

Steps to strategic security and stability in space: a view from the United States

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Although the United States has been a spacefaring nation for over 50 years, the essential and growing role that space plays as a fundamental enabling feature of conventional and strategic military posture and the strength of advanced civilian economies around the world is too little understood. The rivers of information and other services that space assets provide allow economies to function more efficiently and provide ever increasing benefits to people around the world, as satellite navigation systems and international cellphones, to name but a few applications, attest. These space information services are also key to the verification of arms control agreements, and they permit military systems, and military decision-making, to be far more effective than in the past—vital advantages across the spectrum of national security concerns. It is no wonder that current US space policy for the first time calls US space assets “vital” to its national interests.

More serious than this lack of public understanding about space is the serious shortfall in understanding the larger implications of the importance of space. Threats to the world’s space assets, and hence to the world’s vital national interests, come in many forms—some hostile, some not. One of the biggest threats is what we just do not know: about objects in space, the intentions of those who put the objects there, and the strategic landscape of space itself—how it operates, where it poses strategic dangers, and what needs to be monitored and managed. We need to understand how China, the Russian Federation, the United States and others see space stability. How will this shape their space doctrine, acquisition, strategies and diplomacy? There is much we should know and understand, but do not, about this new space-enabled military era the world has recently entered.

The strategic problem

Given the vital and growing role that space plays in modern life, the world has an overriding interest in maintaining the safety, survival and function of space assets so that the profound civilian, commercial, and military benefits they enable can continue to be available.

These vital space assets face three forms of threat, all of them worrisome and growing. First, the proliferation of space and other technologies, and specifically the anti-satellite (ASAT) capabilities demonstrated within the past three years, call attention to the risk that an advanced country could exploit this fast-growing world dependence on space in a war.¹ Second, space “traffic” is heavier than it has ever been and getting heavier still, in terms of both vehicles and communications, but there is no space traffic control authority. The current level of simply monitoring space objects is widely regarded

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as far below what is needed: there is a substantial and growing need for space traffic management capabilities, including enforceable rules of the road and codes of conduct, and space situational awareness to inform a space traffic management capability. Third, space debris poses an insidious and growing threat to all space assets. Debris in space does not quickly fall to the ground: at all but the lowest orbits, debris can stay aloft for centuries and more. In addition to the 19,000 orbiting objects the United States Air Force is tracking, there are hundreds of thousands of potentially lethal objects in orbit, and millions of smaller objects that pose at least some risk.² If current space debris trends continue, there will be almost 1000% more debris than today within 25 years.³ This would greatly increase the risk of satellite collisions and force satellite operators into making frequent, costly and satellite-lifetime shortening manoeuvres. The collision earlier this year between a US Iridium satellite and an older Russian Cosmos dramatically illustrates the problem.⁴

The core of the space security problem is that the substantial economic and national security benefits that space assets provide is accompanied by their substantial vulnerability to both natural and man-made threats. In addition to the increasingly worrisome threats of orbital debris, as well as physical and electromagnetic traffic in space, military writings in several countries make clear that developing offensive capabilities against space assets has significant appeal to some military planners.⁵

Global space policy needs to address key space stability issues

In 2006, the Bush Administration issued a revised space policy that declared for the first time that US space assets are “vital to its national interests”, in recognition of the extraordinary and growing US military and economic dependence on them.⁶ This phrase carries much heavier national security implications than have ever before been attributed to space.

The 2006 US policy also reserves the right to deny adversaries “the use of space capabilities hostile to US national interests.” But attacking others’ space capabilities invites attacks on one’s own space capabilities. Since evolving technology guarantees that more nations will depend even more on space assets in the future and that these vital assets are also likely to face greater threats, current US space policy faces an inherent contradiction and instability. Failure to address this contradiction will allow instabilities to grow over time, as technology and growing space dependence will make space assets ever more desirable military targets.

