Russian New and Experimental Nuclear-Capable Missiles:
A Short Primer

by Christopher Mihal

"We must take into account the plans and directions of development of the armed forces of other countries. . . . Our responses must be based on intellectual superiority; they will be asymmetric, and less expensive."

– Vladimir Putin[385]

NUCLEAR

Russia has tested a wide variety of new weapon systems in an effort to modernize and upgrade its nuclear forces. Russian President Vladimir Putin has not been shy about publicly discussing these new weapon systems or the capabilities of several of them, though a few are not currently feasible for any sort of deployment. More of a threat, however, are the two weapons that Putin did not boast about: the SSC-8 and SSC-X-31, both of which were almost certainly in violation of the Intermediate-Range Nuclear Forces (INF) Treaty. While these missiles represent a threat in and of themselves, a far greater threat is the indication that Russia does not feel bound by international agreements. These missiles have already had their first successful casualty in the death of the INF Treaty, and they may have also dealt a mortal blow to the New START Treaty.

To adequately understand Russia's new nuclear arsenal, one must simultaneously look at the weapon systems themselves as well as the context in which they are being developed. Russia continues to view both the U.S. and NATO as supreme existential threats. Unfortunately for Russia, both the U.S. and NATO have greater military, political, and economic power, and so Russia has long sought avenues to achieve its national objectives without conventional military confrontation.[386] Russia has turned to two primary means of ensuring supremacy: enhancing its nuclear arsenal, which it views as a powerful deterrent that is cheaper to maintain than a large conventional military, as well as 'hybrid' war, which encompasses a number of techniques just shy of war including cyber warfare, *informatsionaya voyna* (information warfare) and a large amount of *maskirovka* (deception) in both military and non-military realms.[387]

"THE WEAK GET BEATEN"

Putin has emphasized information control and manipulation since coming to power, ranging from direct methods such as election interference and masking the identity of irregular forces in Ukraine, to more subtle methods of *dezinformatsiya* (disinformation), of which the exaggerated capabilities of Russia's new nuclear weapons are prime examples. *Dezinformatsiya* is using false or misleading information and disseminating it to credible news outlets. This causes opponents to either act upon the incorrect information, thus wasting time and resources, or it undermines the credibility of the news outlet when it is proven false.[388] Both of these goals of *dezinformatsiya* are being met with the current furor regarding Russia's new nuclear weapons. This primer aims to dispel some of the false or misleading claims regarding these weapons and present a factual foundation from which to react to Russia's new weapon developments and how they fit into Russia's strategic vision.

RUSSIA'S STRATEGIC GOALS

"Nobody wanted to talk to us. Now listen to us."

– Vladimir Putin[389]

After the collapse of the USSR and continued declining influence under Boris Yeltsin in the 1990s, Vladimir Putin had a very real fear. Putin was worried in 1999, just before his ascendancy to the Russian presidency, that "for the first time in the past 200-300 years, Russia . . . could be relegated to the second, or even the third tier of global powers."[390] Ever since Putin's first terms as president, then as prime minister, and then as president again, rebuilding Russia into a world-class power has been his overarching goal. Russia has since flexed its muscles regionally, invading Georgia and Ukraine, while also decisively deploying its military in support of Syrian ally Bashar al-Assad while he faced civil war. However, significant obstacles continue to bedevil this ambitious plan of a resurgent Russia, namely Russia's continued ethnic instability, declining population, and a stagnating economy.[391] Russia continues to view NATO as its greatest existential threat, as noted in the 2015 Military Doctrine of the Russian Federation, but has looked for innovative ways to counter an alliance that has both greater manpower and a significantly stronger economy.[392]

Russia has pursued multiple lines of effort to asymmetrically counter perceived NATO advantages. It cannot hope to face NATO's military superiority conventionally, and so it has focused on other, cheaper areas to counter NATO. Russia's reasoning for the necessity of huge military expenditures was summed up succinctly by Putin: "the weak get beaten," and Russia will no longer be perceived as weak.[393] While it continues to modernize and strengthen its conventional military, it is also drastically modernizing, expanding, and placing greater doctrinal emphasis on the use of its nuclear forces[394], as well as continuing to develop and implement numerous means to negate NATO advantages through means other than war. These latter lines of effort, emphasizing nuclear and informational warfare, are significantly cheaper than a large conventional force expansion and modernization, and so cash-strapped Russia has placed greater emphasis in these areas. Information warfare contains multiple categories, as outlined in the official Russian military publication, *Information-Psychological Warfare in Modern Conditions*, including but not limited to:

