Russia’s Current Nuclear Modernization and Arms Control

Pavel Podvig

Russian Nuclear Forces Project, Geneva, Switzerland

ABSTRACT

Russia’s strategic modernization program suggests that it is determined to continue its reliance on nuclear weapons as a key element of its national security strategy. The US is now also committed to the large-scale modernization of its strategic forces. Combined with uncertainty about the future of US-Russian arms control, these developments have given rise to concerns about a potential new round of the arms race that could reverse the progress in nuclear disarmament that has been achieved since the end of the Cold War. This paper considers Russia’s key modernization efforts and the factors that influence the decisions in that area. It concludes that modernization is shaped primarily by internal factors and traditional arms control, and that an emphasis on strategic stability plays a limited role in the process.

Introduction

Russia and the US are two countries that account for more than 90% of all nuclear weapons, which are currently undergoing a modernization process that will shape the future of nuclear disarmament for decades to come (Kristensen and Norris 2018b). At the same time, the future of US-Russian arms control is uncertain. The New START Treaty, which remains the key bilateral arms control agreement, reached an important milestone in February 2018, when the parties announced that they completed reductions of their strategic forces. However, the prospects for extending New START or for negotiating a new treaty that would replace it are unclear. Another important agreement, the Intermediate-Range Nuclear Forces (INF) Treaty, has come under considerable stress after the US accused Russia of violating the treaty terms and Russia responded with counteraccusations. The US continues to deploy elements of its missile defense system despite Russia’s concerns.

In this situation, it is important to understand the factors that shape the nuclear modernization process in Russia. This paper outlines the key elements of this process and attempts to identify the factors involved through an analysis of the recent development and acquisition programs, and policy decisions about nuclear forces.

Key Elements of Russia’s Strategic Modernization Program

Russia is clearly determined to maintain all components of its nuclear triad: land-based intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles
(SLBMs), and strategic bombers. The key decisions in this area were taken more than 20 years ago in the late 1990s, during the deliberations on the START II Treaty between Russia and the US (Podvig 2014). The modernization program developed at the time focused on maintaining overall numerical parity with the US and on preserving the industrial base involved in the development and production of nuclear weapons and delivery systems.

The main components of the program remain largely unchanged to this day. Modernization of the land-based component of the strategic triad relies on deployment of the Topol-M (SS-27 Mod 1) ICBM, which is deployed in silos, as well as on road-mobile launchers. The first Topol-M missiles were deployed in 1997. In 2010, when the expiration of the START treaty lifted certain restrictions on the deployment of multiple-warhead ICBMs, Russia also began deploying the MIRVed version of the Topol-M missile, known as RS-24 Yars (SS-27 Mod 2). Another major new ICBM project launched at that time was the development of a new ‘heavy’ multiple-warhead ICBM, that later became known as Sarmat (SS-X-29) (RIA Novosti 2010). The deployment of Topol-M began in 1997, and by 2018 Russia was estimated to have 180 ICBMs of the Topol-M and Yars types carrying about 480 nuclear warheads (Kristensen and Norris 2018a). The deployment of Sarmat is expected to be completed after 2020. Topol-M and Yars are replacing older Topol (SS-25) and UR-100NUTTTH (SS-19) ICBMs that are being withdrawn from service, while Sarmat, when it is ready for deployment, will replace the R-36M2 (SS-18) missiles that by that time will have reached the end of their operational lives.

When the replacement of old Topol missile is completed, Russia will have about 300 Topol-M and Yars missiles capable of carrying more than 1000 warheads. The future of Sarmat ICBM is uncertain, but it can be estimated that up to 40–50 missiles of this type could eventually be deployed, providing Russia with the capacity to deploy as many as 400 additional ICBM warheads. However, it is highly likely that the number of operationally deployed warheads will be lower than the maximum capacity of launchers, probably closer to 900–1000 total warheads, on about 350 land-based missiles. Additional warheads could be kept in reserve as a hedge, mirroring the US capability. It appears that Russia has already reduced the number of deployed warheads in this manner to comply with the limits of the New START Treaty (Kristensen and Norris 2018a).

