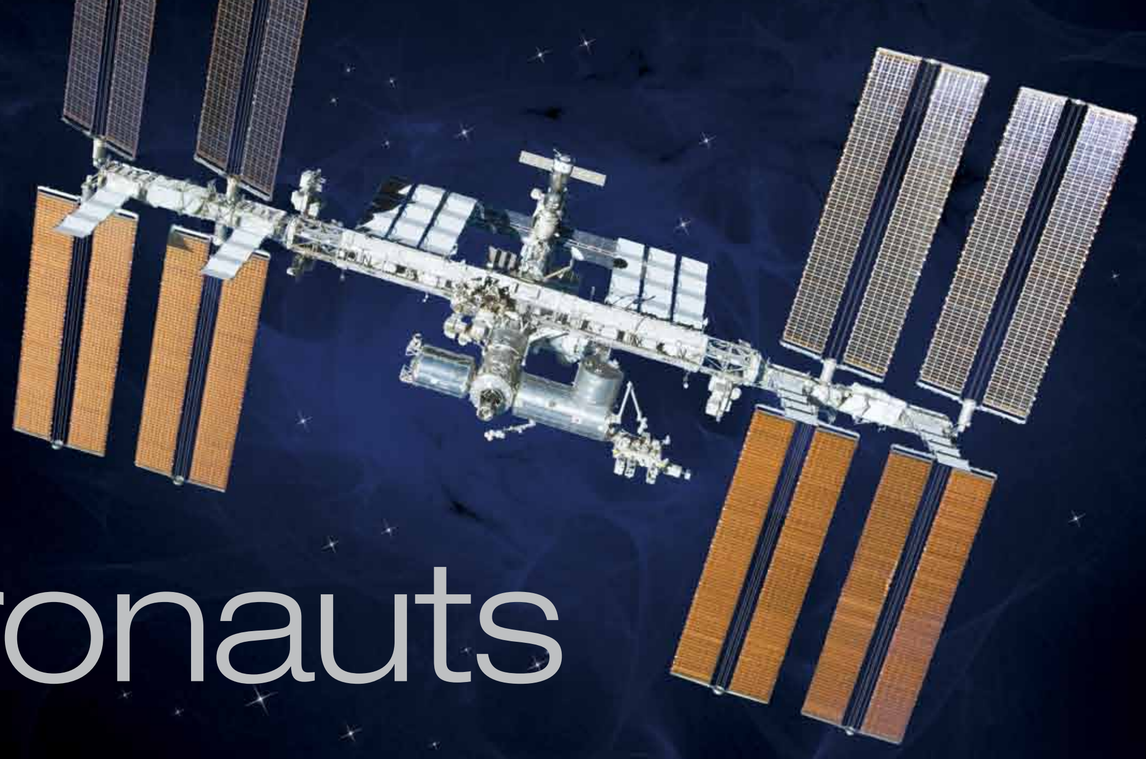
National Aeronautics and Space Administration

2012 NASA Astronauts



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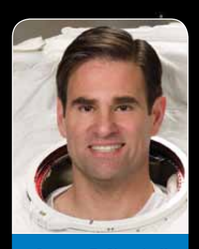

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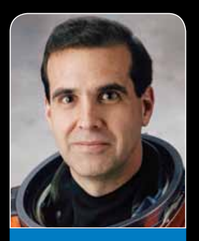

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Astronauts

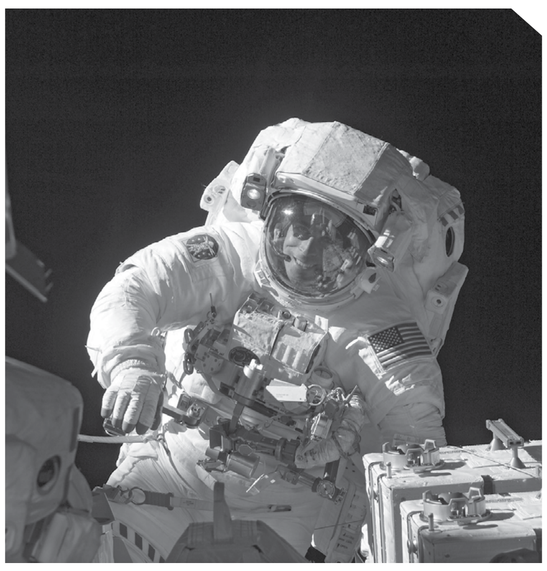
Have you ever wondered what it is like to be an astronaut?