- Direct lies for the purpose of disinformation, both of the domestic population and foreign societies;
- Concealing critically important information;
- Burying valuable information in a mass of information dross; and
- Simplification, confirmation, and repetition (inculcation)[395]

TASS News Agency

This primer will make apparent that the public debut of many of the new Russian nuclear weapons systems are rife with some or all of these information warfare tenets.

Finally, and perhaps most alarmingly, Russia has continually pursued a policy of actively cheating or ignoring the tenets of arms control treaties to which it is signatory.[396] This strategy of cheating will be made evident in the overview of new Russian weapons systems. At least two systems, the Satan II and the Screwdriver, being systems that violate the New START and INF treaties, respectively. Indeed, the public declarations of many of these weapons, but not the SSC-8, is in itself example of information warfare, by concealing important information – a missile whose existence violated a standing arms control treaty – and also attempting to bury any information about it in a mass of information on other weapons systems.

While the development of SSC-8 "Screwdriver" was shrouded in secrecy, and Russia still denies that it violates the INF Treaty, in other respects Russia has become bolder in flagrantly violating – or pretending to violate – the New START Treaty. The New START Treaty placed a cap on the number of delivery systems and warheads that Russia could field in its nuclear forces, including approximately 300 ICBMs and 1,550 warheads. However, recently, Russian media have openly stated Russia actually has between 400 and 500 strategic ICBMs and over 1,800 warheads, and even Russian General Karakayev stated Russia had over 400 ICBMs.[397]

With the U.S. having demonstrated a commitment to lowering global nuclear weapon stockpiles, Russia seems to be going in the other direction, modernizing and expanding its forces, possibly to show its independence and great power status by demonstrating the U.S. cannot dictate in this arena.[398] When questioned about the possibility of further arms control reductions, Kremlin Chief of Staff Sergei Ivanov remarked that Russia has fewer reasons to want to reduce their nuclear stockpile because their systems are new, whereas the U.S. still uses decades-old Trident missiles.[399] The crux of the issue, as the Russians view it, centers on why Russia should effectively waste the money that they recently spent on new weapons systems that will immediately be dismantled by an arms control agreement, as opposed to the U.S. that hasn't designed a new nuclear weapon in decades. As an example, the 2016 Russian military budget allocated roughly 606 billion rubles (or just shy of $11 billion) to nuclear weapons, about 15% of the total military budget; a significant investment.[400] Russia clearly sees the investment as worth the cost, although it is not apparent that the new weapons systems deliver the capabilities that the Russian government portrays.

THE WEAPON SYSTEMS

"The projected missile threat is complex and volatile . . . It is critical we continue to develop innovative and breakthrough technologies to outpace rogue state offensive missile capabilities against the U.S." – Lieutenant General Samuel A. Greaves, USAF[401]

Information regarding Russia's new and experimental nuclear-capable missiles is difficult to come by and often spread amongst many different sources, as well as frequently laden with inaccuracies and discrepancies between sources. Russian disinformation and obfuscation play an important role in masking these system's true capabilities, or even their feasibility. This primer is an attempt to consolidate most of the relevant and accurate information from open sources in one table. Each of the ten systems will also be summarized following the table with a brief overview of its known capabilities and political/military ramifications.

