On tap in space: Urine will not go to waste

By Traci Watson

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WASHINGTON — Astronauts living on the International Space Station soon will take recycling to new extremes: They'll get some of their drinking water from the toilet.

NASA has spent decades perfecting a system to transform urine into water that can be used in space for drinking, food preparation and washing. Agency officials say the water from the system will be cleaner than U.S. tap water.

The new $250 million machine was being unpacked Wednesday at the space shuttle's Florida launch site. Shuttle Endeavour is scheduled to take it to the station this fall. If all goes well, the so-called toilet-to-tap system will be fully operational in six months.

Russia developed a similar system in the 1980s but it never flew in space because of concerns over crew squeamishness, says former station astronaut Leroy Chiao, now a space consultant. He says station crews expect hardships and aren't likely to object.

"You're going (to the space station) as part of exploration," he says. "This is just something you have to put up with, and that's OK."

Some of the crew's drinking water already comes from an unconventional source: evaporated laundry water and sweat, which are captured by a Russian machine.

NASA developed the new system because water is so heavy to carry to orbit. Once the number of station residents grows from three to six next year, it would be impossible to ship enough water to the station, says Marybeth Edeen of NASA's Johnson Space Center.

A toilet to arrive on the station this fall will funnel liquid waste to the new system through pipes, but the wastewater from the station's older toilet will have to be carried in tanks to the processing machine. There, water will be distilled from the waste and undergo six steps to cleanse it, including the addition of iodine to kill microbes. The machine will also suck in humidity from the astronauts' sweat and breath and clean it.

The end product will fill the bowls of the new toilet and will also dribble from taps in a galley and a "hygiene center," where astronauts will bathe and brush their teeth. The new machine will provide roughly half of the crew's water intake, says Bob Bagdigian of NASA's Marshall Space Flight Center, including 1¾ gallons per person per day for drinking and food.

Recycling wastewater also is gaining in popularity on Earth. A dozen or so U.S. communities have plants that cleanse sewage so it can be added to aquifers that supply drinking water. The biggest plant, which can serve 500,000 people, opened this year in Orange County, Calif. Public disgust has squelched such systems in San Diego and Los Angeles.

Edeen admits the recycled water poses a "psychological issue to get past" but says that, after tasting it "many, many times," she can't tell it apart from any other water.

"It's not urine anymore," she says. "It's water."

"I very much understand (public) squeamishness," Bagdigian says. But, he adds, he doesn't have to contend with it, because "you're talking about people who've already come to grips with putting themselves on a rocket."