## 1AC – NTP

### 1AC – Atoms for Peace

#### Advantage One: Atoms for Peace

#### The second cold war has begun. It makes crises likely to escalate into a shooting war.

Edward Lozansky, Founder and President of the American University in Moscow, Professor of World Politics at Moscow State and National Research Nuclear Universities, Foreign Policy Member of the Russian Academy of Sciences, ’18, “The reality of Cold War 2.0” https://www.washingtontimes.com/news/2018/apr/26/crosstalk-reality-cold-war-20/ .

Politicians and experts still debate whether the United States and Russia are in a new cold war. Let’s end the suspense. Cold War 2.0 is a reality. U.N. Secretary-General António Guterres shares that view. He ought to know, as he observes daily the hateful rhetoric exchanged by U.S and Russian delegations during Security Council sessions.

The present situation is even more dangerous than during the U.S.-Soviet Cold War. The old safeguards to prevent direct military confrontation and tragic, accidental escalation have long since atrophied.

The U.S.-led attack on Syria on April 13 nearly missed such an accident. We can only guess whether the world should thank U.S. Defense Secretary James Mattis, Joint Chiefs of Staff Chairman Joseph Dunford or President Donald Trump himself for avoiding strikes on Russians in that country – this time.

Unfortunately, judging from the super-toxic anti-Russia atmosphere in Congress and the mainstream media there is no guarantee that we will be so lucky next time another “trigger” event, like a chemical attack, takes place. It hardly matters whether the event is real or faked, since retaliation is unrelated to presentation of evidence against the presumed guilty party.

Objective “beyond the reasonable doubt” has been replaced by subjective “highly likely,” even if the accused perpetrator had no motive, as with the claimed chemical attack in the Syrian city of Douma. Sen. Rand Paul and other prominent American and European figures like, for example, the former head of the British Navy Lord West and possible future British Prime Minister Jeremy Corbyn, share the opinion that the Syrian government had no reason to conduct a chemical attack.

#### Potential flashpoints are multiplying. MAD doesn’t prevent nuclear escalation.

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Entanglement, driven by the development of new non-nuclear technologies that can threaten nuclear weapons and their associated command, control, communication, and information (C3I) systems, is giving rise to the risk that a nonnuclear conflict—even a local one—between the great powers might escalate rapidly and unintentionally into a global nuclear war. This danger is underestimated by politicians and military experts—including in Russia—because of a deeply rooted idea about the nature of war as “a true political instrument, a continuation of political activity by other means,”1 to quote the Prussian general and military strategist Carl von Clausewitz. This belief has led to a visceral assumption among contemporary Russian strategists that the decision to use force—including nuclear weapons—would be a rational step.

A corollary is that, since the great powers—Russia, the United States, and China—would inevitably sustain devastating damage in a nuclear war, none of them would consciously start one, making such a conflict extremely unlikely. This assessment is backed up by the apparent infallibility of mutual nuclear deterrence, and reaffirmed by calculations showing that neither the United States nor Russia could, by striking first in an effort to disarm its opponent, reduce the damage from retaliation to an acceptable level (whatever such a level might be). Russian military and political thinking largely ignores the possibility that the outbreak of a war may be unintended, the result of an uncontrolled escalation of a military action-reaction sequence.2 This may also be true of the new administration in the United States.

But as the history of wars has shown time and again, especially since 1945, a war between the great powers can arise not as the result of planned large-scale aggression but from a chain reaction of military operations by both sides that leads to the escalation of a crisis or regional war involving allies. In such situations, each side views itself as acting purely defensively, even if it carries out offensive actions, while believing that it is the enemy that has aggressive intentions or is reacting disproportionately.

The Cuban Missile Crisis of October 1962 is a case in point: it was sheer luck that saved the world, at several points in this crisis, from a nuclear catastrophe, even though neither side wanted war and both feared its possibility. And, while this crisis may have been the most dangerous episode of the Cold War, it was not exceptional. Other crises and conflicts— including the Suez Crisis of 1956–1957, the Berlin Crisis of 1961, and the 1967 and 1973 Arab-Israeli wars in the Middle East—also threatened to spiral out of control. In each of these cases, there was some risk of nuclear war because the Soviet Union and the United States were involved (to varying degrees).

In the Cold War, the superpowers managed to halt escalation before reaching the precipice of a direct conflict. In today’s more complex world order, this luck may one day run out, with terrible consequences, even though nuclear deterrence between Russia and the United States remains stable in the sense that neither can execute a disarming strike against the other.

Two trends give rise to this increased danger. The first is a general deterioration in international relations, including the tense militarized standoff over Syria and Ukraine between Russia on one hand and the United States and the North Atlantic Treaty Organization (NATO) on the other. This standoff encompasses a large region extending from the Mediterranean and Black Seas to the Baltic and Arctic regions. Tensions are also increasing in the Western Pacific between China and the United States and its allies—although they are presently less serious than in Europe.

The second trend is the development of new military technologies and exotic strategic concepts (such as “nuclear deescalation” and “limited strategic nuclear exchanges”). Of particular consequence is the development of new non-nuclear weapons that might be used in a conflict against an enemy’s nuclear arms, the bases at which those arms are deployed, and their associated command, control, communication, and information systems. Such entanglement erodes the traditional delineation between nuclear and nonnuclear arms, as well as between offensive and defensive systems, and creates the threat of a swift and unintended escalation of a local conventional armed collision between the great powers into a nuclear war.

#### AND Russian hardliners who seek destabilizing military modernization and preemptive warfighting are gaining government support.

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Against this background, Russian military and technical experts are currently engaged in efforts to elaborate strategies for fighting an air-space war. The following is an attempt to frame such an integrated doctrine by one of its main theoreticians, Colonel Yuri Krinitsky from the Military Air-Space Defense Academy: “The integration of aerial and space-based means of attack has transformed airspace and space into a specific field of armed conflict: an air-space theater of military operations. United, systematically organized actions of [U.S.] air-space power in this theater should be countered with united and systematically organized actions by the Russian Air-Space Defense Forces. This is required under the National Security Strategy of the Russian Federation and Air-Space Defense Plan approved by the Russian president in 2006.”6

This document goes on to list the tasks of the Air-Space Defense Forces as “monitoring and reconnaissance of the airspace situation; identifying the beginning of an aerial, missile, or space attack; informing state organs and the military leadership of the Russian Federation about it; repelling air-space attacks; and defending command sites of the top levels of state and military command authorities, strategic nuclear forces’ groupings, and the elements of missile warning systems.”7

While picking apart in detail the organizational, operational, and technical aspects of the Air-Space Defense Forces (now part of the Air-Space Forces),8 military analysts step around the basic question of what constitutes “the means of air-space attack” (SVKN in Russian, MASA in English). This term and “air-space attack” are broadly used in official documents (including the Military Doctrine) and statements, as well as in the new names of military organizations (such as the Air-Space Forces), and in a seemingly infinite number of professional articles, books, and pamphlets.

If MASA refers to aircraft and cruise missiles, then what does space have to do with it? To be sure, various military communication and intelligence, reconnaissance, and surveillance satellites are based in space, but these assets also serve the Navy and Ground Forces without the word “space” tacked onto their names.

If MASA refers to long-range ballistic missiles, which have trajectories that pass mostly through space, then this threat is not new but has existed for more than sixty years. There was—and still is—no defense against a massive ballistic missile strike, and none is likely in the future in spite of U.S. and Russian efforts at missile defense. In the past (and possibly now), one of the possible tasks of ballistic missiles was to break “corridors” in the enemy’s air-defense system to enable bombers to penetrate it. But with ballistic missiles being armed with more warheads with improved accuracy, and with the advent of longrange air-launched cruise missiles, it is increasingly unnecessary for bombers to be able to penetrate enemy air defenses. Coordination between air and notional “space” systems has apparently moved to the background of strategic planning. Anyway, this tactic was never considered as air-space warfare before now.

MASA may be used in reference to potential hypersonic boost-glide weapons, which are discussed below. But their role and capabilities are not yet known, so it would clearly be premature to build the theory of air-space war on them, and even more so to start creating defenses against them. In any case, referring to those weapons as MASA is farfetched: besides a short boost phase, their entire trajectory is in the upper atmosphere at speeds greater than airplanes but lower than ballistic missiles. It is, therefore, even less apt to describe such systems as space arms than it is to refer to traditional long-range ballistic missiles as such. Finally, as for theoretically possible space-based weapons that would conduct strikes against targets on the ground, at sea, and in the air, they do not yet exist, and their future viability is far from clear.

Even if the concept of air-space war is ill-defined, the military and technical experts who propound it reach a predictable conclusion with regard to the capabilities needed to fight one. They typically argue that Russia needs “to counter the air-space attack system with an air-space defense system. . . . A prospective system for destroying and suppressing MASA should be a synergy of anti-missile, anti-satellite, and air-defense missiles, and air units, and radio-electronic warfare forces. And its composition should be multilayered.”9 Such calls are being translated into policy. Most notably, the air-space defense program, for which the military’s top brass and industrial corporations lobbied, is the single largest component of the State Armaments Program through 2020, accounting for about 20 percent of all costs when the program was first announced in 2011—about 3.4 trillion rubles ($106 billion at the time).10 Along with the modernization of the missile early-warning system by the development and deployment of new Voronezh-type land-based radars and missile-launch detection satellites, the program envisages the deployment of twenty-eight missile regiments of S-400 Triumph air-defense systems (about 450 to 670 launchers), and thirty-eight battalions equipped with the next-generation S-500 Vityaz (recently renamed Prometey) systems (300 to 460 launchers).11 In total, the plan is to manufacture up to 3,000 missile interceptors of the two types, for which three new production plants were built. A new integrated and fully automatic command-and-control system is being created to facilitate operations by the Air-Space Defense Forces. The Moscow A-135 missile defense system (now renamed A-235) is being modernized with non-nuclear kinetic interceptors to engage incoming ballistic missiles (previously the interceptors were armed with nuclear warheads).12 The current Russian economic crisis, which has resulted in defense budget cuts in fiscal year 2017, may slow down the air-space armament programs and the scale of arms procurement, but the underlying momentum will be unaffected unless stopped or redirected by a major change in Russia’s defense posture.

In a sense, Russian policy may be explained by the visceral desire of the military to break out from the deadlock—the “strangulating effect”—of mutual assured nuclear destruction, which has made further arms development, high-technology competition, and supposedly fascinating global war scenarios senseless (indeed, it prompted U.S. and Soviet leaders of the 1970s and 1980s to agree that, as then U.S. president Ronald Reagan put it, “a nuclear war cannot be won and must never be fought.”13) During the four decades of the Cold War, several generations of the Soviet military and defense industrial elite had learned and become accustomed to competing with the most powerful possible opponent, the United States, and such competition became their raison d’être.

The end of the Cold War and of the nuclear arms race in the early 1990s deprived them of this supposedly glorious quest, and opposing rogue states and terrorists was not a noble substitute. U.S. and NATO operations in Yugoslavia and Iraq, however, provided a new hightechnology challenge, defined in Russia as air-space warfare, which was eagerly embraced as a new and fascinating domain of seemingly endless competition with a worthy counterpart. Besides, this new dimension of warfare doubtless gave the military and associated defense industries an opportunity to impress political leadership with newly discovered esoteric and frightening threats, justifying the prioritization of national defense, and hence arms procurement programs and large defense budgets.

In any case, the Russian strategy for air-space war is directly connected to the problem of entanglement. Astonishingly—and this makes the concept look quite scholastic—its framers shed no light on the single most important question: Is the context for air-space war a global (or regional) nuclear war, or a non-nuclear war that pits Russia against the United States and NATO?

If it is the former, then in the event of the large-scale use of ballistic missiles armed with nuclear warheads (and in the absence of effective missile defense systems), the Russian Air-Space Forces would be unlikely to function effectively. Except for issuing warnings about incoming missile attacks, they would not be able to fulfill the tasks assigned to them by Russia’s Military Doctrine, including “repelling air-space attacks and defending command sites of the top levels of state and military administration, strategic nuclear forces’ units, and elements of missile warning systems.”14

Alternatively, if air-space war assumes a non-nuclear conflict, then the concept raises serious doubts of a different nature. Russian state and military leaders have regularly depicted terrifying scenarios of large-scale conflicts being won through non-nuclear means. Former deputy defense minister General Arkady Bakhin, for example, has described how “leading world powers are staking everything on winning supremacy in the air and in space, on carrying out massive air-space operations at the outbreak of hostilities, to conduct strikes against sites of strategic and vital importance all across the country.”15 It is difficult to imagine, however, that such a conflict, in reality, would not quickly escalate to a nuclear exchange, especially as strategic forces and their C3I systems were continually attacked by conventional munitions.

