

## Family Space Day Overview – Space Shuttle

Family Space Day is a three hour event. The activities are set up so that children and their parents can select the order in which they undertake activities. Parents and children are encouraged to learn, play, and explore *together*.

### Objectives of the Day

Children will:

-  learn the components of the Space Shuttle.
-  explore how the Space Shuttle is used to support the space program and space research.
-  participate in a simulated Space Shuttle mission and learn about some of the people involved in Shuttle missions.

### Activities

-  Station 1: Build a Space Shuttle  
Children build a Space Shuttle and learn about its importance in transporting astronauts and other items.
-  Station 2: Create a Mission Patch  
Children learn the different components of mission patches and design their own.
-  Station 3: Land Your Space Shuttle  
Children build a paper model of the Space Shuttle and then attempt to land it safely on the runway.
-  Station 4: Space Shuttle Action Theater  
Children re-enact a Space Shuttle mission, from launch to landing!
-  Station 5: Edible Space Shuttle  
Children learn about the main components of the new Space Shuttle design by building an edible one!
-  Station 6: Put it in Perspective  
Children learn about the distances of different objects in the sky by attempting to put into order images of Earth, Mars, the Space Shuttle, the Moon and the International Space Station.
-  Station 7: Coloring Sheets and Games  
Children relax and color and play simple games related to the Space Shuttle.
-  Station 8: Reading Room

Children and their parents browse and read a selection of books about the Space Shuttle (refer to book list for suggested reading).

### Other Materials

-  *Facilitator Information – Space Shuttle*
-  *Explore Space Shuttle – Book and Website References*
-  *All About Rockets – A Space Shuttle Fact Sheet*

## Facilitator Information

(All you need to know about the Space Shuttle to survive the day)

Modified from [http://www.nasa.gov/returntoflight/system/system\\_STS.html](http://www.nasa.gov/returntoflight/system/system_STS.html) and [http://en.wikipedia.org/wiki/Space\\_Shuttle\\_program](http://en.wikipedia.org/wiki/Space_Shuttle_program))

NASA's Space Shuttle, officially called Space Transportation System (STS), is the world's first reusable spacecraft, and the first spacecraft in history that can carry large satellites both to and from orbit. The Shuttle launches like a rocket, maneuvers in Earth's orbit like a spacecraft and lands like an airplane. The Shuttle usually carries five to seven astronauts (although eight have been carried) and up to 50,000 pounds (22 700 kilograms) of payload into low earth orbit. Three Space Shuttle orbiters now in operation - Discovery, Atlantis and Endeavour. Two of the spacecraft – Challenger and Columbia - have been lost in tragic accidents. The program started in the late 1960s and has dominated NASA's manned operations since the mid-1970s. According to the Vision for Space Exploration, use of the Space Shuttle will be focused on completing assembly of the ISS by 2010, after which it will be retired from service, and eventually replaced by the new Orion spacecraft (expected to be ready in about 2014).

### Space Shuttle Components

The Space Shuttle consists of three major components: the Orbiter which houses the crew; a large External Tank that holds fuel for the main engines; and two Solid Rocket Boosters which provide most of the Shuttle's lift during the first two minutes of flight. All of the components are reused except for the external fuel tank, which burns up in the atmosphere after each launch.

### Space Shuttle Missions

The longest the Shuttle has stayed in orbit on any single mission is 17.5 days on mission STS-80 in November 1996. Normally, missions may be planned for anywhere from five to 16 days in duration. The smallest crew ever to fly on the Shuttle numbered two people on the first few missions. The largest crew numbered eight people. Normally, crews may range in size from five to seven people. The Shuttle is designed to reach orbits ranging from about 185 kilometers to 643 kilometers (115 statute miles to 400 statute miles) high.

The Space Shuttle missions involve carrying large payloads to various orbits (including segments to be added to the International Space Station), providing crew rotation for the International Space Station, and performing service missions. The orbiter can also recover satellites and other payloads from orbit and return them to Earth, but its use in this capacity is rare. However, the Shuttle has previously been used to return large payloads from the ISS to Earth, as the Russian Soyuz spacecraft has limited capacity for return payloads. Each vehicle was designed with a projected lifespan of 100 launches, or 10 years' operational life.

For all of its capabilities, the Space Shuttle cannot get us to the Moon, and cannot land on the Moon. It is intended for lower orbit and structured for landing in an atmosphere (the Moon does not have an atmosphere).

### **NASA's New Spacecraft – To the Moon!**

From [http://www.nasa.gov/mission\\_pages/constellation/orion/index.html](http://www.nasa.gov/mission_pages/constellation/orion/index.html)

America will send a new generation of explorers to the Moon aboard NASA's Orion crew exploration vehicle. Making its first flights early in the next decade, Orion is part of the Constellation Program to send human explorers back to the Moon, and then onward to Mars and other destinations in the solar system.

A component of the Vision for Space Exploration, Orion's development is taking place in parallel with missions to complete the International Space Station using the Space Shuttle before the Shuttle is retired in 2010.

Orion will be capable of carrying crew and cargo to the space station. It will be able to rendezvous with a lunar landing module and an Earth departure stage in low-Earth orbit to carry crews to the Moon and, one day, to Mars-bound vehicles assembled in low-Earth orbit. Orion will be the Earth entry vehicle for lunar and Mars returns. Orion's design will borrow its shape from the capsules of the past, but takes advantage of 21st century technology in computers, electronics, life support, propulsion and heat protection systems.

Orion will be similar in shape to the Apollo spacecraft, but significantly larger. The Apollo-style heat shield is the best understood shape for re-entering Earth's atmosphere, especially when returning directly from the Moon. Orion will be 5 meters (16.5 feet) in diameter and have a mass of about 22.7 metric tons (25 tons). Inside, it will have more than two-and-a-half times the volume of an Apollo capsule.

