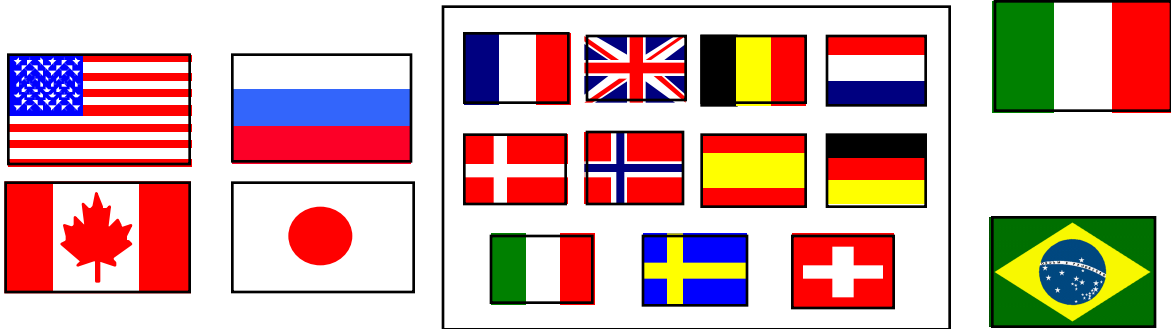




## Living and Working on the International Space Station

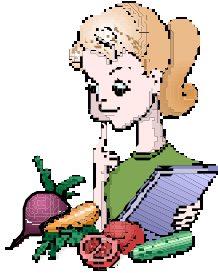
The International Space Station will provide astronauts from around the world with an ideal location from which they will be able to live and work in space. When it is completed in 2005 the Space Station will be the biggest laboratory ever built in space. It will be 108,5 metres by 88,4 metres, which is about the size of a Canadian football field! Wow! That's big!

Do you remember which countries are working together to build the International Space Station? Here's a hint: the following flags belong to the sixteen countries participating in building this incredible habitat in space. Can you name them?





## Eating in Space: What do Astronauts Eat?



Just like you and your parents plan family meals for the week, astronauts also have to decide ahead of time what they will be eating. A few weeks before the launch, Marc Garneau met with a dietician to choose his meals for his time in space. The dietician checks to make sure that each astronaut gets all the vitamins and minerals they will need while they are in space.

Did you know that all meal packages on board the International Space Station have a coloured sticker and a Velcro strip on them? The reason for the coloured sticker is that not everyone likes to eat the same thing, and not every one has the same dietary needs. Thus, each astronaut is assigned a different colour to identify his or her meal. What do you think Marc Garneau's colour is going to be during this mission? **Green!** So, when he is hungry, he will select a meal with the green stickers on it. A Velcro strip keeps the food package on the tray.

Most of the food planned for the International Space Station will be frozen (like frozen TV dinners) refrigerated (like fruits, vegetables and dairy products) or thermostabilized (food that is heat-processed, canned and then stored at room temperature). Many of the beverages will be dehydrated; this means that they will have to add cold or hot water to drink the beverage, just like we do with Kool-Aid or hot cocoa.





## A Typical Meal in Space



Aboard the Shuttle and the Space Station, astronauts prepare their meals in the galley; this is like the kitchen in your home. The galley has a water dispenser, a table, an oven, a freezer and two refrigerators.

The astronaut's meal tray is similar to cafeteria trays with one very important difference; it is magnetised so that metal knives, forks and spoons can stick to the tray and not float away. In addition, on the top and bottom of the tray there are also strips of Velcro. Velcro keeps the tray stuck to the table and the meal packages stuck to the tray.



Astronauts use a knife, fork and spoon to eat and a straw to drink with but they also need another special utensil. Can you guess what that might be? In order to open the food packages, astronauts need a pair of scissors.

## What About Clean Up?

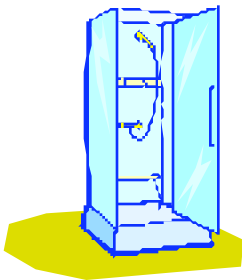
After a meal on Earth, whether it is putting the dishes in the dishwasher or washing them by hand, someone has to clean up. In space, because the water supply is limited, eating utensils and food trays are cleaned with pre-moistened wipes. When the meal is finished, all the trash is collected into trash bags and placed into containers to be brought back to Earth for disposal.



## Hygiene Matters

### Bathing

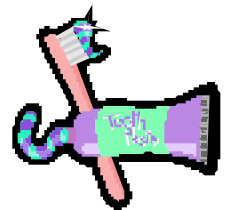
Staying clean is as important in space as it is on Earth. Aboard the space shuttle, astronauts take sponge baths because of the limited water supply. On the International Space Station there is enough space for a full body shower. However, each astronaut will be limited to approximately 4 litres of water per shower.



When astronauts want to take a shower on the International Space Station, they step into a cylindrical shower stall and close the door. In space water does not act the same way it does on Earth. Can you guess what happens to the water? Well, the water will not drip down like on Earth (because there is no gravity to help it flow downward) so it will accumulate on the astronaut's body forming a sort of water skin. The astronaut uses a soap dispenser, which looks like a tube of toothpaste only it has soap inside instead, to get cleaned. In order to get rid of the water and soap, the astronaut uses a suction device (a vacuum) that will remove all the water and soap.

### Dental Care

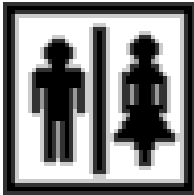
Did you know that astronauts have to bring their own supply of fresh water during space flights? This is why water is such a limited resource on the International Space Station. To save water, NASA developed a special toothpaste that the astronauts can eat in order not to waste water when they are brushing their teeth.