Right up until the mid-1980s, the military leadership of the USSR believed that a major war would likely begin in Europe with the early use by Warsaw Pact forces of hundreds of tactical nuclear weapons “as soon as [they] received information” that NATO was preparing to launch a nuclear strike.16 After that, Soviet armies would reach the English Channel and the Pyrenees in a few weeks, or massive nuclear strikes would be inflicted by the USSR and the United States on one another, and the war would be over in a few hours, or at most in a few days, with catastrophic consequences.17

After the end of the Cold War, the task of elaborating probable major war scenarios was practically shelved because such a war had become unthinkable in the new political environment. However, strategic thinking on the next high-technology global war apparently continued in secret (and probably not only in Russia). Now, at a time of renewed confrontation between Russia and the West, the fruits of that work are finally seeing the light of day. In all likelihood, the authors of the strategy imagine that over a relatively long period of time—days or weeks—the West would wage a campaign of air and missile strikes against Russia without using nuclear weapons. Russia, in turn, would defend against such attacks and carry out retaliatory strikes with long-range conventional weapons. Notably, in 2016, Russian Defense Minister Sergei Shoigu stated that “by 2021, it is planned to increase by four times the combat capabilities of the nation’s strategic non-nuclear forces, which will provide the possibility of fully implementing the tasks of non-nuclear deterrence.”18

In other words, the basic premise is that the U.S.-led campaigns against Yugoslavia in 1999 or Iraq in 1990 and 2003 (which are often cited by experts in this context) may be implemented against Russia—but with different results, thanks to the operations of the Russian Air-Space Forces, the Strategic Rocket Forces, and the Navy against the United States and its allies.

The emphasis on defensive and offensive strategic non-nuclear arms does not exclude, but—on the contrary—implies the limited use of nuclear weapons at some point of the armed conflict. Sergei Sukhanov, one of the most authoritative representatives of the defense industries as the constructor general of the Vympel Corporation, which is responsible for designing strategic defense systems, has exposed the whole panorama of Russia’s contemporary strategic logic on the interactions between offensive and defensive systems and between nuclear and non-nuclear systems:

If we cannot exclude the possibility of the large-scale use of air-space attacks by the U.S. and other NATO countries (i.e., if we accept that the Yugoslavian strategy might be applied against Russia), then it is clearly impossible to solve the problem by fighting off air-space attacks with weapons that would neutralize them in the air-space theater, since this would require the creation of highly effective air- and missile defense systems across the country. Therefore, the strategy for solving the air-space defense tasks faced in this eventuality should be based on deterring the enemy from large-scale air-space attacks by implementing the tasks facing air-space defense in this eventuality at a scale that would avoid escalation but force the enemy to refrain from further airspace attack.19 (Emphasis added.) In other words, because of the inevitable limitations in Russia’s ability to defend against air-space attacks, Sukhanov argues that Russia may have to resort to the limited use of nuclear weapons in order to compel the United States and its allies into backing down. This basic logic is widely accepted in Russia.

Judging by the available information, the United States does not have—and is not expected to have for the foreseeable future—the technological means or the operational plans to wage non-nuclear air-space warfare against Russia. However, the fact that a major war with the United States and NATO is *seen* in contemporary Russian strategic thinking as a prolonged endeavor involving an integrated technological and operational continuum of nuclear and non-nuclear operations, defensive and offensive capabilities, and ballistic and aerodynamic weapons creates a breeding ground for entanglement. The result could be the rapid escalation of a local non-nuclear conflict to a global nuclear war. The remainder of this chapter discusses how new and emerging military technologies might contribute to such an escalation.

#### Russia is increasing testing.

Nathan Levine, Fellow at Asia Policy Institute, MA @ AU International Service, 4-13-2019, "Get Ready: Russia Will Soon Try to Kill a Satellite," National Interest, https://nationalinterest.org/blog/buzz/get-ready-russia-will-soon-try-kill-satellite-52232

Russia has been preparing a purpose-built ASAT missile, the A-235 Nudol, for years, development of which has already included seven flight tests. The latest, on December 23, 2018, appeared highly successful, with the missile flying for seventeen minutes and 1,864 miles before splashing into its intended target area at sea. Described by Russian state-media as part of a new “space defense intercept complex,” the Nudol’s flight tests suggest an orbital ballistic intercept trajectory ideal for ASAT operations.

#### Russian preemptive strike is likely and risks immediate nuclear escalation.

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THE IMPLICATIONS OF NON-NUCLEAR STRATEGIC ARMS

An enduring concern among Russia’s leadership is the threat of a massive disarming strike using non-nuclear high-precision weapons. In a non-nuclear conflict, U.S. strikes might inadvertently spark concern that such a counterforce attack was under way. For example, because strategic submarines and bombers are kept at the same bases as generalpurpose naval vessels and aircraft, strikes designed to target the latter might unintentionally destroy the former. That said, the effectiveness of an attempted disarming strike by the United States using conventional cruise missiles—and, in the future, hypersonic boost-glide weapons— backed up by missile defenses would be highly questionable. Indeed, Russia is already investing in the capabilities needed to ensure the survivability of its nuclear forces.

While this reality may cast doubt on the validity of the concerns held by Russia’s leadership, these concerns may actually be motivated by doubts about whether it is possible to deter a conventional first strike by the threat of a massive nuclear response. In practice, however, Moscow might retaliate early with a limited strategic nuclear strike. Alternatively, it might even preempt the United States with selective strategic nuclear strikes to thwart U.S. naval and air forces that were perceived to be deploying for the purpose of initiating, or actually initiating a massive air-space attack.

The co-location of nuclear and general-purpose forces in the Soviet Union and now in Russia was and is prompted by economic and administrative considerations, not by the strategic goal of trying to deter U.S. non-nuclear strikes against Russian general-purpose forces through the threat of nuclear escalation.

At the moment, Russia’s capability to launch non-nuclear strikes against U.S. strategic sites is very limited, though could be enhanced by the acquisition of hypersonic weapons. However, selective strikes against, for example, radars in Britain, Greenland, and Alaska, which provide both warning of a missile attack and support for ballistic missile defense operations, would be feasible but potentially escalatory.

ANTI-SPACE WEAPONS AND ENTANGLEMENT

Both the United States and Russia appear to have significant non-dedicated and potential anti-satellite capabilities. According to Russian thinking, the effectiveness of NATO’s superior high-precision long-range non-nuclear weapons depends on space-based enabling systems, creating a vulnerability that Russia, even in a non-nuclear war, could not fail to take advantage of. Russia is also concerned about threats to its own satellites. Entanglement arises because some of the satellites that might be attacked in a nonnuclear conflict also serve the United States’ or Russia’s strategic nuclear systems. As a result, their destruction would threaten to immediately escalate a war to the nuclear level, especially since strategic forces would probably be on top alert, even in the case of a local armed conflict.

Communication satellites, some of which are important for the command and control of missile submarines at sea and bombers on patrol, would be possible targets. Attacks on early-warning satellites could be even more dangerous. While these satellites would likely remain unaffected by anti-satellite operations during the course of a non-nuclear war, it is difficult to be certain. In particular, for selective nuclear or conventional strategic strikes to be effective, they would have to penetrate the opponent’s missile defenses, which might require neutralizing early-warning satellites first. The loss of Russian early-warning satellites might be considered as a precursor to a counterforce strike and provoke Moscow to initiate the sequence to launch intercontinental ballistic missiles (ICBMs)—though, under standard procedures, the actual launch would probably await attack confirmation by land-based early-warning radars or the destruction of those radars.

#### The Atoms for Peace agenda thaws US-Russia tensions by increasing transparency and reducing Russian nationalist sentiment.

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With those simple questions in mind, I was concerned to read NASA’s announcement last week that, in light of the Crimean crisis, NASA will suspend ‘‘the majority of its ongoing engagements’’ with Russia, with the exception of continued U.S.-Russian cooperation on the International Space Station. I believe that sweeping limitations of this kind are a mistake. A brief review of the past is instructive for understanding the vital role the scientific and technical communities have played and can continue to play in serving as a bridge between our two countries, especially during times of crisis.

With the dawn of the nuclear age and later the space age, the administration of President Dwight D. Eisenhower sought to avert the possibility of fostering an atmosphere of ‘‘paranoid uncertainty’’ between the United States and the Soviet Union. In 1953, in his Atoms for Peace speech, the president opened the way for the peaceful uses of the atom. As part of that proposal he initiated, with the scientific community, the Atoms for Peace conferences that brought countries together from across the globe to exchange papers on power generation, nuclear medicine and agriculture. These conferences, initiated first in 1955, survived the Soviet invasion of Hungary, Sputnik, the U–2 incident, the Cuban missile crisis—as well as the Soviet invasion of Czechoslovakia in 1968. As a result of that engagement, the Soviet Union declassified a whole field of nuclear science: fusion.

In 1955, the International Council of Scientific Unions spearheaded an international effort to study the Earth. Scientists from the United States, the Soviet Union, and sixty-four other countries agreed that the International Geophysical Year would be marked in 1957–1958. Among its activities, it called for the Soviet Union and the United States to launch artificial satellites and it created a forum for international dialogue on science and the future of the Antarctic. This cooperation also survived those above mentioned crises. Despite this, the work of IGY continued and was augmented by U.S.-Soviet negotiations that led the way for the Antarctic Treaty, signed by the United States, the Soviet Union and ten other countries in 1959. This assured in perpetuity the demilitarized status of an entire continent, preserving the Antarctic for international scientific research—a benefit for all of mankind. Had this U.S.-Soviet cooperation been suddenly cut off, who knows what the impact would have been on Antarctica, then a contested continent.

Even though the 1950s/60s are considered to be, perhaps, the most perilous times of the Cold War, U.S.-Russian ‘‘engagement’’ was seen as a way to gauge the thinking of our adversaries, to understand how the other side approaches issues, and to build bonds among those who were not their country’s chief decision makers. In short: a way to mitigate the potential for ‘‘paranoid uncertainty’’ by achieving some level of transparency. At one point concern was such that there was not enough engagement, prompting the successful effort to sign a bilateral General Exchanges Agreement between the United States and the Soviet Union in 1958. Its role was to foster and, in some cases, mandate science, academic and cultural exchanges. This agreement remained in force until the collapse of the Soviet Union.

Space cooperation was a promising new avenue of engagement with the ApolloSoyuz dock up in July 1975. But things began to change with the U.S. boycott of the 1980 Olympics and the suspension of other cooperative activities in the aftermath of the Soviet invasion of Afghanistan. Until the Shuttle Mir programs (1992) very few people from the space community were schooled in the arts of East-West cooperation. If not for the end of the Cold War, the U.S. and the Soviet/Russian programs might have been doomed to continue operating as rival entities. With this history in mind, let me explain at least three reasons why U.S.-Russian space cooperation should be continued without restriction.

First, decoupling could endanger safety.

Much has been said about our mutual dependency in space. It is not just our reliance on Russian crew transport that is at issue, Russia also relies on the United States for communications after launch and for ISS operations. The Russians also have scientific instruments integrated into our Martian and Lunar programs. Even in day-to-day operations, it is logical and important to note that safety of human life requires international cooperation. Last week, NASA Associate Administrator Michael O’Brien wrote a memo to employees explaining the termination of many important relationships:

‘‘This suspension includes NASA travel to Russia and visits by Russian government representatives to NASA facilities, bilateral meetings, e-mail, and teleconferences or video conferences. At the present time, only operational International Space Station activities have been excepted.’’

But where does work on the ISS begin and where does it end? Continuous improvement and enhanced work on human safety and hardware investment is often made through tangential contacts and interaction. How easy will it be to draw the line between these baskets of activity if there cannot be visits between our two country’s facilities or even e-mail exchanges? This could be of major significance if there is an emergency in space that impacts the community beyond the operational side of the ISS.

Second, if the goal of suspending cooperation is designed to send a strong message to President Putin, we need be careful. It could backfire. While it is true that NASA and its Russian counterpart, Roscosmos, have maintained a professional, beneficial, and collegial working relationship through the various ups and downs of the broader U.S.-Russia relationship, we are assuming that the ISS program will be unaffected by the current policy. In other words, we are presuming that Russian forbearance in this case is ‘‘a given.’’ In recent days, however, there have been cries in the Russian Duma to respond to the cancellation of contacts with the U.S.

Of greatest concern to me, however, is the long-term impact. The Russian scientific community has traditionally been the most progressive of all political sectors in that country. People who are involved in international scientific cooperation are less likely to be nationalists. Rather than sending a strong message to President Putin, suspension of cooperation will strengthen hardliners who would prefer that Russia ‘‘go it alone’’ or work with countries more sympathetic to their views, such as China.

From a U.S. perspective, we cannot afford to lose another generation of people who know how to cooperate with Russia on science and technology, especially with baby boomers retiring.

Finally, those who are aggressively pushing for using space as a way to ‘‘punish Russia’’ should be reminded that contact with countries that have such technical capabilities have, in the past, been a way to enhance transparency. In my book, Partners in Space: U.S.-Russian Cooperation after the Cold War (2004), our research revealed:

Cooperation has had a dramatically positive impact on the transformation of the Soviet hardliner aerospace industry, bringing unprecedented transparency and a move toward western best practices. Increased transparency has reinforced both expanded commercial cooperation and the political goals of civil space cooperation (e.g., nonproliferation).

