

RUSSIA: EMP THREAT

**The Russian Federation's Military Doctrine, Plans, and Capabilities for
Electromagnetic Pulse (EMP) Attack**



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KEY JUDGMENTS

The United States and NATO allies regularly experience from Russia major cyber-attacks penetrating government agencies and critical infrastructures for electric power, telecommunications, transportation and other sectors vital to electronic civilization. These events practice a new way of warfare, including EMP attacks, that could blackout North America and NATO Europe, and win World War III at the speed of light.

Any nuclear weapon detonated in outer space, 30 kilometers or higher, will generate a high-altitude electromagnetic pulse (HEMP) damaging all kinds of electronics, blacking-out electric grids and collapsing other life-sustaining critical infrastructures. No blast, thermal, fallout or effects other than HEMP are experienced in the atmosphere and on the ground.

Russian military doctrine, because HEMP attacks electronics, categorizes nuclear HEMP attack as a dimension of Information Warfare, Electronic Warfare and Cyber Warfare, which are modes of warfare operating within the electromagnetic spectrum.

Russia has “Super-EMP” weapons specialized for HEMP attack that potentially generate 100,000 volts/meter or higher, greatly exceeding the U.S. military hardening standard (50,000 volts/meter).

As a result of its HEMP nuclear tests, the Soviet Union, and today Russia, probably knows a lot more about HEMP effects than the United States.

“Super-EMP is a...first-strike weapon,” according to Aleksey Vaschenko, who describes Russian nuclear weapons specially designed to make extraordinarily powerful HEMP fields as Russia’s means for defeating the United States.

Hypersonic vehicles are potentially a new avenue for surprise HEMP attack, flying at 50-100 kilometers altitude: the optimum height-of-burst for Super-EMP warheads.

Russia has the technical capability to clandestinely orbit a nuclear-armed satellite or satellites to be maintained in orbit for years until needed to make a surprise HEMP attack.

HEMP attack could achieve for Russia a key objective the USSR could not achieve during the Cold War—neutralizing U.S. ballistic missile submarines at sea.

Russia probably remains the world’s leader in Non-Nuclear EMP (NNEMP) weapons, also called Radio-Frequency Weapons (RFWs). Marriage of NNEMP to drones or cruise missiles, equipped with sensors to follow high-power electric lines and target control centers and transformers, introduces a major new threat to national power grids.

As Russia categorizes HEMP attack as Information, Electronic or Cyber Warfare, Moscow’s already very loose strictures for nuclear employment may not even apply to HEMP.

RUSSIA: EMP THREAT

Cybergeddon

The United States and NATO allies regularly experience from Russia major cyber-attacks penetrating government agencies and critical infrastructures for electric power, telecommunications, transportation and other sectors vital to electronic civilization. Few except those familiar with Russian military doctrine are aware that these events are practice for a new way of warfare which would culminate in nuclear high-altitude electromagnetic pulse (HEMP) attacks, that could blackout North America and NATO Europe, and win World War III at the speed of light.¹

In 2020, Russia apparently executed the most sophisticated and potentially most dangerous cyber-attack in history on the U.S. Government and private sector, penetrating the defenses of even the Cybersecurity and Infrastructure Security Agency (CISA)—that is supposed to be the chief guardian against such threats to U.S. critical infrastructures.²

For at least 9 months, from March until December 2020, cyber-spies roamed undetected through: the National Nuclear Security Administration (responsible for U.S. nuclear weapons); the Department of Energy and Federal Energy Regulatory Commission (responsible for protecting national electric grids); defense contractors designing the nation's most advanced weapons; and 18,000 other government and corporate victims.³

Still unknown is the scale and depth of damage.

The U.S. will be fortunate if the cyber-attack was “merely” an intelligence gathering operation, as alleged by CISA and the National Security Agency, and not also a sabotage mission implanting logic-bombs, viruses, and cyber-bugs for future use.

The U.S. Government almost always claims cyber-attacks by Russia, China, and North Korea are for spying, not sabotage. Would the USG even know? Or is “cyber-spying” by Russia and others a politically convenient excuse for the U.S. to understate potential damage—and to escape acknowledging an act of war?

Washington does not know what to do.

As after past major cyber-attacks, Washington is full of sound and fury, promising reforms and retribution, that will probably come to nothing.

Washington's impotence and irresolution will invite future, increasingly aggressive, cyber-attacks.

¹ EMP Commission, *Nuclear EMP Attack Scenarios and Combined-Arms Cyber Warfare* (July 2017) pp. 43-46, 54-57. All the unclassified EMP Commission reports are at www.firstempcommission.org.

² “Joint Statement by the Federal Bureau of Investigation (FBI), the Cybersecurity and Infrastructure Security Agency (CISA), the Office of the Director of National Intelligence (ODNI), and the National Security Agency (NSA)” www.cisa.gov (January 5, 2021). “Russia's Massive Hack Demands A Reckoning For U.S. Cyber Defenses” Washington Post (December 16, 2020). Nathan Bomey and Kevin Johnson, “What You Need To Know About The FireEye Hack” USA Today (December 14, 2020). Kartikay Mehrota, “Critical Infrastructure Left in the Dark About SolarWinds Hack” Bloomberg (January 5, 2021).

³ Ibid.

