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Commentary

Debris Is No Reason for Hysteria

◀ JAMES HACKETT ▶



Those who worry about obscure dangers suffered new anxiety in January when China created a cloud of orbital debris by destroying one of its own weather satellites with the test of a ground-launched anti-satellite (A-Sat) weapon. Subsequent reports claim it was their third attempt.

The Space Surveillance Network has recorded nearly 600 pieces of debris from the Chinese test, but these are only the largest. NASA officials said the debris cloud extends from 200 kilometers to 3,850 kilometers in altitude, encompassing all of low Earth orbit. Marine Corps Gen. James Cartwright, commander of the U.S. Strategic Command, said the test left an enormous debris field that likely will take several decades to fall into the atmosphere.

When the space age began 50 years ago there was no man-made space debris. Since then, Space Command's Space Surveillance Network has tracked more than 25,000 objects of 10 centimeters in diameter (about the size of a baseball) or larger, orbiting Earth. About 10,000 currently are catalogued and tracked.

Over the past 50 years some 15,000 large pieces of debris have fallen into the atmosphere and either disintegrated or landed. But not one person anywhere has been killed or injured by space junk. Earth is a big place, more than two-thirds covered by water, and much of the rest is lightly inhabited. Space junk hardly ever hits anyone.

It is slightly more likely to strike something in orbit. Moving at speeds up to 27,000 kilometers per hour in low Earth orbit, space junk is potentially a danger to everything in space. There are some 850 active spacecraft orbiting at altitudes ranging from the space shuttle at around

300 kilometers to satellites in geosynchronous orbit at 35,790 kilometers.

Traffic is heaviest in certain parts of low Earth orbit. But operational spacecraft are only about 6 percent of the objects being tracked. The rest is space junk that includes inactive satellites, spent rockets, debris from exploding rockets and just plain trash. Space Command monitors debris to identify threats to manned spacecraft and satellites, and alerts users to move them out of the way if a collision appears likely.

There also are an estimated 100,000 small pieces of debris between 1 centimeter and 10 centimeters, which are too small to track, but still can cause damage. About 80 percent of all debris is in orbit between 800 kilometers and 1,000 kilometers in altitude. The Chinese test, which took place at 850 kilometers, created more debris right where satellite traffic is heaviest. By contrast, the U.S. F-15 A-Sat test in 1985, which destroyed a Solwind satellite at 570 kilometers, left debris mostly in low altitude and all of it has re-entered the atmosphere.

Despite all the debris, in 50 years there have been only three documented collisions with active spacecraft, and none have been destroyed. A Space Command Web site describing the Space Surveillance Network notes that there is only a small amount of debris in the low orbits of the space shuttle and space station, and gives a worst-case statistical estimate of one chance in 10,000 years of a piece of debris 10 centimeters or larger hitting either one.

Even in the debris-thick 800 kilometer band, Space Command notes that there normally are only three or four objects orbiting in an area "equivalent to the airspace over the continental United States up to an altitude of 30,000 feet (9,144 meters)." Thus, it states, the likelihood of a collision is very small.

Not much can be done about the junk already in space, most of which eventually will migrate down and burn up in the Earth's atmosphere. The main efforts are to avoid the debris, design spacecraft that will not explode in space, limit the release of debris on orbit and, at the end of their mission, deorbit satellites into the atmosphere or nudge them into a parking orbit over 2,000 kilometers, where

there is little traffic.

The Inter-Agency Space Debris Coordination Committee (IADC) is an international governmental group that promotes good conduct in space. Most spacefaring nations are members, including the United States, Russia, China and the European Space Agency, which together created more than 90 percent of space junk. The IADC is a forum for governments to cooperate in applying debris mitigation guidelines. The IADC will be meeting in late April in Beijing, when China will be expected to explain its deliberate creation of a new debris field.

Beijing ignored the concerns of governments and commercial satellite operators alike by carrying out its test without advance notice to anyone. Even though the danger is not as great as many believe, China's action has led to calls for a ban on tests in space that might create debris.

Michael Krepon of the Stimson Center in Washington suggests rules of the road for objects in space, including a ban on A-Sat flight tests ["A Space Code of Conduct?" March 5, page 19]. But banning tests is unwise because it may be necessary to test A-Sat techniques in space, including the use of lasers and means of interfering with satellite communications, sensors, optics or solar panels, in ways that create little or no debris.

Banning such tests could adversely

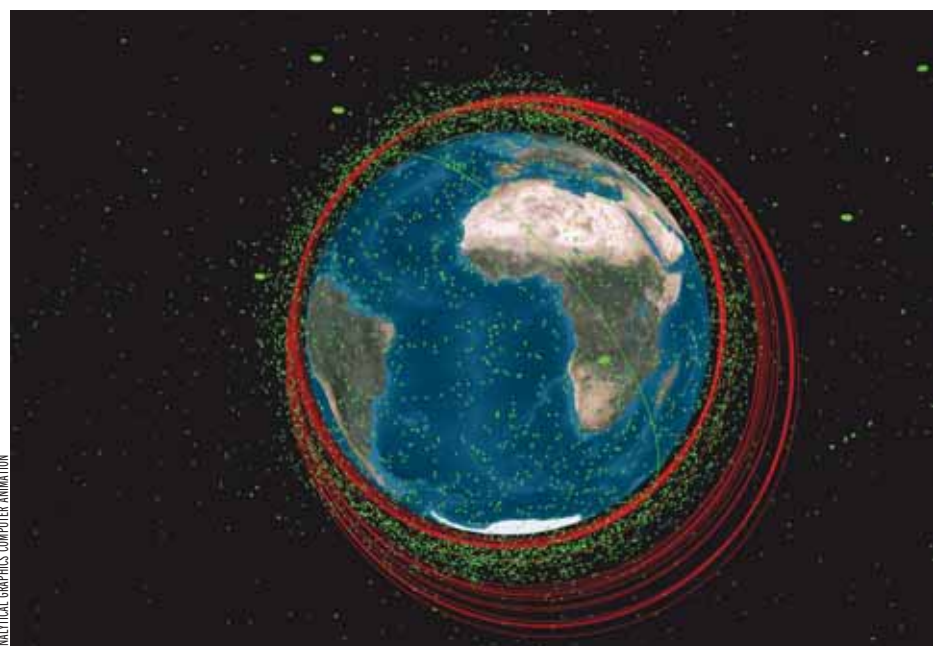
affect this country's ability to protect its armed forces on land and sea from satellite reconnaissance and targeting in a future conflict. We do not need another treaty that we honor while our adversaries do not.

Nevertheless, it may be possible to strengthen IADC guidelines by adding a space code of conduct similar to that of the 1972 Incidents at Sea agreement. That arrangement between the United States and Soviet Union includes rules of the road at sea to avoid collisions, maintain a safe distance, and provide notification of actions that might cause problems.

Similar rules of the road for space might include notifying other spacefaring nations in advance of any action that could produce debris or otherwise affect their space assets. Such rules should be multilateral and voluntary, like the Proliferation Security Initiative.

The main concern today is rogue action by China. Assuring free access to space for peaceful purposes is important and must be protected. But it is worth exploring ways within the IADC to induce China to be a more responsible spacefaring nation. Debris in space is a problem, but it is no reason for hysteria.

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▲ The Analytical Graphics' computer animation scene (above) illustrates how debris from the destroyed Chinese weather satellite (orbit shown as a green line) interacts with other objects in low Earth orbit.