Today, ‘‘Curiosity,’’ NASA’s Mars Science Laboratory, has a Russian instrument on it that uses adapted technology from the heart of the Russian nuclear weapons program. This is a perfect example of how space cooperation has aided in providing greater transparency on the Russian program.

Partners in Space also found that cooperation with Russia brought significant benefits, not only to our national security, but also to our technical knowledge—as Russians were at that time the leaders in long-duration space flight. Since then the lessons we have learned together have strengthened our overall performance in space and have provided an indispensable window into the workings of the Russian military-industrial establishment.

Conclusion

As we know from history, it is always easier to terminate scientific and technical cooperation than it is to get it started again. Before we codify this potential mistake, we must recall that there are ample historical precedents to support the value of science and technology cooperation, even in times of crisis. Space cooperation should be exempt from sanctions, just as Atoms of Peace and IGY survived the tumultuous ups and downs of the Cold War.

Space cooperation is the ultimate global bridge, and international space has unique capacities to serve the global community. It can be a force for preventive diplomacy, transparency and for sustaining and building bonds among those who are willing to put aside solely national pursuits. Like terrestrial cooperation, exemplified by the International Geophysical Year, space cooperation can serve as a stabilizing factor in space. The lynchpin of this goal must be engagement. Through consistent interaction, larger goals can also be realized. This can only enhance America’s national security. We must be wary of any space policy that provides only short-term symbolic satisfaction, just as we should be cautious of those who might want to exploit this crisis for short-term commercial or political gain. They could, ultimately, undermine our long-term strategy in space and possibly jeopardize the enormous human and financial investment we have already made.

On March 27, 2014, former Senator Sam Nunn and former Secretary George Shultz wrote in a Washington Post op-ed, ‘‘A key to ending the Cold War was the Reagan administration’s rejection of the concept of linkage, which said that bad behavior by Moscow in one sphere had to lead to a freeze of cooperation in all spheres.’’

I would add that linkages between geopolitical crises and space should be avoided in favor of more direct ways to impose sanctions. Space can serve as at least one example of what it really means for the global community to set goals and see them through for the betterment of mankind.

### 1AC – Prolif

#### Advantage Two: Nunn-Lugar

#### Russian academic salaries face continued decline.

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The system of higher education in Russia, as in many other countries, is in the midst of reforms related to the global trends of globalization and transformation to a knowledge economy. In order to successfully respond to these global challenges, it is necessary to improve the quality of the university sector and rethink the role of professors in enhancing academic productivity. A 20-year period of recession after the collapse of the Soviet Union has led to a diversification of universities and teachers and resulted in both a sharp fall in academic salaries and a decline in the attractiveness of the academic profession. Since the professoriate constitutes the main source of academic productivity, this article assesses the consequences of the decline in the academic sector before the start of major reforms of academic salaries. Using the data from the ‘The Changing Academic Profession’ project (CAP-Russia 2012 subsample), we identified and evaluated the activities of the professoriate that determine the income of university staff. The results show that, in general, the number of publications positively affected academic salaries, but for certain indicators of research activity, the effects are ambiguous. Administrative duties are important for academic salaries, with a positive effect ranging from 15 to 51%. Seniority also has a positive impact on a professor’s salary. The most consistent results in the pre-reform period were obtained for National research universities (NRUs), where academic salaries are determined by research activity (articles in academic journals) and administrative duties. Salaries rise with seniority, which corresponds to the human capital theory (as well as alternative theories). Salaries in NRUs also reflect gender equality. The results of the study can be used to assess the consequences of the recession in the academic sector in Russia and as a baseline for analyzing current reforms in universities.

#### Salary declines causes brain drain to rogue states.

CANDACE RONDEAUX, Professor of Practice in the School of Politics and Global Studies at Arizona State University and DAVID STERMAN, senior policy analyst at New America and holds a master's degree from Georgetown’s Center for Security Studies, ’19, “TWENTY-FIRST CENTURY PROXY WARFARE,” https://d1y8sb8igg2f8e.cloudfront.net/documents/Twenty-First\_Century\_Proxy\_Warfare\_Final.pdf

Further complicating the situation is the acceleration of technological development, wider availability of dual-use technologies, and technical knowhow and its diffusion across borders. During the 1990s and early 2000s, concern about potential migration of Russian scientists looking to earn higher salaries by serving in WMD programs in states like North Korea, Syria, and Iran prompted the United States to spend millions on grant programs designed to keep Russian scientists at home. While those programs proved fairly effective, at least one major study suggested that the temptation to work for so-called rogue states has not been entirely extinguished.

#### Russian scientists are statistically likely to work for rogue states. Western assistance programs solves.

Deborah Yarsike Ball, National Security Analyst in the Proliferation and Terrorism Prevention Program at Lawrence Livermore National Laboratory and Theodore P. Gerber, Professor of Sociology at the University of Wisconsin–Madison, ‘5 “Does Western Assistance Reduce the Proliferation Threat?” International Security, Vol. 29, No. 4 (Spring 2005), pp. 50–77

Our data from an unprecedented survey of 602 Russian scientists indicate that the brain drain threat from Russia should still be at the forefront of policymakers’ and the public’s attention: roughly 20 percent of Russian physicists, chemists, and biologists say they would consider working in Iran, Iraq,3 North Korea, or Syria—nations that, for the sake of brevity, we refer to as “rogue.”4 To be sure, the vast majority of Russian scientists feel a great weight of responsibility for how their WMD knowledge is used and would not help rogue states or terrorists acquire weapons of mass destruction. Yet given the enormous security implications, the possibility that one-fifth of the scientists would consider working in rogue countries is cause for concern.

The question that remains is: have Western efforts to stem the willingness of Russian scientists to sell their WMD expertise to rogue countries been effective? The data reveal that U.S. and Western nonproliferation assistance programs do indeed work. They significantly reduce the likelihood that Russian scientists would consider working in such countries. To our surprise, the data also suggest that Russian, as opposed to Western, grants do not lessen such scientists’ propensity to work in these rogue countries.

#### Brain drain causes prolif and nuclear terrorism

Maria Katsva, Research Coordinator at the Center for International Trade and Security at the University of Georgia in Athens, “Weapons of mass destruction brain drain from Russia: Problems and perspectives,” ’00, The Journal of Slavic Military Studies, 13:1, 46-67

The most problematic and often practised way of cooperation with rogue states seems to be the training of specialists in these countries. Teaching and training include both directly leaving the state and teaching in rogue states and providing education to students of these countries in Russia. Russian experts go to a rogue state, assist in solving problems in their programs, teach students and come back. They encourage their colleagues and friends to go for training courses and to return. On the other hand, training is the best way for the rogue state specialists to both obtain information and receive further knowledge. For Russian experts that means that they are able to earn money, and to return. Training and teaching foreign students (including Iranian, Korean, Chinese etc) in Russia is legal; it gives poor Russian educational institutes real money, and all attempts to prevent it could be treated as illegal.

If brain drain is understood in a broader sense, as transfering know-how, it should also include transfers of technologies, designs and laboratory experiments results — all the scope of knowledge and know-how. It seems that broader understanding is more correct since it includes all the results of the brain's activity (excluding materials and equipment). This kind of braindrain could also be called by a more scientific name - intangible technologies, which become problem number one all over the world, and nobody knows how to solve it.

Thus, direct brain drain should be regulated by transportation, migrations and travel security measures; indirect brain drain by the system of intellectual property protection. Both should be enforced by criminal and administrative measures as a stick, and economic measures preventing brain drain from a country as a carrot.

Why is brain drain so dangerous? Analysis prior to brain drain problems focused on smuggling nuclear materials and technologies which are necessary for producing nuclear weapons. Although these two components are absolutely sufficient for producing nuclear device/ weapon, knowledge (skills, know-how) and technologies seem even more important and more difficult to obtain. Nuclear materials and even technologies can be bought, smuggled, or obtained by other means. However, if terrorists or rogue states have not enough knowledge to use them, technologies and nuclear materials would not make much sense. The importance of brains and knowledge is greater than the importance of materials and goods. Thus, the role of the human factor (know-how and highly skilled professionals) if not the key is the most important factor. The now defunct nuclear programs of South Africa illustrate this.

Hence Russian understanding of brain drain as well as nonproliferation and security threat is very different from the American understanding, although recently the US has put Russia under pressure to accept some security concerns dealing with 'rogue states' and to approve related directives, especially for cooperation with Iran and Iraq. Russia treats all the states equally which has a positive impact, too. Mostly intangible technologies transfers as well as technology transfers deal with dual-use technology. Dual-use technologies transfers could be limited but not prohibited because otherwise the temptation to violate the rule by business would be irresistible. On the other hand, splitting the world into good and bad guys is wrong as a principle since yesterday's good guy could become bad tomorrow, or could transfer know-how to a bad guy.

#### Joint tech prevents Russian scientists

Richard Dabrowski, Lieutenant Colonel @ USAF, PhD instructional systems technology @ Indiana University, faculty member @ George C. Marshall European Center for Security Studies, ’13, “U.S.–Russian Cooperation in Science and Technology: A Case Study of the TOPAZ Space-Based Nuclear Reactor International Program,” The Quarterly Journal, Winter 2013.

From the U.S. perspective, the work done in Russia had the potential to reduce the cost and time required to develop an equivalent U.S. technology base. Another consideration is that joint thermionic technology efforts kept highly skilled Russian nuclear experts employed in Russia. Funding for their institutes also allowed Russian scientists and engineers to adopt new skills that were useful in an open-market economy so that they were better able to market products that they had created. Using funds received from the United States under these contracts, the Russian institutes were able to convert some of their defense activities into peaceful civilian ones and develop a number of new technologies such as ozone-friendly refrigerants, ceramic/metal x-ray tubes for medicine, ultra-strong mono-crystalline alloys, and other products.

#### Independently, nuclear power cooperation allows repurposing of the remaining 20% of soviet loose nukes.

Siegfried S. Hecker, Former Director of Los Alamos National Labs, Professor of Engineering at Stanford, ’17, “Lab-to-Lab Cooperative Threat Reduction,” AIP Conference Proceedings 1898, 020010

The Soviet Union was estimated to have roughly 39,000 nuclear weapons near the time of its dissolution, spread across the 11 time zones of its republics. Most of the weapons were in the Russian Federation, but significant stockpiles were left in the now independent countries of Ukraine, Kazakhstan, and Belarus. The huge Soviet nuclear complex of some 60 sites with 10 dedicated closed cities and hundreds of facilities had produced nearly 1.4 million kilograms of fissile materials, namely, plutonium and enriched uranium, that could fuel nuclear weapons. The combined military and civilian nuclear complex employed one million people.

David Hoffman tells the story of how the Cold War arms race came to an end to leave a legacy of peril in his Pulitzer Prize winning book, The Dead Hand.2 He points out that the worst fears during the last days of the Soviet Union were that loose nukes, fast money, and a weak state would come together to present Russia and the former Soviet states with “an inheritance from hell.” To Washington, everything in Russia’s nuclear complex posed only dangers and offered no benefits. This was the predominant American view and, quite frankly, it was believed to be an inheritance from hell for the rest of the globe as well.

Yet, none of the West’s fears came to pass. In the nearly 25 years since the Soviet dissolution, there has been no perfect storm—no disaster in Russia’s nuclear weapons complex, no serious nuclear accidents, very limited loss of nuclear material, limited leakage of nuclear weapons know-how or brain drain, and no nuclear weapons stolen, sold, or diverted. How did this happen? In Doomed to Cooperate, I argue that the extraordinary professionalism, dedication, and patriotism of the Russian nuclear weapons workers and leaders, combined with an extraordinary and timely assist from the United States through innovative government programs and scientific cooperation, saved the world from potential disaster. Numerous firsthand accounts from Russian scientists and their leaders, published for the first time in the book, capture the extraordinary actions of the Russians at the frontlines of the nuclear dangers, actions enabled and enhanced by direct scientific cooperation between the Russian and American nuclear laboratories.

In retrospect, in spite of the current political acrimony between Moscow and Washington, cooperative threat reduction, including scientific cooperation, served the United States well because it helped avoid a nuclear disaster of unknown proportions. Cooperation also enabled the rapid implementation of a series of nuclear weapons treaties, which over 30 years resulted in a nearly 80 percent reduction in each country’s nuclear arsenal. It brought longneeded relief from Cold-War tensions and fears of annihilation. Cooperation benefitted Moscow as well. Most importantly, it allowed Russia to safely reduce its nuclear arsenal, which involved the difficult tasks of transporting record numbers of nuclear weapons, disassembling them, and storing the fissile materials safely and securely. Bilateral cooperation greatly enhanced security in Russia’s nuclear complex and its military sites, allowing them to be upgraded to meet the new challenging security environment resulting from the dissolution of the Soviet Union. Cooperation between Russian nuclear scientists and engineers and their American counterparts facilitated successful resolution of many of the most sensitive nuclear security challenges and helped to prevent a brain drain, that is, the leakage of technical expertise outside the Russian nuclear complex.