The sea-based component of the strategic triad currently includes six older ballistic missile submarines of the Project 667BDRM (Delta IV) class and new Project 955 Borey submarines that carry Bulava missiles. Three submarines of the Project 955 class entered service between 2013 and 2016, while five Project 955A submarines are currently at various stages of construction. It is possible that once all new submarines join the fleet, some older Project 667BDRM submarines will be withdrawn from service. Russia has already announced a plan to build six more submarines of the Project 955A class after 2023 (TASS 2018b). It appears that the navy aims to maintain a fleet of at least 12 operational submarines that will carry 192 SLBMs with about 580 warheads. Similar to land-based missiles, the number of operationally deployed warheads will likely be lower than the maximum capacity of SLBMs, with about 200 warheads held in reserve.

The current fleet of strategic bombers is estimated to include 13 Tu-160 and 55 Tu-95MS aircraft. Bombers can carry various air-launched cruise missiles as well as gravity bombs. During their normal operational practice, bombers do not carry nuclear weapons and the
New START treaty specifies that each bomber is counted as a single deployed warhead. This complicates estimates of the number of deployed warheads assigned to strategic bombers. It is believed, however, that Russia has about 200 weapons that can be delivered by bombers and a comparable number of weapons in reserve (Kristensen and Norris 2018a). In recent years, Russia developed and deployed a new long-range air-launched cruise missile, Kh-102 (US Department of Defense 2018, 8). Weapon laboratories also developed a range of gravity bombs that can be carried by strategic bombers (Andreev 2010, 19).

Russia has also resumed production of the Tu-160 aircraft and plans to develop a new strategic bomber, currently known as PAK-DA, which is expected to enter serial production in about 10 years (The Ministry of Defense of the Russian Federation 2017). At this point, the details of the plan are somewhat uncertain, but it is likely that Russia will maintain a fleet of about 60 nuclear-capable strategic bombers (Starchak 2017; Podvig 2017b). It is also possible that some bombers will be converted to conventional missions.

An overview of the existing strategic modernization program suggests that Russia will maintain the number of operationally deployed nuclear warheads at a level that would be compatible with the New START ceiling of 1550 warheads. Due to treaty accounting rules, the actual number of deployed warheads will be somewhat higher; in addition, Russia apparently plans to keep a significant number of strategic warheads in reserve – up to about 1000 weapons – to counterbalance a similar capability maintained by the US.

An increase in the number of deployed weapons significantly above the New START limit is rather unlikely, although such a scenario would be possible if the treaty expires without being replaced by a new one. However, it is also clear that the current round of modernization will complicate future efforts to achieve an agreement that could reduce the number of warheads below the New START limit. While some reductions can be achieved by further reducing the number of warheads on deployed launchers, in most cases, Russia would have to scale down programs that are already underway.

Factors That Shape Strategic Modernization

When assessing the prospects for a new arms control treaty or a new round of the nuclear arms race, it is important to consider the factors that determine the size and composition of Russian nuclear forces. Historically, the number of weapons in the Soviet and Russian strategic arsenal has never been determined by any specific targeting requirements. Rather, the key objectives have been in approximate parity with the US and the capability to inflict a certain level of damage to the aggressor in a retaliatory strike. It is worth emphasizing that there are no indications that the Soviet Union has ever considered a first strike against US strategic forces. Indeed, it never had the military capacity to launch a successful counterforce attack against the US or to engage in a damage limitation strategy (Podvig 2008). Rather, the primary mission of the strategic forces was to provide a deterrent by ensuring guaranteed retaliation.

During the Cold War, the combination of approximate parity and assured retaliatory capability morphed into the concept of strategic stability, understood as the balance of forces, within which neither side could achieve a strategic advantage by denying its counterpart the capability to deter. Strategic stability is often understood as a situation
where neither side has the incentive to use nuclear weapons first, or even more narrowly, as the ability of strategic forces to survive a counterforce strike and launch a retaliatory attack. It could also be defined more broadly, as a relationship where neither of the participants is in a position to prevail during a conflict. Whatever the definition, strategic stability is an extremely flexible concept that can be adapted to justify virtually any strategic posture.

In the Soviet Union during the Cold War, and in Russia today, these general requirements provide the actors involved with a very wide latitude to pursue a variety of programs. In most cases, this process is shaped by defense industry institutions that seek support for their projects developed within this general framework, rather than by any specific requests from the military. In Russia, the Ministry of Defense plays a role in the process since it participates in the development and approval of technical requirements for new systems and controls the acquisition budget. This role, however, is largely limited to the approval or rejection of projects suggested by the industry and may be further constrained by political considerations. Project costs are also considered, although it is rarely a decisive factor.

