



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: Earth Observation

MILO Space Science Institute

The MILO Space Science Institute at Arizona State University was created to provide access to space science for every nation on the planet.

The MILO Institute, the University of New South Wales, and University of Sydney have joined forces to implement a program that will prepare Australian organisations to participate in the new space economy and grow space industry in country.



A rocket launch at Cape Canaveral, Florida. Photo by NASA/Aubrey Gemignani

The Mission Overview

This Earth observation mission is modelled on the Milo Institute's 'Mission Academy'. 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 Earth observation.





Team Deliverables

Earth Observation

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 satellite spacecraft design 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 science experiments 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 **Understanding planetary processes**.

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

- How is the water cycle changing?
- How can environmental predictions of weather and air quality be improved?
- Why do convective storms, heavy precipitation, and clouds occur exactly when and where they do?
- What are the structure, function, and biodiversity of Earth's ecosystems, and how and why are they changing in time and space?
- What are the fluxes (of carbon, water, nutrients, and energy) between ecosystems and the atmosphere, the ocean, and the solid Earth, and how and why are they changing?
- How much will sea level rise, globally and regionally, over the next decade and beyond, and what will be the role of ice sheets and ocean heat storage?
- How can we reduce the uncertainty in the amount of future warming of Earth as a function of fossil fuel emissions, improve our ability to predict local and regional climate response to natural and anthropogenic forcings, and reduce the uncertainty in global climate sensitivity that drives uncertainty in future economic impacts and mitigation/adaptation strategies?

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

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.