Doomed to Cooperate tells the stories of lab-to-lab collaboration between Russian and American nuclear weapon lab scientists. This article also focuses on that collaboration and how it helped to avert the nuclear dangers that arose with the breakup of the Soviet Union.

#### Prolif empirically increases the risk of nuclear war.

Quek 16 (Department of Politics and Public Administration, University of Hong Kong (Kai, “Nuclear Proliferation and the Use of Nuclear Options,” Political Research Quarterly June 2016 vol. 69 no. 2 195-206) [“N” in “N = 2” refers to the number of states with a nuclear option in a crisis)

Does nuclear proliferation affect the risk that nuclear weapons will be used in a crisis? The question implicates human survival but is difficult to study, as observations of nuclear war do not actually exist. Our empirical knowledge is thus limited. I use experimental games with nuclear options to circumvent the observational constraint and construct empirical tests. I find that decisions are mostly peaceful at N = 2 despite the existence of nuclear options with a relative first-strike advantage. This finding is especially relevant as most nuclear-state confrontations in history had been bilateral crises. More generally, I find that one is less likely to choose the nuclear option when it is known that the number of nuclear actors in the crisis is small, and more likely to choose the nuclear option when it is known that the number of nuclear actors is large. In particular, a jump in the number of nuclear actors in crisis beyond N = 2 significantly increases the chance of choosing the nuclear option. Preliminary probes also suggest that players in inter-alliance crises are more peaceful when they have second-strike countervalue capabilities, and that nuclear framing has no significant effect on the use of the nuclear option. To my knowledge, this is the first randomized experiment in political science that focuses on the relationship between proliferation and the use of nuclear options.23 In a fortunate world where nuclear war remains unobserved, there are justifications for an experimental approach on theoretical, practical, and ethical grounds. Methodologically, the use of a controlled experiment also allows for a clean identification of the causal relationship,. This experiment focuses exclusively on the strategic dimension. It also assumes that the crisis has already escalated to the point where players are considering the use of the nuclear option, and thus it does not address the ex ante question of whether nuclear weapons would make states more cautious about avoiding conflict escalation in the first place (Waltz 2003). Nonetheless, while the focus of the experiment is narrow, it is a useful first step toward understanding the strategic effects of proliferation on the risk of nuclear conflict. Several implications arise for future research. First, with the basic mechanism established, we now have a baseline for future experiments that explore various realistic complications to the nuclear-option game. For instance, do interactions between nuclear actors change when we introduce different types of psychological stress, or different stake sizes, or different asymmetries in the expected cost of nuclear conflict? In particular, an interesting extension of this experiment would be to study how behavior differs—or does not—across interactions with different combinations of nuclear and non-nuclear actors. The results suggest that distrust over the rationality of other players increases with an increase in the N parameter, and weakens the tendency toward the payoff-dominant outcome of peaceful restraint. Thus, proliferation may be dangerous even in a world of states trying to behave rationally, contrary to the arguments made by Waltz (2003) and others in which the common knowledge of rationality is assumed. The results also offer an interesting contrast with Asal and Breadsley’s (2007) finding that the risk of (non-nuclear) war is higher when the number of nuclear actors in crisis is lower. This contrast raises the hypothesis that states in bilateral crises may choose to drag out a crisis as the risk of nuclear war is lower under N = 2, as suggested by our results.24 This hypothesis has practical importance and should be investigated in future research.

#### Prolif makes accidents and nuclear terrorism likely.

Ramesh Thakur 15. Director of the Centre for Nuclear Non-Proliferation and Disarmament in the Crawford School of Public Policy, The Australian National University. 2015. “Nuclear Weapons and International Security.” Routledge.

The world faces two existential threats: climate change and nuclear Armageddon. Those who reject the first are derided as denialists; those dismissive of the second are praised as realists. Nuclear weapons may or may not have kept the peace among various groups of rival states; they could be catastrophic for the world if ever used by both sides in a war between nuclear-armed rivals; and the prospects for their use have grown since the end of the Cold War. Even a limited regional nuclear war in which India and Pakistan used 50 Hiroshima-size (15kt) bombs each could lead to a famine that kills up to a billion people. 1 Having learnt to live with nuclear weapons for 70 years (1945–2015), we have become desensitized to the gravity and immediacy of the threat. The tyranny of complacency could yet exact a fearful price with nuclear Armageddon. The nuclear peace has held so far owing as much to good luck as sound stewardship. Deterrence stability depends on rational decision-makers being always in office on all sides: a dubious and not very. reassuring precondition It depends equally critically on there being no rogue launch, human error or system malfunction: an impossibly high bar. For nuclear peace to hold, deterrence and fail-safe mechanisms must work every single time. For nuclear Armageddon, deterrence or fail-safe mechanisms need to break down only once. This is not a comforting equation. It also explains why, unlike most situations where risk can be mitigated after disaster strikes, with nuclear weapons all risks must be mitigated before any disaster. 2 As more states acquire nuclear weapons, the risks multiply exponentially with the requirements for rationality in all decision-makers; robust command-and-control systems in all states; 100 percent reliable fail-safe mechanisms and procedures against accidental and unauthorized launch of nuclear weapons; and totally unbreachable security measures against terrorists acquiring nuclear weapons by being able to penetrate one or more of the growing nuclear facilities or access some of the wider spread of nuclear material and technology. It is far from clear that the old, Cold War parameters of classical deterrence will prove adequate to the new contingencies and risks. It really is long past time to lift the shroud of the mushroom cloud from the international body politic. Five paradoxes set the context for this final concluding chapter. First, the central paradox of nuclear deterrence may be bluntly stated: nuclear weapons are useful only if the threat to use them is credible, but they must never be used. Second, they are useful for some but must be stopped from spreading to anyone else. Third, the most substantial progress so far on dismantlement and destruction of nuclear weapons has occurred as a result of bilateral US and Soviet/Russian treaties, agreements and measures, most recently a new Strategic Arms Reduction Treaty (New START). But a nuclear-weapon-free world will have to rest on a legally binding multilateral international instrument such as a nuclear weapons convention (NWC). Fourth, although nuclear weapons play a lesser role in shaping US–Russia relations today than during the Cold War, the prospects of their use by others in some tense, conflict-prone regions have grown. Fifth, the existing treaty-based regimes have collectively anchored international security and can be credited with many major successes and significant accomplishments. But their accumulating anomalies, shortcomings and flaws suggest that they, or at least some of them, may have reached the limits of their success. The critical challenge, therefore, becomes how to manage the transition to their replacement for the post-nuclear order without undermining their achievements and jeopardizing the security of the existing nuclear orders. On the edge of the cliff Forty-five years after the NPT came into force in 1970, the world is still perilously close to the edge of the nuclear cliff. The cliff is perhaps not quite as steep as it was in the 1980s, but going over it would be fatal for planet Earth. Authoritative roadmaps exist to walk us back to the relative safety of a denuclearized world, but a perverse mixture of hubris and arrogance on the part of the nuclear-armed states exposes us to the risk of sleepwalking into a nuclear disaster. The point to remember about sleepwalking is that people doing it are unaware of it. The number of times that we have come frighteningly close to nuclear holocaust is simply staggering. According to one study by a US nuclear weapon laboratory in 1970 (obtained through the Freedom of Information Act), more than 1,200 nuclear weapons were involved in accidents (most trivial, but some significant) between 1950 and 1968 because of security breaches, lost weapons, failed safety mechanisms or accidents resulting from weapons being dropped or crushed in lifts, etc. 3 For example, a B-52 bomber loaded with 12 hydrogen bombs and nuclear warheads caught fire in Grand Forks, North Dakota, in September 1980. In the same month, a dropped socket punctured the fuel tank of a Titan II ICBM mounted with ‘the most powerful nuclear warhead ever built by the US’ until then at a missile silo near Damascus, Texas. One man was killed in the resulting explosion and the warhead was thrown several hundred feet from its basing silo. 4 It has now been confirmed that on 21 January 1961, a four-megatonne bomb (that is, 260 times more powerful than Hiroshima) was just one ordinary switch away from detonating over North Carolina whose effects would have covered Washington, Baltimore, Philadelphia and even New York City. Just days after President John F. Kennedy’s inauguration, a B-52 bomber on a routine flight went into an uncontrolled spin. Two four-megatonne hydrogen bombs fell loose over Goldsboro, North Carolina, and one, assuming that it had been deliberately released over an enemy target, began the detonation process. Three of the four fail safe-mechanisms failed and only the final, a simple dynamo technology lowvoltage switch, averted what would have been the greatest disaster in US history with millions of lives at risk. 5 In the 1962 Cuban missile crisis, the US strategy was based on the best available intelligence which indicated that there were no nuclear warheads in Cuba. In fact, there were 162 warheads already stationed there, including 90 tactical warheads, and the local Soviet commander had taken them out of storage to deployed positions for use against an American invasion. 6 Recently declassified British cabinet documents show that there was another near miss in November 1983. In response to NATO war games exercise Able Archer, which Moscow mistook to be real, the Soviets came close to launching a full-scale nuclear attack against the West under the misapprehension that a NATO nuclear attack was imminent. And the West was blissfully unaware of this at the time. 7 In January 1995, mistaking a Norwegian weather rocket for a US SLBM, Russia’s senior military officials reportedly advised President Boris Yeltsin – the first leader in Moscow to have the ‘nuclear suitcase’ opened for him – to launch Russian missiles. He demurred. 8 In 2007, a weapons crew at the US Air Force (USAF) base in Minot, North Dakota, mistakenly loaded a B-52 bomber with six nucleararmed cruse missiles. The plane flew across the country to the USAF base in Barksdale, Louisiana, where the bombs were left unsecured for 36 hours. When eventually personnel there realised that the bombs were nuclear, not conventional, they informed their counterparts back in Minot – who had not detected the missing bombs until then. 9 In a closely argued article, Gareth Evans systematically demonstrates the fallacy or extraordinary weakness of the deterrence-based arguments. 10 Nuclear weapons have failed to stop wars between nuclear and non-nuclear rivals (Korea, Afghanistan, Falklands, Vietnam, the 1990–91 Gulf War). Their deterrent utility is severely qualified by the belief among potential target regimes that they are essentially unusable because of the powerful normative taboo. The utility of nuclear deterrence is questionable in shaping relations between: a) major nuclear rivals, b) asymmetric middle-power nuclear rivals, and c) small–major power nuclear pairs of countries. On the first, the role of nuclear weapons in having preserved the peace during the Cold War is debatable. How do we assess the relative weight and potency of nuclear weapons, West European integration and West European democratization as explanatory variables in that long peace? Nor has there been any evidence produced to show that either side had the intention to attack the other at any time during the Cold War but was deterred from doing so because of nuclear weapons held by the other side. 11 Conversely, the Soviet Union’s territorial expansion across Eastern and Central Europe behind Red Army lines took place in the years of US atomic monopoly, 1945–49, and it imploded after, although not because of, gaining strategic parity. With asymmetric middle-power nuclear rivals too national security strategists face a fundamental and unresolvable paradox. In order to deter a conventional attack by a more powerful nuclear adversary, each nuclear-armed state must convince its stronger opponent of the ability and will to use nuclear weapons if attacked. But if the attack does occur, escalating to nuclear weapons will worsen the scale of military devastation even for the side initiating nuclear strikes. Because the stronger party believes this, the existence of nuclear weapons may add an extra element of caution but does not guarantee complete and indefinite immunity for the weaker party. Are those who profess faith in the essential logic of nuclear deterrence prepared, following Waltz, 12 to support the acquisition of nuclear weapons by Iran in order to contribute to the peace and stability of the Middle East which at present has only one nuclear-armed state? It is equally contestable that nuclear weapons buy immunity for small states against attack by the powerful. North Korea is often held up as an example of this, especially against the backdrop of the invasion of Iraq in 2003 and the 2011 fate of Muammar Gaddafi after Libya’s 2003 abandonment of clandestine nuclear weapons pursuit. 13 However, the biggest caution in attacking North Korea in response to its serial provocations lies in uncertainty about how China would respond, followed by worries about the DPRK’s conventional capacity to devastate Seoul and other parts of South Korea. Pyongyang’s puny present and prospective arsenal of nuclear weapons and the rudimentary capacity to deploy and use them credibly is a distant third factor in the deterrence calculus. Nuclear weapons status comes with a significant economic cost. They have not permitted any of the nine states that have them to buy defence on the cheap. There is the added risk of proliferation to extremist elements through leakage, theft, state collapse and state capture. There are political costs and risks of creating a national security state with a premium on increased secretiveness and reduced public accountability.

