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Arms Control in the Third Space Age: Assessing International Efforts to Regulate Military Operations in Outer Space in the "3 C's" Era

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Preserving and protecting the free and open use of outer space benefits all space-faring nations and is vital to U.S. national interests. U.S. military and civil space operations, however, face a number of growing challenges. Several countries possess or are developing means to disrupt or destroy space systems; space debris threatens the safe passage of spacecraft; and outer space is an environment where the United States now competes with a rapidly growing number of other space-faring nations. To remain the world's preeminent military space power, the United States must consider a variety of means and strategies to address these challenges.

A number of foreign states and nongovernmental organizations have proposed addressing threats to the safe and secure use of outer space by drafting new international treaties, agreements, and codes of conduct. In public statements and international forums, major space powers such as Russia and China, and major multilateral organizations such as the European Union (EU), describe space as an increasingly dangerous, lawless frontier. These actors suggest that expanding rules and regulations for state use of outer space, to include negotiating and implementing new space arms control agreements, could prevent future accidents and armed conflicts in this domain.

Current U.S. space policy strongly supports developing multilateral mechanisms to address issues that represent common challenges to all space-faring nations, to include the potential negotiation of space arms control and confidence-building measures. U.S. policy also clearly states, however, that it will only consider space arms control treaties and agreements that are "equitable, effectively verifiable, and enhance the national security of the United States and its allies."[2] Obama administration officials have repeatedly stated that Washington will not accept any negotiations that fail to protect outer space as a free and open environment, or that will have a negative impact on current military space operations.

The present threat environment, U.S. policy imperatives, and the critical importance of the U.S. Armed Forces' space assets, operations, and missions to U.S. national security are all factors highlighting the importance of providing a national security perspective on foreign and international proposals regarding outer space law and space arms control. This article suggests a possible framework for analyzing the potential impact of space arms control proposals on the U.S. armed forces. It also provides an international "state of play" for space arms control, briefly discussing the civilian and military space programs and policies of Russia, China, and the EU, and their proposals for addressing present challenges to the free and open state use of space. It concludes with an assessment of these proposals, which may reflect broader future trends in terms of multilateral efforts aimed at regulating the military use of space or promoting new space arms control agreements.

ARMS CONTROL AND THE THIRD SPACE AGE

During the first space age, the state use of outer space was dominated by the competition between the two Cold War superpowers, perhaps best

[1] This article is based on "Air Force Space Equities and Future International Space Agreements," an Air Force Strategic Plans and Policy Divisions (AF/A5XP) "Emerging Issues" report completed by an SAIC contract support team comprised of Walt Conrad, Justin Anderson, Sarah Jacobs, Troy Wilds, and James Mazol. The views expressed in this article are solely those of the authors, and do not represent the views of SAIC, AF/A5XP, the Air Force, or any SAIC client.

[2] White House, *National Space Policy of the United States of America*, June 28, 2010, p. 7.

characterized by the race to the moon. Despite this fierce rivalry, however, Washington and Moscow were able to reach a remarkable degree of consensus on a number of founding principles forming the basis of an international legal framework for state use of outer space.[3] The United States and Soviet Union, joined by other states concerned outer space might become a key battleground during the Cold War, worked through the United Nations to draft an accord that became known as the Outer Space Treaty (OST).

The OST entered into force in 1967 as the first major multilateral treaty on outer space. More than four decades later, it continues to represent the primary foundation of international space law. As of January 2011, 101 countries have ratified the OST, to include all major space-faring nations.[4] The treaty articulated a number of fundamental principles regarding the state use of space, to include the inherent right of all states to freely access, use, and explore outer space.[5] State Parties to the treaty also agreed that space, and all celestial bodies, cannot be claimed as the territory, property, or exclusive zone of any State.[6]

In addition to articulating key concepts establishing space as a global commons, the OST is the only international treaty containing provisions expressly addressing the military use of space. Significantly, instead of making broad statements attempting to regulate or restrict all military activities in space, the military provisions of the OST take the form of specific, limited prohibitions of certain weapons and operations:

- No Weapons of Mass Destruction (WMD) in Orbit or on Celestial Bodies: The OST prohibits the placement of nuclear weapons or other WMD in orbit, on the moon, or on other celestial bodies.[7] The treaty does not, however, expressly define the terms "weapon" or "WMD."
- Prohibitions of Certain Military Activities on Celestial Bodies: The treaty also prohibits the establishment of military bases, installations, or fortifications on any celestial body. State Parties to the treaty also agree to forego conducting military maneuvers, or testing any kind of weapon, on celestial bodies.[8] The OST does not, however, prohibit any of the above military activities within outer space.

The OST does not prohibit the general military use of space. It does not limit or ban, for example, the placement of non-WMD military systems into orbit, nor does it prohibit members of the military from joining civilian crews for space missions.

The OST provided an international legal framework for outer space and marked an important rapprochement between the two Cold War superpowers, with the treaty's Preamble declaring "the exploration and use of outer space should be carried on for the benefit of all peoples."[9] The OST also prevented either superpower – or any other space-faring nation – from seeking to control or claim areas of space or celestial bodies through use or occupation. Outer space was an arena for state competition during the Cold War, but as a result of the negotiation of the OST it was not an arena without boundaries or rules.

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[3] The treaty also discusses non-governmental activities in outer space within Articles VI, but the text specifies that any actions by a non-governmental entity in space are the responsibility of state governments. State parties are granted authority and oversight over all non-governmental activities in space: "State Parties to the Treaty shall bear international responsibility for national activities in outer space … whether such activities are carried on by governmental agencies or by non-governmental entities … [t]he activities of non-governmental entities in outer space, to include the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty."

[4] Status of International Agreements relating to Activities in Outer Space. *United Nations Office for Outer Space Affairs*. http://www.oosa.unvienna.org/oosa/SpaceLaw/treatystatus/index.html, accessed 25 Sep 2012.

[5] Outer Space Treaty [OST], Art I.

[6] OST, Art II.

[7] OST, Art. IV. The treaty does not preclude the transit of these types of weapons – or any weapons – through outer space.

[8] Ibid.

[9] OST, Preamble.

The collapse of the Soviet Union ushered in the second space age. The United States and the Soviet Union's successor, the Russian Federation, remained the world's two most significant space powers, but a number of areas formerly marked by hostile competition were replaced by mutual cooperation. Other technologically-advanced states, whose space initiatives often operated in the shadow of the massive American and Russian space programs during the Cold War, became increasingly important independent players in outer space. With space increasingly recognized as a critical domain for civil, commercial, and military operations, several states began devoting serious resources to the development of military space programs. Even as advanced militaries began using space for communications, surveillance, and other tasks, the prospects of any kind of conflict involving attacks upon (or from) assets, operations, or platforms in outer space appeared increasingly remote. Although there was little progress on building upon the foundation laid by the OST, and no successful multilateral initiatives were completed on space arms control, there were no major areas of disagreement between major space-faring states in regard to the state use of space.

