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Commander Michael Lopez-Alegria peers through a window on the InternationalSpace Station in February. Crewmembers can spend months at a time in the orbiting lab.

NASA

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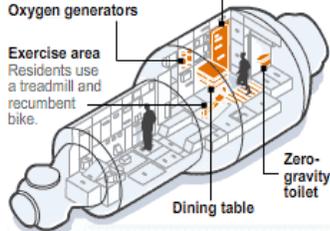
The International Space Station's main living quarters are only about three times longer than a large SUV:

Oxygen generators

Exercise area
Residents use a treadmill and recumbent bike.

Bedrooms

Astronauts' sleeping bags are tied inside tiny closets.



Source: NASA
By Karl Gelles, USA TODAY

By Traci Watson, USA TODAY

HOUSTON — No fresh air. No shower. No TV, no hugs from the kids. And nowhere to go, other than the metal tube that serves as home for as long as seven months.

Such is the lot of the astronauts aboard the International Space Station, which floats about 200 miles above the Earth's surface. Despite its prisonlike conditions, the live-in laboratory has been occupied non-stop with up to three hardy souls at a time since opening in 2000 as a research facility. In all, 36 astronauts have been station residents.

PHOTO GALLERY: [See what life is like in space](#)

Crewmembers — almost all American or Russian — spend up to seven months at a stretch in this orbital group house, deprived of family and basic comforts. They see no one but their crewmates for most of their stay. They don't leave the premises aside from spacewalks on the station's exterior.

Despite the hardships, station assignments are still eagerly accepted by many U.S. astronauts. It's a chance to contribute to NASA's long-term plan to send humans to the moon and Mars, through the research on how their bodies adapt to space. It's a ticket to space for some, who otherwise wouldn't get a chance to go into orbit. And for those astronauts who have already flown on the space shuttle, the orbiting lab allows them to discover what it's like to live long term in space.

"To visit Paris is really wonderful. To go live there is a different type of experience," says astronaut Dan Tani, 46, who has made one shuttle trip and is scheduled for a station assignment this fall.

This year, NASA adds more rooms and a revamped oxygen system so the crew can double in size to six. While funding has been reduced over the years for scientific research on the station, NASA still hopes its work will lead to breakthroughs — even as the space agency shifts its energies and resources. On Monday, station commander Michael Lopez-Alegria, 46, welcomes aboard two Russian cosmonauts. One of them is his replacement. Their arrival will allow Lopez-Alegria to come home April 20 on a Russian spaceship, after seven months in space.

"We ... are looking forward to getting back," he told a San Francisco TV station recently. Despite the confinement, former station residents say they would not trade their experience. They learned the joys of "flying" in space, soaring effortlessly from one spot to the next. Every day they had a view of the Earth so glorious it left them at a loss for words.

"I found ... the act of living in space to be a thrill every single day," says astronaut Bill McArthur, 55, who returned last year from a six-month stay. "The answer to 'What was the best part?' is everything."

All told, 18 Americans have lived on the station. A German and 17 Russians have also lived there. Stays vary from three to seven months. The construction frenzy this year and next will allow the station to reach its longtime goal of a six-member crew in 2009.

"Six is going to be an interesting challenge," says Jeffrey Williams, 50, whose half-year stay ended in September. "Three is still very comfortable."

Here's the lifestyle he considers "comfortable":

Catching zzz's

When it's time to go to sleep, astronauts generally retreat to windowless cabins the size of phone booths and zip themselves into sleeping bags strapped to the wall.

Sleeping in space is difficult at first, because there's no way to satisfy the natural urge to lay one's head down. Former station crewmember Leroy Chiao, 47, calls it the "What am I supposed to do with my neck?" problem.

Eventually, station residents learn to let their necks float freely as they snooze. Many say that once they adjust, sleeping in space is blissfully comfortable.

When astronaut James Voss, now 58, tried to sleep after returning to Earth in 2001, "My arms would go to sleep because I was lying on them, or I'd feel this terribly heavy leg on top of my other leg. ... I really wanted to be back where I could float while sleeping."

Lopez-Alegria, on the other hand, told a TV network last week that sleeping in his own bed on Earth was one of the things he missed most.