#### Nuclear terror causes nuclear war.

Roth and Bunn, PhDs, 17 (Matthew, Prof@HarvardKennedySchool, Nickolas, Researcher@HarvardBelfastcenter, The effects of a single terrorist nuclear bomb," Bulletin of the Atomic Scientists, 9-28-2017, http://thebulletin.org/effects-single-terrorist-nuclear-bomb11150)

The escalating threats between North Korea and the United States make it easy to forget the “nuclear nightmare,” as former US Secretary of Defense William J. Perry put it, that could result even from the use of just a single terrorist nuclear bomb in the heart of a major city. At the risk of repeating the vast literature on the tragedies of Hiroshima and Nagasaki—and the substantial literature surrounding nuclear tests and simulations since then—we attempt to spell out here the likely consequences of the explosion of a single terrorist nuclear bomb on a major city, and its subsequent ripple effects on the rest of the planet. Depending on where and when it was detonated, the blast, fire, initial radiation, and long-term radioactive fallout from such a bomb could leave the heart of a major city a smoldering radioactive ruin, killing tens or hundreds of thousands of people and wounding hundreds of thousands more. Vast areas would have to be evacuated and might be uninhabitable for years. Economic, political, and social aftershocks would ripple throughout the world. A single terrorist nuclear bomb would change history. The country attacked—and the world—would never be the same. The idea of terrorists accomplishing such a thing is, unfortunately, not out of the question; it is far easier to make a crude, unsafe, unreliable nuclear explosive that might fit in the back of a truck than it is to make a safe, reliable weapon of known yield that can be delivered by missile or combat aircraft. Numerous government studies have concluded that it is plausible that a sophisticated terrorist group could make a crude bomb if they got the needed nuclear material. And in the last quarter century, there have been some 20 seizures of stolen, weapons-usable nuclear material, and at least two terrorist groups have made significant efforts to acquire nuclear bombs. Terrorist use of an actual nuclear bomb is a low-probability event—but the immensity of the consequences means that even a small chance is enough to justify an intensive effort to reduce the risk. Fortunately, since the early 1990s, countries around the world have significantly reduced the danger—but it remains very real, and there is more to do to ensure this nightmare never becomes reality. Brighter than a thousand suns. Imagine a crude terrorist nuclear bomb—containing a chunk of highly enriched uranium just under the size of a regulation bowling ball, or a much smaller chunk of plutonium—suddenly detonating inside a delivery van parked in the heart of a major city. Such a terrorist bomb would release as much as 10 kilotons of explosive energy, or the equivalent of 10,000 tons of conventional explosives, a volume of explosives large enough to fill all the cars of a mile-long train. In a millionth of a second, all of that energy would be released inside that small ball of nuclear material, creating temperatures and pressures as high as those at the center of the sun. That furious energy would explode outward, releasing its energy in three main ways: a powerful blast wave; intense heat; and deadly radiation. The ball would expand almost instantly into a fireball the width of four football fields, incinerating essentially everything and everyone within. The heated fireball would rise, sucking in air from below and expanding above, creating the mushroom cloud that has become the symbol of the terror of the nuclear age. The ionized plasma in the fireball would create a localized electromagnetic pulse more powerful than lightning, shorting out communications and electronics nearby—though most would be destroyed by the bomb’s other effects in any case. (Estimates of heat, blast, and radiation effects in this article are drawn primarily from Alex Wellerstein’s “Nukemap,” which itself comes from declassified US government data, such as the 660-page government textbook The Effects of Nuclear Weapons.) At the instant of its detonation, the bomb would also release an intense burst of gamma and neutron radiation which would be lethal for nearly everyone directly exposed within about two-thirds of a mile from the center of the blast. (Those who happened to be shielded by being inside, or having buildings between them and the bomb, would be partly protected—in some cases, reducing their doses by ten times or more.) The nuclear flash from the heat of the fireball would radiate in both visible light and the infrared; it would be “brighter than a thousand suns,” in the words of the title of a book describing the development of nuclear weapons—adapting a phrase from the Hindu epic the Bhagavad-Gita. Anyone who looked directly at the blast would be blinded. The heat from the fireball would ignite fires and horribly burn everyone exposed outside at distances of nearly a mile away. (In the Nagasaki Atomic Bomb Museum, visitors gaze in horror at the bones of a human hand embedded in glass melted by the bomb.) No one has burned a city on that scale in the decades since World War II, so it is difficult to predict the full extent of the fire damage that would occur from the explosion of a nuclear bomb in one of today’s cities. Modern glass, steel, and concrete buildings would presumably be less flammable than the wood-and-rice-paper housing of Hiroshima or Nagasaki in the 1940s—but many questions remain, including exactly how thousands of broken gas lines might contribute to fire damage (as they did in Dresden during World War II). On 9/11, the buildings of the World Trade Center proved to be much more vulnerable to fire damage than had been expected. Ultimately, even a crude terrorist nuclear bomb would carry the possibility that the countless fires touched off by the explosion would coalesce into a devastating firestorm, as occurred at Hiroshima. In a firestorm, the rising column of hot air from the massive fire sucks in the air from all around, creating hurricane-force winds; everything flammable and everything alive within the firestorm would be consumed. The fires and the dust from the blast would make it extremely difficult for either rescuers or survivors to see. The explosion would create a powerful blast wave rushing out in every direction. For more than a quarter-mile all around the blast, the pulse of pressure would be over 20 pounds per square inch above atmospheric pressure (known as “overpressure”), destroying or severely damaging even sturdy buildings. The combination of blast, heat, and radiation would kill virtually everyone in this zone. The blast would be accompanied by winds of many hundreds of miles per hour. The damage from the explosion would extend far beyond this inner zone of almost total death. Out to more than half a mile, the blast would be strong enough to collapse most residential buildings and create a serious danger that office buildings would topple over, killing those inside and those in the path of the rubble. (On the other hand, the office towers of a modern city would tend to block the blast wave in some areas, providing partial protection from the blast, as well as from the heat and radiation.) In that zone, almost anything made of wood would be destroyed: Roofs would cave in, windows would shatter, gas lines would rupture. Telephone poles, street lamps, and utility lines would be severely damaged. Many roads would be blocked by mountains of wreckage. In this zone, many people would be killed or injured in building collapses, or trapped under the rubble; many more would be burned, blinded, or injured by flying debris. In many cases, their charred skin would become ragged and fall off in sheets. The effects of the detonation would act in deadly synergy. The smashed materials of buildings broken by the blast would be far easier for the fires to ignite than intact structures. The effects of radiation would make it far more difficult for burned and injured people to recover. The combination of burns, radiation, and physical injuries would cause far more death and suffering than any one of them would alone. The silent killer. The bomb’s immediate effects would be followed by a slow, lingering killer: radioactive fallout. A bomb detonated at ground level would dig a huge crater, hurling tons of earth and debris thousands of feet into the sky. Sucked into the rising fireball, these particles would mix with the radioactive remainders of the bomb, and over the next few hours or days, the debris would rain down for miles downwind. Depending on weather and wind patterns, the fallout could actually be deadlier and make a far larger area unusable than the blast itself. Acute radiation sickness from the initial radiation pulse and the fallout would likely affect tens of thousands of people. Depending on the dose, they might suffer from vomiting, watery diarrhea, fever, sores, loss of hair, and bone marrow depletion. Some would survive; some would die within days; some would take months to die. Cancer rates among the survivors would rise. Women would be more vulnerable than men—children and infants especially so. Much of the radiation from a nuclear blast is short-lived; radiation levels even a few days after the blast would be far below those in the first hours. For those not killed or terribly wounded by the initial explosion, the best advice would be to take shelter in a basement for at least several days. But many would be too terrified to stay. Thousands of panic-stricken people might receive deadly doses of radiation as they fled from their homes. Some of the radiation will be longer-lived; areas most severely affected would have to be abandoned for many years after the attack. The combination of radioactive fallout and the devastation of nearly all life-sustaining infrastructure over a vast area would mean that hundreds of thousands of people would have to evacuate. Ambulances to nowhere. The explosion would also destroy much of the city’s ability to respond. Hospitals would be leveled, doctors and nurses killed and wounded, ambulances destroyed. (In Hiroshima, 42 of 45 hospitals were destroyed or severely damaged, and 270 of 300 doctors were killed.) Resources that survived outside the zone of destruction would be utterly overwhelmed. Hospitals have no ability to cope with tens or hundreds of thousands of terribly burned and injured people all at once; the United States, for example, has 1,760 burn beds in hospitals nationwide, of which a third are available on any given day. And the problem would not be limited to hospitals; firefighters, for example, would have little ability to cope with thousands of fires raging out of control at once. Fire stations and equipment would be destroyed in the affected area, and firemen killed, along with police and other emergency responders. Some of the first responders may become casualties themselves, from radioactive fallout, fire, and collapsing buildings. Over much of the affected area, communications would be destroyed, by both the physical effects and the electromagnetic pulse from the explosion. Better preparation for such a disaster could save thousands of lives—but ultimately, there is no way any city can genuinely be prepared for a catastrophe on such a historic scale, occurring in a flash, with zero warning. Rescue and recovery attempts would be impeded by the destruction of most of the needed personnel and equipment, and by fire, debris, radiation, fear, lack of communications, and the immense scale of the disaster. The US military and the national guard could provide critically important capabilities—but federal plans assume that “no significant federal response” would be available for 24-to-72 hours. Many of those burned and injured would wait in vain for help, food, or water, perhaps for days. The scale of death and suffering. How many would die in such an event, and how many would be terribly wounded, would depend on where and when the bomb was detonated, what the weather conditions were at the time, how successful the response was in helping the wounded survivors, and more. Many estimates of casualties are based on census data, which reflect where people sleep at night; if the attack occurred in the middle of a workday, the numbers of people crowded into the office towers at the heart of many modern cities would be far higher. The daytime population of Manhattan, for example, is roughly twice its nighttime population; in Midtown on a typical workday, there are an estimated 980,000 people per square mile. A 10-kiloton weapon detonated there might well kill half a million people—not counting those who might die of radiation sickness from the fallout. (These effects were analyzed in great detail in the Rand Corporation’s Considering the Effects of a Catastrophic Terrorist Attack and the British Medical Journal’s “Nuclear terrorism.”) On a typical day, the wind would blow the fallout north, seriously contaminating virtually all of Manhattan above Gramercy Park; people living as far away as Stamford, Connecticut would likely have to evacuate. Seriously injured survivors would greatly outnumber the dead, their suffering magnified by the complete inadequacy of available help. The psychological and social effects—overwhelming sadness, depression, post-traumatic stress disorder, myriad forms of anxiety—would be profound and long-lasting. The scenario we have been describing is a groundburst. An airburst—such as might occur, for example, if terrorists put their bomb in a small aircraft they had purchased or rented—would extend the blast and fire effects over a wider area, killing and injuring even larger numbers of people immediately. But an airburst would not have the same lingering effects from fallout as a groundburst, because the rock and dirt would not be sucked up into the fireball and contaminated. The 10-kiloton blast we have been discussing is likely toward the high end of what terrorists could plausibly achieve with a crude, improvised bomb, but even a 1-kiloton blast would be a catastrophic event, having a deadly radius between one-third and one-half that of a 10-kiloton blast. These hundreds of thousands of people would not be mere statistics, but countless individual stories of loss—parents, children, entire families; all religions; rich and poor alike—killed or horribly mutilated. Human suffering and tragedy on this scale does not have to be imagined; it can be remembered through the stories of the survivors of the US atomic bombings of Hiroshima and Nagasaki, the only times in history when nuclear weapons have been used intentionally against human beings. The pain and suffering caused by those bombings are almost beyond human comprehension; the eloquent testimony of the Hibakusha—the survivors who passed through the atomic fire—should stand as an eternal reminder of the need to prevent nuclear weapons from ever being used in anger again. Global economic disaster. The economic impact of such an attack would be enormous. The effects would reverberate for so far and so long that they are difficult to estimate in all their complexity. Hundreds of thousands of people would be too injured or sick to work for weeks or months. Hundreds of thousands more would evacuate to locations far from their jobs. Many places of employment would have to be abandoned because of the radioactive fallout. Insurance companies would reel under the losses; but at the same time, many insurance policies exclude the effects of nuclear attacks—an item insurers considered beyond their ability to cover—so the owners of thousands of buildings would not have the insurance payments needed to cover the cost of fixing them, thousands of companies would go bankrupt, and banks would be left holding an immense number of mortgages that would never be repaid. Consumer and investor confidence would likely be dramatically affected, as worried people slowed their spending. Enormous new homeland security and military investments would be very likely. If the bomb had come in a shipping container, the targeted country—and possibly others—might stop all containers from entering until it could devise a system for ensuring they could never again be used for such a purpose, throwing a wrench into the gears of global trade for an extended period. (And this might well occur even if a shipping container had not been the means of delivery.) Even the far smaller 9/11 attacks are estimated to have caused economic aftershocks costing almost $1 trillion even excluding the multi-trillion-dollar costs of the wars that ensued. The cost of a terrorist nuclear attack in a major city would likely be many times higher. The most severe effects would be local, but the effects of trade disruptions, reduced economic activity, and more would reverberate around the world. Consequently, while some countries may feel that nuclear terrorism is only a concern for the countries most likely to be targeted—such as the United States—in reality it is a threat to everyone, everywhere. In 2005, then-UN Secretary-General Kofi Annan warned that these global effects would push “tens of millions of people into dire poverty,” creating “a second death toll throughout the developing world.” One recent estimate suggested that a nuclear attack in an urban area would cause a global recession, cutting global Gross Domestic Product by some two percent, and pushing an additional 30 million people in the developing world into extreme poverty. Desperate dilemmas. In short, an act of nuclear terrorism could rip the heart out of a major city, and cause ripple effects throughout the world. The government of the country attacked would face desperate decisions: How to help the city attacked? How to prevent further attacks? How to respond or retaliate? Terrorists—either those who committed the attack or others—would probably claim they had more bombs already hidden in other cities (whether they did or not), and threaten to detonate them unless their demands were met. The fear that this might be true could lead people to flee major cities in a large-scale, uncontrolled evacuation. There is very little ability to support the population of major cities in the surrounding countryside. The potential for widespread havoc and economic chaos is very real. If the detonation took place in the capital of the nation attacked, much of the government might be destroyed. A bomb in Washington, D.C., for example, might kill the President, the Vice President, and many of the members of Congress and the Supreme Court. (Having some plausible national leader survive is a key reason why one cabinet member is always elsewhere on the night of the State of the Union address.) Elaborate, classified plans for “continuity of government” have already been drawn up in a number of countries, but the potential for chaos and confusion—if almost all of a country’s top leaders were killed—would still be enormous. Who, for example, could address the public on what the government would do, and what the public should do, to respond? Could anyone honestly assure the public there would be no further attacks? If they did, who would believe them? In the United States, given the practical impossibility of passing major legislation with Congress in ruins and most of its members dead or seriously injured, some have argued for passing legislation in advance giving the government emergency powers to act—and creating procedures, for example, for legitimately replacing most of the House of Representatives. But to date, no such legislative preparations have been made. In what would inevitably be a desperate effort to prevent further attacks, traditional standards of civil liberties might be jettisoned, at least for a time—particularly when people realized that the fuel for the bomb that had done such damage would easily have fit in a suitcase. Old rules limiting search and surveillance could be among the first to go. The government might well impose martial law as it sought to control the situation, hunt for the perpetrators, and find any additional weapons or nuclear materials they might have. Even the far smaller attacks of 9/11 saw the US government authorizing torture of prisoners and mass electronic surveillance. And what standards of international order and law would still hold sway? The country attacked might well lash out militarily at whatever countries it thought might bear a portion of responsibility. (A terrifying description of the kinds of discussions that might occur appeared in Brian Jenkins’ book, Will Terrorists Go Nuclear?) With the nuclear threshold already crossed in this scenario—at least by terrorists—it is conceivable that some of the resulting conflicts might escalate to nuclear use. International politics could become more brutish and violent, with powerful states taking unilateral action, by force if necessary, in an effort to ensure their security. After 9/11, the United States led the invasions of two sovereign nations, in wars that have since cost hundreds of thousands of lives and trillions of dollars, while plunging a region into chaos. Would the reaction after a far more devastating nuclear attack be any less?

