**War in Space May Be Closer Than Ever**

China, Russia and the U.S. are developing and testing controversial new capabilities to wage war in space despite their denial of such work

By Lee Billings |August 10, 2015



Anti-satellite missile tests, like this one conducted by the U.S. Navy in February 2008, are part of a worrisome march toward military conflict in outer space.

*U.S. Navy*

The world’s most worrisome military flashpoint is arguably not in the Strait of Taiwan, the Korean Peninsula, Iran, Israel, Kashmir or Ukraine. In fact, it cannot be located on any map of Earth, even though it is very easy to find. To see it, just look up into a clear sky, to the no-man’s-land of Earth orbit, where a conflict is unfolding that is an arms race in all but name.

The emptiness of outer space might be the last place you’d expect militaries to vie over contested territory, except that outer space isn’t so empty anymore. About 1,300 active satellites wreathe the globe in a crowded nest of orbits, providing worldwide communications, GPS navigation, weather forecasting and planetary surveillance. For militaries that rely on some of those satellites for modern warfare, space has become the ultimate high ground, with the U.S. as the undisputed king of the hill. Now, as China and Russia aggressively seek to challenge U.S. superiority in space with ambitious military space programs of their own, the power struggle risks sparking a conflict that could cripple the entire planet’s space-based infrastructure. And though it might begin in space, such a conflict could easily ignite full-blown war on Earth.

The long-simmering tensions are now approaching a boiling point due to several events, including recent and ongoing tests of possible anti-satellite weapons by China and Russia, as well as last month’s failure of tension-easing talks at the United Nations.

Testifying before Congress earlier this year, Director of National Intelligence James Clapper echoed the concerns held by many senior government officials about the growing threat to U.S. satellites, saying that China and Russia are both “developing capabilities to deny access in a conflict,” such as those that might erupt over China’s military activities in the South China Sea or Russia’s in Ukraine. China in particular, Clapper said, has demonstrated “the need to interfere with, damage and destroy” U.S. satellites, referring to a series of Chinese anti-satellite missile tests that began in 2007.

There are many ways to disable or destroy satellites beyond provocatively blowing them up with missiles. A spacecraft could simply approach a satellite and spray paint over its optics, or manually snap off its communications antennas, or destabilize its orbit. Lasers can be used to temporarily disable or permanently damage a satellite’s components, particularly its delicate sensors, and radio or microwaves can jam or hijack transmissions to or from ground controllers.

In response to these possible threats, the Obama administration has budgeted at least $5 billion to be spent over the next five years to enhance both the defensive and offensive capabilities of the U.S. military space program. The U.S. is also attempting to tackle the problem through diplomacy, although with minimal success; in late July at the United Nations, long-awaited discussions stalled on a European Union-drafted code of conduct for spacefaring nations due to opposition from Russia, China and several other countries including Brazil, India, South Africa and Iran. The failure has placed diplomatic solutions for the growing threat in limbo, likely leading to years of further debate within the UN’s General Assembly.

“The bottom line is the United States does not want conflict in outer space,” says Frank Rose, assistant secretary of state for arms control, verification and compliance, who has led American diplomatic efforts to prevent a space arms race. The U.S., he says, is willing to work with Russia and China to keep space secure. “But let me make it very clear: we will defend our space assets if attacked.”

**Offensive space weapons tested**  
The prospect of war in space is not new. Fearing Soviet nuclear weapons launched from orbit, the U.S. began testing anti-satellite weaponry in the late 1950s. It even tested nuclear bombs in space before orbital weapons of mass destruction were banned through the United Nations’ Outer Space Treaty of 1967. After the ban, space-based surveillance became a crucial component of the Cold War, with satellites serving as one part of elaborate early-warning systems on alert for the deployment or launch of ground-based nuclear weapons. Throughout most of the Cold War, the U.S.S.R. developed and tested “space mines,” self-detonating spacecraft that could seek and destroy U.S. spy satellites by peppering them with shrapnel. In the 1980s, the militarization of space peaked with the Reagan administration’s multibillion-dollar Strategic Defense Initiative, dubbed Star Wars, to develop orbital countermeasures against Soviet intercontinental ballistic missiles. And in 1985, the U.S. Air Force staged a clear demonstration of its formidable capabilities, when an F-15 fighter jet launched a missile that took out a failing U.S. satellite in low-Earth orbit.

Through it all, no full-blown arms race or direct conflicts erupted. According to Michael Krepon, an arms-control expert and co-founder of the Stimson Center think tank in Washington, D.C., that was because both the U.S. and U.S.S.R. realized how vulnerable their satellites were—particularly the ones in “geosynchronous” orbits of about 35,000 kilometers or more. Such satellites effectively hover over one spot on the planet, making them sitting ducks. But because any hostile action against those satellites could easily escalate to a full nuclear exchange on Earth, both superpowers backed down. “Neither one of us signed a treaty about this,” Krepon says. “We just independently came to the conclusion that our security would be worse off if we went after those satellites, because if one of us did it, then the other guy would, too.”