The interactive dynamics between the defense industry, the military, and the political leadership has been demonstrated in a number of recent decisions about modernization programs. These processes also illustrate the role played by appeals to strategic stability. The original plan developed in the late 1990s was largely built around the need to maintain the size of the strategic force at the level of 3000–3500 warheads included in the START II treaty, and to preserve an industrial infrastructure capable of developing and producing ICBMs, SLBMs, and nuclear submarines. Since the Russian economy was under considerable stress at the time, the cost of the programs was also an important consideration. As mentioned earlier, the program was largely successful in balancing a number of competing requirements and provided a framework for the subsequent evolution of Russian strategic forces.

The key political factor that came to dominate the strategic planning process during the 2000s was the US decision to withdraw from the ABM Treaty, which limited development and deployment of missile defense systems. After the withdrawal, completed in 2002, the US began to deploy of elements of the national missile defense in its territory, and pursued the deployment of components of that system in Europe (Arbatov, Dvorkin, and Bubnova 2013). Russia objected to these developments, arguing that the unconstrained development of missile defenses would undermine strategic stability by depriving Russia’s strategic forces of their retaliatory potential (Poznikhir 2017).

It is highly unlikely that the missile defense system developed by the US could pose a realistic threat to Russian strategic forces. The system is designed to counter simple threats of missiles from countries other than Russia and has no capacity to deal with countermeasures that are deployed on all Russian missiles. Nevertheless, the anti-missile defense potential of various programs has become an important factor in the decision-making, budget allocation, and acquisition process. This factor is responsible for a number of new development efforts that were initiated or resumed following the US withdrawal from the ABM treaty in 2002.

One of these new programs involved the development of a new silo-based liquid-fuel ICBM that is now known as Sarmat. The main argument used to gain support for this system involved Sarmat’s large advantage in throw-weight over the Topol-M/Yars...
missile, which enables the missile to carry a larger number of warheads and countermeasures (RIA Novosti 2010). The missile is also said to have the capacity to reach targets on US territory flying over the southern hemisphere, which would be another way to defeat missile defenses. The development of Sarmat ICBM is currently underway, and it is expected to enter service after 2020 (Krasnaya Zvezda 2018).

Another notable project in this category involved the development of a boost-glide vehicle, referred to as Project 4202 or Avangard (Podvig and Stukalin 2015). The development of this system began in 1987 as part of the effort to counter the US Strategic Defense Initiative. The program reached the stage of flight tests, but was discontinued following the breakup of the Soviet Union. The design bureau that developed the vehicle, NPO Mashinostroyenia, revived the program during the 2000s and conducted a demonstration flight of the vehicle during a flight test in 2004 that emphasized its capacity to penetrate missile defenses in an apparent attempt to win support for the program. The attempt was successful and after receiving an upgrade, the vehicle entered a new series of flight tests in 2011. As of 2018, the system is being prepared to enter serial production (Krasnaya Zvezda 2018).

The Sarmat and Avangard programs are part of a broader effort to build a range of strategic systems specifically designed to circumvent or counter US missile defenses. The importance that Russian leadership attaches to this aspect of its strategic modernization program is illustrated by a presentation of the plan by the President of Russia during an annual address to the Russian parliament (President of Russia 2018). Among the programs described in the address were a cruise missile with a nuclear propulsion unit and a nuclear-powered unmanned underwater vehicle that could be used to target coastal populated areas. These two systems, later designated as Burevestnik and Poseidon respectively (the latter is also known as Kanyon or Status-6), appear to be at the early stages of development, although they have been undergoing tests for some time (Gertz 2018b, 2018a).

The operational viability of these systems is somewhat uncertain and their overall anti-missile defense potential is highly questionable. With the exception of Sarmat, these systems are not ballistic missiles and cannot be intercepted by missile defenses. However, they remain vulnerable to a counterforce strike and therefore may not offer a significant advantage as retaliatory weapons over traditional land-based or sea-based ballistic missiles.