- **What are their backgrounds?**
- **How do they train?**
- **What do they do in space?**

Since the first seven astronauts were selected in 1959, there have been over 350 astronauts at NASA. These men and women represent nearly every state in the U.S., the District of Columbia, and countries throughout the world. The astronaut corps is made up of civilian and military astronauts, and each branch of the military has been represented in the corps.

To become an astronaut, you must go through an extensive application and interview process. You can view astronaut job requirements at http://nasajobs.nasa.gov/astronauts/content/broch00.htm.

Once selected as an astronaut candidate, or ASCAN, the training really begins. You spend the first two years learning all the general information you need to be an astronaut and training for space flight. The training includes physical training, flight training, classroom work, survival training, spacewalk simulations, and much, much more. The activities on this poster were selected to give you a brief glimpse of some of the activities astronauts do.



Activity 1 – Physical Fitness

Astronauts must be healthy and fit to endure the rigorous training that prepares them for space flight. The Fit Explorer set of activities gives students an idea of the physical training astronauts undertake. The Mission Control activity shown below is one of several activities and video resources that can be used to help students "train like an astronaut".

Fitness Resources

- Fit Explorer: http://www.nasa.gov/education/fitexplorer

Activity 2 – Robotics

Robotics is an integral part of space exploration. From the automatic systems on spacecraft to robotic arms used to manipulate equipment, astronauts must be familiar with a wide range of robotic systems. In the activity below, students will assemble a simple robotic arm as well as design, build, and test an end effector.

Robotics Resources

- NASA Education's Robotics Web Site: http://www.nasa.gov/education/robotics
- Robotics Alliance Project: http://robotics.nasa.gov
- Liftoff to Learning Robotics Resource Guide: http://er.jsc.nasa.gov/SEH/Let's_Talk_Robotics.pdf

Activity 3 – Earth Observation

From the beginning of manned space flight, astronauts have commented on the views of Earth from space. In addition to just checking out the view, astronauts have taken over 800,000 images of the Earth. In the activity below, students put together a map of the United States using images taken from space at night.

Earth Observation Resources

- Mission Geography: http://www.missiongeography.org
- Gateway to Astronaut Photography: http://eol.jsc.nasa.gov
- ISS EarthKAM: http://www.nasa.gov/audience/foreducators/teachingfromspace/students/earthkam.html

Activity 4 – Mission Patches

For every space flight, astronaut crews work with graphic designers to create a patch representative of their mission. The patch design contains various elements describing the different phases of the particular mission and usually includes the names of the crew and the mission number. In the activity below, students will work in groups to create a mission patch of their own.

Mission Patch Resources

- Mission Patch Images: http://history.nasa.gov/mission_patches.html

Activity 5 – Spacesuits

A spacewalk is one of the most challenging and exciting parts of a mission. Astronauts must wear spacesuits to venture outside their spacecraft to assemble components, repair satellites, or conduct experiments. In the activity below, students will learn how astronauts keep cool on spacewalks.

Spacesuit Resources

- NASA Education's Spacesuits and Spacewalking Web Site: http://www.nasa.gov/education/spacesuits

Additional Resources

Astronauts and Space Flight Resources

- Astronaut Biographies: http://www.jsc.nasa.gov/bios
- Human Space Flight: http://spaceflight.nasa.gov
- Mission Homepage: http://www.nasa.gov/missions/index.html

NASA Education

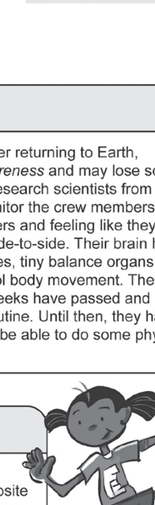
- NASA Education Home Page: http://www.nasa.gov/education

Activity 1 – Physical Fitness

TRAIN LIKE AN ASTRONAUT MISSION HANDOUT

YOUR MISSION: **Mission: Control!**

You will perform throwing and catching techniques on one foot to improve balance and *spatial awareness*. You will also record observations about improvements in balance and *spatial awareness* during this physical experience in your Mission Journal.