Yet for decades Washington has been competently counseled on cyber-threats and solutions. 23 years ago, for example, the President’s Commission on Critical Infrastructure Protection warned in October 1997:

*“In the cyber dimension there are no boundaries. Our infrastructures are exposed to new vulnerabilities—cyber vulnerabilities—and new threats—cyber threats. And perhaps most difficult of all, the defenses that served us so well in the past offer little protection from the cyber threat. Our infrastructures can now be struck directly by a variety of malicious tools.”*⁴

The Pentagon’s Defense Science Board report “Resilient Military Systems and the Advanced Cyber Threat” warned in January 2013: “While the manifestation of a nuclear and cyber attack are very different, in the end, the existential impact to the United States is the same.”⁵

Most dangerous, Washington is ignorant of the full magnitude of the cyber-threat, that has kinetic and nuclear dimensions. The Congressional EMP Commission warns:

*“Combined-arms cyber warfare, as described in the military doctrines of Russia, China, North Korea, and Iran, may use combinations of cyber-, sabotage-, and ultimately nuclear EMP-attack to impair the United States quickly and decisively by blacking-out large portions of the electric grid and other critical infrastructures...The synergism of such combined arms is described in the military doctrines of all these potential adversaries as the greatest revolution in military affairs in history—one which projects rendering obsolete many, if not all, traditional instruments of military power.”*⁶

Is it significant that the protracted 9-months attack on the U.S. in the cyber-domain preceded and coincides with Russia’s major strategic forces exercise on December 9, 2020, wherein dictator Vladimir Putin personally oversaw launching ICBMs, SLBMs, and cruise missiles, simulating a nuclear war against the United States?⁷

Is it significant that on December 15, 2020, Russia test-launched an anti-satellite missile, threatening assets critical to the U.S. military and economy in the domain of space?⁸

Is it significant that Russia’s VOSTOK 2018 massive military exercise, mobilizing 300,000 troops, 36,000 tanks and other vehicles, and 1,000 aircraft, simulating a nuclear World War III, was preceded by cyber-attacks on hundreds of U.S. electric utilities?

Cyber-attacks by Russia, China, and North Korea are not only about stealing U.S. intellectual property and collecting intelligence on U.S. vulnerabilities, but also about testing U.S. responses.

⁴ President’s Commission on Critical Infrastructure Protection, *Critical Foundations: Protecting America’s Infrastructures* (October 1997).

⁵ Defense Science Board, *Resilient Military Systems and the Advanced Cyber Threat* (DOD: January 2013)

⁶ EMP Commission, *Assessing the Threat from EMP Attack* (July 2017) p. 5.

⁷ Ed Adamczyk, “Russia Announces Tests of Nuclear Forces Capability in Real Exercise” www.upi.com and Defense News (December 9, 2020).

⁸ U.S. Space Command, “Russia Tests Direct-Ascent Anti-Satellite Missile” (Peterson AFB: December 16, 2020).

Masao Dahlgren, “Russia Tests Anti-satellite Missile” MissileThreat.CSIS.org (December 16, 2020).

Most ominously—they are practicing a revolutionary new way of warfare coordinating all arms for cyber, space, and terrestrial blitzkrieg.

Washington seems incapable of connecting the dots, unlike Colonel (ret.) Bob Lindseth, former Deputy Director for Intelligence on the Joint Chiefs of Staff and Professor of Information Operations at National Intelligence University:

*“In today’s world a nuclear conflict will be preceded by Cyber operations in every form.”*⁹ (December 18, 2020)

Unlike Admiral (ret.) William Studeman, former Director of NSA and former Acting Director CIA:

*“I see little discussion anywhere of threats which integrate cyber and nuclear (all kinds including EMP) in both the offensive and defense...All these experts seem to stay in their ‘vertical/stove-piped’ fields of expertise and thinking. I think that Cyber/Information Operations and nuclear integrated threats/vulnerabilities considered together need more and new thinking.”*¹⁰ (December 17, 2020)

HEMP—The Ultimate Cyberweapon

Any nuclear weapon detonated in outer space, 30 kilometers or higher, will generate a high-altitude electromagnetic pulse (HEMP). No blast, thermal, fallout or effects other than HEMP are experienced in the atmosphere and on the ground. A nuclear detonation at 30 kilometers altitude will generate a HEMP field with a radius on the ground of 600 kilometers, damaging all kinds of electronics, blacking-out electric grids and collapsing other life-sustaining critical infrastructures. Detonated at 400 kilometers altitude, the radius of the HEMP field will be about 2,200 kilometers, large enough to cover most of North America.¹¹

Russia has what they term “Super-EMP” weapons, nuclear warheads specialized for HEMP attack. Super-EMP warheads have very low explosive yield (10 kilotons or less) but very high gamma yield, which is what generates HEMP. According to Russian military and technical sources, Super-EMP weapons can generate HEMP fields of 100,000 volts/meter or higher, greatly exceeding the U.S. military hardening standard for HEMP (50,000 volts/meter).¹²

Russian military doctrine, because HEMP attacks electronics, categorizes nuclear HEMP attack as a dimension of Information Warfare, Electronic Warfare and Cyber Warfare, which are modes of warfare operating within the electromagnetic spectrum.¹³

Commonplace cyber-theft, e-mail disruptions, and hacking, widely regarded as annoyances by most Americans, could foreshadow catastrophic nuclear HEMP attacks on the grid that would threaten the existence of society. In Nazi Germany's blitzkrieg strategy, probing by their motorcycle corps and scout planes, looking for weakness, preceded the massed onslaught of heavy

⁹ Colonel (ret.) Bob Lindseth correspondence (December 18, 2020).