There is an inherent risk of strategic instability when relatively modest defence efforts can create disproportionate danger to a potential adversary, as with space offence. The technical challenge and cost for nations that already have advanced space capabilities to develop credible anti-satellite and other offensive counter-space capabilities are not unreasonable for the potential military benefits such capabilities would provide. And if a country perceived that space conflict was inevitable, a disabling first strike against an adversary’s space assets would be far preferable to, and easier to execute than, retaliating against the space assets of the side that struck first. This is the essence of crisis instability, when pre-empting pays far greater benefits than retaliating. We don’t know what would happen in a crisis, but the potential for space instability seems high and likely to grow. Sadly, this growing instability problem is largely overlooked in discussions of space security policy. This must change, and wise space policy, and diplomatic initiatives, must take these new strategic space realities into account.

A new perspective on space is needed to understand and more fully appreciate the strategic landscape that space presents. With this strategic understanding, it should be possible to craft approaches that would make space a safer and more stable environment, with the ever-increasing bounty of its benefits available to all states that abide by a common compact of responsible space behaviour. Fortunately, the Obama Administration is conducting a review of US space policy, which provides the United States with an opportunity to address space stability issues more fully.

The mirage of space dominance

It would be unwise for any country to seek space dominance, for quite practical and strategic reasons. There are many ways to attack space assets, and it is easier and cheaper to attack than to defend them, which would likely frustrate any sustained attempt at dominance and leave every country worse off. In trying to maintain dominance, any country would be at the mercy of unpredictably advancing space technologies that could favour another country. In the face of likely resistance to such a provocative and hegemonic posture, any country seeking to dominate in space would constantly be trying to stay ahead technologically to maintain this dominance, demanding large expenditures that would be a growing burden on other national security and economic needs. Such a situation would also be very unstable, especially if another country achieved a technological breakthrough that threatened to upset the previously dominant country's hegemony. A crisis occurring in this context could provide a compelling incentive to the about-to-be-dethroned country to pre-empt before its space dominance slipped away.

In the years ahead, the United States will remain a pre-eminent space power, though other countries, most especially China, will very possibly diminish the margin. US space policy of the recent past has exhibited an incomplete appreciation of this new strategic environment and has been incautious in some policy dimensions. This is because of the absence of both a clearly thought-out space doctrine and a coherent national space security strategy. Other countries, though in different ways, have also exhibited an incomplete appreciation of the new strategic landscape of space.

To avoid the dangers inherent to seeking dominance, the United States could aim instead for a posture of space excellence: the most capable in space, a space leader. The United States could seek a non-hegemonic "best-in-class" posture: a state with more advanced space capabilities than other countries, deriving substantially more benefits from space than others, but which would not dominate in space. This space excellence would provide leverage in commercial, civilian and military applications, but would not make space a new battleground.

A national stabilizing space protection strategy

The Congressional Commission on the Strategic Posture of the United States, led by two former US Secretaries of Defense, recognized the importance of space stability when it recommended in its final report that the United States should "develop and pursue options for advancing U.S. interests in stability in outer space ... includ[ing] the possibility of negotiated measures."⁷

This recommendation is relevant to other countries as well. It would allow everyone to continue to reap the civilian, commercial and military advantages of space and safeguard the continuing commercial development and utilization of space. It would give space and non-space powers alike a vested interest in avoiding space conflict.

A stabilizing space protection strategy for a country would:

- focus on stability, avoidance of conflict in space, and transparency;
- incentivize nations to avoid destabilizing, irreversible actions in space;
- provide back-ups to assure availability of key space services in the event of satellite outages from whatever causes, benign or hostile;
- discourage all nations from initiating space attacks;
- encourage agreements that constrain the most destabilizing dimensions of space competition and provide ground rules for normal space operations; and

- expand dialogue among nations to promote better understanding and reduce chances for misunderstanding and miscalculation, always dangerous in a crisis.

Creating a stable space domain requires countries to respond to space threats in a responsible manner, one that ideally does not provoke other nations to greater counter-space efforts than they would otherwise pursue. All nations should be careful to avoid creating a self-fulfilling prophecy and should refrain from activities and public communications that invite the build-up of the counter-space capabilities of others.