All people need to have well-developed balance and *spatial awareness*. If not, we would all fall over constantly and have trouble walking around corners. Seeing our surroundings and being able to move around them is important so we do not bump into things and get hurt.

When you are participating in athletics, especially sports such as dancing, skateboarding, bowling, diving, and skiing, balance and *spatial awareness* are very important. Even jumping on a trampoline or riding a bicycle requires both!

MISSION QUESTION: How could you perform a physical activity that would improve balance and *spatial awareness*?

MISSION ASSIGNMENT: **Balance Training**

○ **Practice:**
- Choose a smooth-surfaced solid wall, approved by an adult for use.
- Bounce a tennis ball off the wall and try to catch it while balancing on one foot. Raise your foot up behind you, level with your knee.
- Count how many seconds you can stand on one foot while throwing the tennis ball against the wall. Try not to let the ball or your foot touch the floor. Try to balance for at least 30 seconds without falling.
- Continue to practice this activity over time until you can keep your balance for 60 seconds without having to start over.

○ **Game:**

Divide into groups, each forming a circle. Each circle should contain at least 6 players. In your circle:
- Space a distance more than arms length apart.
- Try to balance on one foot while gently tossing a gym ball to a player across from you.
- If a player loses balance and both feet touch the floor, he or she must hop on one foot, around the outside of the circle before rejoining the game.

○ Record observations before and after this physical experience in your Mission Journal.

Follow these instructions to train like an astronaut.

Spatial Awareness: Knowing where you are in your space compared to your surroundings.

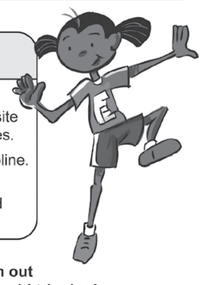
Agile: Being ready and able to move quickly and easily.

Coordination: Using your muscles together to move your body the way you want it to.

It's a NASA Fact:

During the first few days of space flight and after returning to Earth, astronauts experience a change in *spatial awareness* and may lose some sense of balance when they return to Earth. Research scientists from NASA's Neurosciences Laboratory closely monitor the crew members, who often report difficulty walking around corners and feeling like they are "tumbling" when they move their heads from side-to-side. Their brain has to relearn how to use information from their eyes, tiny balance organs in their inner ear, and their muscles to help control body movement. These problems are usually corrected after several weeks have passed and balance exercises are added to their fitness routine. Until then, they have to be extra careful; which means they may not be able to do some physical activities like fly a plane or drive a car.

Fitness Accelerations



○ Bounce a tennis ball off a wall while balancing on one foot. Do this for 60 seconds. Without taking a break, change legs and balance on the opposite foot for 60 second. Take a 30 second break and repeat this routine five times.

○ Conduct the above acceleration while balancing one foot on a small trampoline.

○ Play the Balance Training Game with a partner by balancing one foot on a small trampoline. If a player looses their balance or drops a ball they should hop on one foot around both trampolines.

Improving your balance and *spatial awareness* will make you more *coordinated* and *agile*. It will decrease the chances of being hurt, or hurting someone else, due to a fall.

Think Safety!

○ **While exploring, astronauts must watch out for rocks and craters in their paths to avoid tripping!**
- The area under your feet should be clear of all obstacles.
- Stay at least an arms distance from the wall and from others while doing this activity.
- Do not throw the ball too hard, nor use a ball that is too heavy.
- Remember that drinking plenty of water is important before, during, and after physical activities.

