

## Facilitator Information

(All you need to know about the ISS to survive the day)

### Who's building the ISS?

The ISS construction is a collaborative effort between the United States, Russia, Canada, Japan, Belgium, Brazil, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom. Space Station assembly will require 45 trips from Earth to carry all of the materials - 36 launches are planned for the United States and nine for Russia. The station is scheduled to be finished in 2010. It is 360 feet across and 290 feet long. It travels at 17,500 miles (28,163 kilometers) per hour, orbiting Earth once every 90 minutes at a distance of only 250 miles (400 kilometers) above the surface!

### Why are we building the ISS?

The mission of the ISS is to enable long-term exploration of space and create a permanent orbiting science institute that provides a laboratory free of the effects of gravity where scientists can conduct long-term research in material, life, and medical science. The low-gravity environment unmask the basic properties of materials, which will lead to new manufacturing processes and products to benefit mankind. It provides a unique space platform for observing Earth and space, improving our understanding of Earth's environment and the universe. Finally, the ISS provides the foundation for the future exploration and development of space. It allows scientists to study long-term effects of weightlessness on the human body for application to future human space exploration. It will allow technology research in fluids, combustion, life support systems, and radiation environment, which is needed for future human exploration of space.

### What do astronauts do on space stations?

One thing they are doing right now on the International Space Station is building and maintaining the station! As materials and modules are shuttled to the station, the astronauts put them into place and make sure all systems are working. Space stations also are ideal for launch, repair, and retrieving of satellites. The space shuttle was used for several missions to access, repair, and upgrade the Hubble Space Telescope. Astronauts also conduct scientific experiments in space.

In addition to their work, astronauts have their daily routines of eating, sleeping, bathing, and exercising. And astronauts need a little time off to read, e-mail friends and family, play games, or just look out the window.

### What kind of research can be done on a space station?

On Earth, gravity influences the way crystals, plants, and animals grow. In contrast, space stations offer an environment where there is very little gravity. Research is being conducted to understand how weightlessness influences growth and development. In microgravity nearly perfect crystals can be grown; it may be possible to use these to create new and more efficient drugs for cancer, diabetes,

emphysema, and immune system disorders. Research also concentrates on how plants can be grown in space to provide food. Studies are assessing how weightlessness influences calcium and tissue loss in humans — and how this can be prevented. Perhaps the most important reason for living in space is to determine how to keep humans healthy for the length of time that will be required by journeys of exploration to Mars and other planets.

Fluids, flames, molten metal and other materials are researched on the station so that scientists can create better metal alloys and more perfect materials for applications such as computer chips. Some experiments will take place outside the ISS to study the nature of space - these experiments help spacecraft designers make better and safer spacecraft.

Other research encompasses monitoring our Earth's atmosphere, weather, climate, oceans, land, and resources. The space stations offer “the best seat in the house” to make observations of Earth's environments.

### What challenges are there to living and working in space?

One of the primary challenges to living and working in space is the “weightless” environment. Under reduced gravity conditions, there is very little “load” on bones and muscles, so living organisms lose bone mass, muscle tissue, and fluids. Even the heart — a muscle — loses mass because it does not have to work as hard. Humans in space must exercise about two hours each day to maintain their bone and tissue mass so that they can return to Earth's gravity and function well.

In space there is no protective atmosphere as there is on Earth. Humans must have shielding to protect them from solar radiation, which can damage tissue. The space station offers some protection. While astronauts are working outside the station, they work in the protection of a space suit.

Every-day-stuff can be challenging, too! Most of the food that they eat is frozen or dehydrated; they simply add water and microwave it for a hot space meal. Sleeping has its own challenges — imagine slipping into a sleeping bag that is attached to the wall. Bathing is not routine, either. Instead of a shower, the astronauts take sponge baths to conserve water.

Astronauts have to deal with a tight schedule to get all the work accomplished, and unforeseen issues pop up constantly. The astronauts may get lonely for home on long missions. And living in tight quarters with the same small group of people can get on anyone's nerves! When astronauts are being selected for missions, the mission planners are looking for people who will do well in these conditions. Other mechanisms are implemented as well; leisure time is important and built into the schedule, contact with families and friends is maintained, and there are plenty of the comforts of home, including movies, books, music, and games.