Diplomacy and arms control

Diplomacy and arms control have major roles to play in providing for a safe and stable space environment. Such initiatives on space need to take into account the strategic realities of space in order to enhance space stability in ways that allow all countries to benefit.

While diplomacy and arms control cannot by themselves solve space security problems, they can help mitigate the risks. Space diplomacy and arms control should play a stronger role in the future, a view that the Congressional Commission on the Strategic Posture of the United States stated earlier this year. While noting that the specific promise of space arms control was not clear—it is, after all, in its infancy in many ways—the Commission recommended that:

The United States should seriously study these issues and prepare to lead an international debate about how to craft a control regime in space that serves its national security interests and the broader interests of the international community.⁸

Diplomatic activity on space should seek to strengthen stability in space, encourage the prevention of space conflict, and be verifiable. Diplomacy should promote behaviour that maximizes the world's ability to utilize space and minimize operational and other problems associated with space operations.

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US space policy in the recent past has explicitly rejected space arms control, eroding US international leadership in this area and allowing some to credibly mischaracterize the US stance as provocative and hostile. The Bush Administration was interested in voluntary steps such as a code of conduct and rules of the road, especially regarding space debris, which was commendable but should have been given more emphasis. The Obama Administration has expressed greater willingness to consider arms control as an important tool in addressing space security issues: inter-agency review of space diplomacy and arms control is apparently taking place within the ongoing space policy review. In a welcome and encouraging signal of a shift in US policy, at the First Committee of the Sixty-fourth Session of the UN General Assembly in 2009, the US representative noted that:

In consultation with allies, the Obama Administration is currently in the process of assessing US space policy, programs, and options for international cooperation in space as a part of a comprehensive review of space policy. This review of space cooperation options includes a “blank slate” analysis of the feasibility and desirability of options for effectively verifiable arms control measures that enhance the national security interests of the United States and its allies.⁹

There are several classes of agreement that can be considered for space, one of which includes codes of conduct and rules of the road. These kinds of agreement have been proposed in various forms for several years and are designed to ensure that those who operate in space do so responsibly, with due regard for the rights of others in space, and with an appreciation that space should be available for

the benefit of future generations as well as the present one. Michael Krepon of the Stimson Center has done valuable work in this area, and the European Union has issued a commendable draft Code of Conduct for Outer Space Activities.¹⁰ One value of this kind of approach is that the agreements need not be in treaty form, which takes longer to negotiate. There have been relevant ongoing discussions and meetings on the subject of space debris, a growing problem that cannot be entirely resolved by the voluntary guidelines recently approved by COPUOS.¹¹ Other issues that could be covered by this category of agreement include space situational awareness, space traffic management, and further debris mitigation measures.

A ban on KE-ASAT weapons

One option deserving special attention, which could be in treaty form or not, is a ban on any testing in space that creates significant debris, explicitly including kinetic energy ASAT (KE-ASAT) weapons. KE-ASAT weapons are designed to destroy a satellite by high-speed impact, either through direct ascent from Earth to the satellite (as China and the United States have demonstrated) or by hitting it with shrapnel from a nearby planned explosion (as with the older Soviet ASAT system).

The continued testing of KE-ASAT weapons could seriously interfere with space operations and space traffic management. Space debris is growing by about 10% per year, even without space conflict. Already satellites must occasionally be moved because of debris near-misses: one satellite operator has said that one of its fleet of satellites must be moved every three months because of debris. At this rate, in 25 years there will be ten times as much debris in orbit as we have today. Cascading effects, where debris collides with other debris in space to create still more, known as the Kessler Syndrome, is also a matter of growing concern.

Even a modest space war, involving the destruction of 30 satellites, could increase the level of space debris by almost a factor of four, if each destroyed satellite produced the same level of debris as the Chinese satellite event of 2007.¹² A larger conflict, involving the destruction of 100 satellites, would quickly increase space debris by over 1250%, and that does not include Kessler Syndrome effects, which would increase the debris level still further. We could make the most useful orbits in space useless to future generations. The inability to use space-based assets could threaten international security in other ways, as states would be unable to use their satellites to verify arms control agreements (for example the Russian Federation and the United States' verification of Strategic Arms Reduction agreements).

