Forum for American Leadership

How to Respond to Russia's Anti-Satellite Test

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On November 15, 2021, Russia's Ministry of Defense launched a direct-ascent anti-satellite (DA-ASAT) missile at one of its own satellites, successfully striking and destroying the target. In the process of doing so, Moscow demonstrated that it possesses the capability to strike at Western satellites.

Russia's test also raised considerable issues about the safe operation in, and peaceful use of, space. These necessitate action by, and leadership from, the United States in concert with its allies. In the absence of this leadership and preparation, the likelihood of a catastrophic collision affecting America's capability on-orbit is increasingly possible.

Protection of the space domain is critical not only to ensure military and intelligence operations, but also economic security. Few activities today could operate without the capabilities derived and delivered from orbit. Indeed, the private sector's interest in space entails everything from commercial space travel, to positioning, navigation and timing (PNT), to space-based internet access from low Earth orbit (LEO) satellites.

In response to the test and in light of the importance of space to national and economic security the United States should:

- Lead an international effort to establish space norms of behavior, to include a multilateral moratorium on debris-creating kinetic tests. Even if the effort is unsuccessful, the pursuit of such a multilateral moratorium will demonstrate American leadership on this critical subject.
- Increase investment in space traffic management and on-orbit tracking of debris to ensure the minimization of the likelihood of collisions.
- Work with leading commercial partners to develop capabilities that ensure if a collision does occur on orbit, any degraded or lost assets are swiftly replaced. This must include disaggregated and distributed capabilities to avoid the continued development of "big, fat, juicy targets" in the words of former Vice Chair of the Joint Chiefs, General John Hyten.
- Recognize commercial space providers as a critical part of the national and economic security ecosystem and include them in discussions about the aforementioned norms of behavior.

The Destruction of COSMOS 1408

In November 2021, Russia destroyed a defunct Soviet satellite known as COSMOS 1408 (Tselina-D, according to Russia), striking it at an altitude of 480 kilometers (300 miles) with a variant of the A-235 anti-missile system called the PL-19 Nudol. The Nudol itself is designed as

an ASAT platform. The two-stage, solid fueled missile can strike targets at ranges of 1,500 kilometers and an interception speed of Mach 10. Russia tested the Nudol at least ten previous times over the last eight years, eight of which appear to have been successful. Until November, the tests had only been against simulated targets.

The most immediate concern regarding the test was the resulting debris field and the danger it posed to other space assets. According to U.S. Space Command, the test "generated more than 1,500 pieces of trackable orbital debris and will likely generate hundreds of thousands of pieces of smaller orbital debris." Moving at 17,500 miles per hour, even the smallest piece of debris can damage sensitive satellite components, spacecraft, and, in a worst-case scenario, result in a cascading series of collisions generating more and more spaced debris. Known as a "Kessler Effect", this space-junk cascade effect could render operations in space extremely dangerous if not impossible.

The possibility of a collision on orbit because of the test is not an abstract consideration. Following the Russian test, the International Space Station (ISS), including its Russian cosmonauts, was forced to conduct an unplanned maneuver burn to avoid the debris resulting from the destroyed satellite. Two months later, a Chinese satellite had a near-miss with a piece of the destroyed satellite, with Beijing claiming that it came within 14.5 meters. In March of 2021, a Chinese satellite experienced a break-up following a collision with a piece of debris from a Russian Zenit launch.

Russia joins China, the United States, and India as having recently demonstrated the capacity to conduct kinetic anti-satellite operations. In 1985, the U.S. conducted a DA-ASAT test using an F-15 fighter jet armed with ASM-135 missile. In 2007, Beijing tested a DA-ASAT, striking a weather satellite at an altitude of 865 kilometers. A year later, the United States struck a crippled U.S. spy satellite in a decaying orbit using a ship-launched SM-3 missile. The latter operation was conducted on fears that the hydrazine fuel, a toxic substance, in the satellite could land in a populated area.

In 2019, India joined the club of countries with DA-ASAT capabilities. Delhi tested an anti-ballistic missile, the Prithvi Delivery Vehicle Mark-II, hitting a target at an artificially-low altitude of 282 kilometers (thereby making the test easier and creating a smaller debris field, though the latter was unlikely part of Delhi's calculus). Delhi's decision was in part a response to the rising threat of China and its earlier ASAT test.

Unsurprisingly, Washington was much more vocal about Beijing's 2007 DA-ASAT test than Delhi's 2019 test, given that the latter is seen as a potential bulwark and partner against China's regional hegemonic ambitions.

Russia's test was not entirely a surprise. The Soviet Union possessed anti-satellite weapons of various types and capabilities, and it was known that Moscow retained and continued to develop these after the end of the Cold War. While unsurprising, it does highlight the vulnerability of America's satellite architecture. The United States' defense posture and economy relies on space-based and space-enabled capabilities more than any other country.