These programs illustrate the general principles that underlie strategic modernization in Russia. Numerical parity with the US and an emphasis on the retaliatory capability of strategic nuclear forces remain key considerations guiding the process. It is also notable that the defense industry remains the main driver of the modernization effort, especially when it can offer programs that align with the broader message communicated by the political leadership. Specifically, the capacity to counter deployment of US missile defenses has clearly been one of the primary reasons for the approval of virtually all new research and development efforts in the defense industry.

Budgetary constraints can also play a role. The State Armament Program for 2018–2027, which was approved at the end of 2017 after a more than 2-year delay caused by the uncertain economic situation, did not include a number of projects that were initiated by the industry and supported by the military (Dzhordzhevich and Safronov 2017). Among these projects were the Barguzin rail-mobile ballistic missile
and the RS-26 Rubezh intermediate-range ballistic missile (TASS 2018a). The industry proposed building a series of new Borey-B ballistic missile submarines which was also rejected on the grounds of cost-effectiveness (Interfax-AVN 2018). At the same time, in many cases, the defense industry design bureaus have sufficient internal resources to develop their systems to the stage of flight tests or advanced demonstration. This was almost certainly the case with the Avangard boost-glide vehicle, which received support following a successful demonstration in 2004. Other projects in this category probably include the Barguzin missile, a version of the R-29RM SLBM that can carry 10 warheads instead of 4, and the new warhead section of the Yars missile, where each warhead acts as its own post-boost vehicle (Kristensen and Norris 2018a; Panda 2017).

The current modernization program suggests that Russia will continue its efforts to maintain strategic stability understood broadly as approximate parity with US strategic forces and the inability of either side to achieve a decisive advantage over the other. In order to do so, Russia does not need to increase the number of deployed strategic nuclear warheads above the New START level, especially if the US maintains its forces at that level. Since both sides have the capacity to increase that number by deploying warheads from their reserves, neither one has an incentive to do so. To protect the retaliatory potential of its strategic forces, Russia will focus on the development of new delivery systems that are said to have the capacity to “easily breach all anti-ballistic missile systems” (Putin 2018).

**Modernization and Strategic Stability**

While strategic stability appears to be an organizing principle behind Russia’s modernization, its role should not be overestimated. It is correct that the contribution a specific system makes to overall parity with the US, or its capacity to bolster the anti-missile defense capability, is an important factor in securing support for its development. A closer look at the modernization program, however, suggests that rather than being a coordinated effort to maintain strategic stability the program is a collection of projects that reflects the interests and capabilities of the defense industry, and that may undermine the very stability such projects are supposed to protect.

One example is the new strategic delivery systems that go beyond traditional strategic triad – the boost-glide vehicle, the nuclear-powered cruise missile, or the nuclear-powered underwater vehicle. None of these systems is covered by existing arms control agreements, so their development and deployment would not be constrained. That in itself could become a source of instability in the US-Russian strategic relationship, as it will certainly prompt the US to pursue a similar capability or to develop measures to counter these systems.

The Avangard system with a boost-glide vehicle appears to be a particularly destabilizing development. It is largely similar to the systems developed in the US as part of the Conventional Prompt Global Strike program, which is supposed to develop the capacity to strike targets anywhere at a very short notice. Russia expressed concerns about the US program, arguing that it could be used to attack Russia’s strategic forces. By all indications, the US is likely to respond to the upcoming deployment of Avangard by intensifying its programs, which will only exacerbate Russia’s concerns (Kheel 2018).
The US and Russia could try to find an arms control solution to this problem. The New START treaty allows parties to raise questions if it believes that ‘a new kind of strategic offensive arm is emerging’ (“Treaty Between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms” 2010, Article V). Reaching an agreement, however, will be difficult. The US has already stated that boost-glide systems are not covered by the New START limits as they are not considered ballistic missiles (Acton 2013, 139). An agreement on other systems might be possible, namely the nuclear-powered cruise missile or the underwater vehicle, although Russia indicated that it would try to limit the extent they are covered by the treaty verification provisions (Putin 2018).

Given that the new strategic delivery systems provide a niche capability and therefore are not intended to replace any of the existing elements of the strategic triad, they are not expected to be deployed in any significant numbers. However, their introduction will invite an element of instability into the current strategic posture. Since these systems have been described as retaliatory weapons, to be effective they would have to be deployed in a highly survivable mode. None of them, however, would have an advantage in terms of survivability over traditional components of the strategic triad, nor could they rely on ‘safety in numbers’ as ICBMs and SLBMs do currently. This means that during a time of a crisis, these new systems would probably increase instability and the probability of a miscalculation or an error.