It is worth emphasizing that many of these systems and capabilities may be either exaggerated or not as near to completion as Russia claims. In particular, the Circular Error Probable (CEP) for these systems, when available, seems exceedingly optimistic. CEP is a measure of a weapon's accuracy and delineates the radius of a circle around a target point where a missile is likely to impact. The smaller the CEP, the more accurate the weapon, as there is less variance in where it may hit relative to the target. The CEP values Russia is touting for its new weapons systems significantly deviate from the higher CEPs for previous Russian missile systems. Even the relatively recent Topol-M/SS-27 Mod 1 having a CEP of 350-430 meters, and potentially a CEP as large as 800 meters in a worst-case scenario.[402] Thus, the optimistic CEPs in the table below represent absolute worst-case scenarios and are likely Russian attempts to make their newest hardware seem more accurate than it is. However, these figures are included because Russia's military capability has certainly taken an upswing in recent years and it is possible, though not probable, that the CEP values are true. As there are a very large number of variables governing CEP, without direct observation of weapons tests and intimate knowledge of all of a weapon's subsystems, it is extremely difficult to estimate CEP for these weapons with current data.(see chart pg 128)

Additional Notes by Weapon System

"Moscow is fielding an increasingly advanced and diverse range of nuclear-capable regional offensive missile systems, including missiles with unprecedented characteristics of altitude, speed, propulsion type, and range. These missile systems are a critical enabler of Russia's coercive escalation strategy and nuclear threats to U.S. allies and partners."

– 2019 U.S. Missile Defense Review[461]

SSC-X-9 "Skyfall"

"It is the character of weapons . . . more than their quantity, that makes the military environment stable or unstable."

– Thomas Schelling, Arms and Influence[462]

The SSC-X-9 cruise missile is designed to elude current air defense systems using its unique nuclear propulsion system, which would allow it to theoretically fly for thousands of miles and days or even weeks at a time to strike at the most opportune moment.[463] It is currently unknown whether the SSC-X-9 is a reactor-powered ramjet/scramjet or if it is radioisotope-powered. The presence of strontium-91, barium-139, barium-140 and lanthanum-140 following the deadly 8 August 2019 accident at the Nyonoksa test site indicates a reactor-powered system.[464] While Russia has not acknowledged it was a test related to the SSC-X-9 that caused the accident, the seven scientists killed were from the laboratory that worked on the SSC-X-9 and the experimental engine could have been for the missile.[465] All of the isotopes detected at the accident are fission products from the fissioning of Uranium-235, which Russia used abundantly for its nuclear reactors. Additionally, Russia has drawn huge natural uranium reserves from internal and external sources: Kazakhstan exports uranium to Russia and has the world's second-largest uranium reserves, and Russia has the world's seventh largest uranium reserves.[466]

An indicator that the SSC-X-9 may in fact be radioisotope-powered is related to the mass release of ruthenium-106 (Ru-106) in 2017, as well as Russian statements indicating as such. [467] Ru-106, with a half-life of just over a year is a possible candidate for radioisotope propulsion due to its half-life and ability to be created in the plutonium reprocessing process known as PUREX (plutonium uranium extraction reduction), which Russia uses extensively.[468] A radioisotope-powered weapon would use the heat given off naturally by the radioactive decay of its radioisotope to heat air which would pass through a ramjet/scramjet engine. There are a number of drawbacks with such a power plant, however, which may be insurmountable. The U.S. ceased testing of radioisotope-powered engines in the 1960s for Project PLUTO due to the collateral damage such an engine would cause, as it would be constantly discharging radioactive contamination over its flight path, while further complications to the system ever working include the decay of the radioisotope into its daughter products, which could change the weight and thus the balance of the system, negatively affecting flight performance.[469]

Regardless of how the missile is propelled, a functioning SSC-X-9 would be a potent weapons system. As its nuclear engine would not rely on limited conventional fuel reserves to stay aloft, its loiter time and range is limited only by the nuclear materials in the engine itself. If a true nuclear reactor, it would be limited by the quantity of fissile material, whereas a radioisotope engine would be limited by the quantity and half-life of the radioisotope used. Given that western European countries detected another release of nuclear isotopes in June 2020, including ruthenium, it is likely that Russia has continued to pursue testing this weapons system in order to gain an advantage over typical western air defense systems.[470] However, tests so far have only ranged from "partially successful" to catastrophic.[471] Putin's touting of the system's capabilities are obviously premature, and is most likely intended to convey that Russia has a capability that it most certainly does not.