A logical extension of concerns over space debris, the option proposed here would seek to discourage the development of KE-ASAT weapons by banning testing against orbiting objects. (With carefully crafted language, missile defence testing could be allowed to continue.) By banning such ASAT tests, states could never have the level of confidence in such weapons that they would probably need in order to rely upon them in a major conflict. The ban could potentially be expanded to cover all major debris-producing events in space.

Some point out possible problems with this approach. A ban on debris-creating KE-ASAT weapon tests would not prevent planned near-miss testing, which could still allow improved confidence in such ASAT weapons. The ban could bring to a halt promising new areas of space operations technology—for example, replenishment and repair missions to satellites, and orbital docking. These challenges, however, could be overcome. Keep-out zones could be defined that would ban approaches within a certain distance of a satellite, perhaps with a closing velocity restriction to permit peaceful purpose approaches. These and other negotiating obstacles could be overcome in good faith discussions.

A ban on testing KE-ASAT weapons would bring many benefits. One of the most important is to put states on record as recognizing the major threat that orbital debris poses to all spacefaring nations

and agreeing that, whatever one thinks of offensive space weapons, kinetic energy-based weapons are unacceptable. Without an explicit ban on such weapons, there is no official sanction against the deliberate creation of debris for military purposes. This would be a serious mistake.

Such a ban would be verifiable by national technical means. While a ban on the weapons themselves would be difficult to verify without exceptionally intrusive inspections, destructive KE-ASAT weapon tests, even those involving near misses, can be observed. It is difficult to hide satellite intercepts in space.

A KE-ASAT agreement would be no panacea: it would address only a modest sliver of the much larger space security issue, and would not even guarantee that KE-ASAT weapon capabilities would be completely stopped. The United States' shoot-down of an errant satellite in 2008 with a sea-based missile defence interceptor demonstrated the truism that ballistic missile defences have inherent anti-satellite capabilities. But such an agreement would make much more difficult a country's attempt to develop a force of such weapons in which it could have high confidence during conflict, which would be a significant step toward space stability. A country would be running very serious risks with an untested system if it sought to use a large number of missile defence interceptors in a role for which they were neither developed nor tested. (The alternative to a ban on testing and use of KE-ASAT weapons would be to allow such testing, which would pose a serious threat to space security.)

ACCEPTABILITY

The United States has no plans to develop a KE-ASAT weapon, meaning such a testing ban would have minimal programmatic impact. Conversations the author has had with Russian and Chinese specialists indicate that while they prefer the proposal their governments have presented, they see merit in a partial approach that might be feasible if their broad-ranging proposal is not possible.¹³

It should be noted that a special task force sponsored by US think-tank the Council on Foreign Relations specifically endorsed a KE-ASAT weapon ban:

The Task Force believes that the United States has a clear interest in beginning discussions with China on space weapons, including proposals to ban tests of kinetic antisatellite weapons. The United States and China, along with Russia, should take the lead in implementing a trilateral test ban, which could form the basis for expansion to a global ban.¹⁴

Indeed, this approach has been proposed before by the author and others.¹⁵

Some countries have called for a ban on space weapons without providing credible or convincing ways to verify such a ban. Such far-reaching proposals are troubling because they seem to demonstrate a disregard for the profound risks these proposals, if enacted, would pose, based in part on their major verification challenges. When the stakes involved are low, where violation of an agreement by one party would pose no serious threat to another party to the agreement, such a verification problem may not be a major obstacle. If Country A violated a fishing agreement, it would be a matter of concern, but it would not pose a major threat to the security of Country B. Yet space is so interwoven into the economic and military fabric of some spacefaring states that sudden major damage to its space infrastructure could result in economic and military devastation. A ban on space weapons understandably must demand a much higher and more reliable standard of verification before such an agreement could be seriously considered. Failure to provide such credible approaches to verification demonstrates a misunderstanding of the new strategic landscape of space. It also suggests a diminished level of seriousness of the proposal that is not commensurate with the security stakes involved. Some suggest that the opposition of the Bush Administration to all space arms control is behind the US objections to this approach, yet the verification problems of such a ban were

raised many years before, for example, by the Congressional Office of Technology's 1985 assessment *Anti-satellite Weapons, Countermeasures, and Arms Control*.¹⁶