Mission Explorations:

- While standing still, stand on a soft surface and balance on one foot. Examples: towel, pillow, or cushion.
- Time yourself while trying to balance on two feet with your eyes closed. Open your eyes if you start to lose your balance.
- While practicing simple balance activities, you can also lift one foot to increase the difficulty.

Status Check: Have you updated your Mission Journal?

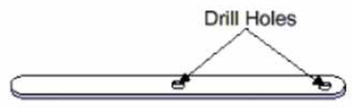
Activity 2 – Robotics

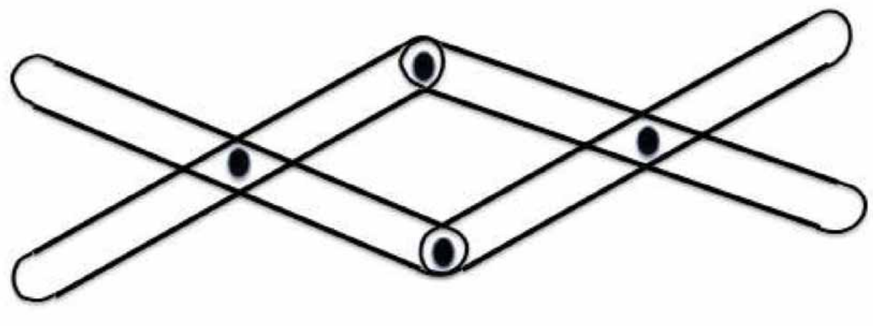
Background: One of the important objectives in the development of robots is to enable robots to interact with their environment. Interaction is often accomplished with some sort of arm and gripping device or end effector.

Materials: Wooden craft sticks, drill, small brass paper fasteners, assorted materials

Procedure:

1. Drill holes through the craft sticks as shown in the diagram. Each student will need four drilled sticks and four brass paper fasteners. Dampening the sticks before drilling can reduce the risk of cracking.
2. Have students assemble robot arms as shown in the diagram.
3. Have students try to pick up a pencil or other object with their arm. (This task will be difficult.)
4. Tell students to design some sort of end effector and attach it to the ends of the arm with glue.
5. Evaluate their work by having them demonstrate picking up an object. Ask students what other objects they can pick up with the arm.
6. Extend the activity by drilling some craft sticks with three holes to allow students to build longer arms. Challenge students to design an arm with an end effector to accomplish a specific task, such as retrieving an object from the bottom of a bucket.





Download the resource that includes this activity at:
http://er.jsc.nasa.gov/SEH/Let's_Talk_Robotics.pdf

