



## **Program Description**

Advanced Space Academy is designed to challenge high school students, or trainees, in the science and technology of the space program. This program runs Sunday through Friday in the spring and Saturday through Friday in the summer months. Each trainee will sign up to be a Mission Specialist or Pilot throughout the week.

### **Core Activities**

Both the Pilot and Mission Specialist tracks will participate in these activities.

### **Space History** (7 hours)

**NSTA Standard:** History and Nature of Science - Science as a Human Endeavor, History of Science

In a program started by rocketry pioneer Wernher Von Braun, it is not surprising that Advanced Academy trainees learn much about the history of the space program. The classroom for these lessons is the U.S. Space and Rocket Center museum, the home of one of the world's largest collections of actual space hardware. In this engaging setting, trainees discover that the space program, like other scientific endeavors, requires the efforts of a wide variety of people and that its accomplishments were the result of incremental tests and experiments.

- **Early Space History** - In this session, trainees find out the inside story behind the beginnings of the space program. Highlights include stories of early rocket scientists and dreamers who persevered despite ridicule from their contemporaries, the reaction of Americans to the Soviet launch of Sputnik and how animals paved the way for manned launches.
- **Mercury** - Trainees discover how NASA chose the first seven astronauts and what they accomplished.
- **Gemini** - Here trainees learn the steps that NASA took to test the many maneuvers and procedures that would eventually take us to the moon.
- **Apollo** - This session chronicles some of the most exciting moments in the space race. Trainees find out how NASA recovered from the tragic Apollo 1 fire, how engineers designed the vehicles that transported men to the moon and what astronauts and scientists discovered from these trips.
- **Shuttle Exhibit** - Trainees explore the new Space and Rocket Center shuttle exhibit and discuss the highlights of twenty years of shuttle flights.





- **Rocket Park/Shuttle Park** - Trainees participate in a scavenger hunt in Rocket Park, a collection of the launch vehicles America used to launch astronauts into space including the largest rocket ever launched, the Saturn V and a full size Space Shuttle model.

- **Museum Hunt** - Another scavenger hunt allows the trainees to explore all of the space memorabilia inside the Space and Rocket Center museum including a moon rock, an Apollo capsule and last remaining fragment of Skylab.

## **Astronaut Training** (21 hours)

**NSTA Standard:** Physical Science; Motions and Forces

This component of Advanced Academy utilizes the excitement of astronaut training to teach scientific concepts. Advanced Academy trainees can define acceleration, gravity and Newton's Laws of Motion in terms of their own experiences on a wide variety of training simulators.

- **1/6<sup>th</sup> Chair** - The trainees find out how it would feel to walk on the moon, where there is only one sixth of the Earth's gravity, in this simulator inspired by the Apollo program.

- **Multi-Axis Trainer** - This simulator, modeled after a trainer used in the Mercury program, allows the trainees to experience the disorientation astronauts would feel if a capsule went into a tumble spin.

- **G Force** - This simulator is designed to prepare trainees for the forces of acceleration experienced by astronauts during launch, the times the force of Earth's gravity.

- **Space Shot** - This exciting simulator launches the trainees 140 feet in 2.5 seconds allowing them to feel four times the force of Earth's gravity and 2-3 seconds of freefall.

- **Spacewalk Simulator** - This motion-based simulation features a spacewalk outside of the International Space Station.

- **Climbing Wall** - Although trainees do not undergo the intense physical training of astronauts, they do test their strength on the Mars Climbing Wall.

- **IMAX** - Advanced trainees experience two Omnimax films during the week.

- **Water Activities** - Astronauts train underwater because neutral buoyancy is the closest we can come on earth to creating a weightless environment in which astronauts can train. The activities are designed to create some of those same sensations as well as opportunities for teams to work together and practice team-building skills.

- **Liftoff** - Trainees take the role of a shuttle commander during launch in this computer simulation.