Avangard

Of the systems listed in this paper, the Avangard represents a unique threat and, like many of the other systems, is tailored to directly counter U.S. systems. President Putin claims the Avangard can attain speeds "20 times the speed of sound, hitting its targets like a meteorite."[472] Carried into suborbital space to an altitude of around 100 km in height via an ICBM, which is far below traditional ICBM altitudes and thus more

Table Legend:

GLCM: Ground-Launched Cruise Missile

UNK: Unknown

HGV: Hypersonic Glide Vehicle

ICBM: Intercontinental Ballistic Missile

MIRV: Multiple Independent Reentry Vehicle

NATO Designation(s)	Russian Designation(s)	Type/fuel	Range
SSC-X-9 / "Skyfall"	9M730 Bureverstinik / "Petrel"	GLCM (unconfirmed) / radioisotope or nuclear powered	Theoretically unlimited
"Avangard"	Project 4202, YU-74	HGV / no fuel	>6,000km,[404] possibly >10,000km[405]
SS-X-29/SS-X-30 / "Satan II"	RS-28 / "Sarmat"	ICBM / liquid fuel[409]	11,000 - 16,000km[410]
SS-X-31 / "Frontier"	RS-26 / "Rubezh"	ICBM and possible IRBM (Russia disputes) / solid fuel	>10,000km[418]
SS-N-33 / "Zircon"	3M22 / "Tsirkon"	HSCM/SLBM/solid fuel scramjet	500 - 1,000km[421]
SSC-8 / "Screw driver"	9M729	GLCM/solid fuel[427]	2,500km[428] (US claim) 480km[429] (Russian claim)
"Kinzhal" / "Dagger"	KH-47M2 / "Kinzhal	ALBM/solid fuel[433]	,500 - 3000km[434,435,436] depending on which vehicle launched from (MIG-31 or TU-223)
AS23B / "Kodiak" [442,443]	KH-102 / "Raduga"	ALCM/Turbofan[444]	2,500 - 5,500km rumored up to 10,000km[445]
N/A	KH-32	ALCM / liquid fuel	1,000km[452]
"Kanyon"	Poseidon / Status-6	Submaribe-launched autonomous torpedo	10,000km with a maximum depth of 1,000m[457]

IRBM: Intermediate-Range Ballistic Missile
HSCM: Hypersonic Cruise Missile
SLBM: Submarine-Launched Ballistic Missile
INF: Intermediate-Range Nuclear Forces Treaty
ALBM: Air-Launched Ballistic Missile
ALCM: Air-Launched Cruise Missile

Yeid	CEP	# Currently Deployed/Planned	Notes
UNK	UNK	0	Prototype, either nuclear or radioisotope-powered. Russia boasts successful tests, but series of failed tests casts doubt on if missile will ever be deployed.[403]
2MT (reported)	UNK	2[406] planned to deploy 60 war-heads[407]	Prototype hypersonic missile, designed to be carried by either SS-19 or, in the future, R-28 ICBMs.[408]
10x500kT (MIRV)[411] or 16 smaller warheads[412] or 5-24 Avangard HGV (2MT)[413]	10m[414]	0, 50 missiles on order for 2021[415]	Expected delivery in February 2021.[416] Deployment may violate New START.[417]
4x150/300kT (MIRV)	UNK	0	Possibly violated INF Treaty.[419] Production delayed until at least 2027.[420]
UNK	UNK	Deployed on battle-cruiser *Admiral Nakhimov* in unknown quantity as of 2020,[422] general deployment around 2023[423]	Test-fired from frigate January 2020,[424] designed to be launched from submarines or surface vessels. Nuclear capability stated by President Vladimir Putin,[425] but unconfirmed. Deployment date unconfirmed, likely not before mid-2020s.[426]
10-100kT[430]	5m[431]	16	Primary reason for U.S. withdrawal from INF Treaty,[432] tested at ranges below 500 km but U.S. states capability is much greater; exceedingly similar design to Kalibr-NK SLCM and produced by the same company, Novator.
UNK, though Iskander-M, which system is based on, has a 10-50kT yield[437]	10-20m[438]	UNK, but 10 MIG-31s confirmed to have been modified as of 2018 to each carry one missile as of 2018[439]	Extremely similar to existing Iskander-M system,[440] may also have a conventional warhead variant. Intended for anti-ship use primarily, possibly against ground targets as well.[441]
450kT[446]	5-20m[447,448]	UNK, but the TU-95H6 can carry up to 6 missiles each and the TU-95H16 can carry up to 16 missiles each, while the TU-160 could carry up to 12 each[449]	Confirmed squadron of MiG31Ks located at Akhtubinsk,[450] total bombers modified to carry weapon unknown though at least 20 TU-95MS have been upgraded to carry the Kh101/102.[451]
150-500kT	UNK	0, 32 planned[453]	Modernized Kh-22 allegedly designed to be hypersonic and carried by the Tu-233M3M, which can carry two missiles each[454,455], Russia has stated the Su-30SM fighter will also be modified to carry the missile.[456]
Between 2MT (most likely) and 100MT (highly im-probable), possibly salted with Co-60	UNK	0, "more than 30" planned by 2027[458]	Will be carried by new Khabarovsk[459]- and Belgorod-class (a heavily modified Oscar II) [460] submarines