China's successful test in January 2007 of an anti-satellite weapon, resulting in the destruction of a defunct Chinese satellite by a ground-based missile, marked the end of an era characterized by a lack of friction between space-faring nations and a general acceptance of norms governing the common use of space. The destruction of the satellite, and the creation of a hazardous debris field, confirmed the relative safety and security of the second space age was a thing of the past.[10] The third space age features a number of serious threats to the sustainable use of space. The 2011 U.S. National Security Space Strategy describes three major challenges to the free and open state use of space, stating space is increasingly **contested**, **competitive**, and **congested** (sometimes referred to as the 3 C's).[11] Described in further detail below, the 3 C's together encompass a range of pressing threats to the U.S. ability to maintain space primacy, and, more broadly, to the ability of all states to safely operate within the outer space domain. U.S. support for future space arms control agreements will depend heavily on how these accords propose to tackle the 3 C's.

In the third space age, outer space increasingly represents a contested domain where the free operation of national assets cannot be assumed. Potential adversaries in future conflicts may attempt to challenge or even overturn U.S. space superiority by attacking U.S. civilian or military space systems. Multiple states (including Iran and North Korea) have already carried disputes or conflicts into the space arena, covertly employing means to blind the satellites of opposing states and disrupt the information they transmit.[12] Russia, China, and India openly profess an interest in developing anti-satellite (ASAT) weapon systems, arguing they must field these weapons because future conflicts are likely to include military attacks physically destroying state assets in outer space.

The third space age is also characterized by the proliferation of outer space actors beyond technically-advanced states. For example, more than fifty nations now have a presence in space.[13] Several states can now design and build, with little or no assistance from the traditional major space powers, satellites or space launch vehicles. International interest in space has spurred the

[10] China is the third state to test an anti-satellite system in outer space. The United States and Soviet Union conducted anti-satellite tests in space during the Cold War. U.S. Congress Office of Technology Assessment, "Anti-Satellite Weapons, Countermeasures, and Arms Control," report, October 1985, pp. 5-7; Hunter, Maj. Roger C. "A US ASAT Policy for a Multipolar World," Air University thesis, 1992, pp. 21-22 and Grier, Peter "The Flying Tomato Can," *AirForce-Magazine.com*, February 2009, http://www.airforce-magazine.com/MagazineArchive/Pages/2009/February%202009/0209tomato.aspx

[11] Director of National Intelligence, *National Security Space Strategy*, 2011, p. 1.

[12] Ferster, Warren and Colin Clark, "NRO Confirm Chinese Laser Test Illuminated U.S. Spacecraft," *Space News*, October 3, 2006; Butler, Robert, "Statement … Before the House Armed Services Committee Strategic Forces Subcommittee," April 21, 2010, p. 3, and; "N. Korea Stops Sending Out Jamming Signals to S. Korea: Source," *Korea Herald*, May 15, 2012.

[13] "First time in History". *The Satellite Encyclopedia*.

growth of an international space industry, to include the marketing of launch capabilities. Globally, there are now twenty-two launch sites operated by eleven different countries.[14] The recent successful launch, voyage to the International Space Station (ISS), and return to Earth of the SpaceX Dragon spacecraft also underlines the fact that corporations are increasingly important and independent actors in outer space, developing and fielding capabilities that were once the exclusive preserve of states. Whether measured in terms of state activities in outer space, the market for space assets and operations, or interest in exploiting the resources of outer space, space is a far more competitive environment in the 21st century.

The third space age has also observed the "shrinking" of outer space, once considered so vast that no number of space missions or space actors could possibly impede the ability of future generations to use and explore space. While the cosmos remain infinitely large, there is a growing realization that those parts of outer space most critical to state use are increasingly – and dangerously – congested. At present there are over 1,100 active systems in orbit and an additional 21,000 pieces of debris littering the skies. The 2007 Chinese ASAT test, for example, generated an estimated 3,500 pieces of space debris.[15] The area of space near Earth is now so cluttered with debris that accidental collisions, such as the 2009 collision between the defunct Russian satellite *Cosmos 2251* and the U.S. commercial communications satellite *Iridium 33*, are increasingly likely.[16] This condition could put certain orbital planes in jeopardy of becoming unusable for decades. Congestion will only increase in the future as more consortia, states, non-state actors, and commercial providers launch and operate space objects, particularly in low Earth orbit.[17]

To date, the third space age has yet to see the major space powers reaching any significant consensus on how to address the common – but also complex – threats represented by the 3 C's. As a result, whether this era will represent one of cooperation or competition remains to be seen.

ASSESSING SPACE ARMS CONTROL PROPOSALS: A DRAFT FRAMEWORK

Tackling the 3 C's will likely require a range of creative solutions carried out by individual states and coalitions of space-faring states. A number of state governments and non-governmental organizations argue that military competition in space, and the threat of a possible armed conflict either spilling into space or being fought in the domain itself, represent pressing issues either causing or contributing to space as a contested, competitive, and congested environment. Countries such as China and Russia believe the time is ripe for negotiating new space arms control agreements, asserting the limited prohibitions on weapons and military operations found in the OST are out-of-date and cannot address present military developments in outer space.

As noted above, the U.S. government is prepared to consider space arms control proposals, but its support for any accord is conditional on the agreement: 1) meeting standards articulated by the 2010 National Space Policy (NSP) – the proposal must be "equitable, effectively verifiable, and enhance the national security of the United States and its allies;" and 2) addressing the challenges (the 3 C's) identified by the 2011 National Security Space Strategy (NSSS). Using these concepts as initial building blocks, the authors developed an assessment framework of six questions for space arms control proposals presented in Figure 1 on page 20. The authors

[14] Space Launch Sites Around the World. *Space Today Online.* http://www.spacetoday.org/Rockets/Spaceports/LaunchSites.html

[15] Wright, David, "Debris in Brief," *Physics Today*, October 2007, pp. 35-40.

[16] "Satellite Collision Leaves Significant Debris Clouds," *Orbital Debris Quarterly News*, April 2009, pp. 1, 2.

[17] If current trends in the use of space continue, and no solution is reached for removing space debris, the Air Force assesses it may track upward of 60,000 individual space objects by 2030. Shelton, General William L., Address, 27th annual National Space Symposium, April 11, 2011.

view this draft framework as a possible point of departure for developing more detailed analyses of the potential impact of proposed space arms control agreements on specific branches of the Armed Services.

KEY SPACE-FARING STATE PERSPECTIVES ON THE MILITARY USE OF SPACE AND SPACE ARMS CONTROL

Outside of the United States the most significant space-faring actors – in terms of systems, operations, and space research and development – are Russia, China, and the European Union (EU).[18] They also represent key players in recent efforts to amend international space law, to include discussions regarding bans on space weapons and establishing new norms for the military use of space. Russia and China's joint proposal of a draft treaty to ban the "weaponization" of space, and the European Union's proposal of a draft "Code of Conduct" for space-faring nations, represent two fundamentally different approaches to addressing several of the challenges embedded within the 3 C's. These differing approaches are strongly shaped by each actor's space policies, programs, and views on the potential development of space weapons.