Implications & Policy Issues

Moscow's DA-ASAT test raised several inter-related issues regarding space security.

In a classic international security dilemma, these DA-ASAT capabilities are inherently dual-use. A missile that can successfully strike a satellite orbiting at 17,500 miles per hour in orbit has the potential capability for use in missile defense.

This reality is, arguably, one of the key reasons why the United States has been reluctant to support or adopt moratoriums on debris-creating events. With China's nuclear modernization and hypersonic weapons program, Washington is rightfully reluctant to surrender any potential defensive capability. This is especially the case at a time when Moscow has demonstrated a willingness to violate existing international agreements, such as the Intermediate Nuclear Forces treaty, and Beijing is unwilling to engage in strategic arms discussions until it has achieved nuclear parity with the United States.

Both Russia and China are aware of this and are attempting to put Washington on the backfoot on the issue. Both countries have advocated for a "Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT)". The advocacy is disingenuous at best and would constrain America's hands and defensive posture far more than it would either Russia or China.

While the United States and others would prefer a norms-based approach, Russia and China seek nominally legally-binding treaties on space issues such as the PPWT. On the PPWT, the United States found it "fundamentally flawed", noting the lack of a verification mechanism, no restrictions on stockpiling such weapons, and other issues.

In the absence of either a soft or hard approach to governing space security, the existing governance structure, including the Outer Space Treaty (OST) does not prohibit the conduct of debris-creating events. Unsurprisingly, Russia's test sparked renewed calls for a moratorium on such anti-satellite missile tests. There is a precedent for similar moratoriums and treaty-bans on certain behaviors, for example: the 1963 Partial Test-Ban Treaty, which prohibited nuclear weapon tests in space; and the OST's prohibition of any weapon tests on the moon or other celestial bodies.

It is interesting to note that one notable difference between Russia's 2020 test and previous international DA-ASAT tests is the extent to which commercial space companies are now significant players on orbit. Multiple private sector actors, such as Astroscale, Virgin Orbit, and Planet, condemned the test, and companies such as these are likely to have an increasing role in the definition of space norms and governance. In January, a SpaceX Falcon 9 launch put another 49 satellites into its Starlink constellation, bringing the company's full launch total to over 2,000.

Suggestions for Congress & the Executive Branch

While the physics of space are predictable, the human terrain is dramatically less so. Nonetheless, it is governed by the same principles of geo-politics. National self-interest and

self-defense are going to trump moratoriums, bans, and treaties in the near-term, especially as tensions over Ukraine with Russia are at a fever pitch. While there have been some discussions about bringing strategic arms control discussions to the table to reduce tensions, this is an unwise move and unlikely to be met with success. The two issues are fundamentally disconnected and connecting them will embolden the Kremlin to raise the stakes in the future if it feels it can get a better agreement out of the United States.

Washington will, and should, pursue the development of norms of behavior amongst its allies to demonstrate leadership in both thought and action on space security. Here, the Space Force, in concert with the Department of State, should work with our allies to establish clear multilateral standards of activity on orbit, promulgate them, get multiple countries to notionally agree to them, and then hold Russia and China to account to agree to these developing norms. At the same time, Washington should not overstate the risk of joint Sino-Russian cooperation on orbit and on space issues nor should it unilaterally disarm by pursing its own ban on such tests without getting multilateral cooperation and agreement from key nations with demonstrated capabilities.

To be sure, suggestions that the United States could reach an agreement with Russia, China, and India on a moratorium are ambitious at best. None of the four countries have a motivating interest in ensuring space stability that would overcome terrestrial geopolitics or security requirements.

On a technical level, there is relatively little that the United States can do to defend its existing satellites already on-orbit. There exist few physical defensive measures for satellites facing direct ascent anti-satellite threats. As a result of not being challenged on orbit, American intelligence and defense satellites swiftly grew to "big, fat, juicy targets" in the words of former Vice Chairman of the Joint Chiefs, General John Hyten.

As such, the United States should explore investment in new and next generation capabilities to ensure that in the event of an on-orbit collision, any lost or degraded capabilities are swiftly replaced. This could be done either by having rapid replacement capabilities sitting in a metaphorical barn near a launch pad or on-orbit through repurposed second-stages, mother-ships, or other capabilities. Ensuring the swift replacement of existing capabilities and the development of a more diversified architecture will go some way to offset the vulnerability that America's national security space architecture currently possesses.

The risks of an on-orbit collision and the resulting cascade effect are very real and becoming increasingly so as companies like SpaceX put more satellites into orbit. Amazon's Project Kuiper, Planet, and others are likely to increase space traffic significantly at a time when there is no international system for space traffic management and global space situational awareness.

The United States should undertake both a policy and technological approach to the issue of DA-ASAT capabilities if it is to ensure its continued leadership on orbit and strategic dominance in space.

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