Program Description

A week at U.S. Space Academy is an intense experience designed to immerse the middle school student, or trainee, in the science and technology of the space program. Throughout the week trainees explore topics in science and technology in innovative ways while challenging and improving interpersonal skills such as teamwork and communication.
All Space Academy trainees explore these concepts in three core areas: Space History, Astronaut Training and Simulated Missions, as well as a track specific area of their choice.

SPACE ACADEMY Space Track
This is the core program and includes one more mission and more space and science than any other track. School groups attend this program in the spring and individuals in the summer.

SPACE ACADEMY Aviation Track
This program combines the best of Aviation Challenge and Space Academy. It is really fun way to experience a little bit of everything. We only have two Aviation track teams each week.

SPACE ACADEMY Robotics Track
Trainees in the Robotics Track work together to design and program the ultimate robot. Our Robotic Lab can accommodate four robotics teams a week between Camp and Academy programs.

Core Activities
All three of the SPACE ACADEMY Tracks will participate in these core 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 Space Academy trainees learn much about the history of the space program. The classroom for these lessons is the U.S. Space & 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 perservered 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 manuvers and procedures that would eventually take us to the moon.

• **Apollo** - This session chronicals some of the most exciting moments in the space race. Trainees find out how NASA recoved 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 expore the new Space & 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 lauched, 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.

• **Midweek Review & Space Bowl** - These game show style sessions review the information the trainees have learned throughout the week.

Astronaut Training (17 hours)

NSTA Standard: Physical Science; Motions and Forces

This component of Space Academy utilizes the excitement of astronaut training to teach scientific concepts. Space 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.

• **1/6th 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.

• **Manned Maneuvering Unit (MMU)** - Shuttle astronauts tested a jet pack known as the MMU in 1984. Trainees at Space Academy learn the six degrees of freedom as they test our MMU simulator.

• **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 Simulato**r - 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.

• **Crew Systems** - Part of astronaut training is learning how to sleep, eat and work in space. This session answers commonly asked questions about how astronauts perform everyday activities in microgravity.

• **Why Space?** - Trainees discuss why scientists chose to explore space, and a game introduces them to common products developed with space technology.

• **IMAX®** - Academy 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.

• **Rocket Construction and Launch** - Academy trainees discover how rockets function by creating and launching their own two stage Estes rockets.

Missions (12 hours)

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

The mission is the highlight of a week at Space 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 and that its development and use requires the combined efforts of many people.

• **Mission Orientation** - These two sessions are designed to introduce the trainees to their simulated

mission. In the first session the roles of the orbiter, space station and mission control are introduced with video clips and slides. In the second the trainees take a brief tour of the Mission Center Complex and fill out a questionnaire that is used to determine mission positions.

• **Shuttle Orientation** - This presentation is designed to teach trainees the basic systems of the Space Shuttle. The emphasis is placed on the vocabulary and concepts the trainees will need to understand the simulated mission.

• **Mission Training** - Academy trainees experience a 2-hour mission. Each member of the team will be trained in a specialized role in Mission Control or the Orbiter and Space Station simulators.

• **Script Practice** - This is the last practice before the mission commences.

• **Mission** - 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.

• **Mission Debrief** - The mission debrief is a time to discuss and celebrate the completed mission and to share the comments made by Simulations staff.

Track Specific

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

Space Track (14.5 hours)

NSTA Standard: Science as Inquiry; Abilities necessary to do scientific inquiry, Understanding about Scientific Inquiry

Trainees in the space track learn more about space related sciences than any other group. They not only find out how science is conducted in the largest orbiting laboratory ever constructed, the International Space Station, but they also conduct the types of experiments performed on the International Space Station using the scientific method.

• **Additional Mission Sequence** - Space Track trainees become experts at problem solving and the types of experiments performed on orbit as they lead an additional mission to the International Space Station.

• **Astronomy and Night Telescope** - NASA conducts a multitude of astronomy experiments from orbiting telescopes, but Space Academy trainees learn how to conduct astronomy experiments from their backyard. Trainees learn how to use the Internet to find out what objects will be visible on a particular night during the Astronomy session, and if weather permits the trainees find these objects using binoculars and a telescope during Night Telescope.