This analysis supports the view that strategic stability, especially in its narrow understanding as “a state of strategic relations that is removing incentives for a nuclear first strike and a first use of nuclear weapons” (Arbatov 2018), is hardly the primary factor behind the key elements of the Russia’s modernization program. This view is also supported by the fact that the program includes a number of projects that are not constrained by considerations of stability or parity with the US. For example, Russia is known to be developing an upgrade of its own missile defense system deployed around Moscow; it also has a range of active projects to develop anti-satellite land-based and space-based systems (Stukalin 2011; Samson and Weeden 2018). While it can be argued that these projects mirror some of US development programs, it is difficult to see how they fit into the strategic stability framework. In general, the way Russia structures its modernization today is similar to the Soviet response to the US Strategic Defense Initiative missile defense program during the 1980s. At the time, the Soviet defense industry used the US program to request support for a broad range of research and development projects, whether or not they were actually related to strategic parity or stability (Podvig 2017a).

The outsized influence of the military-industrial complex on decisions that affect development of strategic nuclear forces is not an entirely new phenomenon; neither it is a uniquely Russian one. In today’s Russia, however, that influence has grown due to the relative lack of public and bureaucratic institutions that could provide an effective counterweight to the interests of the military and the defense industry. Domestic politics also plays an important role, since these sectors can generate strong political support. The emphasis on military strength has mobilized great support for the current political leadership.
The Role of Arms Control

Even though arms control has been seen historically as a constraining factor in the nuclear arms race, in an environment where defense industry interests primarily drive the development of new military capabilities, it is just one of the factors that shape nuclear postures. The history of US–Soviet nuclear arms control demonstrates that arms controls agreements tend to codify existing policies and programs, rather than constrain them in a substantial way.

The most recent example illustrating the limits of arms control in constraining nuclear modernization is the development and deployment of a ground-launched cruise missile known as 9M729 or SSC-8. The US alleged that the flight tests and deployment of 9M729 constitute a violation of the INF treaty, since according to the US estimates, the missile “has a range capability between 500 and 5,500 kilometers” (US Department of State 2017, 11). The INF Treaty prohibits its parties from having ground-launched cruise missiles of this kind. Meanwhile, Russia insists that the 9M729 missile is fully compliant with the INF Treaty (Ulyanov 2017).

A full analysis of the situation is problematic due to the absence of public information on the details of US accusations (Podvig 2017c). However, it appears that the development of the 9M729 missile was part of the program to develop a range of cruise missiles with different basing modes and capabilities that was carried out by the lead design bureau in the field, Novator. As part of this effort, the design bureau developed the 9M728 short-range cruise missile for a mobile ground-based system, Iskander-M. Among the other missiles developed by Novator is a sea-based cruise missile (SLCM) known as Kalibr, which has a demonstrated range of more than 500 km. Kalibr, however, is fully compliant with the INF treaty, since the latter does not prohibit development or deployment of sea-launched missiles. It appears that the 9M729 missile that the US believes violates the INF Treaty is a similar missile to the Kalibr SLCM, that can be launched from a mobile ground launcher and has been deployed in some of the units that operate Iskander-M system. If this is the case, it is indeed possible that the missile has the range capability that violates the INF Treaty, even though it appears that it has ever been tested to the prohibited range.

The apparent conflict between Russia’s arms control obligations and its cruise missile development program is rather difficult to explain. Russia has reportedly deployed only two battalions with a total of eight launchers armed with the 9M729 (Gordon 2017). This number does not suggest a significantly new military capability. Also, Russia has the capacity to deploy a much larger number of treaty-compliant sea-launched Kalibr missiles on a variety of surface ships and submarines (Stukalin 2017). Overall, the military advantages offered by this system are uncertain at best. Russia has expressed its reservations about the INF Treaty in the past, but has not exercised the option to withdraw from the treaty, which would enable it to deploy INF-range missiles legally (Kubiak 2018, 4–5). This suggests that the current conflict with INF Treaty obligations is not a result of a deliberate political decision, but an unintended consequence of the wide latitude given to the industry in developing new systems and pursuing new capabilities; in this case, the Novator design bureau.