The larger size will allow Orion to accommodate four crew members on missions to the Moon, and six on missions to the International Space Station or Mars-bound spacecraft. Orion is scheduled to fly its first missions to the space station by 2014 and carry out its first sortie to the Moon by 2020.

For missions to the Moon, NASA will use two separate launch vehicles, each derived from a mixture of systems with heritage rooted in Apollo, Space Shuttle and commercial launch vehicle technology.

An Ares V cargo launch vehicle will precede the launch of the crew vehicle, delivering to low-Earth orbit the Earth departure stage and the lunar module that will carry explorers on the last leg of the journey to the Moon's surface. Orion will

dock with the lunar module in Earth orbit, and the Earth departure stage will propel both on their journey to the Moon. Once in lunar orbit, all four astronauts will use the lunar landing craft to travel to the Moon's surface, while the Orion spacecraft stays in lunar orbit. Once the astronauts' lunar mission is complete, they will return to the orbiting Orion vehicle using a lunar ascent module. The crew will use the service module main engine to break out of lunar orbit and head to Earth.

Orion and its crew will reenter Earth's atmosphere using a newly developed thermal protection system. Parachutes will further slow Orion's descent through the atmosphere.

## Build a Space Shuttle

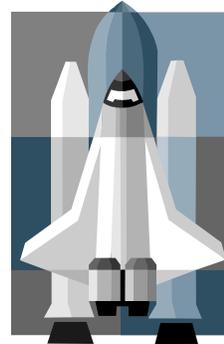
The Space Shuttle is used to transport people, supplies, and components to the International Space Station. The great thing about the Space Shuttle is that it's reusable. Without the Space Shuttle, we would not have the opportunity to explore our solar system. We wouldn't have ever been able to walk on the Moon!

The Space Shuttle is comprised of several parts. The three main components of it are the orbiter which houses the crew members; a large external tank which holds the fuel for the main engines; and two solid rocket boosters which give the Shuttle its lift during the first two minutes of flight. All of the components are reused except for the external fuel tank which burns up in the Earth's atmosphere after each launch.

In this activity, you and your child will build a Space Shuttle and learn about its importance of transporting people and stuff.

### What You Need:

-  Toilet paper tube
-  [Space Shuttle Template](#)
-  Tape
-  Scissors
-  Object to transport



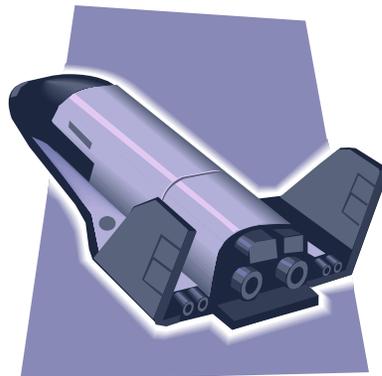
### What to Do:

-  Cut out the Space Shuttle template and attach it to the toilet paper tube.
-  Cut the toilet paper tube so that you can insert an object to transport.
-  Insert an object to transport.

### Parent Prompts:

What are some of the different things that the Space Shuttle transports?

Where does the Space Shuttle go?



## Make a Mission Patch!

Every Shuttle flight has its own mission patch, designed by the crew members. The mission patches always feature the astronauts' names (usually five to seven), and often include the Shuttle and important elements of the mission, such as particular experiments that the mission crew will undertake, or equipment that they are installing. Some examples of patches, and explanations appear below.

### What You Need:

-  Sheets of white and black construction paper or cardstock
-  A variety of large patch outlines created out of cardboard (circles, ovals, rectangles, squares, badge-shapes); alternatively, put these shapes directly on the cardstock (one shape per page) and make copies.
-  Crayons
-  Scissors
-  Glue
-  Craft items, such as different colors of construction paper, yarn, glitter, tinsel, tissue paper

### What To Do:

-  Invite your child to create their own mission patch. Help them select a patch outline (shape) that appeals to them and trace around it on the construction paper.
-  Have your child design the mission patch. The patch should include your child's name. Other names could be those of family and/or friends.
-  What else does your child want to include? Often the patch has an image of the Shuttle.

### Parent Prompts:

As your child is designing the patch, help them to think of what else they want to incorporate into their design.

What mission might the Shuttle be undertaking? (Fixing the Hubble Space Telescope? Installation of a laboratory on the International Space Station?)

What might the Shuttle astronauts be studying? (Earth? the Moon? Stars or galaxies? How plants grow in microgravity?)

What equipment might it carry? (A new telescope? Solar panels for the International Space Station?)

All of these things could be included in the mission patch design!



STS-61-Endeavor launched in 1993, carrying "eyeglasses" for the Hubble Space Telescope (the actual piece of equipment was the Corrective Optics Space Telescope Axial Replacement, or COSTAR). The Hubble had been having trouble! The solution worked. The astronauts installed the eyeglasses, and the Hubble Space Telescope has been producing amazing images ever since. A new Shuttle mission is planned to the Hubble in 2009 to fix some malfunctioning software. NASA hopes that this will keep the Hubble going for many more years.

STS-67-Endeavor flew the Hopkins Ultraviolet Telescope for use aboard the Shuttle to study the ultraviolet light from planets, stars, and galaxies; this light can't penetrate the Earth's atmosphere and reach ground-based telescopes. In 1995, the astronauts used the telescope to characterize the gas between galaxies, obtaining data to help us understand the origin and development of the universe. The telescope is now on display at the Smithsonian's National Air and Space Museum.



Astronauts aboard STS-109-Columbia delivered new instruments to the Hubble Space Telescope in 2002. These instruments greatly increase the telescope potential for making new discoveries.