### 1AC – Tech Transfer

#### Advantage three: Space Superiority.

#### We’re in a race for space power. Russia and China are pushing ahead.

Michael Obal, PhD Aerospace Engineering @ Georgia Tech and CEO of Obal Technologies Group, and Marco Concha, Technical Manager of Project Kuiper Flight Dynamics @ Amazon Flight Dynamics, 16 years as a flight dynamics engineer @ NASA, ’19, “Reenergizing U.S. Space Nuclear Power Generation” AIAA Scitech 2019 Forum

The United States and Russia have been working on space nuclear power and propulsion technologies flight programs since the 1950s. This work has resulted in numerous successful space missions (80+) and a few failures. The two failures that resulted in terrestrial radioactive contamination (United States: Transit-5BN-3 (in 1964) and Soviet Union: Cosmos 954 (in 1978)) have hampered the development of future space nuclear systems in the United States by creating a politically hostile environment based on misinformation that is still prevalent today [1, 2]. This environment, coupled with the past failures of two major U.S. space nuclear reactor program initiatives (the SP 100 and the Prometheus/Jupiter Icy Moons Orbiter (JIMO)), has essentially eliminated any substantial government or commercial investment interest (FY10 - 17 approximately $10M to $20M/year). Several excellent Refs. [3, 4, 5, 6, 7, 8] provide details on the goals, accomplishments, and demise of the SP-100 and Prometheus programs.

This paper will only concentrate on the nuclear reactor component of space nuclear power technology. It suggests a path forward to rebuild this technology within the next decade. The key argument presented is the role that space nuclear reactors can have in sustaining U.S. space freedom of action and deep space exploration. It will also show how this objective can be achieved with space electrical power availability above 100 kWe, which is not practical using solar power technology.

Until a comprehensive and verifiable ban on offensive and defensive spacecontrol activities is enacted, the “electric power” available to a nation’s earth orbiting spacecraft ultimately will decide which nation maintains space freedom of action in the future. Without a strong “wow” mission pull and an innovative design, development, test, and evaluation approach, space nuclear reactor technology will not have the support to overcome the residual political resistance or to secure the necessary funds.

Russia and China do not have these political restrictions and could field space nuclear reactors within the next decade if they so desire. The Former Soviet Union (FSU) has flown about 31 reactors for military intelligence applications in Radar Ocean Reconnaissance Satellites (RORSATs) since 1965, while the United States has flown only one (the Systems for Nuclear Auxiliary Power (SNAP-10) for a short period of time [2], see Fig. 1. When the Soviet Union dissolved into the Russian Federation, their program was put temporarily on hold (around 1987). Recent statements by Russia imply that it has rejuvenated its space nuclear reactor program, they may have:

• Invested hundreds of millions since 2009 for space nuclear propulsion and power generation in the megawatt class [9].

• Started to work on standardized modules with nuclear-powered propulsion systems involving 150 to 500 kWe devices.

• Created concept designs around 2011 leading to possible ground testing and a launch goal of 2020 [10].

#### Nuclear electric power can provide 200 thousands watts of electric capacity, enabling its possessors to evade space object surveillance.

Michael Obal, PhD Aerospace Engineering @ Georgia Tech and CEO of Obal Technologies Group, and Marco Concha, Technical Manager of Project Kuiper Flight Dynamics @ Amazon Flight Dynamics, 16 years as a flight dynamics engineer @ NASA, ’19, “Reenergizing U.S. Space Nuclear Power Generation” AIAA Scitech 2019 Forum

In the next 10 to 20 years, space freedom of action will belong to the country that has the ability to fly systems having at least 200 kWe power capabilities. This amount of power supplied by a space nuclear reactor will provide two key attributes for future spacecraft:

• By powering electric propulsion (EP) systems, it will contribute significantly to increased spacecraft survivability by changing orbits in a manner that will degrade adversary Space Object Surveillance and Identification (SOSI) capabilities used for tracking and targeting.

• When not providing power to an EP system, the nuclear reactor would provide power to game-changing payloads. Table 2 lists a few unclassified examples. These mission payloads will revolutionize DoD and IC operations in space. Actual performance details of these payloads are sensitive and will not be discussed in this report.

#### Space object surveillance evasion makes nations impervious to anti-satellite weapons.

Michael Obal, PhD Aerospace Engineering @ Georgia Tech and CEO of Obal Technologies Group, and Marco Concha, Technical Manager of Project Kuiper Flight Dynamics @ Amazon Flight Dynamics, 16 years as a flight dynamics engineer @ NASA, ’19, “Reenergizing U.S. Space Nuclear Power Generation” AIAA Scitech 2019 Forum

The freedom to access space and to safely place and maintain U.S. and allied intelligence, surveillance, and reconnaissance (ISR) and commercial assets is critical to our national security during peace and wartime. China’s successful series of anti-satellite demonstrations and the ground-based electronic warfare probing by unknown actors has challenged the control of the space assets of the United States and other countries.

This new threat environment has led to the development of space-control technology investments by most space-faring nations. Although the details of space-control activities are highly classified, the technology is available to degrade or neutralize each other’s space assets [17]. One key element of space control is awareness of where everything in space is at any given moment. By powering EP systems, it will improve spacecraft survivability by changing orbits in a manner that will degrade adversary SOSI capabilities used for tracking and targeting. SOSI at Low Earth Orbit (LEO) is primarily radar with some optical and signal intelligence support [18]. These systems typically use “predictive techniques”—spot-checking objects as they enter and reenter certain sectors—but do not track continuously. This estimation process does not perfectly model perturbations, including maneuvers, so maneuvering can introduce uncertainty into orbit estimates (i.e., degraded SOSI system performance as shown in Fig. 6). Thrust activated at the right time degrades this type of SOSI approach. At 200 kWe and using EP it is technically feasible to severely stress the tracking capabilities of adversary SOSI systems for extended periods of time. If the SOSI system is continually searching for an object, it cannot target the object.

#### AND Nuclear electric power prevents non-kinetic ASATS.

Michael Obal, PhD Aerospace Engineering @ Georgia Tech and CEO of Obal Technologies Group, and Marco Concha, Technical Manager of Project Kuiper Flight Dynamics @ Amazon Flight Dynamics, 16 years as a flight dynamics engineer @ NASA, ’19, “Reenergizing U.S. Space Nuclear Power Generation” AIAA Scitech 2019 Forum

Demands on secure communication services from GEO to tactical users continue to drive spacebased communication capacity. The ongoing command and control, and ISR revolution requires continuous secured communications to a variety of ground, sea, and air-moving weapons platforms to meet user needs. Currently, wideband (highcapacity), protected (anti-jam, covertness, and nuclear survivability), and narrowband (mobile, voice, and low data rate) space-based communications are evolving rapidly as military satellite communications deploy Wideband Gapfiller System, Advanced Extremely High Frequency and the next generation protected communications satellites. These systems, as well as commercial services, already require kilowatts of power.

As demand continues to increase, highcapacity signal processing (switching) and laser communications will be needed for robust anti-jam and ultra-secure point-to-point and broadcast communications. This will push the satellite power loads to 100 kWe and beyond. At that point, nuclear reactors will need to be included in the design mix to place these advanced systems into GEO orbit in a single launch.

Figure 7 is an example of a large GEO commercial communications satellite design and shows a first order extrapolation of the power system mass (assume 72 minute eclipse at spring and fall equinox) using a linear factor to ~ 6,413 kg for 100 kWe and to ~ 12,826 kg for 200 kWe this would result in an a of 64 kg/kWe significantly higher than a nuclear space reactor.

#### ASAT tech is proliferating.

Kyle L Evanoff, Research Associate, International Institutions and Global Governance at Council on Foreign Relations, B.A. Phi Beta Kappa, Political Economy @ UC Berkeley, 7/27/19, "Big Bangs, Red Herrings, and the Dilemmas of Space Security," Council on Foreign Relations, https://www.cfr.org/blog/big-bangs-red-herrings-and-dilemmas-space-security

On March 27, India used a Prithvi Defense Vehicle Mark-II to destroy the 740-kilogram Microsat-R some three hundred miles above the Earth’s surface. The completion of Mission Shakti, an anti-satellite (ASAT) missile test conducted from Dr. APJ Abdul Kalam Island in the northwestern Bay of Bengal, thrust the country into the international spotlight. With the operation, India joined China, Russia, and the United States as the fourth member of the club of nations to have destroyed a satellite with a kinetic ASAT weapon.

Global Governance

Analysts pointed to Mission Shakti as a vivid example of growing contestation in the outer space domain. Traditional U.S. dominance in space has eroded as a litany of foreign actors (collaborator and competitor alike) have increased their spacefaring prowess, including through the development and use of ASAT weapons and dual-use uncrewed orbiters capable of space rendezvous and proximity operations [PDF]. Pundits fear that such space technologies could alter the calculus of deterrence to inauspicious effect or, worse, become instruments in an adversary’s enactment of a “space Pearl Harbor.” These fears are valid in some senses, overblown and misleading in others. Developments in space pose significant challenges for strategic stability. Obsessive concern with the remote contingency of kinetic warfare in orbit, however, detracts from efforts to address more pressing space security issues and makes catastrophic outcomes more, not less, probable.

Missiles and Lasers and Viruses, Oh My

Recent years have witnessed burgeoning democratization in the outer space domain as plummeting costs—both for manufacturing satellites and placing them in orbit—and proliferating technologies have enabled new spacefaring actors to deploy assets in Earth orbit. The number of active satellites has ballooned to more than two thousand, and their integration into military operations and civil life has deepened in tandem. Recognition of the indispensability of these orbital assets to numerous areas of strategic competition, and defense planners’ emphasis on offensive capabilities as a deterrence measure, has led states to invest large sums in the development of ASAT weapons of various stripes.