¹⁰ Admiral (ret.) William Studeman correspondence (December 17, 2020).

¹¹ EMP Commission, *Nuclear EMP Attack Scenarios and Combined-Arms Cyber Warfare* (July 2017) pp. 13-17.

¹² Ibid, pp. 17-18.

¹³ Ibid, pp. 1-10. EMP Commission, *Chairman’s Report* (July 2017) pp. 17-23.

armored divisions. The same principle may be at work in cyber-space with probing attacks from Russia, China, North Korea and Iran.

From the perspective of adversary military doctrine on Electronic Warfare and Cyber Warfare, cyber-thefts and intrusions look less like isolated cases of theft and hacking and more like probing U.S. defenses and gauging Washington's reactions—perhaps in preparation for an all-out cyber offensive that would include physical sabotage, radio frequency weapons, and ultimately nuclear HEMP attack.

Russian HEMP Tests

The Soviet Union discovered the high-altitude electromagnetic pulse (HEMP) phenomenon probably years before the United States. High-altitude nuclear testing at its Novaya Zemlya site would have exposed the Russian cities of Archangel and Murmansk and electric grids on the Kola Peninsula to HEMP effects. Moreover, Russia being located at a higher northern latitude than most of the U.S., on the same latitude as Canada and Alaska, meant greater exposure to geomagnetic storms and their EMP/GMD effects on communications and power grids, an awareness reflected in their military writings.

On October 22, 1962, the Soviet Union conducted a high-altitude EMP test—Nuclear Test 184—over part of its own territory, deliberately exposing Kazakhstan's electric grid to HEMP as an experiment. "These EMP producing tests were done over a large populated land mass in Kazakhstan," writes Jerry Emanuelson in his study of Test 184, "Even though the economic state of Kazakhstan in 1962 was quite primitive by today's standards, it was heavily industrialized and electrified." The HEMP field generated by Nuclear Test 184 covered all of Kazakhstan. Emanuelson:

*"Test 184 was detonated at 290 kilometers above a point that was 180 miles due west of Zhezhgazghan....At an altitude of 290 kilometers above the detonation point in central Kazakhstan, the distance to the horizon would have been more than 1900 kilometers, which would have caused an electromagnetic pulse over all of Kazakhstan."*¹⁴

Data from Nuclear Test 184, the results of which were kept secret for over thirty years, were partially shared with the West in a briefing by Russian General Vladimir M. Loberev in 1994. Nuclear Test 184 confirmed definitively for the Soviets in 1962 what the United States concluded independently by extrapolation from the U.S. STARFISH PRIME and other nuclear test results (conducted over the Pacific Ocean), and from experiments conducted over 50 years using EMP simulators and by computer modeling.¹⁵

Nuclear Test 184 destroyed transformers, generators, communications, switches and all manner of electronics within an enormous footprint extending hundreds of kilometers—thereby proving the

¹⁴ Quote and for a good summary of the Soviet 1961-62 EMP nuclear test series and Test 184 see Jerry Emanuelson, "Soviet Test 184" Futurescience <http://www.futurescience.com/emp/test184.html>.

¹⁵ Ibid. For some data on infrastructure effects from Nuclear Test 184 provided by Russian General Loberev in 1994 see Dr. Peter Vincent Pry, *Electric Armageddon* (EMP Task Force: 2013) p. 35. For a brief history of U.S. HEMP science see Dr. Peter Vincent Pry, *The Power And The Light: The Congressional EMP Commission's War To Save America 2001-2020* (EMP Task Force: 2020) Part I: The Foundations of EMP Science and Threat Assessment.

advantages and dangers of HEMP attack empirically. Monstrous and unethical as may have been the USSR's decision to conduct an HEMP test against their own people, Nuclear Test 184 and other tests armed the Soviet Union with the best HEMP data in the world in 1962.¹⁶

Nuclear Test 184 was part of a series of seven Soviet nuclear HEMP tests conducted over the USSR's own territory, mostly over Kazakhstan, commencing on September 6, 1961, and ending on November 1, 1962. Whereas the U.S. was surprised by its discovery of HEMP during its 1962 nuclear test STARFISH PRIME, the Soviets were already aware of HEMP during their nuclear test series and were very well prepared with a large array of scientific instruments all over Kazakhstan to test and investigate HEMP effects from actual high-altitude nuclear detonations in a way that has never been approximated by the United States or any other nation.¹⁷

The first two Soviet HEMP nuclear tests, on September 6, 1961, and October 6, 1961, were codenamed "Thunderstorm" and "Thunder" perhaps reflecting the HEMP mission. All of the tests were very realistic, using military ballistic missiles, mostly the SS-4 medium-range missile, to deliver and detonate the warheads at high-altitude. The HEMP tests used a wide variety of warheads, with yields ranging from merely 1.2 kilotons to 300 kilotons, detonated at greatly varying altitudes, ranging from 22.7 kilometers to 300 kilometers height-of-burst.¹⁸

There is no question that as a result of its HEMP nuclear test series, the Soviet Union, and today Russia, probably knows a lot more about HEMP effects than the United States. "In 1962, the then Soviet Union conducted several high-altitude nuclear tests in Kazakhstan in the course of which were obtained vast facts on the damage levels from HEMP illuminating both military and civil systems," writes Russian scientist Vasilii Greetsai today. "Most of those 'vast facts' are apparently still kept secretly at the Russian Federation Ministry of Defense at the Central Institute of Physics in Sergiev Posad, Russia," warns Emanuelson in his study of Test 184, "Only a tiny amount of those facts have been publicly released, but those facts have been extremely informative."¹⁹

Russia Shares Some HEMP Data

Why did Russia share any HEMP nuclear test data with the West, and why just Nuclear Test 184 in particular? It is generally assumed that Russian General Lobrev's 1994 briefing on Nuclear Test 184 to an international audience was a benign act, part of the post-Cold War thaw in relations under the pro-Western Russian President Boris Yeltsin.