Russia

For many years Russia and the United States represented the two space superpowers. Russia continues to play a central, albeit reduced, role in the outer space domain. With the suspension of the U.S. space shuttle program, Russia is currently the only state capable of transporting human passengers to the ISS. The Russian space program, however, currently faces a number of major structural challenges. Six Russian space launches have failed over the last two years, destroying a number of costly satellites and other space hardware.[19] Internal investigations and outside analysts have found the country's space programs hobbled by graft and corruption.[20] Russia's military space programs also appear to be in trouble, with Russian experts arguing the country's space defenses are obsolete. At a May 2010 air and space event in Moscow, former Russian Air Force commander Anatoly Kornukov stated Russia's military space programs were "25-30 years" behind the United States, an opinion echoed by a number of prominent Russian non-government military analysts.[21]

In an effort to shore up Russia's civil and military space programs, Russian President Vladimir Putin recently pledged approximately 150 billion rubles ($4.6B USD) for the Russian 2012 space budget.[22] Moscow has also announced plans to launch one hundred military satellites over the next ten years to boost the Russian military's global positioning, mapping, and missile detection capabilities.[23]

Russia is reportedly working to develop anti-satellite capabilities to match similar efforts by other nations. Asked to comment on recent foreign ASAT tests, then-Deputy Defense Minister Vladamir Popovkin (now head of Roscosmos) told reporters in May 2009 "we can't sit back and quietly watch others doing that; such work is [also] being conducted in Russia." Popovkin did not, however, offer specific details about Russian research or testing of an ASAT weapon, or key components of such a weapon.[24] Russia developed a co-orbital ASAT during the Cold War and conducted several tests of the system in space, but declared a moratorium on

[18] The United States and Russia, for example, possess over eighty percent of the world's payloads in orbit. Watts, Barry D., "The Implications of China's Military and Civil Space Programs," *CSBA Testimony*, May 11, 2011, p. 2.

[19] Amos, Jonathan, "Phobos-Grunt," *BBC News*, January 15, 2012.

[20] Flintoff, Corey, "For Russia's Troubled Space Program, Mishaps Mount," NPR, March 12, 2012 and "Russian Space Program Brought Down by Embezzlement," *RT.com*, September 8, 2011.

[21] Razbakov, S. And Belogurov, I., "Russia's Space Defenses in Shambles," *RIA Novosti*, May 13, 2010.

[22] "Putin Calls for Space Launch Development Strategy," *RIA Novosti*, April 13, 2012.

[23] Zhitenev, A., "Russia to Launch 100 Military Satellites in Next Decade," *RIA Novosti*, February 22, 2012.

[24] "Russia Pursuing Anti-Satellite Capability," *Global Security Newswire*, March 6, 2009.

testing in 1983.[25] Moscow may have also investigated the use of lasers for ASAT applications.[26] It is unclear if Popovkin's 2009 comments were referencing research based on long-dormant Cold War programs, more recent space and missile defense programs, or some other technology or platform. Russia likely already fields systems capable of disrupting enemy satellites, to include jamming capabilities and "dazzling" lasers.[27]

Some Russian officials believe their space systems have already faced direct foreign attacks. Following a failed February 2011 attempt to launch a military mapping satellite, news reports featured quotes from an unnamed Russian space official speculating a foreign power may have used an electromagnetic pulse to deliberately interfere with the rocket's controls.[28] In an interview after the November 2011 failure of a rocket intended to launch a satellite to the Martian moon of Phobos, Popovkin suggested deliberate interference from a foreign "device" might have caused the rocket to malfunction.[29]

For decades, Russia has actively lobbied for a treaty prohibiting the deployment of "weapons" in space. Since 2004, Russia has publicly stated it will not be the first state to deploy space weapons, and has strongly encouraged other nations to make the same pledge.[30] In February 2008, China and Russia proposed the Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects (PPWT), a draft treaty whose stated intent is to prevent arms races and the use of force in outer space (further PPWT discussion begins on page 13). In the event another state chooses to place weapons in space, however, Russia reserves the right to take whatever measures are necessary to protect its space assets.[31]

Russia's current position in favor of space arms control may reflect its concerns regarding the costs of attempting to match the military space capabilities of other states. In addition, its willingness to consider a ban on space-based weapons and offensive operations in space may stem from its tests of ASAT systems, and studies of the potential consequences of a conflict in space, conducted during the Cold War. Moscow's decision in the 1980s to halt Soviet ASAT programs may have reflected a conclusion they lacked military utility. Beyond the considerable fiscal and technical hurdles associated with ASAT development, Soviet scientists and strategists studying the results of their ASAT tests likely recognized any attack using these systems could generate large amounts of debris potentially damaging or destroying its own critical space systems.

China

China believes the development of space technology is critical to the country's continued economic growth and future ability to compete with military powers such as the United States.[32] Beijing has devoted considerable resources in recent years to building up its space program. China does not make its space budget public, but one estimate by a U.S. non-government expert in late 2011 placed the figure at upwards of $5 billion.[33] A 2008 Congressional Research Service (CRS) overview of China's space program noted its rapid development over the course of the preceding decade, to include fifty consecutive

[25] "Anti-Satellite Weapons, Countermeasures, and Arms Control," pp. 5-7.
[26] Ibid. p. 6.
[27] Air University Space Primer, Chapter 18, *Rest of World Satellite Systems: Russian Satellite Systems*, 2003 http://space.au.af.mil/primer/rest_of_world_satellites.pdf.
[28] "Russia Says Foreign Power May Have Caused Spy Satellite Loss," AFP, February 14, 2011.
[29] Kramer, Andrew E. "Russian Official Suggests Weapons May Have Caused Spacecraft Failure," *New York Times*, January 10, 2012.
[30] Loshchinin, Ambassador Valery, "Peaceful Uses of Outer Space," Address, Geneva, November 11, 2010.
[31] "Russia Issues Warning on Space-Based Weapons," *New York Times*, September 27, 2007.
[32] Smith, Marcia S. "China's Space Program," Congressional Research Service (CRS) Report, October 18, 2005, and Watts, pp. 4-6.
[33] Hennigan, W.J. and Ralph Vartabedian, "Foreign Nations Push Into Space," *Los Angeles Times*, July 22, 2011.

successful space launches by the country's "Long March" family of SLVs.[34]

China is moving forward with a broad range of sophisticated satellite and rocket programs, to include significantly expanding its space-based ISR, navigation, and communications satellite constellations.[35] China is scheduled to test its Long March-V SLV in 2014, a heavy-launch space platform with double the payload capacity of its current rocket fleet.[36] It has also developed a robust manned space program. China put its first *taikonaut* in space in 2003, and has started planning for a future manned mission to the moon.[37]