Keeping sort of clean

The station has neither flush toilet nor shower. Nor does it have a sink, so astronauts usually swallow their toothpaste after they brush.

The station lavatory is a Russian model that sucks waste away with a vacuum.

BLOGS IN SPACE

From [Sunita Williams' blog](#):
The view

"One observation worth noting this week is what the Earth looks like at night. It is a funny thing, but it surely looks a lot more populated. Lights are all over the place. There are areas of the Earth that I would absolutely think no one lived in based on daytime observations. But then at night, lights pop up in those areas. The cities are really prominent. Sadly enough, the border between N. Korea and S. Korea is even visible. I think if I were going to another planet, I would like to orbit at night to see what type of activity shows up..."

Baking garlic

"We cut a drink bag, put the garlic cloves in, poured on some olive oil, sealed it up - we thought - and baked it over night. Oil has a tendency to migrate, so it got out of the aluminum pouch and all over the oven. The oven smelled good, and still smells good. However, everything else we put in there comes out smelling like garlic and olive oil. Even the berry cherry cobbler, heated up, was smelling like garlic."

Planets seen from space

"Planets look about the same here as they do to you on the Earth because we really aren't that much closer. Our home, the International Space Station orbits around the Earth at about 200 miles. The planets, and the moon for that matter, are so much further away that even 200 miles closer to them doesn't make them appear any bigger. However, we are above the thin layer of our atmosphere so the stars and the planets look a lot clearer up here. We don't have the water vapor in the sky above us blurring our vision/view of the stars and planets."

Her wasabi fight

"I started opening the jar paper cover, about 1 millimeter wide hole and the wasabi sauce came out at me like a fire hose. I was dodging the spray as well as trying to catch it, because it was going all over the walls. I finally got the cap back on and thought, okay, the pressure is gone. I opened it again to use the sauce and again, it came flying out at me. ... This is what I call a 1-G (gravity) moment."

From [Michael Lopez-Alegria's blog](#):

What food is like

"Dehydrated food is packaged in plastic containers or 'bags' that have a septum built into them. Our galley doesn't have anything that looks much like a stove. When it's time to "cook" we use a special machine. The machine has a needle, not unlike that used to inflate sports balls, that is inserted in the septum. A specific quantity of either hot or cold water (specified on the label) is then selected on the machine and is subsequently dispensed into the bag via the needle. When complete, the needle is withdrawn, and the septum closes to prevent water from coming back out. One usually squishes the contents of the bag around to evenly distribute the water. In 5-15 minutes, depending on the contents, voila — food!"

A gravity issue

"Contrary to popular belief, there is plenty of gravity 240

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It's not easy to use: When an astronaut needs relief, he or she has to flick a series of switches in just the right order and watch for colored lights to turn on and off.

"You cannot just push 'Flush' and walk away," says Microsoft billionaire Charles Simonyi, who will spend April 9-20 on the station as a jaying passenger. He learned to use the toilet during his training in Russia. "If you're careless, you can cause it to break."

The toilet sucks waste into metal buckets. When the buckets are full, the crew stashes the waste in a Russian cargo pod that will later burn up in the Earth's atmosphere.

"The worst that happens when you change the buckets is you could have one drop of urine on your finger," says astronaut John Phillips, 55.

Crews use no-rinse shampoo to wash their hair and Russian "wetted towels," cleanser-soaked gauzy fabric, to bathe. They swab their hands with commercial U.S. baby wipes. By the end of their stay, many crave a hot shower or bath.

"You're never really extra-clean," says Phillips, who lived on the station for six months in 2005. "But you're never filthy either."

Weaker muscles

Without gravity, astronauts don't bear weight on their feet except during exercise, which they try to do several hours a day. As a result, any calluses they had on their feet before arriving on the station often peel away in large chunks in orbit or when they get back to Earth.

Instead, they get hardened spots on the tops of the feet. That's because many stabilize themselves on the station by inserting their shoeless feet under metal handholds mounted all over the walls.

Weightlessness also leads to more serious changes. Bones shrink, because the body isn't pushing against the force of gravity. On average, 16 station residents studied by Thomas Lang of the University of California, San Francisco, lost as much bone from the hip in one month as an elderly woman loses in one year.