However, a less benign interpretation of the facts is possible.

Perhaps the Russian General Staff approved Lobrev's 1994 briefing to the West on Nuclear Test 184 because they hope to mislead the United States on the real severity of the threat and preserve U.S. vulnerability to HEMP attack. Emanuelson in his study of Test 184 observes that the nuclear weapon used for this test—as impressive as were the results—was an inefficient design for HEMP, and probably produced weaker HEMP fields than the U.S. STARFISH PRIME nuclear test. Nor

¹⁶ Ibid.

¹⁷ Jerry Emanuelson, "Soviet Test 184" Futurescience <http://www.futurescience.com/emp/test184.html>.

¹⁸ Ibid.

¹⁹ Ibid. Vasilii N. Greetsai et. al., "Response of Long Lines to Nuclear High-Altitude Electromagnetic Pulse (HEMP)" IEEE Transactions on Electromagnetic Compatibility, Vol. 4, No. 4 (November 4, 1998).

have the Russians disclosed, even for Test 184, the strength of the peak HEMP fields that can do the most damage.²⁰ Yet among Western specialists Test 184 has become a sort of "gold standard" that rivals in importance STARFISH PRIME as a basis for designing HEMP protection.

Moscow jealously guards the secrets of its other HEMP nuclear tests—that includes more than the seven high-altitude detonations for the 1961-62 test series. Most Western analysts assume that Russia is sharing its best data by disclosing Test 184. Even the usually meticulous Emanuelson appears to jump to this conclusion: "The first two of the K Project high altitude nuclear tests (in 1961) over Kazakhstan were only 1.2 kilotons so the EMP...apparently did not have much of an impact on the 1961 infrastructure of Kazakhstan."²¹

But we do not know the impact of these HEMP tests, because Moscow is not telling.

Perhaps significantly, at least one of these Soviet HEMP tests was conducted in an Anti-Ballistic Missile (ABM) mode, involving a high-altitude interception of a target. Moreover, all of the tests were conducted over the Saryshagan ABM test range.²² One design of a Soviet ABM warhead is like an Enhanced Radiation Warhead, a warhead having low explosive yield but capable of producing lots of neutrons, x-rays, gamma rays and other radiation to kill incoming warheads. Such a weapon, low-yield but emitting enhanced gamma rays that make high-frequency HEMP, could produce an extraordinarily powerful HEMP field, tantamount to a Super-EMP warhead.

Is it possible that Moscow discovered, by accident or design, the secret for making a Super-EMP nuclear weapon in 1961? Did Moscow share data from Nuclear Test 184 in 1994 because they want to disinform the United States and its allies about the real maximum HEMP threat, so that the West will under-prepare, and remain vulnerable to Super-EMP?

Russian HEMP Threats

Russia's Super-EMP weapons—that have no counterpart in the U.S. nuclear arsenal—and Russia's superior defensive preparations against HEMP, may have emboldened the Russian Duma in 1999 to threaten an HEMP attack against the United States for NATO's bombing of Russian ally Serbia. As witnessed by the U.S. congressional delegation to Vienna, meeting with their counterparts from the Russian Duma, Vladimir Lukin, Chairman of the Duma International Affairs Committee, and Deputy Chairman Alexander Shabonov, threatened:

LUKIN—"Hypothetically, if Russia really wanted to hurt the United States in retaliation for NATO's bombing of Yugoslavia, Russia could fire a submarine launched ballistic missile and detonate a single nuclear warhead at high-altitude over the United States. The resulting electromagnetic pulse would massively disrupt U.S. communications and computer systems, shutting down everything. No internet. Nothing."

*SHABANOV—"And if that didn't work, we'd just launch another missile."*²³

²⁰ Jerry Emanuelson, "Soviet Test 184" Futurescience <http://www.futurescience.com/emp/test184.html>.

²¹ Ibid.

²² Ibid.

²³ House Armed Service Committee CODEL Transcript on Vienna Conference (May 2, 1999) and interviews with Rep. Curt Weldon and Rep. Roscoe Bartlett of congressional delegation.

Moscow's threatened nuclear HEMP attack on the U.S. to the face of an official congressional delegation was a contributing factor to the establishment of the EMP Commission.