China's military space programs also appear to be making steady progress. Efforts to match the United States and other advanced states in military space capabilities likely reflect the People's Liberation Army's (PLA) strategic assessment of the critical importance of space assets to recent U.S. and coalition military operations. At present Chinese strategists do not regard outer space as a distinct theater of conflict.[38] They emphasize, however, the critical inclusion of space assets and operations in plans for all other domains, and advocate taking steps to disable, seize, or destroy enemy satellites in order to gain the upper hand on a technically-advanced adversary.[39] The PLA is committed to establishing "space dominance" in future conflicts, with a particular focus on developing the capability to "sustain the uninterrupted operation of space information collection and transmission systems."[40] Establishing the necessary conditions for "space dominance" requires a range of space assets to coordinate different branches of the military, and the PLA has organized many of its space operations around the achievement of three key missions – observations/intelligence, navigation/positioning, and communications.[41]

In addition to these enabling capabilities to boost the performance of its land, sea, and air forces, China has also invested in systems allowing it to carry future offensives into outer space itself. China is developing and fielding capabilities to jam, dazzle, and destroy satellites, to include both kinetic and directed-energy systems.[42] On January 11, 2007, China destroyed a non-operational Fengyun-1C weather satellite with a ground-based ballistic missile.[43] Traveling at nearly 18,000 miles per hour, the missile functioned as a kinetic kill vehicle, striking and shattering the satellite. According to a U.S. National Security Council official, the Chinese ASAT weapon was a medium-range ballistic missile that destroyed the satellite at an altitude of 537 miles.[44] An April 2003 Congressional Research Service report, citing a range of government and media sources, stated the missile was an SC-19 fired from a transporter-erector-launcher operating near China's Xichang Space Center.[45] Launched without prior notification or warning, the test (which, as noted above, generated thousands of pieces of dangerous space debris), was immediately protested by the United States and a number of other space-faring nations.[46] Although China has not conducted

[34] Logan, Jeffrey, "China's Space Program," CRS Report, September 29, 2008, p. 1.
[35] Ibid, p. 7.
[36] Office of the Secretary of Defense (OSD), *Military and Security Developments Involving the People's Republic of China*, 2011, p.5
[37] Smith, Marcia, "China's Space Program," CRS Report, October 21, 2003 and Kluger, Jeffrey, "China's Going to the Moon," *Time*, January 4, 2012.
[38] OSD, *Military and Security Developments*, 2011, pp. 23-24.
[39] OSD, *Military and Security Developments*, 2011, pp. 23-24 and Pillsbury, Michael, "An Assessment of China's Anti-Satellite and Space Warfare Programs, Policies, and Doctrines," U.S.-China Economic and Security Review Commission report, pp. 10-12.
[40] Cheng, Dean, "China's Military Role in Space," *Strategic Studies Quarterly* (Spring 2012): 68.
[41] Smith, Lt Col Steven, "Chinese Space Superiority?," Air University paper, February 17, 2006, p. 3
[42] OSD, *Military and Security Developments*, 2011, p. 37.
[43] Covault, Craig "Chinese Test Anti-Satellite Weapon," *Aviation Week*, January 17, 2007.
[44] Kaufman, Mark and Dayna Linzer, "China Criticized for Anti-Satellite Missile Test," *Washington Post*, January 19, 2007.
[45] Kan, Shirley, "China's Anti-Satellite Weapon Test," CRS report, April 23, 2007, p. 1.
[46] China labeled the test an "experiment" and asserted the event did not change its official position against the "weaponization of space and an arms race in space."

additional space tests of this ASAT weapon, it continues to improve this system and appears intent on including it as part of its arsenal.[47]

While the Chinese military devotes resources to developing its space capabilities, Chinese diplomats call for an international agreement to ban the deployment of weapons in space. China joined Russia in 2008 in proposing the PPWT, and continues to advocate for its ratification. In a government-issued white paper released in 2011, China reaffirmed its commitment to the prevention of space weaponization, stating:

> The Chinese government has advocated from the outset the peaceful use of outer space, and opposes any weaponization of outer space and any arms race in outer space. China believes that the best way for the international community to prevent any weaponization of an arms race in outer space is to negotiate and conclude a relevant international legally-binding instrument.[48]

China is working assiduously to match – and in regard to its development of ASAT weapons, counter – the current military space capabilities of technologically-advanced states. Beijing's interest in space arms control may reflect its concern the United States and other countries could remain ahead of China with next-generation military space systems, forcing the expenditure of considerable resources in order to keep up. As such, China may view space arms control as a means to put a "ceiling" on global military space capabilities and prohibit capabilities currently beyond China's reach, while continuing to allow China to pursue parity in military space technologies – and, with the development of ground-based ASAT weapons, perhaps even gain a strategic edge.

European Union

The European Union (EU) has increasingly sought to advance European space interests through harmonizing the space policies and programs of its twenty-seven member states. European states have long recognized no single space-faring nation in Europe can compete with the range of space programs fielded by countries such as the United States, Russia, or, in the 21st century, China. In recent years, however, concerns that Europe may be falling behind in space prompted EU member states to consider taking steps to more closely align their national space policies, strategies, and decision-making. In 2007 the EU's Council (the EU's guiding political body of member heads of state or government) jointly drafted a "Resolution on the European Space Policy" with the European Space Agency (ESA). The European Space Policy provides a common space policy framework and roadmap for the ESA, EU, and EU member states, coordinating their efforts to ensure Europe can "stay a major player [internationally], solve global problems and improve quality of life."[49]

Significantly, the European Space Policy also called for the EU to consider how to pursue civil-military "synergies" in space.[50] The language represented an important change from earlier European efforts to coordinate space activities, which did not involve national military space programs and were often deliberately focused on non-military applications.[51] The European Space Policy was followed in July 2008 by the passage of a European Parliament resolution titled "Space and Security" calling for EU states to work together to develop a range of space programs focused on addressing current and future security needs, to include developing satellite capabilities for navigation, reconnaissance, surveillance, and

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Kahn, Joseph, "China Confirms Anti-Satellite Test," *International Herald Tribune*, January 23, 2007.

[47] OSD, *Military and Security Developments*, 2011, p. 37.

[48] White Paper on Arms Control and Disarmament, *China's National Defense in 2010*, March 31, 2011.

[49] Dordain, Jean-Jacques and the European Commission, *Resolution on the European Space Policy*, May 22, 2007, p. 9.

[50] Ibid., p. 11.

[51] The ESA's mandate, for example, expressly limits cooperation between its members' space programs to "exclusively peaceful purposes." Article II, Convention of Establishment of a European Space Agency, SP-1271(E), 2003.

missile warning.[52] Even as the Parliament called for the EU to forge "a common approach … for defending European interests in space," however, it also cautioned that the organization must simultaneously avoid taking any steps that might "contribute to the overall militarisation and weaponisation of space."[53]

Given these caveats, the EU's Galileo satellite program may represent a model for the future pursuit of space capabilities meeting the political, policy, and strategy needs of an organization whose twenty-seven member states have widely varying national space and military capabilities.[54] Once Galileo is complete (currently two of the system's four satellites are in orbit) it will provide the EU with satellite navigation/positioning capability similar to the U.S. Global Positioning System (GPS). As with GPS, Galileo will provide a capability with a host of potential civilian and military applications. The EU has decided the Galileo constellation of satellites represent "civilian systems under civilian control" but has also provided policy and institutional mechanisms to allow member state militaries to access and leverage the information provided by the system's satellites.[55] This approach of developing a system that is civilian controlled but also provides vital capabilities to the militaries of EU member states may represent the organization's long-term approach for equipping Europe with the means to address a range of space defense challenges through civilian/military partnerships.

