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The ASAT Prisoner's Dilemma

The Case for U.S. Leadership and a Unilateral Moratorium on Kinetic-Energy Antisatellite Testing

BY Douglas Loverro, Brian Chow, Brandon Kelley, Brian Weeden, and Robert Cardillo

OVER 70 YEARS AGO, two RAND researchers structured the fundamental tenets in game theory of what later became known as “[The Prisoner's Dilemma](#)” – a description of a situation in which two perfectly rational actors, ignorant of the decisions of the other, will wisely pursue their own self-interest, but ultimately suffer a worse fate than if they had cooperated. The Prisoner's Dilemma applies to many real-life problems such as agreements on climate change, individual firms' investments in advertising, and the decision on one's use of steroids in sports. In all these cases, the conditions of the Prisoner's Dilemma are established by the fact that any single actor is either incapable of knowing what the other will do or has a high mistrust in any actions they may promise. They are therefore motivated to follow their own self-interest despite the overall negative impact to all. And so today, the United

States, China, India, and Russia find themselves locked in their own ASAT Prisoner's Dilemma.

Over the past 15 years, four countries – China in 2007, the United States in 2008, India in 2019, and now Russia this past year – have conducted such tests, using ground-based kinetic-energy (KE) missiles to deliberately destroy their own satellites. These tests have created many thousands of pieces of debris in low earth orbit (LEO) in the process. While the resultant harm to the LEO space environment varied depending on the altitudes of these engagements, no nation can be certain how far debris from such an impact will spread, nor what unlucky third-party will cross into its path. As space becomes increasingly congested, the risk grows exponentially.

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Simultaneously, these same nations have all argued for internationally agreed to treaties, mandatory or voluntary guidelines, or simply a code of conduct that would arrest such debris-creating activities and reduce the threat to space sustainability. Yet, locked in Prisoner Dilemma cells of their own rational construction, they have been unable to reach consensus. The time has come for the United States to lead, and to engineer an escape.

Roots of the Dilemma

KE tests against objects in space are not [new](#); they began shortly after the first satellite was launched into space but faded away during the latter part of the 20th century. That momentum was reversed early this century when China infamously [shot down](#) its Fengyun-1C weather satellite on January 11th, 2007, generating thousands of pieces of space debris. Since that time, taken aback by the immensity of the debris generated and the severe international backlash that ensued, China has conducted only non-debris-generating [ASAT tests](#). Unfortunately, other nations have not been so restrained.

One year later, in apparent response to the Chinese test, the United States destroyed its own failed USA-193 satellite. While the level of dangerous debris created was significantly smaller, and the international outcry muted, the die had been cast, and the effects of the dilemma were on full display. Despite proposals and calls for restraint or limits on space weapons, no space-faring nation was ready to negotiate away its right to follow suit. An Indian test in 2019, and the failure of other nations to react strongly despite the moderate level of dangerous debris created, further reinforced the notion that these destructive tests were becoming more acceptable. All of which led to the most recent Russian

test in November which not only begat another round of international recriminations but risked the lives of Russian cosmonauts on the International Space Station.

Given the varied reactions, a cynic might be forgiven for concluding that the differing responses had less to do with space sustainability and more to international geopolitics – and certainly that played a role. Equally at play was the calculable difference in the risk created. However, beneath it all lay the undeniable tenets of the Prisoner’s Dilemma: none of the four nations were prepared to restrain their right to test despite undeniable harm to their own interests, since they either could not know, or did not trust the others’ intents.

Rational Self-Interest?

These trends underscore the pressing need for action. As noted in an [open letter](#) to the United National General Assembly (UNGA) signed by hundreds of prominent [space](#) experts and stakeholders in September 2021, debris-producing KE-ASAT tests must be stopped because even good-faith efforts to minimize debris are empirically insufficient and precariously unsafe. The letter, penned less than two months before the November Russian test, noted that, despite their efforts to reduce risk:

“...debris from [the Indian] test did cross the orbit of the International Space Station and would have crossed the orbits of both the planned satellite mega-constellations and China’s new Tiangong space station, creating multiple operational hazards... [and that future large constellations would] make debris-generating ASAT tests significantly more perilous than before.”

Ironically, the nations with the largest level of space investments (China, Russia, and the United States), with potentially the most to gain in any future space economy and therefore most at risk of debris-caused

mishap, are in large part the ones conducting the tests, in clear contravention to their own interests. Left unchecked, destructive testing of KE-ASATs will lead to a space environment full of collision hazards and of therefore far lower commercial, civil, and national security value. The likelihood and impact of collisions will increase dramatically as constellations – each with hundreds, thousands, or even tens of thousands of satellites – continue to proliferate. With each collision, the next becomes more likely, to the clear detriment of all parties.

The competing interest – the self-interest component of the “dilemma” which motivates continued testing – is that space warfare is unavoidable and that KE-ASAT systems are a weapon of choice; or perhaps that successful testing is necessary to sufficiently intimidate or coerce potential adversaries. Even were those to be true, these rationales cannot explain the countries’ continued failure to negotiate cessation *after* having conducted such tests. The key driver is mistrust between the actors. This counterproductive stalemate provides the key rationale for U.S. action.

Unraveling the Dilemma

The United States – as both a global superpower and a nation with strong civil, commercial, and military stake in the future of the space environment – must take a leadership role in solving this problem. ***The United States should immediately declare a unilateral moratorium on debris-producing kinetic-energy anti-satellite (KE-ASAT) testing against orbital objects, and actively promote international agreement(s) prohibiting such tests.***

Now is the perfect time. On the 15th anniversary of the first modern-day ASAT test, there is growing momentum in favor of such a ban as indicated by the majority of [responses to U.N. resolution A/75/36](#) and the subsequent formation last month of an [Open-Ended Working Group](#) aimed at establishing space norms – a

group which the U.S. supported. The U.N. approved group will meet in 2022 and 2023 and report back to the UNGA in Fall 2023. What better way for the U.S. to shape the results of such a group than to lead the way with its own, unilateral ban?