Information modified from: <http://www.jhu.edu/~jhumag/O602web/space.html>

# Land Your Shuttle!

Upon return from space, the Space Shuttle re-enters Earth's atmosphere and is able to fly like an airplane. At this point, flight computers fly the Shuttle. The Shuttle makes a series of S-shaped turns to slow its descent speed as it begins its final approach to the runway.

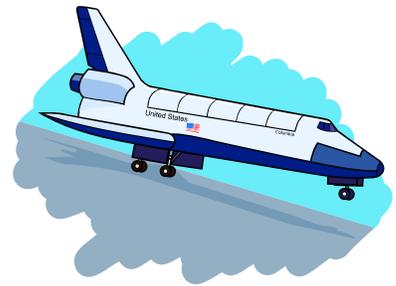
At 25 miles (40 km) out, the Shuttle's landing computers give up control to the commander. The commander flies the Shuttle around an imaginary cylinder to line the orbiter up with the runway and drop the altitude. During the final approach, the commander steepens the angle of descent (almost seven times steeper than the descent of a commercial airliner).

When the Shuttle is 2,000 ft (610 m) above the ground, the commander pulls up the nose to slow the rate of descent. The pilot deploys the landing gear and the orbiter touches down. The commander brakes the Shuttle and a parachute is deployed from the back to help it stop. The Shuttle stops about midway to three-quarters of the way down the runway.

In this activity, you and your child will build a paper model of the Space Shuttle and try to land it safely on a runway.

## What You Need:

-  [Shuttle template](#)
-  [2 Styrofoam plates](#)
-  [Scissors](#)
-  [Paper clips](#)
-  [Hula-hoop](#)
-  [Runway drawn on butcher paper and taped to the floor](#)



## What To Do:

-  [Cut out the templates on a Styrofoam plate and experiment with different sized wings, etc.](#)
-  [Using paper clips, experiment with the flight of your Shuttle!](#)
-  [Try to land your Shuttle on the runway by flying it through the hoop!](#)

## Parent Prompts:

Which design worked best? Why?

Were you able to land your Shuttle safely?

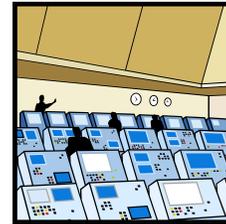
What does the Shuttle do upon descent to help it slow down?  
(It makes several S-shaped turns.)

# Space Shuttle Action Theater

Every Space Shuttle mission involves hundreds of factors and thousands of people on Earth, all working together to help the astronauts with a successful mission.

The purpose of this activity is to increase your child's awareness of the variety of people on the ground that are involved in a Space Shuttle mission, and that many decisions are made during each mission that will affect its outcome.

In this activity, your child will re-enact a Space Shuttle mission, from launch to landing.



## What You Need to Prepare:

-  2 or 3 (or more!) square cardboard boxes
-  Packing tape
-  White contact paper
-  Markers
-  Names of different mission support staff (see Background Information)
-  5 bright color poster boards
-  Scotch tape
-  6 sheets of cardstock per poster with a mission support staff printed on each sheet
-  4 Shuttle Mission Report sheets

## What You Need to Play:

-  One of several large dice with the names of different mission support staff on it
-  One of four different Shuttle Mission Report sheets
-  5 different mission posters: Launch, Activity 1, Activity 2, EVA, and Landing

## What to Do to Prepare:

-  Tape the cardboard boxes closed and cover with white contact paper.
-  With a marker, write the name of a mission support staff on each side.
-  Label the 5 poster boards Launch, Activity 1, Activity 2, EVA and Landing.
-  Using the wording for each of the posters below, increase the font size and adhere statements to poster boards according to the name of the poster.
-  Cover each of the statements with the cardstock labeled with the mission support staff name (i.e., cover the Flight Director action with a flap that says "Flight Director")
-  Print several of the Shuttle Mission Reports on different color paper.

## What to Do to Play:

-  Pick up a Shuttle mission report sheet with your child, and read about the mission.
-  At each of the steps, help your child to go to the identified poster and roll a die. Depending on which mission support staff person the die selects, lift the corresponding flap on the poster and follow the directions underneath. Those directions may be to go on to the next step on the sheet, to end the mission and start a new one, to go to a different poster, or to roll again.

### Background on the mission support staff on the posters:

**Flight director (FD)** leads the flight control team and is responsible for the overall Space Shuttle mission and payload operations and all decisions regarding safe, expedient flight.

**Space communicator (CAPCOM)** serves as primary communicator between flight control and astronauts.

**Flight activities officer (FAO)** plans and supports crew activities, checklists, procedures and schedules.

**Flight surgeon (Surgeon)** monitors crew activities, coordinates the medical operations flight control team, provides crew consultation, and advises flight director of the crew's health status.

**Ground control (GC)** directs maintenance and operation activities affecting Mission Control hardware, software and support facilities; coordinates space flight tracking and data network and Tracking and Data Relay Satellite system with Goddard Space Flight Center.

**Public affairs officer (PAO)** provides mission commentary to supplement and explain air-to-ground transmissions and flight control operations to the news media and the public.

# Information for Posters

## Launch Poster

### Flight Director flap:

The weather is too stormy; the flight director has determined that you need to abort this mission before lift-off. Turn in your sheet and start with a new mission.

### Space Communicator flap:

The launch weather officer has advised that weather is currently "green" for launch. Time to launch your mission!

### Flight Activities Officer:

All systems check out and you're ready to go.  
Time to launch your mission!

### Life Support flap:

The flight surgeon has determined that you have a cold and cannot go on this mission; you need to turn in your mission card and start over with a new one.