difficult to intercept, the Avangard is currently designed to be carried by the SS-19 "Stiletto" but will be instead mounted on the new R-28 "Sarmat" when that system is deployed.[473] Capable of mounting conventional or nuclear payloads, the Avangard, which has no engine, is designed to eliminate U.S. ballistic missile defenses prior to a general nuclear attack. The ICBM that carries the HGV ascends into low orbit and then releases the HGV, which streaks towards its target at high speed and is capable of performing evasive maneuvers to elude air defense assets and radar tracking. Because Avangard remains suborbital, it is designed to strike below the current ballistic missile defense shield umbrella.[474]

Avangard represents a new class of weapon, as it is neither a ballistic missile nor a cruise missile. Thus, any future arms control agreements will have to take into account its unique nature, otherwise Avangard deployment can theoretically be a means by which Russia can circumvent current arms control rules on deployments of certain types of missiles.

SS-X-29/SS-X-30 Satan II

Designed to replace the aging R-36M "Satan I," the Satan II will be the world's largest ICBM with a launch weight of over 200 tons, designed to carry up to 16 nuclear warheads or up to 24 of the new Avangard HGV.[475] Of the six weapons President Putin unveiled in his now-famous 2018 state of the nation speech, this weapon is the closest to actual deployment and feasibility, especially compared to the SSC-X-9 and other wildly experimental technologies mentioned that day. Deployment was originally planned for 50 units delivered in 2020 but has been pushed back to February of 2021 at the earliest.

The development of the Satan II should concern the United States, which has preferred to upgrade older ICBMs rather than introduce new models. Russia's more autocratic form of government grants the ability of its weapons programs to accept increased risks in safety and in disregarding international opinion, such as in developing new strategic weapons where previously the international consensus was to limit new strategic weapons. The planned deployment of the Satan II has increased drastically from its original concept of 46 missiles, with current Russian plans looking at deploying between 120 and 200 of these missiles.[476] Given that Russia under New START can only have a total of 700 ICBMs, SLBMs, and heavy bombers, this number indicates Russia may intend to breach New START's delivery system limit, and the full payload of 120 Satan II missiles would also exceed the warhead cap of 1,550 total warheads imposed by New START.[477] Russia's continued preference for developing new systems presents a great strategic risk while also running counter to international norms of the past few decades that focused on arms reduction rather than arms increases. As with the INF Treaty, despite Russian protestations otherwise, it seems that Russia no longer finds itself bound by the New START Treaty and will continue to undermine and violate the treaty if there are no consequences.[478]

SS-X-31 "Frontier"

The SS-X-31 system is reportedly based on the Rs-24 Yars.[479] Further development of this system was halted in favor of the Avangard until at least 2027.[480] Nevertheless, the SS-X-31 is noteworthy, as U.S. scientist and senior analyst at the National Institute for Public Policy Dr. Mark Schneider emphasized upon its testing in 2011 that the missile may be in violation of both the INF Treaty as well as the New START Treaty.[481]This is due to the ranges at which the missile was tested, which fell more in line with IRBM ranges, with the U.S. claiming that the SS-X-31 is an IRBM that Russia has disguised or falsely designated as an ICBM.