The EU voices strong support for new multilateral initiatives to ensure space remains a domain free of armed conflict. The organization, however, has taken a different approach from Russia and China in attempting to address the potential security challenges and risks associated with the increasing use of – and competition over – outer space by state militaries. Rather than propose a legally-binding space arms control treaty, the EU believes the first step toward addressing the security challenges currently facing space-faring states is the establishment of additional "rules of the road" for state conduct in outer space that build on the principles of the OST. As discussed on page 15, the EU's Draft Code of Conduct for Outer Space Activities (EU CoC) suggests the best means for preventing provocative military actions in space is to embed guidelines and restrictions on the national military use of space within a broader framework that covers all state activities in outer space.

EVALUATING THE PPWT AND EU CoC

The United States has stated its official opposition to the PPWT and the EU CoC. U.S. officials have described the PPWT as "fundamentally flawed."[56] The United States has consistently opposed the draft treaty at the UN Conference on Disarmament (CD) since its introduction by Russia and China in 2008. The United States has also rejected the EU CoC, stating in January 2012 that the text was "too restrictive."[57] The United States, however, did not reject the EU CoC in its entirety, viewing the draft accord as a "good foundation" for a future agreement.[58] At the time of this writing, the United States, European Union, and other states are currently engaged in discussions regarding the development of an "International Code of Conduct" based on the EU text.

A thorough assessment and understanding of both proposals is important for national security practitioners, analysts, and scholars. The PPWT and EU CoC represent two poles bounding a range of proposals aimed at regulating the state and military use of outer space. The former is a legally-binding treaty attempting to ban weapons and the "use of force" in space; the latter is a

[52] European Parliament, "Space and Security," resolution, July 10, 2008, 2008/2030(INI)
[53] Ibid.
[54] Silvestri, Stefano, "Space and Security Policy in Europe," EU Institute for National Security Studies, Occasional Paper no. 48, December 2003, pp. 5, 12-13 and Pasco, Xavier, "A European Approach to Space Security," AAAS Reconsidering Rules of Space Paper Series, pp. 12-14.
[55] Dordain and the European Commission, p. 11 and Pasco, "A European Approach," pp. 12-14.

[56] Kennedy, Ambassador Laura, Statement, UN Conference on Disarmament, February 8, 2011.
[57] Herb, Jeremy, "U.S. Won't Sign EU Space Treaty," *The Hill*, January 12, 2012.
[58] Rose, Frank, Deputy Assistant Secretary of State Address, 15th Annual FAA Commercial Space Transportation Conference, February 16, 2012.

politically-binding agreement that seeks to articulate normative standards for state conduct that will prevent actions or practices precipitating conflicts in outer space. As such, understanding the theoretical underpinnings and potential impact of these two agreements can provide valuable insights into broader efforts to apply arms control measures to outer space or otherwise regulate the military use of this strategic domain. In addition, evaluating the shortcomings of the PPWT and EU CoC can underscore the importance of existing U.S. Government (USG) and U.S. Armed Services' significant concerns in the area of space arms control, while also potentially raising new issues and questions that may prove valuable in future reviews of proposed agreements.

PPWT

In February 2008 China and Russia tabled a draft treaty at the United Nations CD titled the Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects (PPWT).[59] The PPWT grew out of longstanding efforts by several states at the UN General Assembly to pass resolutions banning weapons from space, often under the title "Prevention of an Arms Race in Outer Space" (PAROS). The United States has consistently opposed PAROS resolutions in their various iterations and, as noted above, has also stated its firm opposition to the PPWT.[60]

PPWT represents the most significant draft accord on weapons in outer space currently under consideration within international negotiating forums. The stated intention of the PPWT is to prevent states from deploying weapons in outer space and ensure space remains a peaceful domain free from the use of force. The proposed treaty's major provisions include:

- Proposing the first international legal definition of the terms "weapon in outer space," "use of force" in outer space, and "threat of force" in outer space[61]
- Prohibiting the placement of weapons in outer space[62]
- Prohibiting the threat or use of force against outer space objects[63]

Analysis of the key provisions of the PPWT raises a number of issues and questions for the United States and, indeed, any space-faring nation whose military has interests or involvement in outer space.

The PPWT and the 3 C's: The PPWT purports to address concerns that space, as an increasingly contested domain, will someday become a battleground, with space-faring nations deploying and using weapons in outer space. Article VIII of the PPWT calls for the formation of an "executive organization" to address a range of issues related to implementation of, and compliance with, the treaty. The executive organization's responsibilities would include adjudication of disputes and addressing charges of noncompliance.[64] The structure and authority of the executive organization, however, is left for negotiation within a separate protocol. Neither the exact nature of the organization or its adjudication processes are specified; the PPWT does not discuss, for example, whether the executive organization would refer treaty enforcement issues pertaining to international peace and security to the UN Security Council. In the event of serious breaches, the executive organization can "take steps to put an end to the

[59] Loschinin, Ambassador Valery and Ambassador Wang Qun, letter, February 12, 2008, CD/1839. This official letter to the CD presented the Russian and Chinese delegation's draft text of the treaty (hereafter referred to as PPWT).

[60] In August 2008 the U.S. delegation to the CD provided a detailed analysis of U.S. concerns regarding the PPWT to other CD members. Rocca, Ambassador Christina B., CD/1847, August 26, 2008, pp. 3-4. U.S. officials have stated in subsequent CD sessions that this analysis continues to represent the USG's views on the PPWT. United States Mission to the UN and Other International Organizations, "Press Conference: Deputy Assistant Secretary of State Frank A. Rose," July 13, 2010.

[61] PPWT, Art I (c).

[62] PPWT, Art II.

[63] Ibid.

[64] PPWT's Article VII states that when a dispute arises between States Parties, the parties should attempt to resolve disputes through consultations. If there is no resolution, the situation may be referred to the executive organization. Article VIII discusses the executive organization.

violation", but what these steps might entail is not specified.[65] The lack of description in regard to the executive organization also raises questions as to whether it is a permanent entity staffed by international civil servants (similar to the Comprehensive Test Ban Treaty Organization) or a joint commission bringing together diplomats and officials from participating states to address treaty matters (such as New START's Bilateral Consultative Commission). With little offered in the text regarding the form and function of the executive organization, it is unclear what mandate – if any – it would have for investigating treaty violations or sanctioning member states failing to comply (or deliberately violating) key provisions of the treaty.[66]

The draft PPWT thus provides no clear recourse for States Parties complying with its standards who discover a second State Party placing objects that are weapons – or, importantly, could be weapons – into orbit. Past experience with other arms control accords underscores the critical importance of providing a forum and process for addressing "suspect" objects that may fall under the restrictions of a treaty. Given that the introduction of even one "space weapon" into a space domain currently free of any weapons systems would represent an extremely destabilizing event, the PPWT's failure to provide clear mechanisms or processes for adjudicating questions of compliance, disputes regarding potential violations, or for sanctioning violators, represents a major flaw within the draft treaty. The PPWT's stated intent of addressing the particulars of the executive organization within an additional protocol to be negotiated at a later date is not an acceptable solution to this problem. Electing to leave an essential requirement of effective treaties to later negotiations will leave PPWT signatories with fundamental doubts about future implementation, and unanswered questions regarding whether the treaty ultimately serves their national interests. Furthermore, the history of treaty negotiations reveals that significant issues left unfinished at major negotiating rounds or within principal drafting sessions prove difficult to impossible to resolve in later consultations.