### Ground Control flap:

Ground Control reports that the communication system is malfunctioning. You need to abort this mission; turn in your sheet and start with a new mission.

### Public Affairs flap:

The President of the United States is watching your launch! Say something to the reporters about your mission, then it's time for your successful launch!

# Activity 1 Poster

## Flight Director flap:

The payload is caught inside the Space Shuttle. You need to plan an EVA (a spacewalk) to free it— go to the EVA poster and roll one of the dice.

## Space Communicator flap:

A solar flare will increase the amount of radiation in the next few hours; you need to end the mission immediately as incomplete. Turn in your sheet and start with a new mission.

## Flight Activities officer:

You and your team have successfully deployed your payload!  
Activity is complete, go to the next step on your mission report.

## Life Support flap:

Another astronaut is having physical difficulties as he deploys the payload; you need to plan an EVA (a spacewalk) to assist him. Go to the EVA poster and roll one of the dice.

## Ground Control flap:

Ground Control reports that the payload has been successfully deployed from the Space Shuttle! Activity is complete; go to the next step on your mission report.

## Public Affairs flap:

Classroom students would like to speak with you about your current task; describe your activities then roll again for Activity 1 to see whether you are successful at deploying the payload.

# EVA Poster

## Flight Director flap:

Your EVA (spacewalk) and activity were successful! Go to the next step on your mission report.

## Space Communicator flap:

Reports from scientists on the ground indicate that your EVA spacewalk activity was successful! Congratulations; continue onto the next step on your Mission Report.

## Flight Activities flap:

You're having difficulties with guide wires, which are snagging during your EVA. It is time to take a break, and then try again. Roll one of the dice again to see if your second EVA is successful.

## Flight Surgeon flap:

The temperatures inside your spacesuit are becoming too high; you need to stop and roll one of the dice again to see if your EVA is complete.

## Ground Control flap:

The computer system on the Space Shuttle is experiencing technical difficulties; the Shuttle needs to return to Earth immediately. This mission is ended as incomplete; turn in your mission sheet and start over with a new one.

## Public Affairs flap:

Reporters are calling to talk with you about your successful EVA!! Continue with the next step on your mission report.

## Activity 2 Poster

### Flight Director flap:

Your activity will require an EVA in order to be successful. Go to the EVA poster and roll one of the dice.

### Space Communicator flap:

Reports from the science specialist indicate that your activity was a huge success! Congratulations! Continue with the next step on your Mission Report.

### Flight Activities:

The scientists on the ground report your activity was a complete success! Congratulations! Continue with the next step on your Mission Report.

### Flight Surgeon:

Not only was your activity successful, but the flight surgeon reports that your health is excellent! Continue with the next step on your Mission Report.

### Ground Control flap:

As you were conducting your activity, the Space Shuttle experienced some technical difficulties. You will need to conduct an EVA in order to finish your activity; go to the EVA poster and roll one of the dice.

### Public Affairs:

There are reports of an unsuccessful terrorist attack; NASA would like you to stop your activity and return to Earth immediately. Turn in your Mission Report as incomplete; you may begin a new one if you would like.

# Landing Poster

## Flight Director flap:

You had a successful landing! Congratulations on a successful mission!

## Space Communicator flap:

The radio on the Space Shuttle was experiencing temporary difficulties; you will have to orbit the Earth one more time before landing. Roll one of the dice and try to land again.

## Flight Activities:

Weather is poor at both landing sites; you will have to orbit one more time. Roll one of the dice to try again.

## Flight Surgeon:

All the crew are in excellent health, and you have made a successful landing!  
Congratulations!

## Ground Control flap:

Weather is poor at Kennedy Space Center in Florida; you make an emergency landing at Edwards Air Force Base in California instead. Congratulations on a successful mission!

## Public Affairs:

You have one last task before you land; you need to make a report from orbit, so you will need to orbit the Earth one more time before landing. Roll one of the dice and try to land again.

## The Edible New and Improved "Shuttle"

NASA is retiring the Space Shuttle around 2010. However, it needs a new way to "Shuttle" astronauts back and forth between Earth and the International Space Station – and the Moon – and eventually, Mars! NASA's new spacecraft – the Ares Launch Vehicle, and the Orion Crew Vehicle will get crew and cargo to the space station. Orion will be able to rendezvous with a lunar landing module and an Earth departure stage in low-Earth orbit to carry crews to the moon and, one day, to Mars-bound vehicles assembled in low-Earth orbit.

The Ares Launch Vehicle, and the Orion Crew Vehicle are comprised of several parts. The three main components of it are the orbiter which houses the crew members; a large external tank which holds the fuel for the main J2 engines; and two solid rocket boosters which give the Shuttle its lift during the first two minutes of flight.

In this activity, you and your child will learn about the main components of the new Space Shuttle design by building an edible one!

### What You Need:

-  1 Twinkie (External Tank)
-  1 Swiss Roll (Orbiter)
-  1 Marshmallow (J2 Engine)
-  1 Hershey's Kiss (Nose Cap)
-  1 Pirouline broken in half (Solid Rocket Boosters)
-  Marshmallow Cream
-  Paper towel
-  Spoon
-  Wipes!
-  Image of the new [Space Shuttle](#)



### What To Do:

-  The Twinkie represents the External Tank.
-  Using marshmallow cream, attach a marshmallow to the top/end of the Twinkie. This marshmallow represents the J2 Engine.
-  Attach 1 Swiss Roll to the other side of the marshmallow with marshmallow cream. The Swiss Roll represents the Orbiter.
-  To the top/end of the Swiss Roll, attach a Hershey's Kiss using marshmallow cream. The Hershey's Kiss represents the Nose Cap.
-  Attach ½ of a Pirouline to each side of the Twinkie using the marshmallow cream. These Piroulines represent the Solid Rocket Boosters.
-  Now you've got yourself an edible Space Shuttle!