Today, the situation is much more complicated. Low- and high-Earth orbits have become hotbeds of scientific and commercial activity, filled with hundreds upon hundreds of satellites from about 60 different nations. Despite their largely peaceful purposes, each and every satellite is at risk, in part because not all members of the growing club of military space powers are willing to play by the same rules—and they don’t have to, because the rules remain as yet unwritten.

Space junk is the greatest threat. Satellites race through space at very high velocities, so the quickest, dirtiest way to kill one is to simply launch something into space to get in its way. Even the impact of an object as small and low-tech as a marble can disable or entirely destroy a billion-dollar satellite. And if a nation uses such a “kinetic” method to destroy an adversary’s satellite, it can easily create even more dangerous debris, potentially cascading into a chain reaction that transforms Earth orbit into a demolition derby.

In 2007 the risks from debris skyrocketed when China launched a missile that destroyed one of its own weather satellites in low-Earth orbit. That test generated a swarm of long-lived shrapnel that constitutes nearly one-sixth of all the radar-trackable debris in orbit. The U.S. responded in kind in 2008, repurposing a ship-launched anti-ballistic missile to shoot down a malfunctioning U.S. military satellite shortly before it tumbled into the atmosphere. That test produced dangerous junk too, though in smaller amounts, and the debris was shorter-lived because it was generated at a much lower altitude.

More recently, China has launched what many experts say are additional tests of ground-based anti-satellite kinetic weapons. None of these subsequent launches have destroyed satellites, but Krepon and other experts say this is because the Chinese are now merely testing to miss, rather than to hit, with the same hostile capability as an end result. The latest test occurred on July 23 of last year. Chinese officials insist the tests’ only purpose is peaceful missile defense and scientific experimentation. But one test in May 2013 sent a missile soaring as high as 30,000 kilometers above Earth, approaching the safe haven of strategic geosynchronous satellites.

That was a wake-up call, says Brian Weeden, a security analyst and former Air Force officer who studied and helped publicize the Chinese test. “The U.S. came to grips decades ago with the fact that its lower orbit satellites could easily be shot down,” Weeden says. “Going nearly to geosynchronous made people realize that, holy cow, somebody might actually try to go after the stuff we have up there.”

It was no coincidence that shortly after the May 2013 test, the US declassified details of its secret Geosynchronous Space Situational Awareness Program (GSSAP), a planned set of four satellites capable of monitoring the Earth’s high orbits and even rendezvousing with other satellites to inspect them up-close. The first two GSSAP spacecraft launched into orbit in July 2014.

“This used to be a black program—something that didn’t even officially exist,” Weeden says. “It was declassified to basically send a message saying, ‘Hey, if you’re doing something funky in and around the geosynchronous belt, we’re going to see.’” An interloper into geosynchronous orbit need not be an explosives-tipped missile to be a security risk—even sidling up to an adversary’s strategic satellites is considered a threat. Which is one reason that potential U.S. adversaries might be alarmed by the rendezvous capabilities of GSSAP and of the U.S. Air Force’s highly maneuverable X-37B robotic space planes.

See also:

* Energy & Sustainability: 5 Steps to Feed the World and Sustain the Planet |
* Evolution: Origin of Life: First Cells May Have Been Glued Together |
* Health: Pharma Watch: Raising Awareness or Drumming Up Sales? |
* Mind & Brain: Lie Detection is a Team Sport |
* Technology: Will Artificial Intelligence Surpass Our Own? |
* More Science: Baby Chicks' Mental Number Line Looks Like Ours

Russia is also developing its own ability to approach, inspect and potentially sabotage or destroy satellites in orbit. Over the past two years, it has included three mysterious payloads in otherwise routine commercial satellite launches, with the latest occurring in March of this year. Radar observations by the U.S. Air Force and by amateur hobbyists revealed that after each commercial satellite was deployed, an additional small object flew far away from the jettisoned rocket booster, only to later turn around and fly back. The objects, dubbed Kosmos-2491, -2499 and -2504, might just be part of an innocuous program developing techniques to service and refuel old satellites, Weeden says, though they could also be meant for more sinister intentions.

**Treaties offer little assurance**  
Chinese officials maintain that their military activities in space are simply peaceful science experiments, while Russian officials have stayed mostly mum. Both nations could be seen as simply responding to what they see as the U.S.’s clandestine development of potential space weapons. Indeed, the U.S.’s ballistic missile defense systems, its X-37B space planes and even its GSSAP spacecraft, though all ostensibly devoted to maintaining peace, could be easily repurposed into weapons of space war. For years Russia and China have pushed for the ratification of a legally binding United Nations treaty banning space weapons—a treaty that U.S. officials and outside experts have repeatedly rejected as a disingenuous nonstarter.