Overall, the PPWT does little to change the assessments or incentives that might lead states to consider developing weapons – particularly ground-based weapons with space applications – or compete to develop offensive space systems. The PPWT is a flawed draft treaty that fails to clearly incentivize compliance or protect states acting in good faith from potential treaty violators. It does not address the challenges posed by outer space representing an increasingly contested and competitive environment.

Impact on U.S. Military Space Assets, Operations, or Strategies: The PPWT seeks to ban the placement of weapons in space, with Article 1(c) advancing the following definition of "weapon in outer space":

> Any device placed in outer space, based on any physical principle, which has been specially produced or converted to destroy, damage or disrupt the normal functioning of objects in outer space, on the Earth or in the Earth's atmosphere, or to eliminate a population or components of the biosphere which are important to human existence or inflict damage on them.

This definition, however, is not accompanied by any means to inspect or verify that a space object is (or is not) a "weapon." As the properties of weapons and the effects of weapons purportedly covered by the treaty are extremely wide-ranging, States Parties could attempt to claim that a broad variety of non-kinetic military space systems would either be captured under this definition, or should at the very least be subject to some form of negotiation to prove that they were not covered by the treaty. The treaty's lack of clarity could lead states to argue that U.S. space systems such as GPS satellites are "weapons," because they are "devices placed in outer space" that are integral to guiding a range of land- and sea-based weapons to their targets (as the definition includes destruction of targets both in space and "on Earth"). Furthermore, the treaty completely fails to make any provision for *ground-based* weapons that can destroy objects in space. The PPWT would not,

[65] PPWT Article VIII
[66] Rocca, CD/1847, pp. 3-4.

for example, limit or ban the Chinese medium-range ballistic missile ASAT.[67]

Another problem with the PPWT's definition of "weapon" is that it makes no distinction between offensive and defensive systems. While the PPWT's Article V acknowledges a State's inherent right to individual or collective self-defense, this language appears to be in tension with its Article II prohibition against the use of force in space. The draft treaty fails to address what actions a state is permitted to take, or what systems it is permitted to deploy (if any), to face a threat from an adversary's space systems.[68]

In general, the experience of U.S. negotiators of arms control accords, and of delegations addressing questions of treaty compliance, demonstrates that treaty definitions of weapons or other military objects should be written in specific language that accurately defines the intended system(s) and clearly separates these systems from other objects. The treaty's vague definition of "weapon" does not meet either standard, and may provide a means by which other states could question, criticize, and even attempt to ban many U.S. military space systems.

Equitable, Verifiable, and in the Best Interests of the United States?: The PPWT fails each of the three tests provided by the 2010 NSP: it is not equitable, it is not verifiable, and it is not in the best interests of the United States. The draft treaty is not equitable, giving a free hand to states wishing to project power into space using ground-based systems, while potentially prohibiting the deployment of defensive systems – whether for land or space-based missions – in space. It thus favors a particular force posture and force structure for states interested in controlling or denying access to outer space. PPWT recognizes the importance of establishing an executive organization to address disputes that arise under the treaty, but fails to include vital implementation language necessary to create a body that could play a critical role in ensuring the fair application of treaty provisions to all participating parties.

The PPWT is also inherently unverifiable. Although the PPWT's text suggests States Parties could negotiate an additional protocol addressing verification and compliance issues, the treaty itself has no verification regime, only calling for participating states to engage in voluntary confidence building measures.[69] The PPWT does not provide a mechanism for authenticating the technical aspects of space systems to determine compliance with the treaty, leaving unanswered how signatories could "prove" to other states that equipment onboard objects such as satellites would not, or could not, be used as a weapon.

Overall, as detailed in Figure 2 on page 21, accession to the PPWT is not in the best interests of the United States. The United States, for example, would probably interpret a term such as "space weapon" within a space arms control agreement more narrowly than many other states. If the United States acceded to the PPWT, it would likely face repeated accusations of treaty violations for allegedly fielding and/or developing space-based weapons. Moreover, the treaty is flawed in its apparent focus on *space-based weapons* – a type of weapon that remains confined to the realm of science fiction. As a result, it fails to address ground-based systems, such as the ASAT capabilities currently under development by states like China and India, which appear more likely to either precipitate a regional or international arms race in weapons with space applications or be used in a potential future conflict in space.

European Union Code of Conduct for Outer Space Activities

In December 2008, the Council of the European Union officially released its Draft Code of Conduct (EU CoC) for Outer Space Activities.[70] Following a series of EU deliberations, the organization released a revised draft in October 2010, using this second text in its consultations with third-party states.[71] In creating the EU CoC,

[67] Kennedy, Ambassador Laura, Statement, UN Conference on Disarmament, February 8, 2011.
[68] Rocca, CD/1847, pp. 3-4.
[69] PPWT, art VI.
[70] Council of the European Union, "European Union Draft Code of Conduct," December 17, 2008.
[71] Council of the European Union, "Revised Draft Code of Conduct for Outer Space Activities," October

the EU had two goals: 1) to strengthen existing UN space treaties and agreements; and 2) to complement these agreements by codifying best practices for state use of outer space. The politically binding agreement seeks to "strengthen the safety, security and predictability of all space activities" by promoting norms of responsible conduct across the entire community of space-faring nations. The EU CoC also promotes means and mechanisms for improving communication and encouraging transparency within this community. In an attempt to build on key principles of space law found in the OST and provide more detailed "rules of the road" for state activities in outer space, the EU CoC includes provisions requesting Subscribing States:

- "Refrain" from "intentional" actions that damage or destroy outer space objects[72]
- "Take reasonable measures" to prevent collisions in space[73]
- Commit to not taking actions causing long-lived debris[74]
- Commit to a wide range of notifications regarding state activities in space[75]
- Commit to sharing national space policies and procedures[76]

The EU CoC is not an arms control treaty; it does not attempt to balance the space military systems of states, nor does it feature provisions expressly limiting or banning either the placement or use of armaments in space. In articulating a "set of best practices aimed at ensuring security in outer space [that] could become a useful complement to international space law,"[77] however, it attempts to provide a framework providing guidelines for national security activities in space, to include the military use of space.