Parent Prompts:

What are the main components of the Space Shuttle?  
(External Tank, Solid Rocket Boosters, and the Orbiter)

What is different about the new Space Shuttle design?  
(The new design doesn't have a winged Shuttle on the side of the external tank.  
Rather it is a tall structure that looks much like Apollo!)

## Put it in Perspective

In this activity, your child will learn about the distances of different objects in the sky by attempting to put into order images of Earth, Mars, the Space Shuttle, the Moon and the International Space Station.

### What You Need:

-  Images of Earth, Mars, the Space Shuttle, the Moon and the International Space Station.

### What To Do:

-  Using the pictures, invite your child to place the objects in order beginning with the closest – Earth!

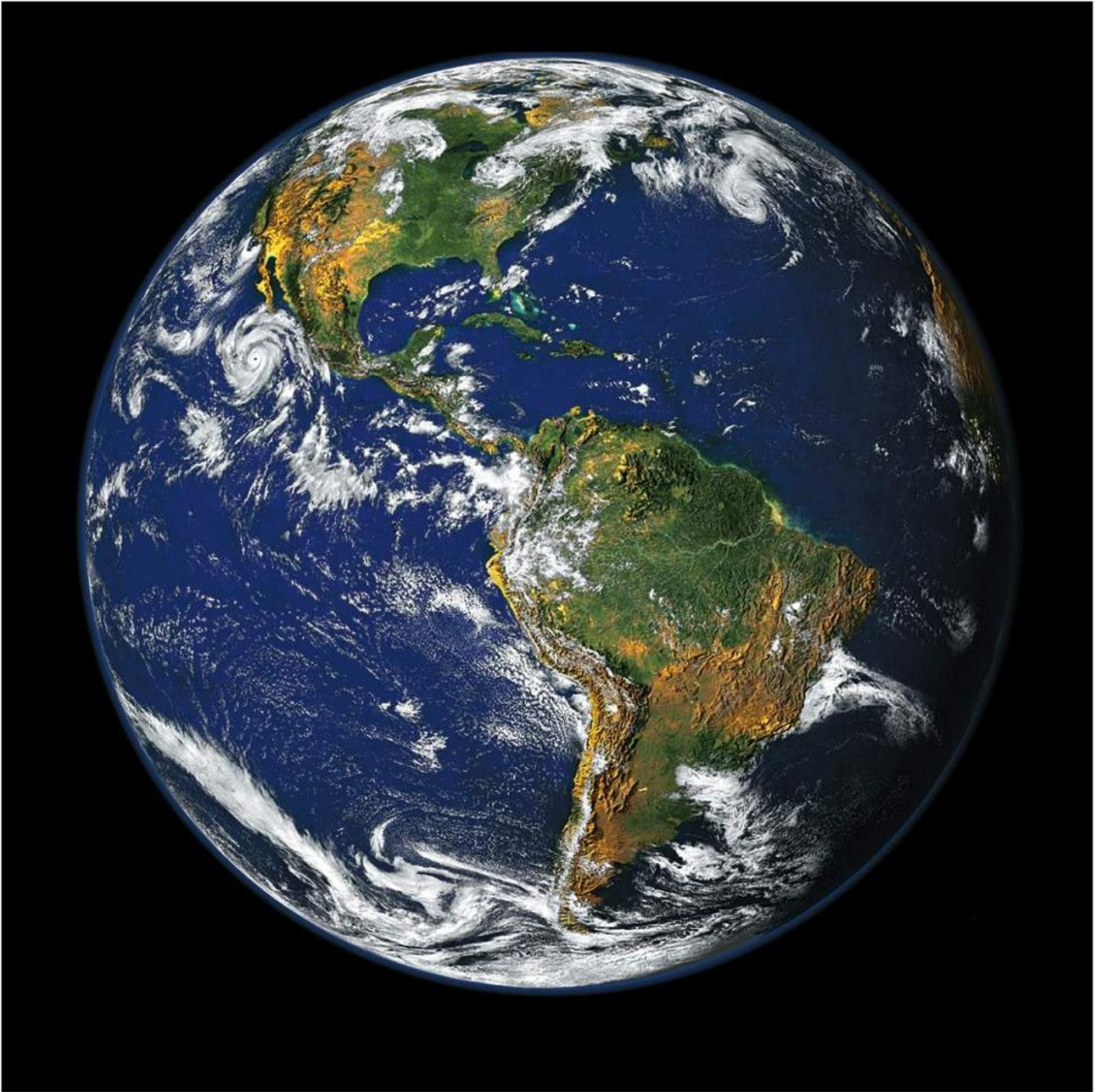
Proper order: Earth, International Space Station and Shuttle, Moon, Mars.

Many children think that the Shuttle travels to the Moon; it is not able to do so. The Shuttle and International Space Station fly at about the same distance from the surface of the Earth. The Shuttle missions typically operate at altitudes about 190 miles (300 kilometers; one resource stated that the Shuttle can fly as high as 350 miles or 560 kilometers) The International Space Station maintains an altitude of approximately 215 miles (350 kilometers) above the Earth; it often is visited by the Shuttle.

### Parent Prompts:

What comes next? What object(s) is closest to Earth?  
And what is the next distant object? And the next?