Indeed, Moscow frequently flourishes its nuclear saber to threaten the United States, as if emboldened by knowledge of some decisive nuclear advantage, like Super-EMP weapons and HEMP attack. For example, Russian General Staff Chief Nikolai Makarov threatened a preemptive strike against NATO anti-missile sites in Poland and the Czech Republic in 2012.²⁴ Increasingly aggressive nuclear threats have been made by Russia in 2013, 2014, 2015, 2016, 2017 and especially after Vladimir Putin's March 1, 2018 announcement of new nuclear super-weapons, that Putin threatened will compel the U.S. to, "Listen to us now!"²⁵ According to former senior Defense Department official, Dr. Mark Schneider:

*"Between October 24, 2018 and March 2019, the nuclear missile targeting threat was made at least 11 times at the highest levels—by President Putin, by the Chief of the General Staff of the Army Valery Gerasimov, by the Strategic Missile Force Commander Colonel General Sergei Ryabkov."*²⁶

Yet despite all Russia's nuclear preparations and threats, Moscow still fears a HEMP attack. A Norwegian scientific rocket, launched on January 25, 1995, to explore the aurora borealis, was mistaken by the Russian military as a surprise HEMP attack launched by a U.S. submarine—nearly resulting in a massive Russian preemptive strike. This still little known incident, happening a half decade after the end of the Cold War, is the closest the sides have ever come to nuclear conflict, triggered by the specter of surprise HEMP attack.²⁷

Russian Military Doctrine: HEMP Attack Decisive

Russian General Vladimir Slipchenko in his military textbook *Non-Contact Wars* describes the combined use of cyber viruses and hacking, physical attacks, non-nuclear EMP weapons, and ultimately nuclear HEMP attack against electric grids and critical infrastructures as a new way of warfare that is the greatest Revolution in Military Affairs (RMA) in history. Slipchenko sees EMP as such a departure from traditional ways and means of warfare that he describes EMP weapons and warfare as "based on new physical principles"—a phrase that has become ubiquitous in Russian literature to describe the military revolution that is EMP:

"In practically all preceding generations of wars...weapons were employed that acted against targets primarily by kinetic, chemical and thermal energy. In addition to these arms...new ones will also appear...in wars of the future...Weapons based on new physical principles having an

²⁴On Makarov see Jim Heintz and Liudas Dapkus, "Russia's Military Threatens Pre-Emptive Strike If NATO Goes Ahead With Missile Plan" Fox News and Associated Press (May 3, 2012)

<http://www.foxnews.com/world/2012/05/03/russian-military>. Andrew E. Kramer, "Russian General Makes Threat on Missile-Defense Sites" New York Times (May 3, 2012).

²⁵ "Russia's Putin Unveils 'Invincible' Nuclear Weapons" BBC News (March 1, 2018). Andrew Osborn, "Putin, Before Vote, Unveils 'Invincible' Nuclear Weapons to Counter West" Reuters (March 1, 2018). Joseph Trevithick, "Here's the Six Super Weapons Putin Unveiled During Fiery Address" www.thedrive.com (March 1, 2018).

²⁶ Mark B. Schneider, "Russia's Massive Nuclear Weapons Arsenal Is A Threat" National Interest (May 29, 2019).

²⁷Nikolay Devyanin, "All That Has Happened, Alas, Had To Happen" Moskovskiye novosti (January 29-February 5, 1995). Dr. Peter Vincent Pry, *War Scare: Russia and America on the Nuclear Brink* (Westport, CT and London: Praeger, 1999), Part V The Norwegian Missile Crisis, January 25, 1995.

electromagnetic effect will see considerable development. They will represent a form of casualty and damage producing effect on targets through the energy of electromagnetic emissions of various wavelengths and levels of power generated by radio frequency and laser weapons and by means of electronic countermeasures using a conventional or high-altitude nuclear burst...Depending on the power of emission, such weapons will be capable of...suppressing practically all classic electronic equipment...causing the melting or evaporation of metal in the printed circuit boards...or causing structural changes of electronic elements... ”²⁸

Like Nazi Germany’s “Blitzkrieg” (“Lightning War”) strategy that coordinated airpower, armor, and mobile infantry to achieve strategic and technological surprise that nearly defeated the Allies in World War II, the “New Blitzkrieg” is, literally and figuratively, an electronic “Lightning War” so potentially decisive in its effects that an entire civilization could be overthrown in hours. According to General Slipchenko, EMP and the new military revolution renders obsolete modern armies, navies and air forces. For the first time in history, small nations or even non-state actors can humble the most advanced nations on Earth.

An article in Military Thought, the flagship journal of the Russian General Staff, “Weak Points of the U.S. Concept of Network-Centric Warfare” points to nuclear HEMP attack as a means of defeating the United States:

“American forces may be vulnerable to electronic warfare attacks, in particular, an electromagnetic pulse that is a brief powerful electromagnetic field capable of overloading or destroying numerous electronic systems and high-tech microcircuits that are very sensitive to the electromagnetic field, even if transmitted from a distance. A single low-yield nuclear weapon exploded for this purpose high above the area of combat operations can generate an electromagnetic pulse covering a large area and destroying electronic equipment without loss of life that is caused by the blast or radiation.”²⁹

Moreover: “Today, too, a considerable body of administrative information in the U.S. armed forces goes through the civilian Internet. Many civilian commercial communication satellites, particularly satellites in low orbits, can have their functions impaired or they can be disabled by electromagnetic shocks from high altitudes.”³⁰

According to another Russian article: “Nuclear war strategy has already planned nuclear explosions at an altitude of 50-100 km to destroy enemy satellites’ electronic instruments with electromagnetic pulse”:

“There are now about 683 space craft in near-earth orbit. Of these about 150 are Russian and about 400 American. In the estimation of specialists, for every 100 of our ‘purely’ military espionage artificial earth satellites there are 300 civilian satellites. Clearly, this discrepancy will increase both quantitatively and qualitatively (considering the state of the Russian military-

²⁸ General Vladimir Slipchenko, *Non-Contact Wars* (Moscow: January 1, 2000).