In their April Space Threat Assessment 2019 [PDF] report, Todd Harrison, Kaitlyn Johnson, and Thomas G. Roberts of the Center for Strategic and International Studies outline four categories of counterspace operations: kinetic physical attacks, non-kinetic physical attacks, electronic attacks, and cyberattacks. This litany of potential threats, which vary in their severity, reversibility, ease of attribution, and other aspects, makes U.S. policymakers uneasy. After over half a century of spacefaring pre-eminence, the United States has come to depend on the remote-sensing, telecommunications, and positioning, navigation, and timing capabilities that satellites provide. The resounding defeat of the Iraqi military by American and coalition forces during the Gulf War of the early 1990s underscored the substantial battlefield advantages that orbital capabilities confer, and numerous subsequent conflicts have affirmed the U.S. military’s tactical and strategic reliance on space assets. Proliferating counterspace systems heighten the potential for adversaries to disrupt American command, control, and communications networks, as well as surveillance and reconnaissance operations. In attacking these critical space systems, U.S. adversaries could compromise large segments of the national defense enterprise.

Indeed, an insecure orbital environment poses significant challenges for broader strategic stability. Actors in possession of counterspace capabilities can threaten or attack vital elements of ballistic missile launch detection architectures and other systems integral to national and international security, which opens new avenues for intentional, inadvertent, or accidental dispute or conflict escalation. In this sense, novel satellite vulnerabilities add layers of technical and psychological complexity to already labyrinthine deterrence calculations. The effect compounds in light of the deep integration of satellites into information and communications networks: cyber intrusions into space systems are a tantalizing option for state and nonstate actors, and such operations carry their own elaborate deterrence considerations, not least the difficulty of attribution. The net result is a convoluted deterrence landscape, rife with uncertainty and in constant motion thanks to the rapid clip and often competitive character of technological innovation.

#### Rouge nation first strike is likely.

Todd Harrison et al Director, Defense Budget Analysis, Director, Aerospace Security Project and Senior Fellow, International Security Program Kaitlyn Johnson Associate Fellow and Associate Director, Aerospace Security Project Zack Cooper Thomas G. Roberts, ’17, “Escalation and Deterrence in the Second Space Age,” https://www.csis.org/analysis/escalation-and-deterrence-second-space-age

AS THE COLD WAR CAME TO AN END IN 1991, the space domain began to transition into what has been called the “second space age.”19 This transition was the result of nearly simultaneous shifts in the commercial uses of space, the geopolitical environment on Earth, and the military balance of power. The fall of the Soviet Union meant that there were no longer two superpowers locked in a stable, long-term competition in space. Operation Desert Storm, also in 1991, proved to be a key turning point in the military use of space because it was the first time space-based capabilities played a major role in conventional military operations—what Air Force General Merrill McPeak called “the first space war.”20 Furthermore, beginning in the 1990s space capabilities began to spread to other countries and commercial firms, bringing more of the benefits of space to people around the globe. The defining characteristics of the second space age are that it is more diverse, disruptive, disordered, and dangerous than the first space age. It is more diverse because space capabilities have proliferated to many other nations, despite several attempts by the United States at limiting the spread of space technology.21 From 1991 through 2016, 43 percent of new satellites and 39 percent of launches have been from nations other than the United States and Russia. Moreover, since 2014, a majority of satellites and a majority of launches have been from nations other than the United States and Russia—primarily China, Japan, Europe, and India

A greater number and variety of commercial firms have also emerged since the end of the Cold War and the easing of government restrictions on space technologies. In the first space age (1957 to 1990) just 4 percent of satellites launched were commercial, while in the second space age (1991 to present) more than 36 percent of satellites launched have been commercial. Moreover, commercial firms have developed space capabilities in areas that were once dominated by governments, such as high-resolution satellite imagery, signals intelligence, and space situational awareness, and in some cases commercial firms are launching satellites with capabilities that rival or exceed those of the U.S. military. For example, one of ViaSat’s recent communications satellites (ViaSat-2) has a total data throughput capacity of 300 gigabits per second22—nearly 100 times that of the U.S. military’s current generation of wideband communications satellites, Wideband Global SATCOM (WGS).23

The accelerating pace of innovation in commercial space is also leading to disruptive changes in the way space is used. A notable example is the space launch industry where a handful of billionaire-backed startups, such as Elon Musk’s SpaceX, Jeff Bezos’s Blue Origin, Richard Branson’s Virgin Galactic, and Paul Allen’s Stratolaunch, are competing to lower the cost of access to space and to create a space tourism industry. SpaceX and BlueOrigin in particular have disrupted the launch industry by developing first stages that can land vertically and be reused for multiple launches. Several commercial space firms are planning to launch constellations with hundreds—and in some cases thousands—of satellites for missions that include communications, imagery, and signals intelligence.24 Since the total number of satellites in orbit today is roughly 1,459,25 these massive constellations could dramatically increase the number of objects that need to be tracked—and associated space traffic management issues—by an order of magnitude over the coming decade. Private companies are also planning space missions in new areas that go beyond what current laws and regulations were designed to accommodate, such as on-orbit servicing of satellites, asteroid mining, and on-orbit manufacturing. The renewed energy in the commercial space sector has also led to a growing global space economy— now estimated at $323B annually—that creates high-tech, high-paying jobs and improves the lives of people around the world.26 Government regulation of the space industry presents a sort of prisoner’s dilemma: if one nation attempts to significantly limit commercial space activity on its own, it puts its own companies and citizens at a disadvantage relative to other less restrictive nations. The increased use of space by more nations and the development of new commercial space capabilities is making the space domain more disordered. Policy makers are scrambling to understand the national security and foreign policy implications of this new environment, and some have argued that current laws and treaties are outdated and not designed to accommodate the way space is being used today.27 One of the policy implications of the second space age is that the availability of advanced space capabilities on the commercial market can potentially bring the advantages of space within the reach of rogue nations and non-state actors. As a result, it could make the world more transparent to the public and weaken the ability of state actors—including the U.S. Government—to control the flow of information.

While space has become more diverse, disruptive, and disordered, it is also more dangerous because the targets in space—particularly U.S. military satellites—are more attractive for adversaries to attack in a wide range of scenarios with a wide array of counterspace weapons. The 1991 Gulf War, 1999 NATO bombing campaign in Yugoslavia, and 2003 Iraq invasion demonstrated the tremendous advantage that U.S. military space systems provide as a force multiplier in conventional conflict, particularly in command and control (C2) and the employment of precision-guided weapons.28 While in the First Gulf War, less than 8 percent of the munitions used were precision-guided (including both laser-guided and GPS-guided), by the 2003 Iraq invasion, more than 60 percent of the munitions used were precision-guided.29 This trend continued to grow, and by the opening phases of operations in Syria in 2014, some 96 percent of munitions used were precision-guided.30 The demand for satellite communications (SATCOM) has also grown significantly, in many cases outpacing the capacity of military systems and forcing DoD to lease capacity from commercial satellite operators. The increase in demand for satellite communications bandwidth in U.S. military operations has grown exponentially, from 100 megabits per second (Mbps) in the 1991 Gulf War to 250 Mbps in Joint Task Force Noble Anvil in 1999, 750 Mbps in the early months of Operation Enduring Freedom in Afghanistan in 2002, and 2,400 Mbps in the opening phases of Operation Iraqi Freedom in 2003.31

Other nations have taken note of the many advantages space provides to the U.S. military and its critical dependence on space-based capabilities. Some have attempted to replicate U.S. space capabilities to provide similar advantages for their own forces. Other nations have developed counterspace capabilities to reduce or eliminate the advantages space provides for the United States. China and Russia appear to be pursuing both strategies.32 These developments indicate that space is a more strategically important domain in modern warfare, not just for the U.S. military but for others as well, which increases the potential for conflict in space. Senior leaders in the U.S. military are quick to point out that conflict in space is not something that occurs in isolation. Instead of talking about a war in space, military leaders routinely refer to a war that “extends into space.”33 One could argue, though, that war already extends into space every time space-based capabilities are used in combat, from GPS-guided weapons to unmanned aircraft controlled through satellite data links. The U.S. military uses its space systems across the full spectrum of conflict, from gray zone conflicts to high-end major theater war. It is only natural to expect that adversaries will attempt to disrupt, degrade, or destroy these systems.34 What is different in the second space age is not that war could extend into space, but rather that a wider array of adversaries can begin to fight back against U.S. space capabilities —both from the ground and from space. Further complicating matters, military satellite constellations that were once intended primarily for nuclear missions, and were thus protected by the cloak of nuclear deterrence, are now being used routinely for conventional warfighting at lower ends of the conflict spectrum. This calls into question whether a nuclear or non-nuclear adversary would be deterred from attacking these systems in a conventional conflict—especially if these systems are actively providing the U.S. military with a substantial advantage in that conflict. The second space age is more dangerous because old notions of deterrence and controlling escalation in space may no longer be valid.

#### ASAT attacks escalate to the nuclear level.

Joan Johnson-Freese, Professor and chair of space science and technology @ Naval War College, 17, *Space Warfare in the 21st Century*, Routledge, ISBN 978131552917, p 18-20.

Space warfare runs two untenable risks: the creation of destructive debris and escalation to terrestrial, even nuclear, warfare. Kinetic warfare in space creates debris traveling at a speed of more than 17,000 miles per hour, which then in itself becomes a destructive weapon if it hits another object—even potentially triggering the so-called Kessler Syndrome,86 exaggerated for dramatic effect in the movie Gravity. Ironically, both China and the United States learned the negative lessons of debris creation the hard way. In 1985, the United States tested a miniature homing vehicle (MHV) ASAT launched from an F-15 aircraft. The MHV intercepted and destroyed a defunct US satellite at an altitude of approximately 250 miles. It took almost 17 years for the debris resulting from that test to be fully eliminated by conflagration re-entering the Earth’s atmosphere or being consumed by frictional forces, though no fragment had any adverse consequences to another satellite—in particular, no collisions. China irresponsibly tested a direct-ascent ASAT in 2007, destroying one if its defunct satellites. That test was at an altitude almost twice that of the 1985 US test. The debris created by the impact added 25 percent to the debris total in low Earth orbit87 and will dissipate through the low Earth orbit, heavily populated with satellites, for decades, perhaps centuries, to come. Perhaps most ironically, because of superior US debris-tracking capabilities, the United States—even though not required to do so—has on more than one occasion warned China that it needed to maneuver one of its satellites to avoid a collision with debris China itself had likely created.88 In 2013, a piece of Chinese space junk from the 2007 ASAT test collided with a Russian laser ranging nanosatellite called BLITS, creating still more debris.89 The broader point is that all nations have a compelling common interest in avoiding the massive increase in space debris that would be created by a substantial ASAT conflict.

Gen. Hyten has said that not creating debris is “the one limiting factor” to space war. “Whatever you do,” he warns, “don’t create debris.”90 While that might appear an obvious “limiting factor,” preparing to fight its way through a debris cloud had been a Pentagon consideration in the past. Now, however, sustaining the space environment has been incorporated into Pentagon space goals. Beyond debris creation, MacDonald points out that as China becomes more militarily capable in space and there is more symmetry between the countries, other risks are created – specifically, escalation.

That is, the United States could threaten to attack not just Chinese space assets, but also ground-based assets, including ASAT command-and-control centers and other military capabilities. But such actions, which would involve attacking Chinese soil and likely causing substantial direct casualties, would politically weigh much heavier than the U.S. loss of space hardware, and thus might climb the escalatory ladder to a more damaging war that both sides would probably want to avoid.91

MacDonald isn’t alone in concerns about escalation. Secure World Foundation analyst Victoria Samson has also voiced apprehension regarding US rhetoric that does not distinguish between actions against unclassified and classified US satellites, stating that “things can escalate pretty quickly should we come into a time of hostility.”92

Theresa Hitchens explained the most frightening, but not implausible, risk of space war escalation in a 2012 Time magazine interview. Say you have a crisis between two nuclear-armed, space-faring countries, Nation A and Nation B, which have a long-standing border dispute. Nation A, with its satellite capability, sees that Nation B is mobilizing troops and opening up military depots in a region where things are very tense already, on the tipping point. Nation A thinks: “That’s it, they’re going to attack.” So it might decide to pre-emptively strike the communications satellite used by Nation B to slow down its ability to move toward the border and give itself time to fortify. Say this happens and Nation B has no use of satellites for 12 hours, the time it takes it to get another satellite into position. What does Nation B do? It’s blind, it’s deaf, it’s thinking all this time that it’s about to be overwhelmed by an invasion or even nuked. This is possibly a real crisis escalation situation; something similar has been played out in U.S. Air Force war games, a scenario-planning exercise practiced by the U.S. military. The first game involving anti-satellite weapons stopped in five minutes because it went nuclear – bam. Nation B nuked Nation A. This is not a far-out, “The sky’s falling in!” concern, it is something that has been played out over and over again in the gaming of these things, and I have real fears about it.93 While escalation to a nuclear exchange may seem unthinkable, in war games conducted by the military, nuclear weapons are treated as just another warfighting weapon.