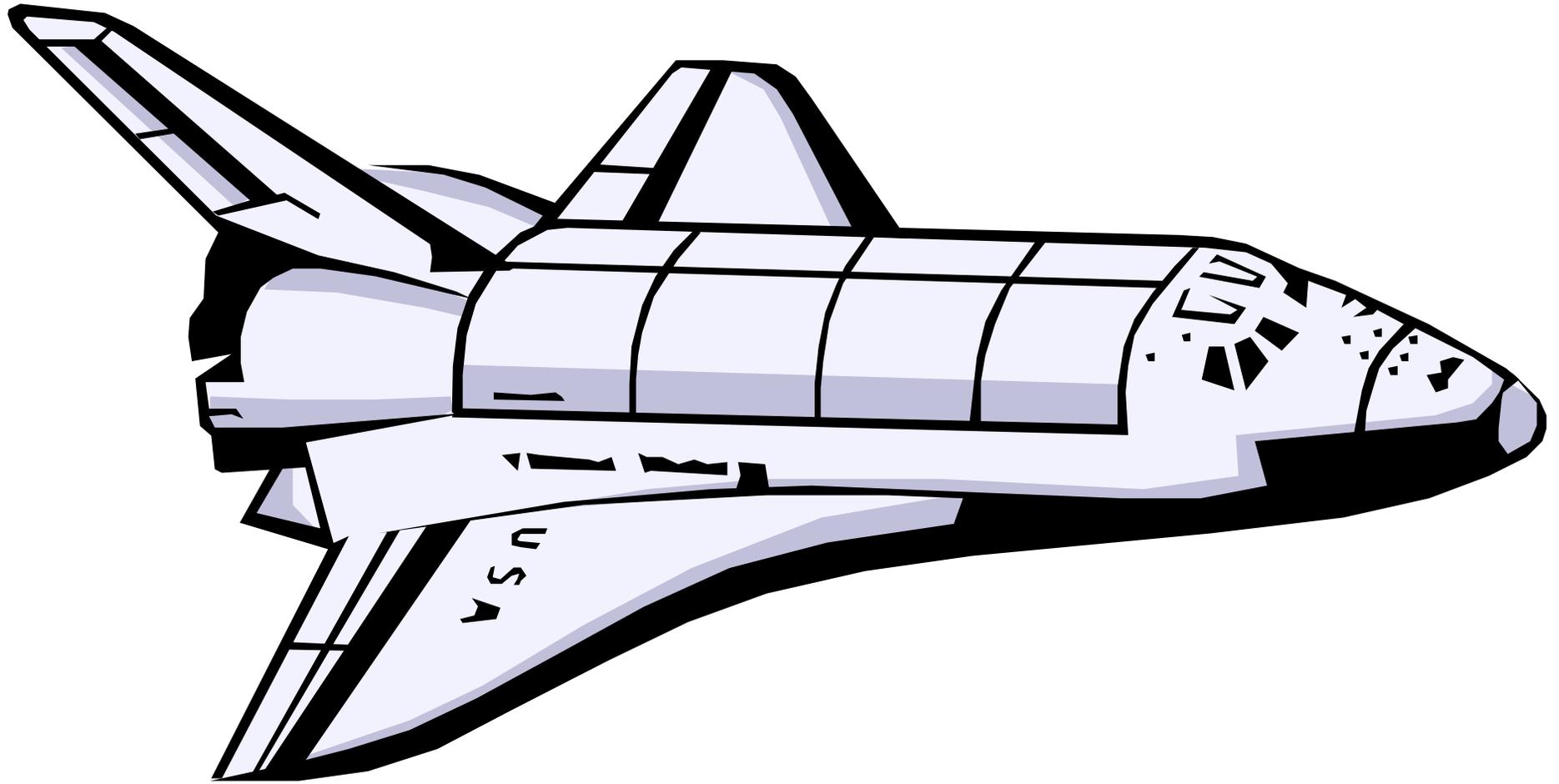




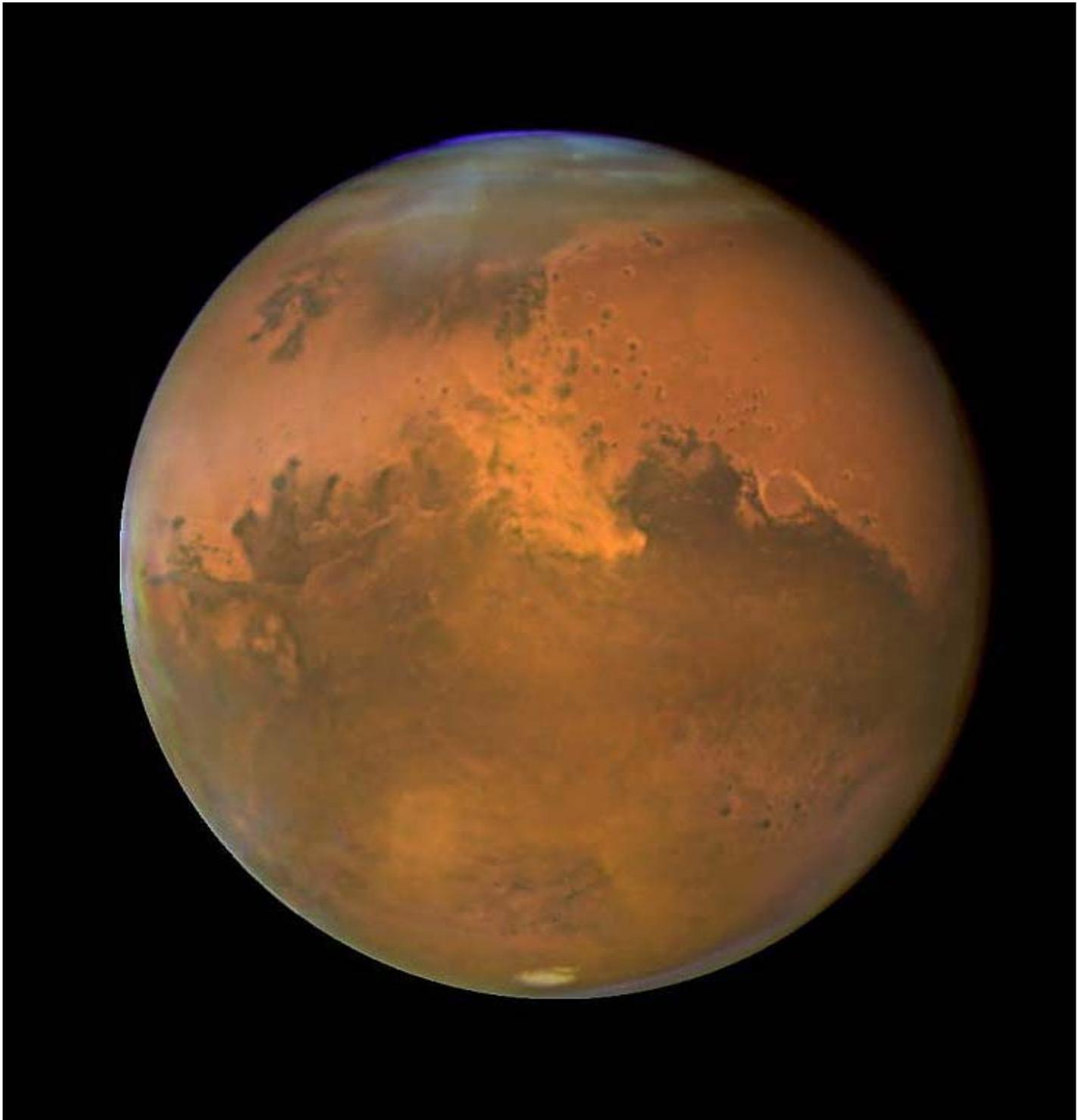
# EARTH



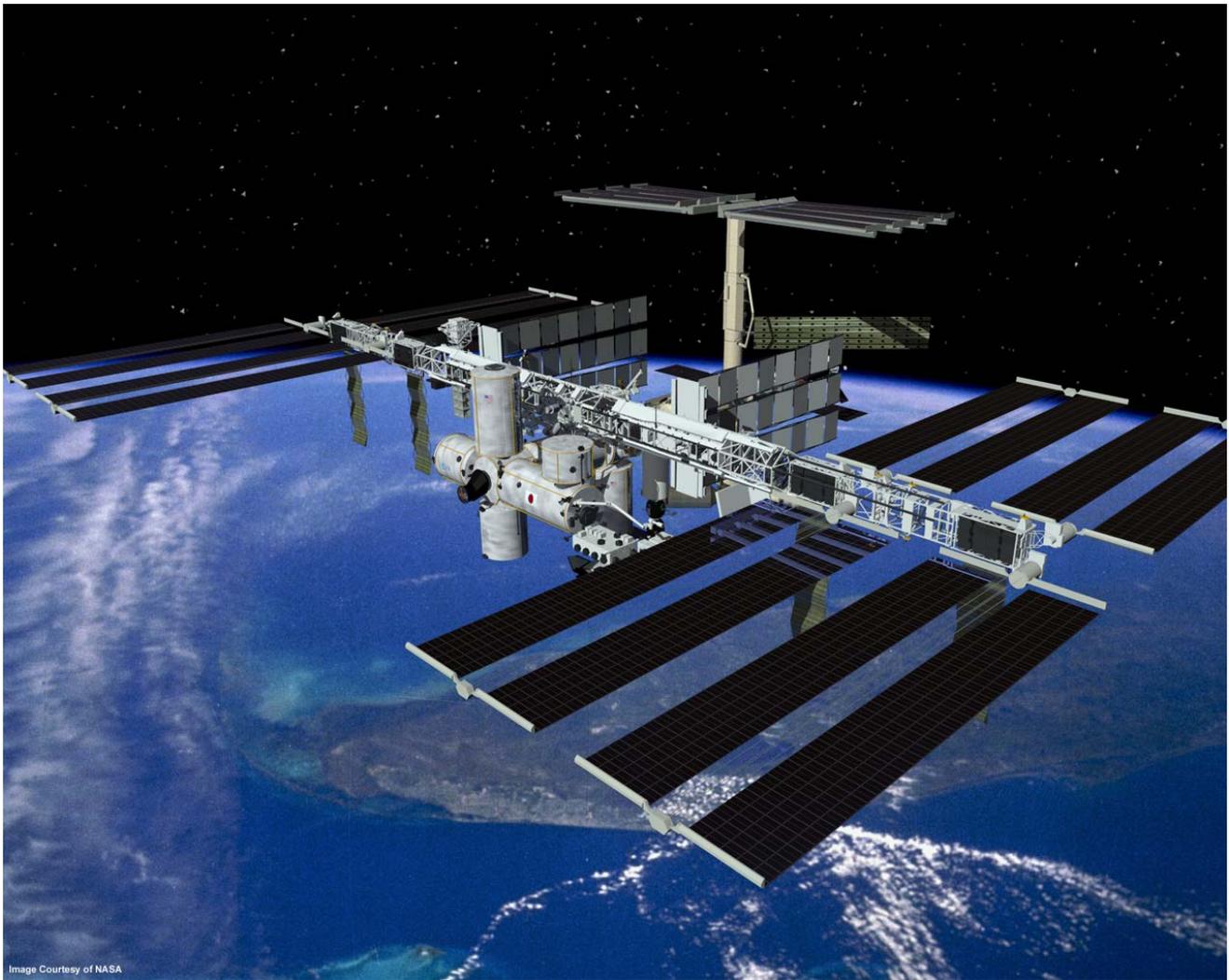
# MOON



# SPACE SHUTTLE



# MARS



# ISS

# Coloring Pages and Games

## Space Shuttle

<http://www.coloring-pages-book-for-kids-boys.com/airplane-coloring-pictures.html>

