Space station faces steady threat from orbiting space junk

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Now that the space shuttle is retired, NASA and space agencies around the world will focus on the International Space Station for the rest of this decade - and cross their fingers that it lasts that long.

The station, with its crew of six international astronauts, orbits Earth at an altitude of about 220 miles, a neighborhood that is increasingly cluttered by space junk, mainly parts of old rockets and satellites that were either abandoned or destroyed in orbit.

Thousands of pieces are big enough - and shooting through space fast

enough - to seriously damage or destroy the $100 billion laboratory.

"The orbit they are flying in is the worst possible. . . . The Russians blew up all kinds of things in that damned orbit. So there are thousands of pieces in that particular orbit," said Christopher Kraft, a retired director of NASA's Manned Space Flight Center.

The odds are against the station getting hit by debris big enough to destroy it before its planned abandonment in late 2020. But the threat is no long shot. NASA's projections indicate the chance of a disastrous collision with space junk are about 1 in 13.

Most space debris - and the station itself - flies at or near orbital velocity of 17,500 mph. At that speed, collision with debris the size of a large bullet could blow open a hole in a station module, releasing the air inside. Larger pieces could destroy one or more of the modules.

In recent weeks, Kraft organized a belated campaign urging NASA to reconsider retiring all the shuttles, contending they are needed as emergency repair and rescue trucks. A June 30 letter he and Washington consultant Scott Spencer sent to NASA Administrator Charles Bolden and others was endorsed by other high-profile NASA retirees, including astronauts Bob Crippen, Neil Armstrong and James Lovell; flight director Gene Kranz; and space-station program director Tom Moser.

But a response by Bill Gerstenmaier, NASA associate administrator for space operations, said the station is "fully stocked" with spare components. "The space station has a spacewalk capability, with redundant suits and systems, which will allow crews to perform repairs on orbit without the need of the space shuttle," he said.

In addition, debris shields have been put in place around the station's modules, and around critical life-support units. Air-pressure sensors in

each module can trigger airlock closings. And two Russian Soyuz spacecraft wait as lifeboats.

"We've done our best to put ourselves in a good position, now that the shuttle is being retired," said NASA spokesman Kelly Humphries.

Still, the shields - made of layers of aluminum, ceramic and the Kevlar fabric used in bulletproof vests - can withstand only hits by tiny debris and micro-meteors; bigger things could blow through them.

And the threat posed by space junk is getting worse. In 2007 China blew up one of its satellites, dropping thousands of pieces into range of the station's orbit. In 2009, an American and a Russian satellite collided, spreading more debris.

NASA, which evaluates risk in six-month increments, says there is a 1-in-114 chance a serious debris strike will partially disable the space station during the next six months, and 1 chance in 241 of a collision that kills astronauts or totally disables or destroys the station.

During the station's lifetime, that works out to a 1-in-6 chance of a disabling strike - and a 1-in-13 chance of a fatal collision.

A 2007 task force reporting to NASA found slightly worse odds - estimating a 1-in-8 chance that an astronaut would die or the station would have to be abandoned.

The task-force chairman, retired NASA space-station program manager Tommy Holloway, praised Gerstenmaier for overseeing improvements the report recommended, principally retrofitting old modules with shields, and building a stock of repair supplies and tools. "But that only reduced it somewhat," Holloway said, adding that such collisions remain a "substantial risk over the lifetime of the program."

NASA and the U.S. military debris surveillance systems can track junk no smaller than about 4 inches, and have identified about 20,000 pieces that size or larger. But the agency estimates there might be 500,000 smaller pieces that are big enough to do damage.

Alarms caused by detectable chunks are increasing. To avoid collisions with tracked debris, the station has had to change its orbital altitude five times in the past three years. In its first eight years, such maneuvers were required only six times.

On June 28, a piece of debris of unknown size and origin was detected 14 hours before it would cross the station's path. There was no time for an avoidance maneuver, so the astronauts took safe harbor aboard the station's two docked Soyuz spacecraft waited. The debris passed about 1,100 feet from the station.

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