As Dr. Schneider notes, the unusual amount of secrecy surrounding the SS-X-31 may be due to the fact that it was in violation of either the INF Treaty or the New START Treaty.[482] If production restarts, it will be worthwhile to examine the exact capabilities of this system, even though the INF Treaty is no longer in force.

SS-N-33 "Zircon"

Designed to be launched from both surface vessels and submarines, the hypersonic Zircon/Tsirkon was used in a strangely direct threat by Russian state television in 2019 that identified several U.S. military facilities as targets that could be hit from submarine-launched Zircons "within five minutes."[483] Putin made the threat to include hypersonic missiles on submarines lurking near the U.S. in response to allegations that the U.S. plans to stage intermediate-range nuclear missiles in Europe following the U.S. withdrawal from the INF Treaty – a claim that U.S. officials discounted as pure propaganda.

The Zircon uses solid fuel in its first stage and a scramjet in its second stage to achieve hypersonic velocities.[484] So far the Zircon has only been test-fired from surface vessels, though development for it to be submarine-launched is well under way. Putin stated that the missile is nuclear-capable but there have been no indications of that fact otherwise. As is evident from the Zircon and several other recently developed missiles, Russia is putting great faith in the capabilities of hypersonics, perhaps to the detriment of other, proven systems.

SSC-8 "Screwdriver"

The SSC-8 may be the most infamous weapon system in this list, as it is the weapon directly responsible for the withdrawal of the U.S. from the INF Treaty. The U.S. Department of State Compliance Report is replete with examples of how this missile directly and flagrantly violated the treaty. This has been accompanied by a speech from the Director of National Intelligence confirming that the ranges the missile was originally tested at went beyond the 500 km limit the INF Treaty imposed for a GLCM.[485]

As with the SS-X-31, Russia has been extremely tight-lipped about this system, until directly confronted by a

U.S. delegation using the then-secret Russian designation of the weapon, 9M729, in a conference.[486]The great amount of secrecy lends credence to the theory that this missile was knowingly constructed in violation of the INF Treaty. Further construction of GLCMs now that the INF Treaty has been dissolved is worrisome, as it will give Russia additional flexibility and the ability to project nuclear power into Europe without utilizing its strategic nuclear forces. Russia had four missile battalions equipped with the SSC-8 as of 2019, with each battalion consisting of four launchers with four missiles each, for a total of 64 deployed missiles.[487]

Russia continues to deny that the SSC-8 violated the INF Treaty, but has recently made claims stating that Russia will not deploy the SSC-8 in the European part of Russia "in the spirit of goodwill" provided NATO countries do not deploy missiles previously prohibited by the treaty in what would be a bizarre compromise if the missile didn't also violate the treaty.[488]

"Kinzhal"

Likely derived from the Iskander-M, this ALBM is currently loaded on modified MiG31s (sub-variant identified as MiG31K), with future deployment on Tu22m3 bombers planned.[489] The Kinzhal ("Dagger") is designed to destroy land- and ship-based missile defense systems and also to act as a nuclear deterrent, with a secondary mission of striking naval and carrier groups.[490] The Kinzhal is classified as an "aero-ballistic" missile, meaning that it is capable of performing evasive maneuvers in flight; this is designed to defeat U.S. missile defense systems.[491]

Unlike several of the systems in this Primer, the Kinzhal has actively been deployed already. However, Russian claims as to the efficacy and range of this weapon are dubious. It is interesting that this missile has apparently been designed primarily for older MiG31s, but not for new aviation assets like the Su-57. Given Russia's increased economic difficulties, the Su-57 may be too expensive to purchase in quantity, as well as still being in the prototype stage, and so Russia is resorting to retrofitting older, less advanced planes to carry its nuclear weapons.