<http://www.letmecolor.com/2007/10/29/space-Shuttle-coloring-page/>

<http://www.lunaroutpost.com/mall/games/coloring/index.htm>

<http://www.lunaroutpost.com/mall/games/coloring/index.htm>

## Games

<http://quest.nasa.gov/space/frontiers/activities/aeronautics/search.html>

<http://www.starbaseok.org/projects/pdf/spaceShuttlewordfind1.pdf>

<http://quest.nasa.gov/space/frontiers/activities/aeronautics/dot.html>

<http://quest.nasa.gov/space/frontiers/activities/aeronautics/cross.html>

## *Explore the Space Shuttle!*

### Websites

<http://spaceflight.nasa.gov/Shuttle/index.html>

Find out the latest news about the Space Shuttle!

<http://spaceflight.nasa.gov/>

NASA's official human space flight Web site. This site is full of recent space news and contains links for further exploration

<http://Shuttle.msfc.nasa.gov/>

The Marshal Space Flight Center provides Shuttle enthusiasts with all the information you need to understand the Space Shuttle and its missions. This is a great site for older children to explore or for younger children and parents to explore together.

<http://www.playkidsgames.com/games/ShuttleLaunch/default.htm#>

Children 5-10 will enjoy launching their own Shuttle!

<http://science.howstuffworks.com/space-Shuttle.htm>

Good site for kids. A brief history of the Space Shuttle and information about all its parts.

[http://www.nasaexplores.com/show\\_k4\\_teacher\\_st.php?id=02122694816](http://www.nasaexplores.com/show_k4_teacher_st.php?id=02122694816)

An activity in which children ages 5 to 9 draw and create a model of a future Space Shuttle. Parental involvement needed – the background reading will need to be shared at the child's level.

## *Explore the Space Shuttle!*

### Books

The Space Shuttle, Jeffrey Zuehlke, First Avenue Editions, 2007, ISBN-10: 0822564262.

Zuehlke describes to his readers how the Space Shuttle works. Great pictures accompany his explanations. This is a great book for ages 4-8.

Living on a Space Shuttle, Carmen Bredeson, Children's Press (CT), 2003, ISBN-10: 0516269550.

This book provides 4-8 year olds a simple description of how astronauts aboard a Space Shuttle perform everyday activities such as eating, drinking, and sleeping.

The Space Shuttle, Allison Lassieur, Children's Press, 2000, ISBN: 0-516-22003-9. Lassieur offers children ages 4-8 an introduction to the Space Shuttle including sections on its parts, a brief history, and the future with the space station. Large print for young readers.

Space Suits, Deborah Shearer, Bridgestone Books, 2002, ISBN: 0-7368-1144-3. Targeted at ages 4-6. Shearer's book reveals information about the first space suits, suits worn throughout the Shuttle era and space suits for the future.

The Life of an Astronaut Niki Walker, Crabtree Publishing, 2001, ISBN: 0-86505-683-8.

For ages 7-10. This book describes the requirements, training, tasks, and duties of astronauts and covers other aspects of living in space.

Launch Day, Peter Campbell, Millbrook Press, 1995, ISBN: 1-56294-611-0.

Suitable for ages 6-10. A well-illustrated and informative book for young readers. Covers the Space Shuttle's preparation, departure and in orbit operations on launch day.

Floating Home, David Getz, Henry Holt, 1997, ISBN 0805065806.

A young girl explores the Kennedy Space Center at Cape Canaveral and becomes involved with a Space Shuttle mission. Children ages 6 to 9 will enjoy learning about the astronaut preparation presented in this book.

Adventure in Space: The Flight to Fix the Hubble, Elaine Scott and Margaret Miller, Hyperion, 1995, ASIN 0786800380.

Children ages 8-13 go behind the scenes with the astronauts to learn about preparations for a space flight to repair the Hubble Space Telescope. The book follows the mission from start to finish.

## All About the Space Shuttle

- ✈ When the Space Shuttle takes off, it weighs about as much as 300 elephants!
- ✈ The first Space Shuttle flew in April 1981. The first few missions only included two crew members.
- ✈ A typical mission today carries between 5 and 7 astronauts which include a mission commander, a pilot, a flight engineer, and mission specialists.
- ✈ Three of the six original Space Shuttles are still flying -- Discovery, Atlantis and Endeavour.
- ✈ There are more than two million parts on the Space Shuttle.
- ✈ The Wright brothers' first flight was shorter than the length of the Space Shuttle's External Tank.
- ✈ The pump on the Space Shuttle's main engine is very strong. It could empty a pool in half a minute!
- ✈ Most of the exhaust from the Shuttle's engines is water.
- ✈ The Space Shuttle takes off like a rocket. It flies like an aircraft. And, it lands like a glider.
- ✈ The Space Shuttle Main Engines can be reused from one mission to the next. No other rocket engine can claim that!
- ✈ The Space Shuttle flies about 330 kilometers above the Earth. That's as tall as the state of Iowa up on its side!
- ✈ A ready-to-launch Space Shuttle is as tall as the Statue of Liberty, but it weighs three times more.
- ✈ The longest the Shuttle has stayed in orbit on a mission is 17.5 days on mission STS-80 in November 1996.
- ✈ NASA is retiring the Space Shuttle in 2010, after the International Space Station is completed. It will bring a new "shuttle" on line – the Orion Crew Vehicle and the Ares Launch Vehicle. Like the Shuttle, the Orion is reusable. Unlike the current Space Shuttle, they can be used to us get to the Moon and, eventually to Mars!