²⁹ Colonel A.V. Kopylov, “Weak Points of the U.S. Concept of Network-Centric Warfare” *Military Thought*, Volume 3 (2011).

³⁰ *Ibid.*

industrial complex)...Nuclear war strategy has already planned nuclear explosions at an altitude of 50-100 km to destroy enemy satellites' electronic instruments with an electromagnetic pulse."³¹

A 2015 article from Russia's A.A. Maksimov Scientific Research Institute for Space Systems, alludes to low-yield nuclear enhanced-EMP as the most effective cyber weapon: "Even more effective are remote-controlled cyber weapons in the nuclear variant, but in this case a warhead is required with a capacity many times smaller by comparison with the charges of the typical strategic missiles."³²

"Super-EMP is a...first-strike weapon," according to Aleksey Vaschenko, who describes Russian nuclear weapons specially designed to make extraordinarily powerful EMP fields as Russia's means for defeating the United States in "A Nuclear Response To America Is Possible":

*"The further direction of the work on the development of Super-EMP was associated with the increase of its kill effect by focusing Y-radiation, which should have resulted in an increase of the pulse's amplitude. These properties of Super-EMP make it a first strike weapon, which is designed to disable the state and military command and control system, the economy, ICBMs, especially mobile based ICBMs, missiles on the flight trajectory, radar sites, spacecraft, energy supply systems, and so forth. So, Super-EMP is obviously offensive in nature and is a destabilizing first-strike weapon...The Russian nuclear component relies on the Super-EMP factor, which is the Russian response to U.S. nuclear blackmail."*³³

Hypersonic Warheads: New HEMP Threat

Russian development of hypersonic missile warheads is a dangerous new dimension of the nuclear and HEMP threat. Great speed (Mach 20, twenty times the speed of sound) and flying a flat trajectory, skimming along the top of the upper atmosphere, significantly reduces visibility to U.S. early-warning satellites and radars, while also reducing arrival time. Maneuvering makes hypersonic warheads more difficult to track and intercept, virtually impossible to intercept with existing U.S. National Missile Defenses. Former senior Defense Department official Dr. Mark Schneider writes, "The main reason for Russian hypersonic missiles is a nuclear surprise attack and America has no defense against it."³⁴

Four-star General John Hyten, then chief of the U.S. Strategic Command that controls the nuclear Triad (now Vice Chairman Joint Chief of Staff), agrees with Schneider: "Hypersonic capabilities are a significant challenge. We are going to need a different set of sensors to see hypersonic threats. Our enemies know that."³⁵

³¹ Aleksandr Khokhlov, "If There Are Star Wars Tomorrow" *Novyye Izvestiye* (November 5, 1997) p. 2.

³² Department Chief Dr. Grigoriy Vokin, "Remote Custodian: Warheads with Artificial Intelligence for Reconnaissance, Guaranteed Destruction of Targets, and Human Rescue" A.A. Maksimov Scientific Research Institute (2015).

³³ Aleksey Vaschenko, "A Nuclear Response To America Is Possible" *Zavtra* (November 1, 2006).

³⁴ Dr. Mark Schneider, "Russian Hypersonic Missiles Have 1 Goal (And They Might Be Unstoppable)" *National Interest* (September 11, 2019).

³⁵ Barbara Starr, "U.S. General Warns of Hypersonic Weapons Threat from Russia and China" *CNN* (March 27, 2018) www.cnn.com.

Russia deployed its first regiment of SS-19 ICBMs armed with hypersonic Avangard nuclear warheads at the end of December 2019.³⁶

Hypersonic vehicles fly over most of their trajectory at 50-100 kilometers altitude: the optimum height-of-burst for Super-EMP warheads.³⁷

Hypersonic weapons are potentially a new avenue for surprise nuclear HEMP attack that could defeat deterrence. We cannot see the attack coming and may not know against whom to retaliate, especially if HEMP attack blinds satellites and radars needed for early-warning and threat assessment.

Hypersonically delivered HEMP attack could win World War III with a single electronic blow.

HEMP Satellites?

During the Cold War, the USSR developed a secret weapon called the Fractional Orbital Bombardment System (FOBS). The FOBS would disguise a nuclear attack as a peaceful satellite launch, orbiting a nuclear-armed satellite over the South Pole to attack the U.S. from the south—from which direction the U.S. is blind and defenseless as there are no BMEWS radars or anti-missile defenses facing south. The FOBS satellite could deliver a HEMP attack paralyzing U.S. retaliatory forces and C3I in the first shot of a nuclear war.

Miroslav Gyurosi in *The Soviet Fractional Orbital Bombardment System* describes Moscow's development of the FOBS as part of "a long running campaign of strategic deception against the West through the whole Cold War period, and the protracted development of the Soviet FOBS nuclear weapon system presents an excellent case study of such." Gyurosi:

*"The Fractional Orbital Bombardment System (FOBS) as it was known in the West, was a Soviet innovation intended to exploit the limitations of U.S. BMEW radar coverage. The idea behind FOBS was that a large thermonuclear warhead would be inserted into a steeply inclined low altitude polar orbit, such that it would approach the CONUS from any direction, but primarily from the southern hemisphere, and following a programmed braking maneuver, re-enter from a direction which was not covered by U.S. BMEW radars."*³⁸

"The first warning the U.S. would have of such a strike in progress would be the EMP...," writes Gyurosi.³⁹

Russia has the technical capability to clandestinely orbit a nuclear-armed satellite or satellites to be maintained in orbit for years until needed to make a surprise HEMP attack against the U.S., NATO Europe, or some other target.