## Do You Really Have to Go?

The waste collection system, or what we call a toilet on Earth, is basically the same in space as on Earth. First of all, because of microgravity astronauts must use feet and thigh restraints so that they don't float away! When an astronaut flushes the toilet, instead of having water dispose of the waste there is a vacuum. That's right! Air is used to dispose of the waste. Solid wastes are compressed and stored onboard to be removed later. Liquid wastes are recycled into water or simply evacuated into space.



When astronauts need to urinate, they use a large tube that is connected to the bottom-front of the toilet. Anatomically correct "urine funnel adapters" are attached to the tube so both men and women can use the same toilet.



## The Space Bedroom Private Quarters



Each astronaut has a “personal sleep station”, which is like their bedroom. One of the sleep station’s walls is lined with a large drawer. Pulling out the drawer is like pulling out a wall bed. The inside of the drawer looks like the inside of a suitcase. This is where they keep their personal belongings. The sleep station has a reading lamp, clothes drawers and/or nets to make sure nothing floats away, a shelf or desktop and a sleeping bag.

### Bed Time

Going to sleep in space is like going camping. When it’s time for bed, astronauts take their “sleep restraint” (sleeping bag) and snap it to one of the walls, floor, or ceiling - it doesn’t matter since there is no up or down in space.



Once they are in the sleeping bag they zip themselves in, letting their arms float outside the sleeping bag. They also use a head strap that attaches to the wall with Velcro so that their head doesn’t move.



## A Space to Themselves

Astronauts go to space to perform science, observe the Earth, repair satellites and so much more. However, during their free time, astronauts have the opportunity to play cards, games, read or write. They also bring their favourite music to listen to on CD players. What would you like to do if you had some free time in space?

An astronaut's favourite "off-duty" past time is just looking out the window at the Earth below. Many astronauts have mentioned how they would spend many hours looking down on our planet, noticing how beautiful and fragile it looks from space.

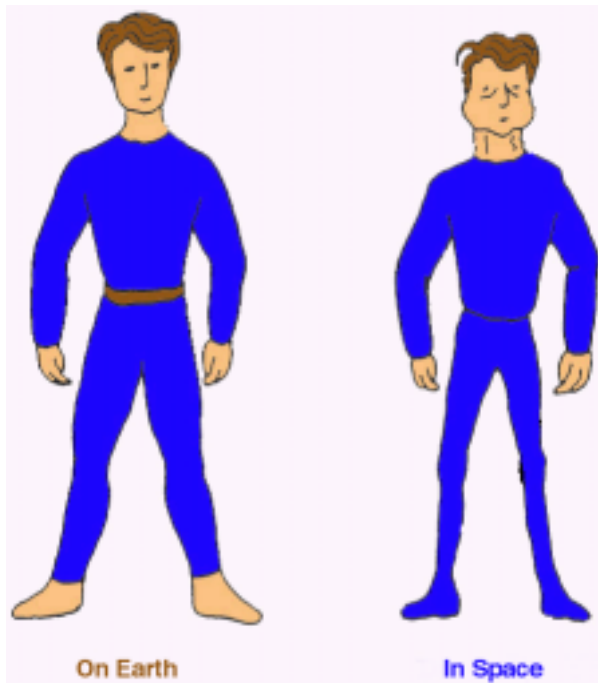




## Why is Exercise so Important? Bird Legged, Puffy Faced Astronaut

On Earth, gravity pulls everything down. Thus, the lower torso and legs carry the weight of the body. In space, because of microgravity, astronauts float and the legs are basically not used.

In space, the lower back and leg muscles are affected the same way as muscles that have been in a cast for a while. Muscles become flabby and lose tone and mass. This is called muscular atrophy, and makes the limbs affected look skinnier. The bones also become weaker because of the loss of minerals like calcium, potassium and sodium.



Space also affects the cardiovascular system of the human body. On Earth, because of gravity, blood naturally pools in the legs, therefore, the heart has to pump against gravity to supply enough blood to the brain. In space, the heart acts the same as it would on Earth. However, because there is no gravity, the blood rushes to the torso and head. In this case, what the astronaut experiences is the "puffy face syndrome". The veins in the neck and face stand out more, and the eyes become red and swollen.





## Daily Exercise

Astronauts try to lessen the puffy face and the bird leg syndromes by exercising as often as possible. Astronauts must exercise at least two hours every day to keep their muscles healthy.

What kind of exercise can astronauts do in space? Astronauts use a stationary bicycle and a treadmill to exercise both the lower and the upper body muscles. They use a series of straps and restraints to remain secure against the exercise equipment.

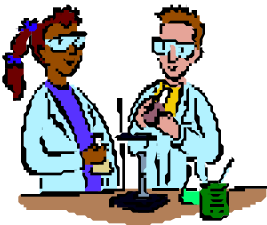


## Working on the International Space Station

Because of microgravity on the space shuttle and on the International Space Station, some jobs are a challenge. For example, tools and fluids float away if not handled carefully. Eating is also more of a challenge and so is going to the lavatory. Other jobs, however, become easier. Moving about is very easy and so is reaching the top shelf. Moving massive objects is also accomplished with greater ease because they feel like they do not have any weight. But, once a massive object is moving stopping it is a challenge; the object could collide with the inside walls with the same force used to get it moving.



During spaceflight, astronauts are often the subjects of experiments to determine how they adapt to weightlessness. They also conduct experiments with cells, plants, and other biological material in order to understand the basic mechanisms underlying the changes observed in humans.



This research has already had many applications on Earth. Research in calcium loss, human energy use, and muscular atrophy in space has had an impact on the treatment of elderly patients and those with cerebral palsy.

Before long, when Canadians spend long periods aboard the Space Station, space life science researchers will be able to extend their research over several months, and it is expected that this will have a considerable impact on the quality of life on Earth.