The 3 C's: The EU CoC proposes to address the challenge of space representing an increasingly contested environment by promoting norms of behavior that will preempt or reduce potential sources of friction between space-faring states. It does not provide means to encourage compliance with its suggested "rules" or sanction violators, preferring to promote dialogue to address disagreements. A potential weakness of the EU CoC is that all states that subscribe to its principles "resolve … to take all appropriate measures to prevent outer space from becoming an area of conflict."[78] The vagueness of this clause – found within the EU CoC's "General Principles"– is a double-edged sword. On the one hand, the statement correctly recognizes the importance of states considering whether planned activities in outer space might be perceived as destabilizing or provocative by other space-faring nations. But the statement is so broad (using "conflict" rather than "armed conflict", for example) that any state agreeing to abide by the EU CoC could be open to criticism for *any* level of military involvement in space. Some states, for example, might argue that outer space will only be a peaceful domain if it is "demilitarized" – that is, free of military systems of any kind – and that the placement of any military asset in space, even if its only role is communications or surveillance, is a potential catalyst for turning space into an "area of conflict."

A related issue is the EU CoC's choice of words within a clause asking subscribing states to commit to follow-on discussions regarding "security guarantees," to include measures for the "prevention of an arms race in outer space."[79] The choice of language in the latter clause is similar to that employed by PAROS initiatives proposed at the United Nations that the United States regularly opposes, and its lack of definition again opens a potential avenue for U.S. military space assets and operations to come under criticism. One state's legitimate efforts to stay a step ahead of potential adversaries in military space capabilities – even if these capabilities do not include placing offensive

11, 2010. This article's citations to the Code refer to the October 2010 revised text.
[72] EU CoC, Article II, Section 4.2.
[73] EU CoC, Article II, Section 4.3.
[74] EU CoC, Article II, Section 5.
[75] EU CoC, Article III, Section 6.
[76] EU CoC, Article VIII, Section 8.1.
[77] EU CoC, Preamble.
[78] EU CoC, Article I, Section 2.
[79] EU CoC, Article II, Section 4.5.

weapons systems in orbit – may in the eyes of other states represent a dangerous desire to launch an "arms race" in the cosmos.

The EU CoC clearly recognizes the inherent right to self-defense with the UN Charter, and its voluntary nature would not preclude the United States or any space-faring state from taking the actions in space it deemed necessary to defend itself from aggression. The discussion of the clauses above, however, points to the current tension between space-faring states over what represents acceptable actions to undertake in space in promotion of national defense objectives. The EU CoC recognizes that this tension – and lack of consensus – is a problem, but it arguably fails to communicate a concept of what actions in terms of militaries or armaments are destabilizing or dangerous because of the threat they pose to space as a domain free and open to all states. Communicating this concept would not be a simple task, but it could create a point of departure for discussing possible norms regarding the military use of space. Including a discussion or understanding of the role of armaments, or more broadly, state militaries, in stabilizing (or destabilizing) the outer space environment within the text could lead to an agreement better equipped to address outer space as an increasingly contested environment.

The EU CoC is on firmer ground with its attempt to address the "congested" dimensions of the 3 C's challenge. The problem of space debris is addressed in a number of ways by the EU CoC, which asks Subscribing States to commit to sharing information on debris-mitigating policies and procedures, and refrain from actions likely to generate debris. The Code frames actions destroying space objects as only acceptable in the context of national security or attempting to reduce debris.[80] If short on specifics, the EU CoC's effort to address space debris as a multi-dimensional problem requiring information-sharing and the establishment of a norm that would prevent states from carrying out actions such as China's 2007 ASAT test likely represents an approach that can be built on during the drafting of an International CoC.

Impact on U.S. Military Space Assets, Operations, or Strategies: The EU CoC does not expressly limit or ban any military space systems or operations. The discussion regarding its attempt to address outer space as a contested environment, however, is relevant to U.S. military space operations. If the United States signed the EU CoC, it would need to internally address (and probably externally, in terms of responding to questions from other Subscribing States) the following questions, whose answers might impact its own conduct of space operations:

- What actions lead to space "becoming an area of conflict"?[81]
- What actions represent "harmful interference in outer space activities"?[82]
- What actions enhance (or detract) from space security?[83]
- Under what circumstances is it acceptable to destroy an outer space object?[84]

The United States is a responsible state actor in outer space, and its military space assets, operations, and strategies are both vital to the country's national defense and critical to international stability – on Earth and in outer space. This set of questions, directly linked to clauses within the EU CoC, brings forward important issues regarding the military use of space that are increasingly important for all space-faring states to address and answer. Given the EU CoC's politically binding nature, and the fact that United States' military operations in space adhere to both international space law and the law of war, a legal review of the EU CoC and any given U.S. military space operation would likely conclude that the action in question would be entirely compliant with the space security provisions of the Code. Nevertheless, similar to the PPWT, if the United States were to sign on to the EU CoC it would need to prepare to address a range of questions and demarches on the issues highlighted above; as the world's largest space power, the United States would likely field both in the event it signed on to the EU CoC.

[80] EU CoC, Art. II, Sec. 4.2.

[81] EU CoC, Art. I, Sec. 2.
[82] Ibid.
[83] EU CoC, Art. II, Sec. 4.5.
[84] EU CoC, Art. II, Sec. 4.2.

The EU CoC's provisions regarding exchanges of information might have an impact on U.S. military space operations. The EU CoC seeks to cover "all outer space activities conducted by a Subscribing State", calls for information to be exchanged on activities "relevant for the purposes of the Code", and includes a broad range of examples of the types of activities that should generate notifications to other participating states.[85] This could lead to the interpretation that essentially all state activities in space should result in some type of notification being sent to all of the Code's Subscribing States.

Although the form (and level of detail) of information to be exchanged is not specified, such an interpretation would raise issues for U.S. military space operations. While the voluntary nature of the agreement would always allow the United States to opt out of sharing sensitive information on its military space activities, this is a much more broad-brush approach to transparency than that employed by arms control agreements the United States has negotiated in the past. In general, the EU CoC's discussion of information exchanges lacks clarity on a number of key points, including: when, where, and how information is exchanged; whether these exchanges are similar to, or more expansive than, information exchanged under other outer space accords (and if so, whether duplication is necessary); and what exceptions, if any, are allowed, or whether the Code intends states to exchange information on all activities aside from occasional exceptions citing reasons of "national interest" or "force majeure".

Equitable, Verifiable, and in the Best Interests of the United States?: The EU CoC appears broadly equitable in regard to its treatment of space-faring states, although its stipulation that the agreement cover "all space activities" would place a larger reporting burden on major space powers. Some foreign critics of the draft accord, however, have advanced arguments that the EU CoC is unfairly biased toward European practices and space programs.[86]

The EU CoC did not attempt to establish a verification regime; Subscribing States would have to rely on national assets and whatever information other governments chose to share under the auspices of the agreement's notification provisions to determine if participating states were complying with the Code. The EU CoC also does not establish a formal body to adjudicate disputes over compliance, or resolve other questions related to the agreement, suggesting that Subscribing States engage in consultations to address these types of issues.[87] Similar to the PPWT, this lack of an institutional mechanism (such as New START's Bilateral Consultative Commission) for addressing questions of compliance or disputes between participating states is a potential weakness of the accord.