Kh-102 "Kodiak"

The Kh-102 is the nuclear-armed companion of the conventional Kh-101 missile, designed to replace aging Kh-55 and Kh-555 ALCMs.[492] Range is accepted by multiple sources as being approximately 2,500-2,800 km, though the Russian Ministry of Defense claims a range of up to 4,500 km.[493] Even at the shorter range, the Kh-102 could be launched outside of the U.S.'s air-defense identification zone (ADIZ). Planes entering the ADIZ must announce their intention and destination to the U.S; having the capability to avoid entering this zone with standoff distance provided by the long range of the missile increases the utility of the weapon and survivability of the bomber carrying it. After launch, the Kh-102's stealth capabilities and the terrain-hugging nature of its flight path would make detection via radar difficult once it is launched.[494]

The Kh-101 has seen extensive deployment in Syria against ISIS militants since its initial deployment in 2012 on modified Tu-160 and Tu-95 bombers. In one notable instance on the Syrian coastline, thirty-four Kh-101s were launched within one hour from multiple Tu-160 and Tu-95MS aircraft against targets at Aleppo and Idlib.[495] Given that the only difference between the conventional Kh-101 and the nuclear-armed Kh-102 is the type of payload, this marks the Kh-102 as the most extensively tested of Russia's new missiles. In further demonstrations of force, the Tu-160 has conducted two long-range patrols, to Venezuela and South Africa in 2018 and 2019 respectively, demonstrating its long reach and ability to deploy nuclear cruise missiles anywhere in the world.[496] Deployment of the Kh-102 is currently unconfirmed aside from 10 assigned to a bomber squadron in Akhtubinsk.

Kh-32

An upgraded version of the Kh-22 with an improved warhead and newer engine allegedly capable of speeds up to Mach 5, the Kh-32 is purpose-built to destroy U.S. aircraft carrier strike groups.[497] The maiden flight of the prototype variant Tu22M3M bomber which will carry the Kh-32 was in December 2018, with delivery for deployment scheduled for 2021.[498] Russian sources have repeatedly stressed that U.S. air defense is completely ineffective against the Kh-32 as it coasts at an altitude inaccessible for air defense platforms to respond to, but this seems to be idle boasting.[499] The same source notes that, while the Kh-32 may be an excellent system, it is so expensive that Russia cannot afford many of them currently. The same may be said of the other systems in this list.

"Poseidon"

The Poseidon (previously known as the Status-6 in Russia) is an autonomous nuclear-armed and -powered stealth torpedo. Bridging the gap between drone, torpedo, and cruise missile, it is designed to circumvent U.S. ballistic missile defenses focused on deterring aerial threats. The Poseidon is the largest torpedo ever built, with a length of approximately 80 feet and a diameter of 5 feet, with a maximum speed of 100 knots. Poseidon's capabilities are probably exaggerated, from wildly ranging estimates for its nuclear yield, from a sensible 2 MT to a wildly improbably 100 MT, to the rumors of the weapon to be a salted bomb, as well as uncertainty with the efficacy, power and range of its experimental nuclear propulsion system.[500]

The stated maximum speed of Poseidon is more than twice that of the most advanced U.S. torpedo, the Mark 54, which is specifically designed for speed.[501] While its nuclear propulsion system is frequently touted, Russia's actual nuclear submarines are nowhere as sophisticated in their propulsion, which begs the question of whether Poseidon's engine is really as advanced as claimed. Furthermore, the 100 MT yield and allegations of a salted weapon must be falsehoods. A weapon with that high of a yield simply cannot be a salted weapon, as salted

weapons exchange nuclear explosive power for enhanced radioactive fallout. Additionally, the largest nuclear weapon ever detonated, Tsar Bomba, only had a yield of 50 MT.