A graduated approach

There is a larger point at work here as well. Space arms control is an important new subject area on the international agenda, and with which the world has little experience—the Outer Space Treaty is now 42 years old, and there have been no such new agreements since that time. Accordingly, smaller steps that have less risk associated with them and can build confidence should be preferable to grand far-reaching ones about which serious concerns exist. Precisely because a ban on all space weapons, or ability to interfere with weapons in space, is a broad approach, characterized by important verification shortcomings, and has profound implications for the security interests of potential signatories, it represents a limiting and perhaps indigestible approach to some countries. In getting from the first floor to the second floor of a building, one climbs a staircase with multiple steps. Trying to do so in one big step is a formula for making no progress at all. Accordingly, a more modest step in space arms control could help pave the way to greater progress, and give all participants the opportunity to accustom themselves to options for progress in this area.

A more modest step in space arms control could help pave the way to greater progress.

Achieving greater security in space will take time, given the stakes involved, and should be achieved incrementally. Neither strategic arms reductions, nor controls on nuclear testing, achieved progress all at once, but rather have made progress through a graduated series of steps. Given the security stakes involved, progress on space diplomacy is unlikely to be achieved any differently. This does not mean that important progress cannot be made, just that it should not be sought all at once.

Clearly, more thoughtful review of space arms control options is needed, but there is ample room to move forward, with broad civilian and commercial backing, in the areas of space traffic management and space debris. Such steps would be an affirmative US response to China's and Russia's space arms control proposals at the United Nations and would position the United States to play a major leadership role in shaping a more responsible space regime.

In addition to diplomatic steps, countries can help reduce the vulnerability of their space assets by reducing incentives to attack them. For example, having more distributed capabilities spread across larger numbers of smaller satellites, and maintaining non-space back-up capabilities, although this could aggravate the problem of space traffic. Enhanced space situational awareness and incident attribution techniques could also help.

Beyond negotiations toward specific agreements, the dialogue that has begun on space issues should be expanded. Again, the Congressional Commission on the Strategic Posture of the United States offers advice, recommending "a strategic dialogue with Russia broader than nuclear treaties, to include ... space systems" and that "there are other serious civilian issues such as space situational awareness, space debris, and space traffic management that could be used to develop international discussion and working relationships".¹⁷

A "no first use" policy should also be considered, as it could be a useful adjunct to other space agreements. Countries that derive major benefits from space should generally be loath to initiate space conflict, as they would only put at great risk their own space assets, at least when their adversaries are themselves major space powers. While such declarations could always be reversed, they could provide a stabilizing context in which mutually beneficial agreements could be sought.

It appears that there will be an opportunity to make important progress on making space more stable and secure in the coming year, given that "the United States looks forward to discussing insights

gained from this Presidential [space] review next year at the Conference on Disarmament during substantive discussions on the Prevention of an Arms Race in Outer Space agenda item as a part of a consensus program of work.”¹⁸ It seems likely that steps can be taken that would improve security in space, if countries are willing to set aside overly ambitious grand proposals and begin building a step-by-step staircase of practical agreements to greater security and stability in space.

Conclusions and recommendations

Countries need to take important policy, programmatic and diplomatic steps to protect and strengthen their own and global security interests in space. Steps they should seriously consider taking include:

- developing a space security strategy that emphasizes space stability;
- opening up national space policies to allow and encourage negotiated agreements on the basis of national interest and verifiability;
- enhancing their space situational awareness capabilities;
- diversifying how space information services are provided to reduce vulnerability;
- building upon current military-to-military dialogues to see what can be accomplished in the space arena, and according high foreign policy priority to this;
- giving arms control an appropriate role in addressing space security;
- strengthening space dialogue on codes of conduct and “rules of the road” on a multilateral basis; and
- seeking a KE-ASAT weapon testing moratorium or ban.