³⁶ "Russia Deploys First Hypersonic Avangard ICBMs" Moscow Times (December 27, 2019).

³⁷ Ryan White, "Hypersonic Weapons (Part-1)" navalnews.net (May 13, 2020).

³⁸ Miroslav Gyurosi, *The Soviet Fractional Orbital Bombardment System*, Air Power Australia, Technical Report APA-TR-2010-0101 (January 2010 updated April 2012).

³⁹ Ibid.

If Russia is orbiting nuclear-armed satellites for HEMP surprise attack, this would be one of their deepest and best protected military secrets. In addition to obvious strategic considerations, the Outer Space Treaty bans orbiting nuclear weapons in space. Moreover, Russia has pursued a long propaganda offensive criticizing the U.S. for “militarizing space” intended to deter the U.S. from orbiting space-based missile defenses and from improving U.S. military capabilities in space.

HEMP attacks by satellite or missiles or in combination could be the key to Russian victory in a nuclear war, as U.S. strategic bombers, missiles, and C3I are not hardened to survive attack by Super-EMP weapons, as noted in testimony before the House Armed Services Committee by Dr. William Graham, Chairman of the EMP Commission:

MR. BARTLETT: “It is my understanding that, in interviewing some Russian generals, that they told you that the Soviets had developed a ‘Super-EMP’ enhanced weapon that could produce 200 kilovolts per meter at the center?...This is about, what, four times higher than anything we ever built or tested to, in terms of EMP hardening?”

DR. GRAHAM: “Yes.”

MR. BARTLETT: “Which means that, even if you were some hundreds of miles away from that, that it would be somewhere in the range of 50 to 100 kilovolts per meter at the margins of our country, for instance?”

DR. GRAHAM: “Yes. Over much of the margin.”

MR. BARTLETT: “So, we aren’t sure that much of our military would still be operable after that robust laydown. Is that correct?...I also understand that we aren’t certain that we could launch, through a series of robust EMP laydowns, that we could launch our intercontinental ballistic missiles?”

DR. GRAHAM: “We designed both the missiles and their bases and the strategic communications systems during the Cold War to be able to survive and operate through EMP fields on the order of 50 kilovolts per meter, which was our concern at the time, before we realized that weapons could be designed that had larger EMP fields.”⁴⁰

Russian President Vladimir Putin, in a world televised speech on March 1, 2018, announced a new heavy-ICBM, the most powerful ever made, called “Sarmat” (“Satan II” by NATO) that is “invincible” because it can strike anywhere on Earth, and even attack the U.S. by flying over the South Pole, like the FOBs. Putin declared: “Not even future missile defense systems will offer any trouble to the Russian rocket complex, Sarmat,”⁴¹

HEMP Threat To U.S. Submarines?

HEMP attack could achieve for Russia a key objective the USSR could not achieve during the Cold War—neutralizing U.S. ballistic missile submarines at sea.

Russian Super-EMP weapons could destroy or degrade U.S. bombers, ICBMs, SSBNs in port and their strategic C3I—including land-based VLF communications systems, TACAMO aircraft, and

⁴⁰ “Threat Posed By Electromagnetic Pulse (EMP) Attack” Hearing before the House Armed Services Committee (Washington, DC: January 10, 2008).

⁴¹ “Russia Tests New Ballistic Missile That Putin Says Can Strike Anywhere On Earth” Associated Press (March 30, 2018). Patrick Reeve, “Russia Has Tested New Nuclear Missile That NATO Calls ‘Satan 2’” ABC News (March 30, 2018).

other redundant means of strategic command and control used to convey Emergency Action Messages (EAMs) to submarines hiding at sea. Severing their communications links to the National Command Authority would neutralize U.S. submarines, rendering them useless.⁴²

HEMP could also be used to attack submarines on patrol at sea directly.

A high-yield warhead (1 megaton or more) detonated for HEMP over the ocean would cover an area 2,200 kilometers in radius, a zone nearly as large as North America, with powerful E3 HEMP that would penetrate the ocean depths and possibly damage or destroy the electronics of submarines on patrol. Submarines would be especially vulnerable when deploying their very long antennae—which they need to do precisely when trying to receive EAMS.⁴³

VOSTOK-18

On September 11-17, 2018, Russia's VOSTOK-18 was perhaps the largest military exercise in history, happening two months after U.S. Department of Homeland Security revelations that Russia penetrated hundreds of U.S. electric utilities with cyber-weapons.

A few significant highlights:

VOSTOK-18 mobilized 300,000 troops, 36,000 tanks and other vehicles, 1,000 aircraft, and 80 ships. Russian Defense Minister Sergei Shoigu described it as the largest exercise since ZAPAD-81, the largest Cold War exercise that, 40 years ago, simulated invading NATO.⁴⁴

VOSTOK-18 apparently utilized other forces not advertised, including Russia's Mediterranean fleet fighting a real war in Syria and the Strategic Rocket Forces Missile Armies, simulating a global nuclear World War III.⁴⁵

VOSTOK-18 was a joint Russia-China exercise, signifying de facto alliance against the United States. Russia and China conduct many joint military exercises. Their nuclear collaboration began February 2001 in a combined nuclear war scenario against the U.S. over Taiwan.⁴⁶ The Sino-Russian Friendship Treaty (July 2001) promises their military cooperation “will further strategic stability and security around the world.”⁴⁷

⁴² Sebastien Roblin, “The Deadliest Aircraft in the U.S. Military Arsenal You Have Never Heard Of” *The National Interest* (April 23, 2017). “Nuclear Launch Codes” <https://www.everything2.com/title/Nuclear+launch+codes>.