Poseidon being a salted weapon using Cobalt-60, is pure disinformation.[502] First proposed in 1950 by Leonard Szilard as a means of demonstrating how destructive and dangerous nuclear weapons development could become if unchecked, salted weapons take their name from the fact that they would "salt" the Earth with radiation.[503] They have never been deployed by any nation due to their extreme destructiveness and immorality, and the universal international condemnation for deploying such a weapon would drastically outweigh any potential gain. Salted weapons work by replacing some of the components that contribute to the explosive force of a nuclear weapon with naturally-occurring Cobalt-59; neutrons released by the nuclear weapon would be absorbed and transform the cobalt into the isotope Cobalt-60. Cobalt-60 is highly radioactive; any appreciable amount of Cobalt-60 would render an area completely uninhabitable for decades, with fallout 150 times greater than traditional nuclear weapons even five years after detonation.[504]

Regardless of the technical specifications, the purpose of Poseidon is suspect, as it is a poor candidate for striking its primary targets of coastal cities and ships.[505] For use against cities, Russia has an improved ICBM fleet as well as the Avangard HGV, while against ships there seems little point in using nuclear weapons when newer cruise missiles are already designed to combat U.S. ships. Finally, Poseidon's maximum deployment of approximately 30 weapons systems is too small to offer any sort of strategic advantage. If the supposedly new nuclear propulsion system works, this would provide Poseidon with extended loiter time underwater, while its stealth capabilities are apparently extensive; these indicate Poseidon may be a proof-of-concept rather than a weapons system.

Despite this, the impact Poseidon has had on the media has been nothing short of hysterical, with numerous outlets breathlessly reporting as fact its extraordinarily high yield, extreme stealth capabilities, and ability to devastate large swathes of the U.S. coastline with Cobalt-60. Thus, as a disinformation asset, Poseidon may have already achieved its purpose.

CONCLUSION

"RVSN [Raketnye voiska strategicheskogo naznacheniia – Strategic Mission Missile Forces] will play a special role in psychological pressure on the potential aggressors (the U.S. and China) . . . nuclear weapons became for us the most important 'force equalizer.' **Most important is the psychological education of the Russian ruling elite; it should show the whole world its resolve to use nuclear weapons at the critical moment, unafraid of any international tribunals.**" [Emphasis in original] – *Various Authors, "Russian Doctrine: The State Ideology in Putin's Era"*[506]

What is most concerning about Russia's flouting of international agreements by designing so many new nuclear weapon systems is what it forebodes for Russian foreign policy. The INF Treaty was negotiated from a position of weakness for Russia, as arguably was New START. Russia's disdain of the INF Treaty has been documented for years. As early as 2005 Russia has sought to withdraw from the treaty, considering it a relic of the Cold War and not relevant to today's geopolitics.[507] In a moment of unexpected candidness, retired Russian Air Force Colonel Mikhail Khodarenok perhaps summed up Russia's primary reason for wanting the treaty gone: NATO and the U.S. would "only listen to someone with equal power."[508] In Russia's myopic strategic view, only vastly increased nuclear arsenals, including previously-forbidden weapons, will force the West to treat them as an equal.

The reality is that many of these weapon systems, in one form or another, exist or may soon exist. While the international community may not desire to increase nuclear tensions, the presence of these weapons requires the international community to relook at a number of potential responses. The existence of the SSC-8, Satan II and SS-X-31 are the most recent demonstrations that Russia is willing to skirt the limits of arms control treaties to which it is a party. Russia's autocratic government grants it freedoms in violating international agreements that more western democratic governments are simply incapable of doing. Indeed, there is a substantial amount of documentation on Russian violations of multiple arms control treaties going back decades.[509] While the U.S. Department of State has previously noted that, even were Russia to "cheat" on its obligations under New START it still would not threaten the U.S.'s response capabilities, it is an unfortunate reality that any arms control treaty with Russia must acknowledge Russian propensity for cheating and negotiate accordingly.[510]

Any demonstration of new capabilities, especially regarding nuclear weapons, is a worrisome development in international relations. A measured, effective response is required to counter the very real threat that these weapon systems represent. It is evident that Russia feels unconstrained by current arms control treaties, the international community's previous responses to Russia aggression in Ukraine and Georgia, and the continued inability to counter Russian irregular/cyber warfare throughout the western world. Implementing solutions that effectively inhibit and deter such gross violations of international norms will be difficult, but this is a problem that can no longer be ignored. As the Russian government feels more confident in its ability, its flouting of international norms or attempts to upend the international order entirely will only increase unless the international community responds accordingly. Russia's new weapon systems are merely one dangerous facet of this trend, but without an adequate response, they will not be the last.

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