Muscles also atrophy in orbit, and stamina can suffer. Ten months after returning to Earth, McArthur says running is "very fatiguing. I still have not recovered the same ability to endure even moderate running distances yet."

Long-term space residents are also at higher risk of kidney stones because the calcium lost from their bones builds up in their urine. Crewmembers are testing pills to counteract that possibility.

Freeze-dried food

Station crews give five stars to much of the orbital menu, which is half Russian food and half American. Dishes include comfort food such as lasagna, and Russian specialties that many U.S. astronauts have grown to love, such as a sweet cheese called *tvorg*.

Only two problems: The menu repeats after 10 days, and everything is canned, freeze-dried or precooked. All the food is "mushy," Chiao says — so much so that he admits to diving into a can of Pringles that his wife included in a care package that he received via a Russian cargo ship.

Some astronauts, finding the diet monotonous or bland, resort to piling on the condiments, such as garlic paste. A jar recently spurted a fiery wasabi sauce all over current resident Sunita Williams.

"I don't think we're going to use that anymore. It's too dangerous," Williams said after the incident.

The crews occasionally receive special deliveries. Simonyi will bring a multicourse French feast, prepared in the kitchens of superstar chef Alain Ducasse.

Such treats don't make up for the station's lack of ordinary pleasures, such as salad. Nor are crews supposed to drink alcohol, leaving Lopez-Alegria to write longingly in his online diary about "a nice glass of wine to go with our meal."

Space brothers'

For most of their months in space, station astronauts see only the other one or two residents. Those roommates might be American but are often Russian.

Despite the lack of company, astronauts do not complain of loneliness. They're in frequent radio contact with Mission Control, so much so that Lopez-Alegria has been playing a game with ground engineers. Every week he sprinkles lines from a movie into his conversations, and Mission Control has to guess the name of the film.

The intensity of the experience and the years of training seem to draw crews together. They learn a bit of each other's language, and their bonds help prevent fights about whose turn it is to change the toilet bucket. "Even given all the potential for stress and pressure ... not once did we ever even have a hint of tension between us," says Jeffrey Williams about his Russian crewmate, Pavel Vinogradov.

Chiao describes his Russian crewmate Salizhan Sharipov as "the brother I never had." Phillips and his Russian crewmate Sergei Krikalev ate all but two meals together over a six-month period.

McArthur's Russian crewmate Valery Tokarev "referred to us as space brothers," McArthur says. "The only person with whom I have a relationship so close ... is my (biological) brother."

Astronauts say their greatest challenge is not the people who are there but the people who aren't. Crewmembers talk to family daily on an internet-based phone and weekly via videoconference. Still, the separation is for many a strain.

Jeffrey Williams says he and his wife of 26 years are best friends. They "got tired of staying in contact through a telephone, through a vide screen." He knew his absence burdened her. "I have to admit, walking to the launch pad this time, I had a little twinge of 'Am I really doing the right thing?' primarily because of that."

Work and play

The recreational opportunities on the station are limited. There's no bar or golf course or beach, not even a TV or traditional radio.

Astronauts say there's something better: the beauties of the Earth just outside the window, which Chiao calls "the greatest thing about life up there." Many crewmembers, like Chiao, spend a lot of their spare time just gazing out the window and snapping photos.

If that gets old, the station has a vast collection of movies and music. Astronauts can't surf the Web, but they get e-mail three times a day. Phillips read a daily newspaper summary. In a twist of irony, McArthur watched episodes of *Lost*, a TV program about people stranded on a desert island, that were e-mailed to him as video files.

There are more ways to goof off than there is time to do so. In theory, the crews get Sunday and half of Saturday off and are allotted private time on workdays. In practice, the daily schedule is jammed full of duties: experiments, maintenance checks, repairs. When that work is done, there's a "job jar" of more tasks to tackle whenever the crew can fit them in.

Time off, McArthur jokes, was a period "in the schedule in which I got to pick the work."

Still, he dismisses suggestions that station life is a hardship.

'Are there things that you miss up there? Clearly there are," he says, citing the separation from family as "not enjoyable."

The pluses outnumber the minuses, he says. "When you can zoom around and float, even wiping down the walls with disinfectant is just a unique and entertaining experience," McArthur says. "There are few things I would exchange for that experience."

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