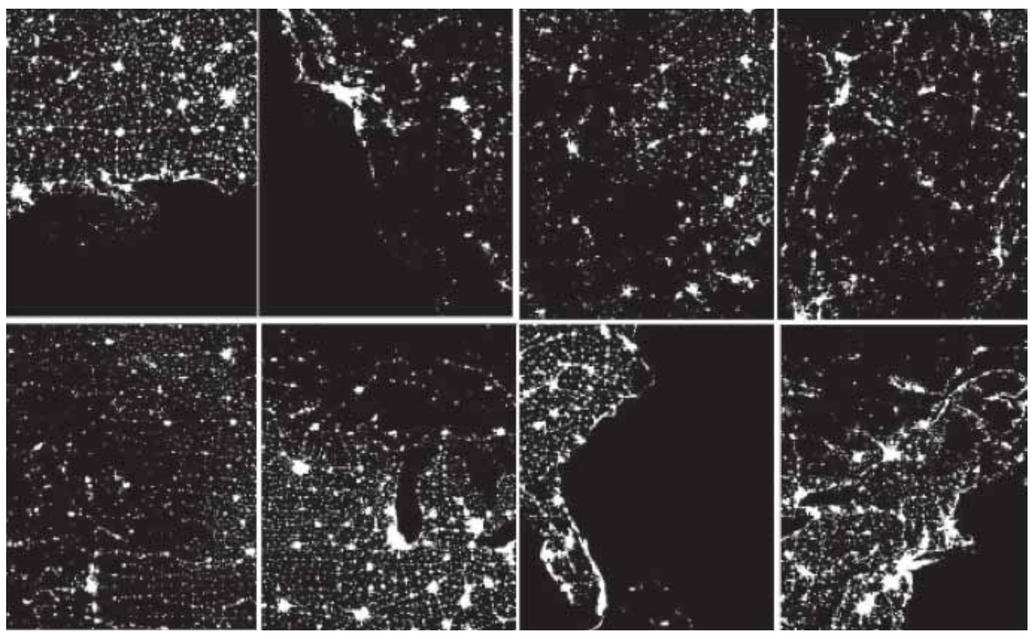
Activity 3 – Earth Observation

Background: NASA has been observing and studying Earth since 1958. These observations have generated millions of images and tremendous amounts of data. NASA Earth observations have helped geographers worldwide study and answer many questions about human migration and settlement patterns by providing researchers with large-area views of our planet.

Materials: Scissors, puzzle pieces

Procedure:

1. Cut out the eight puzzle pieces.
2. Arrange the pieces to correctly show the U.S., plus some regions of Mexico and Canada, as seen from space at night.



Download the resource that includes this activity at:
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Activity 4 – Mission Patch

Background: NASA's astronaut crews design mission patches to symbolize the goals and objectives of their missions. The patches are usually personalized with the astronauts' names and are used to represent the crew's mission.

Materials: White poster board, pencils, markers, crayons, example patches (http://history.nasa.gov/mission_patches.html), round stickers (optional)

Procedure:

1. Demonstrate and share 2 or 3 mission patches. Describe mission and explain symbols on patch.
2. Divide participants into groups.
3. Give each group a NASA mission patch.
4. Ask the group to observe and describe the patch. The group can also be given the crew's mission explanation, which can be found online at http://spaceflight.nasa.gov.
5. Direct the groups to pay close attention to the symbols on the patch.
6. Have each group report their observations to the class. Ask them to make inferences about the meaning of the patch.
7. Have each group design their own mission patch, using appropriate symbols, which represent each member

Download the resource that includes this activity at:
http://www.nasa.gov/pdf/239517main_Calculator_Controlled_Robots_Exploration_Ext_3.pdf.

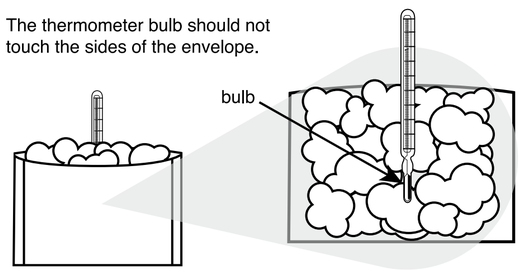
Activity 5 – Spacesuits

Background: In space, temperatures can vary greatly from extreme heat to extreme cold. For this reason, spacesuits are made from different colors and materials to keep astronauts comfortable and safe.

Materials: Thermometers, black construction paper, white construction paper, tape/staples/glue, cotton balls/tissue paper, stopwatches

Procedure:

1. Create 2 construction paper envelopes – 1 with white paper and 1 with black paper.
2. Stuff cotton balls or tissue paper inside the envelopes and then carefully place a thermometer inside each envelope. The thermometers should be upright in the envelope and the bulb of the thermometer should touch the cotton or tissue, not the envelope, as shown on the right.
3. Let the thermometers rest in the envelope for about 1 minute to record the temperature of the new environment. Check the temperature and record. Also, record the temperature from the control thermometer.
4. Take each envelope from the box and place them in the "test site" where they will receive direct sunlight. Make sure that both envelopes received the same amount of sunlight.
5. Predict how many degrees the temperature will change in each envelope over the 5-minute period. Record the predicted temperatures. Discuss your predictions with the group.
6. After 5 minutes, collect data by reading the temperature on the thermometers and recording the data in a data table.
7. Repeat steps 6 and 7 for the next thirty minutes. After taking all measurements, study the data, discuss with your group and draw conclusions. Write a summary of your conclusions.



Download the resource that includes this activity at:
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Cool_Suits_Activity.html