This pattern of interaction between the arms control process and the internal dynamics of strategic modernization programs is not unprecedented. The most well-known example of a conflict of this kind involved the construction of early-warning
radar near Krasnoyarsk in the 1980s. The US insisted that the location of this radar violated the terms of the ABM Treaty and the Soviet Union eventually admitted the violation and dismantled the radar (Savel’ev and Detinov 1995, 95–110). It should be noted, however, that this became possible only as part of a broader process of improved relations with the US that marked the end of the Cold War. The dynamic could be quite different with the INF treaty, as Russia’s actions could trigger US withdrawal from the treaty, allowing Russia to deploy its intermediate-range systems while having the US bear most of the political cost of terminating the treaty.

Conclusions

The direction of Russian nuclear modernization demonstrates that the program largely follows its internal logic determined by a number of factors. Maintaining broad parity with the US in terms of the number of deployed launchers and warheads is likely to remain the primary objective, but other factors play a role too. For example, Russia has structured its forces in a way that will allow it to match the US ‘upload potential’ – the capacity to deploy reserve warheads on deployed launchers as a hedge against unexpected developments.

There are no signs of Russia reconsidering the structure of its strategic triad. Even though the triad is usually rationalized in terms of the survivability of strategic launchers, for Russia, preserving the historical balance between services appears to be a more important consideration. Specifically, Strategic Rocket Forces are poised to remain the dominant component of the strategic force with at least half and perhaps two thirds of all warheads deployed on land-based ICBMs, most of them on missiles with multiple warheads.

Another important factor that shapes the strategic force modernization effort is the policy of protecting the defense industry in general and the key design bureaus and production enterprises in particular. Facing a choice of different development options, the Russian government tends to support those that protect the industrial base. This approach enables Russia to maintain a capacity to develop and produce liquid-fuel and solid-propellant ballistic missiles, nuclear submarines, and heavy bombers. Other key industries that support strategic forces operations have been protected as well.

The defense industry, in fact, remains the dominant force in determining the direction of strategic modernization programs. By offering a range of choices and actively lobbying for their projects, defense enterprises maintain a strong influence over policy decisions about nuclear programs. Although the executive and the military have some degree of control over the process due to budget allocations and acquisitions policy, strategic modernization remains largely driven by the industry.

Despite the maintenance of stability in the broad sense remaining at the center of Russia’s strategy, specific measures aimed at reducing the incentive to make a first nuclear strike rarely have precedence over other factors. There are no indications that Russia will reconsider its reliance on MIRVed land-based ICBMs, although they are often believed to be a destabilizing element in the strategic triad.

The arms control process remains an important element of Russia’s overall approach to nuclear weapons. Arms control agreements are seen as an important tool for codifying parity between Russia and the US, and providing a focal point for dialogue on a range of issues related to military balance. At the same time, Russia seems to have
concluded that traditional arms control no longer limits strategic competition reliably, since it fails to constrain a number of important capabilities, from missile defense to conventional strike weapons, and potential capabilities, such as weapons in space. It has also questioned the extent to which traditional treaties, such as New START, can limit the number of strategic launchers and warheads (The Ministry of Foreign Affairs of the Russian Federation 2018). Despite its reservations, Russia has expressed an interest in extending New START (TASS 2018c).

Russia has expressed its readiness to continue an arms control dialogue with the US and to refrain from increasing the number of deployed nuclear weapons (Putin 2018). However, Russia clearly wants to maintain its leverage in this process by investing in a range of new systems and capabilities. Adapting the existing framework of bilateral arms control to account for these systems (as well as those developed by the US) would probably take the US and Russia considerable time and effort, and the success of this process is far from guaranteed. Even though arms control dialogue is likely to remain an important communication channel between Russia and the US, it is difficult to expect dialogue to resolve the outstanding issues unless it is accompanied by a significant improvement in the US–Russia relationship.

Disclosure Statement

No potential conflict of interest was reported by the author.

Notes on Contributor

Pavel Podvig is an independent researcher based in Geneva, where he runs his research project Russian Nuclear Forces. He is also a Senior Researcher at the United Nations Insitute for Disaramament Research and a Researcher at the Program on Science and Global Security at Princeton University.

ORCID

Pavel Podvig http://orcid.org/0000-0001-7131-7898

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