Carbon Farmer is a Magnitude.io program involving students using scientific inquiry to learn about the importance of the carbon cycle on Earth and in space. It does this via a real mission to the International Space Station. Students run Earth based missions using the ExoLab equipment and compare the results with those experiments occurring on the International Space Station. The ExoLab-10 experiment is to capture the most carbon by growing the largest alfalfa plants, a versatile forage and legume crop known for high edible biomass production, carbon sequestration, soil rejuvenation and potential for biofuel.

The AVA program will use ExoLab-10 as a case study.

Mission Overview

Growing Food in Space
You are part of a team of astronauts, scientists, engineers and leaders who are working on the Artemis program. In this 9-step design sprint, students will complete an engineering design process to develop a new plant growth mission for the International Space Station, Mars or the moon.

This mission could be a new growth experiment, device or environment, your client will be Ted and the team at Magnitude.io. Throughout the 9 missions, students will complete activities as if they were real astronauts on a mission and will complete a series of collaborative activities in order to develop a new mission concept suitable for the International Space Station, Mars or the Moon.

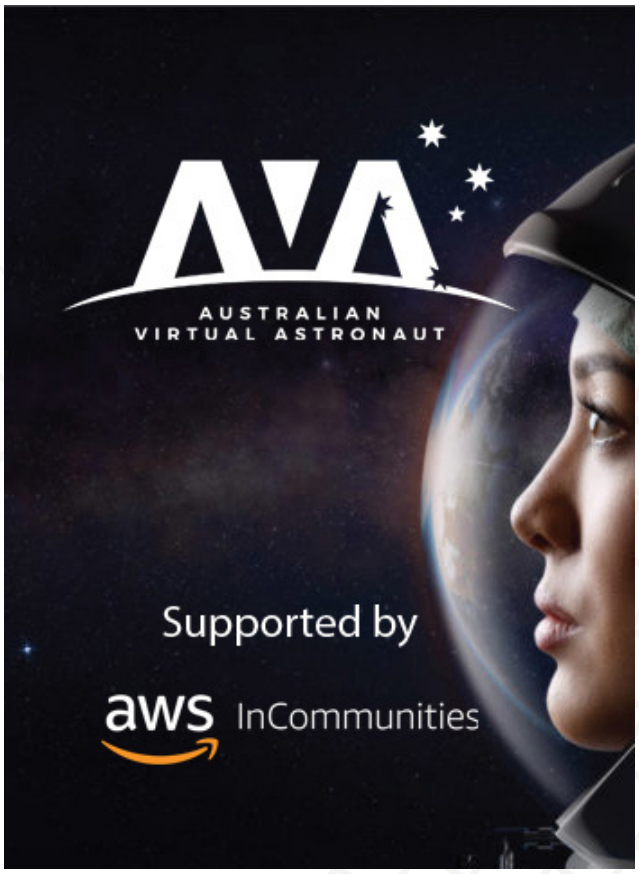
Mission Schedule

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 Youn 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)

Team Deliverables

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

- Identification of the primary science goal that the mission will investigate;
- Outline a design concept for a mission that will meet the planned science objective;
- Identify the resource(s) outlined in a proposed mission plan.

Science Goals

Each team must seek to answer one of the following Artemis Science Goals:

- Goal 7a: Study the fundamental biological and physiological effects of the integrated lunar environment on human health and the fundamental biological processes and subsystems upon which health depend;
- Goal 7g: Study the influence of the lunar environment and its effects on short- and long-term plant growth, productivity (as a food source), palatability, and nutrition;
- Goal 7h: Evaluate the use and effectiveness of model plants in ecological life support systems;
- Goal 7i: Study the effect on microbes of long-duration exposure to the lunar environment;
- Goal 7j: Assess the effect on plants of long-duration exposure to the lunar environment;

Alternatively teams can choose to base the mission on there own goal. e.g. Produce sustainable food sources for space.

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. Teams unable to attend in person will be able to 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 why it is best to design the mission;
- Outline why this mission should be chosen.