“The draft treaty from Russia and China seeks to ban the very things that they are so actively pursuing,” Krepon says. “It serves their interests perfectly. They want freedom of action, and they’re covering that with this proposal to ban space weapons.” Even if the treaty was being offered in good faith, Krepon says, “it would be dead on arrival” in Congress and would stand no chance of being ratified. After all, the U.S. wants freedom of action in space, too, and in space no other country has more capability—and thus more to lose.

According to Rose, there are three key problems with the treaty. “One, it’s not effectively verifiable, which the Russians and Chinese admit,” he says. “You can’t detect cheating. Two, it is totally silent on the issue of terrestrial anti-satellite weapons, like the ones that China tested in 2007 and again in July 2014. And third, it does not define what a weapon in outer space is.”

As an alternative, the U.S. supports a European-led initiative to establish “norms” for proper behavior through the creation of a voluntary International Code of Conduct for Outer Space. This would be a first step, to be followed by a binding agreement. A draft of the code—which Russia and China prevented from being adopted in last month’s UN discussions—calls for more transparency and “confidence-building” between spacefaring nations as a way of promoting the “peaceful exploration and use of outer space.” This, it is hoped, can prevent the generation of more debris and the further development of space weapons. However, like the Russian-Chinese treaty, the code does not exactly define what constitutes a “space weapon.”

That haziness poses problems for senior defense officials such as General John Hyten, the head of the U.S. Air Force Space Command. “Is our space-based surveillance system that looks out at the heavens and tracks everything in geosynchronous a weapons system?” he asks. “I think everybody in the world would look at that and say no. But it’s maneuverable, it’s going 17,000 miles per hour, and it has a sensor on board. It’s not a weapon, okay? But would [a treaty’s] language ban our ability to do space-based surveillance? I would hope not!”

**Is war in space inevitable?**  
Meanwhile, shifts in U.S. policy are giving China and Russia more reasons for further suspicion. Congress has been pressing the U.S. national security community to turn its attentions to the role of offensive rather than defensive capabilities, even dictating that most of the fiscal year 2015 funding for the Pentagon’s Space Security and Defense Program go toward “development of offensive space control and active defense strategies and capabilities.”

“Offensive space control” is a clear reference to weapons. “Active defense” is much more nebulous, and refers to undefined offensive countermeasures that could be taken against an attacker, further widening the routes by which space might soon become weaponized. If an imminent threat is perceived, a satellite or its operators might preemptively attack via dazzling lasers, jamming microwaves, kinetic bombardment or any other number of possible methods.

“I hope to never fight a war in space,” Hyten says. “It’s bad for the world. Kinetic [anti-satellite weaponry] is horrible for the world,” because of the existential risks debris poses for all satellites. “But if war does extend into space,” he says, “we have to have offensive and defensive capabilities to respond with, and Congress has asked us to explore what those capabilities would be. And to me, the one limiting factor is no debris. Whatever you do, don’t create debris.”

Technology to jam transmissions, for example, appears to underpin the Air Force’s Counter Communications System, the U.S.’s sole acknowledged offensive capability against satellites in space. “It's basically a big antenna on a trailer, and how it actually works, what it actually does, nobody knows,” Weeden says, noting that, like most space security work, the details of the system are top secret. “All we basically know is that they could use it to somehow jam or maybe even spoof or hack into an adversary’s satellites.”

For Krepon, the debate over the definitions of space weapons and the saber-rattling between Russia, China and the U.S. is unhelpfully eclipsing the more pressing issue of debris. “Everyone is talking about purposeful, man-made objects dedicated to warfighting in space, and it’s like we are back in the Cold War,” Krepon says. “Meanwhile, there are about 20,000 weapons already up there in the form of debris. They’re not purposeful—they’re unguided. They’re not seeking out enemy satellites. They’re just whizzing around, doing what they do.”

The space environment, he says, must be protected as a global commons, similar to the Earth’s oceans and atmosphere. Space junk is very easy to make and very hard to clean up, so international efforts should focus on preventing its creation. Beyond the threat of deliberate destruction, the risk of accidental collisions and debris strikes will continue to grow as more nations launch and operate more satellites without rigorous international accountability and oversight. And as the chance of accidents increases, so too does the possibility of their being misinterpreted as deliberate, hostile actions in the high-tension cloak-and-dagger military struggle in space.

“We are in the process of messing up space, and most people don’t realize it because we can’t see it the way we can see fish kills, algal blooms, or acid rain,” he says. “To avoid trashing Earth orbit, we need a sense of urgency that currently no one has. Maybe we’ll get it when we can’t get our satellite television and our telecommunications, our global weather reports and hurricane predictions. Maybe when we get knocked back to the 1950s, we’ll get it. But by then it will be too late.”