On December 1st, at the inaugural meeting of the Biden administration’s National Space Council, Vice President Kamala Harris highlighted the risks posed by Russia’s debris-generating ASAT test, and Deputy Secretary of Defense Kathleen Hicks [declared](#) that the Department of Defense “would like to see all nations agree to refrain from antisatellite weapons testing that creates debris,” a position echoed by National Security Advisor Jake Sullivan and Deputy Secretary of State Wendy Sherman. Surely these are welcomed statements, but the fact remains that nothing prevents the U.S. from acting unilaterally to establish its own ban, irrespective of others’ agreement. A U.S. moratorium would not only align U.S. actions with its words, but also provide a model for the world to follow – one set by the single actor most active across decades of security-related space activities.

The careful formulation of such a moratorium is the key to its domestic bi-partisan acceptability and rapid international adoption. ***The moratorium should apply only to KE tests aimed at impacting orbital objects.***

This means that anti-ballistic missile tests would not be prohibited, as the targets are not orbital. Orbital testing of KE-ASATs would be allowed, but collision tests would be barred in favor of deliberate near-miss “fly-bys” of their targets. Testing of non-KE-ASAT systems would also be allowed. Alternative formulations describing levels of debris created or the lifetime of such debris are far less desirable, as they are open to interpretation and leave undue room for “creative” violators. Such wording also entails months or years of technical debate, compared with the straightforward language of the proposed moratorium.

While some would argue this still leaves room for many other ASAT activities – and they are correct – the goal here is to eliminate the most detrimental outcome of such testing, not to constrain any nation’s right to defend itself. The United States should strongly encourage other countries, including but not limited to those who have previously conducted such tests (i.e., India, China, and Russia), to adopt matching voluntary moratoria, while also seeking a subsequent binding multilateral agreement. China essentially instituted such a self-imposed ban after its 2007 test and, according to [U.S. intelligence reports](#), their ASAT program has not appeared to suffer from it.

Experience of unilateral action suggests it could be highly effective. In 1991, following decades of failed negotiations, Soviet leader [Mikhail Gorbachev](#) declared a unilateral nuclear test moratorium and called for the United States to reciprocate; a year later the U.S. Congress passed its own unilateral 9-month ban, later extended by President Clinton. These actions broke the longstanding stalemate at the U.N. leading to a fully ratified and signed treaty by 1996, for which the United States was the first nation to sign – though the Senate’s refusal to ratify it prevented entry into force. Since then, the U.S. and other signatories have avoided testing regardless of the treaty’s absolute legal standing.

Some believe that the United States should await international action before proceeding with our own ban. However, this ignores the history (and causes) of long-term negotiating failure, the fact that there is much to be gained by acting now, and the lack of upside to waiting. As General John Hyten noted in November, prior to his retirement as Vice Chairman of the Joint Chiefs of Staff (JCS), the glacial pace at which the U.S. has moved thus far will be insufficient to counter current threats to space security and safety. A declaration of our own limit will help to restore U.S. credibility and moral leadership, convey willingness to make concrete progress on space security issues, make clear that orbital KE tests are not necessary for a strong

counterspace program, provide a workable model for how to best formulate such a restriction, and lend forward momentum with allies, and in international fora, at a critical juncture.

The United States – and everyone else – must be clear-eyed about the fact that this unilateral ban and any follow-on agreement are narrowly-tailored solutions to only one single problem: the production of debris in orbit through KE testing of ASATs. This narrowness is a central feature, not a flaw. This ban would not limit ASAT development. It would not limit war-time use of debris-producing ASATs (although that would optimistically be an eventual result). It would not limit testing of non-KE-ASATs. And it would not even prevent testing of direct-ascent KE-ASATs, provided such tests do not produce any orbital debris (using deliberate “near-misses,” or by engagement with purely sub-orbital targets).

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Therefore, this ban may be better understood as an environment sustainability measure than as an “arms control” measure *per se* – but, for exactly that reason, is in the clear self-interest of all parties. Because it does not prevent development, testing, or use of KE-ASATs, there is nearly zero cost to adopters, even those who may favor new KE systems. Continued destructive testing is potentially catastrophic for the space environment and continued peaceful use of space, while being unnecessary – and arguably of no use at all – to the goal of achieving adequate space deterrence and defense.

Liberating the Prisoners

The remarkable impact of a self-imposed, unilateral ban is that it fundamentally unwinds the calculus that begat the current dilemma. By recognizing that interests in ASAT development are not harmed by this narrow ban, the United States can pursue its interests in space sustainability and security regardless of the actions of other nations, as well as increase the likelihood of other countries adopting such a ban. Other nations will be able to have clear knowledge of U.S. intent, thus removing the unknowing or untrusting component of the dilemma so that they too may act. A self-imposed ban also needs no verification protocol – an oft-cited pretext for refusing agreement – and, most importantly, the ability of many world actors to easily monitor debris creation eliminates the verification challenges attending many other proposals.

The stakes could not be higher – nor the opportunity clearer. Absent prohibition, we should expect the recent trend toward testing to continue and for international negotiations to once again bog down. Each new nation seeking to join ‘the club’ may feel the need to conduct such a test, and every new KE-ASAT development by an existing power might also be a candidate for orbital KE tests. The consequences would be catastrophic. Fortunately, there are good reasons to believe that this is preventable. The United States has a golden opportunity now to lead the world in addressing this issue and raze the prison cells we so foolishly erected. There is no time to waste. ➤

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