- **Rocketry** - This session teaches trainees some rocketry basics, such as engine placement, reasons for a recovery system, and how to direct the flight of the rocket. Mass and drag, two items that can hinder the rocket's flight are also discussed.
- **Rocket Construction and Launch** - Using the knowledge obtained in Rocketry, small groups of trainees will use assorted rocket parts to design and build their own one to three stage rocket. They will see how successful their design was later in the week when they have an opportunity to launch their rocket (weather permitting).
- **Radio Astronomy & Solar Physics** - These two sessions give trainees a more in-depth look at the study of the solar system and our sun. They will have an opportunity to listen to either the Sun or Jupiter and gaze through an optical solar telescope to identify sunspots.
- **Russian Space History** - Although Advanced Space Academy continues to focus on American space history, this session details the achievements of the Russian Space Program from Sputnik to the present.
- **Area 51** - This is a set of challenges designed to develop leadership and teamwork skills.
- **Orbiter and Station Systems** - In preparation for their missions, trainees learn about the various systems used in the spacecraft and what to do if a problem with one of the systems should arise.
- **Orbital Mechanics** - During this session, trainees learn the mechanics behind docking with the Space Station. They also discover the importance of ground tracking.
- **Orbital Pursuits & Spacebowl** - These games review information that has been taught throughout the week. Spacebowl is an overall, end of the week review, while Orbital Pursuits focuses on information relevant to the trainees final extended 6-hour mission.

## **Missions** (21 hours)

**NSTA Standard:** Science and Technology; Understanding about Science and Technology

The mission is the highlight of a week at Advanced Academy, and missions are better than ever in the new Mission Center Complex. During a mission, the trainees take on the role of a member of mission control or a member of a shuttle flight crew. Throughout the experience, trainees discover that the technological designs have constraints. They also find that the development and use of technology requires the combined efforts of many people.

- **Mission Prep** - This session is designed to familiarize the trainees to the positions, timeline and duties they will encounter during their simulated missions.
- **Shuttle Orientation** - This is a series of presentations and activities designed to teach trainees the



basic systems of the Space Shuttle. Areas taught include the shuttle anatomy, timeline, and possible aborts.

- **Mission Training** - Advanced Academy trainees experience four one-hour missions and one extended length mission. During each of the one-hour mission trainings, the trainees will be assigned a new position each mission, allowing them to become familiar with the Space Station, Shuttle and Mission Control.

- **Missions** - The trainees work together to launch the shuttle to the International Space Station, to complete experiments that approximate those conducted in space and to return the crew to Earth in each two-hour mission. Problem solving and communication is key as problems, or anomalies, arise.

## Track Specific

*Below is a brief description of the activities that are specific to the chosen track.*

### Pilot Track

Every trainee in the Pilot track will have the opportunity to be the Commander or Pilot of the Space Shuttle in at least one mission. Trainees will also experience the flight simulators at Aviation Challenge.

- **Flight Sim Introduction** - This session introduces the trainees to the information they will need in the flight simulators. Trainees discuss the forces that act upon an aircraft in flight and the basics of aircraft design.

- **Flight Simulators** - Trainees practice take-off, landing and basic maneuvers in four computer simulations that allow the trainees to see the principles of flight in action.

- **GNC** - This activity will test the trainees' emergency navigation skills for land survival.

- **Space Piloting** - This activity will introduce trainees to the reference points and terminology unique to space navigation.

### Mission Specialist Track

Mission Specialists are the astronauts who perform Extravehicular Activities (EVAs) or spacewalks. Trainees who sign up for this track will receive specialized classes which will help them be better prepared for exposure to the harsh environment of space.

- **SCUBA Introduction** - This session teaches the trainees the basics to SCUBA diving and how it affects the body. Trainees' questions about neutral buoyancy will be answered and safety issues will be addressed.



- **SCUBA** - Trainees will experience neutral buoyancy in our Underwater Astronaut Trainer (UAT). The UAT is 24 feet deep and contains simulated space station hardware, much like the astronauts' 40-foot-deep NBF (Neutral Buoyancy Facility) in Houston. Participation in the SCUBA experience requires approval of our medical staff.
- **Suits** - Trainees will explore the protective properties of the materials used in space suits. They will also see how space suit design has changed and developed over time.
- **Space Meds** - Trainees will learn about the physiology of spaceflight and how to respond if an emergency should arise.