Morgan also voiced concerns about escalation generally and nuclear escalation specifically in the 2010 RAND report, stating: The adversary would also likely be deterred from damaging U.S. satellite early-warning system (SEWS) assets to avoid risking inadvertent escalation to the nuclear threshold, but that firebreak would almost certainly collapse with the conclusion that such escalation is inevitable and that it is in the adversary’s interest to launch a preemptive nuclear strike.94

#### US lacks credible or proportional responses.

Christopher Fabian, M.S. in Space Studies, ’19 “A Neoclassical Realist’s Analysis Of Sino-U.S. Space Policy,” January 2019, https://commons.und.edu/cgi/viewcontent.cgi?article=3456&context=theses) vw

The second question necessary to determine offense-defense balance is one of military utility: has first-strike stability been established? When a successful attack will weaken the other side to the point where victory becomes quick, bloodless, and decisive, this increases the incentives to strike first and makes establishing first-strike stability difficult.282 The Chinese desire to use counterspace assets for the purpose of creating a temporary, localized advantage within the East Asian theater (which has already been covered at length) suggests that they are highly incentivized by the prospect of a first-strike that disrupts U.S. expeditionary capability.283 In a simple denial of gains versus cost imposition equation, the high value of U.S. space systems, and the distinct lack of defensive measures to protect them with, means that creating deterrence through denial of gains is unlikely. Cost imposition strategy has its own set of concerns. First, a symmetric U.S. deterrent threat has little credibility. Engaging in a tit-for-tat exchange with ASAT systems is not a credible deterrent because China has more to gain from this strategy.284 Whereas, an asymmetric attack using conventional forces (for example, an attack on terrestrial segments of space systems within China) or other domains (nuclear, cyber, terrestrial) risks horizontal escalation, broadens the scope of conflict, and could allow China to seize the narrative.285 Second, remaining U.S. deterrent options lack proportionality. If China applies sublethal counterspace options against the high value of space systems, the gains China reaps from ASAT attacks will outweigh perceived cost (unless the U.S. threatens a seemingly disproportionate response). 286 This has created a gap between credible threat and proportionality, where any U.S. response has either a credibility or proportionality problem, limiting options for establishing first-strike stability

#### Space dominance is unsustainable and invites first strike. Transition to space superiority key to prevent space war.

Travis C. Stalcup, PhD, CSIS Nuclear Scholars Initiative fellow and a defense policy analyst in Arlington, ’14, https://thediplomat.com/2014/01/u-s-in-space-superiority-not-dominance/2/

Conditions for Space Dominance

Given this challenge from China and the proliferation of space programs around the world, is space dominance even a feasible goal? For the U.S. (or any state) to dominate space, one or a combination of three conditions must exist. The first condition requires the U.S. to develop offensive and defensive capabilities so insurmountable as to dissuade competitors from attempting to access space. Unfortunately, history has shown that dissuasion only works against states disinclined or incapable of competing in the first place. Great powers like the United States and China, which landed its first lunar rover on the surface of the moon last December, are inexorably drawn into competition with one another. Beijing’s plans to complete its own space station by 2020 demonstrate that it is not dissuaded by enormous American capability.

The second condition is a change in priorities by a competitor away from space. Economic turmoil and consequent social unrest could cause the Chinese Communist Party to turn inward, but there is no reason to believe that economic problems would result in a more restrained Chinese foreign policy. It is equally likely that a strife-ridden China would deflect popular enmity toward a neighbor, pursuing a more aggressive foreign policy to boost support for ruling elites’ priorities.

The third condition is an American willingness to deny competitors access to space by attacking targets on the ground including anti-satellite weapons, satellites and their delivery vehicles, and launch pads. The U.S. has demonstrated a willingness to take preventive action against second-order adversaries like Iraq, but the uncertainty of preventive strikes against China would give American military planners pause. As former Secretary Robert Gates expressed in his memoir, war is “tragic, inefficient, and uncertain.” Moreover, it is highly questionable that the American people would support such a provocative and costly endeavor.

American Policy Options

Absent these conditions and given the immense importance of space access, what are American policymakers to do? The United States may choose from one of three policy options: it can do nothing and countenance the continued erosion of the American position; it can pursue space dominance despite its requirement of preventive war; or it can pursue a more modest goal of space superiority, remaining, as scholars Gene Milowicki and Joan Johnson-Freese write, “first among many.”

The Easy (and Costly) Option: Do Nothing

Were the U.S. to take no action at all, China would continue to access space and grow its capability, undermining American strategic advantage. Moreover, space situational awareness would remain limited leaving U.S. satellites extremely vulnerable. Without improving the resilience of its satellites or demonstrating the ability to hold adversary satellites at risk, the U.S. position would continue to diminish. This course is unacceptable because it leaves American satellites at risk without stabilizing the relative decline of the United States’ strategic advantage.

The Scary (and Costly) Option: Space Dominance

If denying adversaries access to space is truly essential to the American way of war and life, then Washington should pursue a strategy that establishes space dominance. By combining immense offensive capabilities with a willingness to strangle the baby in the crib, the United States can temporarily achieve dominance in space. This strategy would require offensive weapons in space to destroy deployed space-based assets as well as robust land-based anti-satellite weapons.

Such a course of action is counterproductive. If the United States were to engage in preventive action and initiate war over space, it would invite the very anti-satellite attacks the United States wishes to avoid. (Even more pernicious is the cheapness of ASAT missiles relative their very expensive targets.) To recover from such attacks, the United States would need to reinvigorate its satellite manufacturing infrastructure and space technology sector to ensure it can easily replace disabled or destroyed space assets, a costly venture.

A policy of space hegemony would also require some sort of action against friendly space-faring nations such as Japan and India as well as coalitions of states like the European Union. While Europe and Japan already closely cooperate with the United States in space, it is unlikely that these allies would willingly surrender their space programs or subordinate them to American control. Even if the United States chose to eschew preventive action, the presence of offensive weapons would create dangerous spirals of hostility fraught with inadvertent escalation. The pursuit of space dominance is thus far too costly and unsustainable, requiring perpetual wars for perpetual dominance.

The Way Forward: Space Superiority

Through a combination of deterrence and defense, a policy in pursuit of space superiority would allow other states to access space and use it for military purposes while preserving the sizable strategic advantage the United States currently enjoys. To strengthen deterrence, the United States must signal the capability to hold space infrastructure aloft and on the ground at risk by testing non-kinetic kill weapons and periodically dazzling (temporarily blinding) Chinese satellites. Additionally, as Chinese reliance on space assets increases, the U.S. will be able to hold more of China’s satellites at risk, thus strengthening deterrence.

In addition to developing the capability to hold space assets at risk, the United States must better defend its own satellites, making them more resilient and agile while diminishing the benefits of an attack. Better maneuverability would give satellites a fighting chance of survival, but adding the additional fuel necessary to execute defensive maneuvers quickly increases the weight of satellites and the cost of launching them. Forrest Morgan refers to this limitation as the “tyranny of orbital mechanics.” Until better propulsion and materials technology exists, improved maneuverability will remain a long-term goal. Other improvements, especially to civilian satellites, involve hardening against directed energy weapons and anti-jamming capabilities. Vulnerable commercial space assets provide 80 percent of the bandwidth required for military missions and unlike their military counterparts, civilian satellites have little in terms of hardening.

### 1AC – Plan

#### The United States federal government should invite Russia to participate as an equal partner in a joint second generation Nuclear Electric Propulsion Space Test program for a Thermionic Experiment with Conversion in Active Zone type space propulsion module.

### 1AC – Solvency

#### Solvency!

#### Russian expertise key to the *next generation* of nuclear power. They say yes only if treated as an equal partner.

Richard Dabrowski, Lieutenant Colonel @ USAF, PhD instructional systems technology @ Indiana University, faculty member @ George C. Marshall European Center for Security Studies, ’13, “U.S.–Russian Cooperation in Science and Technology: A Case Study of the TOPAZ Space-Based Nuclear Reactor International Program,” The Quarterly Journal, Winter 2013.

On 27 March 1992, President George W.H. Bush approved the TOPAZ purchase at a meeting with Secretary of State James Baker and Secretary of Defense Richard Cheney, as the first Russian-U.S. government-to-government cooperative program in science and technology since the dissolution of the Soviet Union.9 As Al Marshall commented, “An enlightened foreign policy opened the door to the TOPAZ program, and the TOPAZ program encouraged good relations between the United States and Russia.” TOPAZ preceded the Nunn-Lugar Cooperative Threat Reduction program (which provided assistance for dismantling or safely storing the weapons of the Soviet nuclear arsenal), although it was in its spirit, in that the TOPAZ program provided continued employment for certain former Soviet nuclear scientists, engineers, and technicians who might otherwise have been tempted by job offers from rogue states. What is important to remember is that the TOPAZ purchase was not intended as an assistance program; rather it allowed the United States to obtain advanced space nuclear power technology at a fraction of the cost of internal development. As Frank Thome commented, “The Russian TOPAZ design was unique to anything America had ever devised. This was done by using non-nuclear electrical heat for testing and qualification on Earth. The only thing we could say was, ‘Why hadn’t we Americans thought of this?’” It is unlikely the United States will ever design a space reactor again without incorporating the Russian non-nuclear prelaunch testing design features that add safety and reduce risk.

The initial TOPAZ purchase was the model for a portion of the Nunn-Lugar Cooperative Threat Reduction program to counter the proliferation of weapons of mass de-struction known as the International Science and Technology Center (ISTC). The ISTC helped the newly independent Soviet republics by sponsoring research and development to utilize weapons technology for commercial purposes. However, after twenty years the Nunn-Lugar program and the ISTC were renegotiated following Russian complaints that the original agreements implied it was a recipient of aid rather than an equal partner. Russian analysts Vladimir Orlov and Alexander Cheban commented that, among other complaints, Nunn-Lugar had given the United States the opportunity to intrusively visit secret facilities, a humiliating practice that had to be allowed as the U.S. was financing improvements to their security.10

The United States and a skeptical Russia have been discussing for many years how they might benefit from cooperation in scientific research and development.11 From the year 2013 forward, only limited cooperation will continue in those areas that are deemed to be in the national interests of both Russia and the United States. The New York Times reported that the United States will continue to help Russia secure nuclear and radiological material, but will no longer participate in destroying old missiles, securing the transportation of nuclear warheads, or eliminating chemical weapons. Russia has promised to continue such activities, but on its own, and as a result some U.S. contractors will leave Russia.12

Many of the Russian scientists, engineers, and technicians involved with the TOPAZ program continue to pursue the development of space nuclear power together with the leading Russian scientific research institutes independently of the United States.13 They have a goal of building a TOPAZ-II type power module by 2018 for use in propulsion in space for missions to the Moon and Mars; as a power source for commercial applications of manufacturing in zero-gravity; and as a means of dealing with the danger of asteroids.14 Academician Ponomarev-Stepnoy noted, “An effective way of [developing] space nuclear power should be the organization of international programs, allowing the use of the highest achievements of the participating countries.” If such cooperation can be seen as a true partnership benefiting all the countries involved, there is cause for optimism that the warm friendships fostered by the TOPAZ program could continue in this and other fields of scientific cooperation.

In the twilight of the Cold War, the TOPAZ International Program represented a prominent example of international cooperation in the peaceful application of thermionic space nuclear technologies that were highly classified in the past. The TIP was highly cost-effective: with NEPSTP it came close to space flight testing of the TOPAZII system, though this did not happen due to the anti-nuclear stand of the Clinton Administration. The program served as a model for U.S.-Russian cooperation in other domains, and led to many discoveries and product developments involving materials science. While the TOPAZ-II has never been flown in space, it has flown to the United States and returned back to Russia, thus paving the way to international science and technology cooperation.

#### They’ve proposed the plan many times, but America refuses to take Russian help.

Valery Yarygin, Doctor of Technical Sciences, Deputy Director of the Institute for Special Nuclear Power Systems of the SSC RF- IPPE, ‘7, “Apophis Can Change Priorities: TOPAZ, Enisey and Space Nuclear Power Systems (NPS) of the Second Generation,” Atominfo.ru (10 December 2007)

Let's talk about the development work, if possible. As we know, the Americans had the projects of NPS not only for satellites, but also for interplanetary flights, for example, to Jupiter's moons.

You are right, such projects exist. For example, the project for flights to icy moons of Jupiter you mentioned, it is called "JIMO" (Jupiter Icy Moons Orbiter). But it was officially suspended in August- September 2005, as you know. The reason for the suspension published in the open literature was that this project is long, expensive and not sufficiently validated.

You see, the Americans have no experience. The Russians have this experience ("TOPAZ"), while the American experience of the gas turbines' use is restricted by aviation! Moreover, practically every year "Roscosmos" proposes to the Americans the cooperation in the context of global problems, for example, the Moon base. As you know, the Americans set the task to create the base on the Moon and chose the suitable place. By the 2030-s the stationary base should start functioning with a gradual increase of the level of its electrical power. Russia proposes cooperation, but receives only negative responses.

The same concerns the flights of the JIMO-type space vehicles. This is an extremely complex and very expensive project. If there are no "exterior" considerations, of course, it makes sense to combine here the efforts of many countries. But we see absolutely the same situation - the Americans either don't want or may not resort to the help of the Russians.