• **ISS Introduction** - This game of mystery and intrigue introduces the trainees to the International Space Station, the largest orbiting laboratory ever constructed.

• **BEAM ME up!** - This session utilizes four experiments to teach the trainees about the scientific method and the wide variety of experiments conducted on the International Space Station. Each group of four completes one experiment.

• **Guest Speaker/Teambuilding Course** - Many teams have the opportunity to meet Dr. Von Tiesenhausen, a German Rocket Scientist who is known for his work on the lunar rover. Other teams work together on activities that challenge their problem solving, communication and teamwork skills to prepare them for the ultimate challenge, the shuttle mission.

• **Skybase** - Trainees design their own modular space station that meets particular engineering objectives in this computer simulation that utilizes the parts of the International Space Station.

• **Toys in Space** - To discover how the laws of physics apply to microgravity, the trainees experiment with four different toys and predict how they would behave in space. Thanks to shuttle astronauts, the trainees can watch a film to see if their predictions were true.

• **Russian Space History** - Although Academy continues to focus on American space history, this session details the achievements of the Russian Space Program from Sputnik to the present.

• **Mission Patch** - Every NASA crew since Gemini 8 has created their own mission patch. In this session the trainees work together to design a large, poster-sized mission patch that describes them as a group.

Robotics Track (15 hours)

NSTA Standard: Science and Technology; Abilities of Technological Design

In the robotics track trainees become NASA engineers as they work with their peers to design a robot capable of a variety of tasks. Using the tools of Lego Mindstorms, trainees experience the design process firsthand as they identify design problems, brainstorm, test solutions and make the necessary adjustments.

• **Robotics Overview** - This kick-off event introduces the trainees to the International Space Station challenge, designed for Space Academy in conjunction with the Lego corporation.

• **Lego Teamwork** - In this communication activity, the trainees become familiar with the wide variety of Lego Mindstorms elements and the importance of a shared technical vocabulary.

• **Engineering Workshop** - This session uses a Lego model, the Mars Car, to teach the trainees the

steps of the design process and basic building strategies. The trainees have an opportunity to experiment with different gear and pulley combinations before they race their creations at the end of the session.

• **Programming Workshop** - In this session the trainees learn to use Robolab, a powerful programming language, to command their robotic creations. Soon after this session the trainees will divide into groups of four, each with two engineers and two programmers.

• **Robotics (1-4)** - Throughout these four sessions each group of four is working together to design and program their robot. As the competition nears, engineering, programming and teamwork skills are put to the test.

• **Strange Robotics** - This session presents the trainees to the many real world applications of robotics technology with a slide show and Lego examples.

• **Competition** - The competition is the culmination of the week's events. The trainees have an opportunity to test their robots in two 2-minute performance rounds and to discuss their design with expert judges. Several awards are presented at graduation.

• **Robotics Banners** - Robotics trainees create banners to represent the attributes of their robotics group and to display at the competition.

Aviation Track (14.5 hours)

NSTA Standard: Physical Science; Motions and Forces

Trainees in the Aviation Track receive a taste of the training that NASA pilots undergo before testing their knowledge in our aircraft simulators. Sessions are held at Aviation Challenge.

• **Aerodynamics and Aeronautics** - 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.

• **Walking Tour** - Trainees see how engineers solved design problems in a variety of ways by seeing a collection of eight retired aircraft that is not open to the public. Highlights include a T-38 Talon which NASA has used to monitor the orbiter during landing, an F-14 Tomcat used in the popular film *Top Gun* and an F-4 Phantom that has a confirmed air combat victory.

• **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.

• **Land Survival** - Aircraft may not always work, and pilots should be prepared for any situation. Like pilots and astronauts, the trainees learn the basics of land survival.

• **Flight Physiology** - Trainees investigate the spatial disorientation pilots feel when aircraft malfunction in the Barney Chair, a training device used in pilot training programs worldwide. Concepts include aileron malfunction, tail rotor failure and their physiological effects on body systems.

• **Patch Design** - In this session the trainees work together to design a squadron patch that describes them as a group.