As with all politically binding accords, the impact of an agreement like the EU CoC on the United States would vary depending on the diplomatic and political capital the USG wished to invest within it. The EU CoC articulates and attempts to address the 3 C's within a broad framework that seeks to add depth and fidelity to current international space law – law that, in many cases, was negotiated during a fundamentally different era for the state use of space. As such, it represents an important effort to rally governments behind a common approach to address the 3 C's as multilateral threats to all space-faring states. It is important to note that the EU CoC draws principles from the United Nations Debris Mitigation Guidelines, adopted in 2008. These guidelines outline space debris mitigation measures for the planning, design, manufacture, and operational phases of spacecraft and launch vehicles, and call for limiting the long-term presence of spacecraft in low Earth orbit at the end of their useful life. The EU CoC falls short, however, in regard to its execution, as it identifies challenges and proposes cooperative approaches without clearly specifying what state actions are negative or destabilizing, or what recourse good actors have for dealing with actors that violate (whether willfully or unintentionally) its provisions. As shown in Figure 3 on page 21, the

[85] EU CoC, Art I, Sec 2 and Art. III, Sec 6.
[86] Victoria Samson, "India and Space Security" May 9, 2011; Rajagopalan, "The Space Code of Conduct Debate," *Strategic Studies Quarterly* (Spring 2012): 142-145.
[87] EU CoC, Art. III, Sec. 9.

EU CoC promotes the safe use of space. Since it is politically binding with no verification regime, it would have little direct impact on the current U.S. military space operations or damage U.S. national security interests in outer space. However, such a Code would do little to deter countries from pursuing weapons in space.

SPACE ARMS CONTROL IN THE 21st CENTURY: A NEW HOPE OR LOST IN SPACE?

The significant challenges faced by space-faring nations in the third space age are too large for any single state to fully address alone. The future safety of space will likely require state governments, international organizations, and the private sector to collaborate in exchanging information, respecting established procedures regarding navigation, and, in some cases, discussing the possible development of new norms or rules to address an increasingly competitive, contested, and congested space environment. These efforts must account for, and will impact, both the civilian and military use of space.

U.S. policymakers confronted with the 3 C's problem set have stated their interest in multilateral approaches, to include space arms control, to address the present reality that outer space is an area of military operations for multiple States and a possible theater of conflict in future wars. Space arms control long remained dormant in large part due to a lack of space arms or weapons deployed in other environments possessing an ability to strike space assets. However, with China testing ASAT systems and states such as India signaling an interest in developing these capabilities, in the near future multiple actors may field weapons capable of threatening objects in space. All of these developments open the possibility that a State or States may propose a future space arms control treaty or an agreement addressing some aspect of the military use of space that is in the best interests of the United States. The authors agree with the assessment of U.S. policy makers that neither the PPWT nor EU CoC enhances U.S. national security. Future progress in space arms control or confidence building measures (CBMs) will require an agreement that can balance the significant space security needs of states against the legitimate threat posed by weapons (whether based on Earth or in space) that can range space systems.

In providing a draft framework for assessing the potential impact of space arms control proposals on the United States, the authors hope to shed light on several of the key military and strategic requirements that future arms control agreements or CBMs must address when attempting to resolve the challenges of the third space age.

Figure 1: Assessment Criteria for Space Treaties and Agreements	
Based on current USG guidance (e.g. 2010 NSP and 2011 NSSS), does the treaty or agreement under consideration …	
Freedom of Action	*preserve or enhance space as an open, free, and safe operating environment?* • Maintaining space as a free domain for all states remains a core principle of USG space policy.
Access	*ensure the United States maintains access to space?* • U.S. access to space requires reliable, responsive, and cost-effective launch capability; access to data from space systems; and access to the radio frequency spectrum.
Transparency	*include acceptable transparency measures?* • Transparency measures should apply equitably to all space-faring nations, should not create onerous reporting requirements, and should not include the exchange of information with the potential to compromise the operational security of U.S. space systems.
Verification and Enforceability	*include means of verification and enforcement mechanisms?* • Agreements should include means/mechanisms for adjudicating and resolving disputes, and for referring violators whose actions threaten international peace and security to the UN Security Council.
Affordability	*impose (significant) monetary costs on the United States?* • Given current resource constraints, the possible costs of implementing and complying with any agreement must be carefully considered by the USG.
U.S. Military & Space	*negatively or positively impact U.S. military space assets, operations, or strategies?* • The United States must have the freedom to design, build, launch, operate, and maintain national security space assets.

Figure 2: Assessment of the PPWT	
Freedom of Action	The PPWT is overly restrictive of U.S. freedom of action. The lack of clarity in the PPWT could force the United States into providing lengthy explanations and justifications for many of the space assets and operations of the Armed Forces.
Access	The PPWT's ban on "weapons" in space could potentially complicate or preclude access to space by U.S civil and military platforms.
Transparency	The PPWT would not enhance transparency. Although it does encourage States' Parties to implement transparency and confidence-building measures on a voluntary basis, these would be difficult to implement.
Verification and Enforceability	The current draft of the PPWT does not contain a verification regime. The United States would be forced to rely on something like national technical means (NTM) to determine compliance.
Affordability	The PPWT does not appear to levy any new requirements in terms of costs.
U.S. Military & Space	Treaty terms are vague, complicating questions of compliance/noncompliance. Treaty fails to address what actions a state is permitted to take, or what systems it is permitted to deploy (if any), to face a threat from an adversary's space systems. Other states could question, criticize, and even attempt to ban many U.S. military space systems.

Figure 3: Assessment of the Draft European Union Space Code of Conduct (EU CoC)	
Freedom of Action	The EU CoC would have little direct impact on current U.S. military space operations. The draft has no definition of weapons and does not prohibit placing military systems in space.
Access	The EU CoC endorses the principle of free access, stating it seeks to protect "the freedom of access [to space] without interference."[88]
Transparency	The EU CoC could marginally increase transparency regarding other state space programs depending on the type of information other governments elect to share. The information-sharing clauses, however, do not specify the level of detail of notifications exchanged under the Code. Strict adherence with the EU CoC's provisions on information sharing could raise issues regarding some military space operations. Much of the information requested by the EU CoC appears similar to information the United States exchanges due to other agreements.
Verification and Enforceability	The EU CoC does not have a verification regime. Signatories can request consultations to discuss possible violations. The United States would rely on existing capabilities to detect violations. The EU CoC does not have an enforcement mechanism.
Affordability	Little additional costs associated with the code. The United States is already meeting most EU CoC reporting and notification requirements through the OST.
U.S. Military & Space	The EU CoC would not damage U.S. national security interests in outer space or limit research and development of classified programs relating to outer space activities. It also includes a right to self-defense clause.

[88] EU CoC, Art. I, Sec. 2.