Notes

1. In 2007 China tested a direct ascent kinetic energy anti-satellite weapon on one of its weather satellites, and in February 2008 the United States shot down one of its own satellites using a modified Aegis missile defence system (“China Claims Peaceful Missile Test”, *Reuters*, 23 January 2007; “US Missile Hits ‘Toxic Satellite’”, *BBC News*, 21 February 2008).
2. “How much orbital debris is currently in Earth orbit?”, *Orbital Debris Frequently Asked Questions*, NASA Orbital Debris Program Office web site, last updated 7 July 2009.
3. For figures on current trends in space debris, see Paul Marks, “Space Debris Threat to Future Launches”, *New Scientist*, 27 October 2009.
4. For further details of this collision, see Celestrak’s account, “Iridium 33/Cosmos 2251 Collision”, 5 March 2009, updated 15 July 2009, at <celestrak.com/events/collision.asp>.
5. See, for example, United States Department of Defense, 2009, *Annual Report to Congress: Military Power of the People’s Republic of China 2009*, “Space Warfare”, pp. 13–14; “China Declares Space War Inevitable”, *DoD Buzz*, 4 November 2009, which reports on an interview with People’s Liberation Army Air Force Commander Xu Qiliang conducted by the *People’s Liberation Army Daily*; Brigadier General Kevin T. Campbell, Director of Plans, United States Space Command, “Warfighter Perspective on Space Capabilities”, briefing presented to the Council on Foreign Relations, 23 May 2002; and US Joint Chiefs of Staff, *Space Operations*, Joint Publication 3-14, 9 August 2002.
6. Excerpts from the US National Space Policy of 2006, released by the White House 6 October 2006, are available at <www.globalsecurity.org/space/library/policy/national/us-space-policy_060831.pdf>.
7. Congressional Commission on the Strategic Posture of the United States, 2009, *America’s Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States*, Washington, DC, United States Institute of Peace, p. 71. The author is Senior Director of the Commission.
8. *Ibid.*, p. 69.
9. Garold N. Larson, Alternate Representative to the First Committee, Statement to the First Committee of the Sixty-fourth Session of the United Nations General Assembly, 19 October 2009, at <usun.state.gov/briefing/statements/2009/130701.htm>.
10. For more on the Stimson Center’s model code of conduct, go to <www.stimson.org/space/programhome.cfm>; for more on the European Code of Conduct on Outer Space Activities, see the article by Wolfgang Rathgeber, Nina-Louisa Remuss and Kai-Uwe Schrogl in this issue of *Disarmament Forum*.

11. Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, in UN document A/62/20, New York, 2007.
12. Celestrak's account of China's ASAT test states that 2,377 items of debris have been catalogued from the event, see <celestrak.com/events/asat.asp>, updated 10 June 2009.
13. In February 2008, China and the Russian Federation introduced a draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects to the Conference on Disarmament (see document CD/1839, 29 February 2008).
14. William J. Perry and Brent Scowcroft (chairs), *U.S. Nuclear Weapons Policy*, Independent Task Force Report no. 62, New York, Council on Foreign Relations, p. 45.
15. Bruce W. MacDonald, 2008, *China, Space Weapons, and U.S. Security*, Council Special Report no. 38, New York, Council on Foreign Relations, September, p. 30; T. Bolz, 2009, *In the Eyes of the Experts: Selected Contributions by the Experts of the Congressional Committee on the Strategic Posture of the United States*, United States Institute of Peace, October, p. 326; William J. Perry and Brent Scowcroft, op. cit.; Michael Krepon, 2008, *Space: A Code of Conduct*, Washington, DC, Henry L. Stimson Center.
16. The report states that a ban on space weapons "would have the disadvantage of being the most difficult [approach] to verify" (US Congress, Office of Technology Assessment, 1985, *Anti-satellite Weapons, Countermeasures, and Arms Control*, Washington, DC, US Government Printing Office, p. 132).
17. Congressional Commission on the Strategic Posture of the United States, op. cit., pp. xii and 69.
18. Garold N. Larson, op. cit.