⁴³ Dr. Peter Vincent Pry, *POSEIDON: Russia's New Doomsday Machine* (EMP Task Force: 2018) pp. 21-22.

⁴⁴ Dr. Peter Vincent Pry, “The Danger of Russia's Largest Military Exercise: Understanding Vostok-18” *Newsmax* (October 8, 2018). Dr. Stephen Blank, *Russia's Vostok-2018: A Rehearsal for Global War?* *DefconWarningSystem* (September 6, 2018) www.defconwarningsystem.com. Lyle J. Goldstein, “What Russia's Vostok-18 Exercise with China Means” *National Interest* (September 5, 2018). “Vostok 2018” www.en.wikipedia.org “Russia War Games: Biggest Since Cold War ‘Justified’” *BBC News* (August 28, 2018). Dr. Peter Vincent Pry, “Russia, NATO Exercises Demonstrate West's Death Wish” *The Hill* (November 20, 2018).

⁴⁵ *Ibid.*

⁴⁶ Bill Gertz, “Russian Forces Help China In Mock Conflict” *Washington Times* (April 30, 2001).

⁴⁷ Ariel Cohen, “The Russia-China Friendship Cooperation Treaty” *Heritage Foundation* (July 18, 2001). “2001 Sino-Russian Treaty of Friendship” www.en.wikipedia.org

*VOSTOK-18, though conducted in Siberia, may well be full-dress rehearsal for conquering NATO, practicing new nuclear warfighting techniques. Siberian operations are harder for the U.S. to monitor, so new strategies and tactics can be exercised secretly.*⁴⁸

Russia's new nuclear doctrine (similar to Khrushchev-era thinking, like a more aggressive version of Marshal Sokolovsky's 1962 *Military Strategy*) relies on nuclear firepower and relatively small armies, but highly mobile and survivable, to knife through Europe in a week or two.⁴⁹ Russia's new generation nuclear weapons for strategic HEMP attack and tactical battlefield use make this possible.⁵⁰

Theoretically, Russian invasion of NATO by 300,000 troops, 36,000 tanks and other vehicles, and 1,000 aircraft could overrun NATO paralyzed by EMP attack and outgunned by tactical nuclear weapons 10-to-1. A single nuclear weapon detonated 60 kilometers above NATO HQ in Brussels would generate a paralyzing HEMP field from Poland to Scotland, like a magic carpet to the English Channel.⁵¹

*VOSTOK-18 practiced civil defense and recovery operations unrivaled in the West. "Eastern Military District engineer formation mopped-up in aftermath of a simulated technogenic emergency during VOSTOK-18 maneuvers," according to the Russian Defense Ministry, "The military engineers launched bridges and ferry crossings, restored demolished roads, prepared passage through rubble...evacuated the population, and cleared terrain of simulated explosive objects and radioactive and chemical waste."*⁵²

These same operations could support an invasion of NATO.

But the most important part of VOSTOK-18 was invisible.

Russian and Chinese military doctrine also advocates a revolutionary new way of warfare rendering obsolete traditional military power by relying on cyber-attacks, sabotage, and EMP to

⁴⁸ Dr. Peter Vincent Pry, "The Danger of Russia's Largest Military Exercise: Understanding Vostok-18" Newsmax (October 8, 2018).

⁴⁹ Marshal of the Soviet Union Vasily D. Sokolovsky, *Military Strategy* (Moscow, 1962).

⁵⁰ Dr. Peter Vincent Pry, "The Danger of Russia's Largest Military Exercise: Understanding Vostok-18" Newsmax (October 8, 2018). Dr. Stephen Blank, *Russia's Military Strategy and Doctrine* (Jamestown Foundation, 2019). Dr. Mark Schneider, "Russian Nuclear 'De-Escalation' of Future War" *Comparative Strategy*, Vol. 37 (2018).

⁵¹ EMP Commission, *Nuclear EMP Attack Scenarios and Combined-Arms Cyber Warfare* (July 2017) p. 45.

⁵² Russian Defense Ministry, Department of Information, "Eastern Military District Engineer Formation Mopped Up in the Aftermath of a Simulated Technogenic Emergency During Vostok-2018" (September 14, 2018) translated in Open Source Enterprise, "Russia: Combat Engineers Practiced Mopping Up in Aftermath of Simulated Emergencies in Vostok-2018" CEW2018091444582051. Dr. Peter Vincent Pry, "The Danger of Russia's Largest Military Exercise: Understanding Vostok-18" Newsmax (October 8, 2018).

collapse adversary electric grids and life-sustaining critical infrastructures, thereby achieving victory.⁵³

Russian cyber-attacks against U.S. and allied electric grids are the “edge of the wedge” for this new way of warfare that could culminate in unleashing of a VOSTOK-18 for real—or make VOSTOK-18 unnecessary for global conquest.

As noted earlier, in July 2018, two months before VOSTOK-18, the Department of Homeland Security revealed Russian cyber-weapons Dragonfly and Energetic Bear penetrated hundreds of U.S. electric utilities and could cause a nationwide blackout.⁵⁴

Former senior Pentagon official Michael Carpenter warned: “They’ve been intruding into our networks and are positioning themselves for a limited or widespread attack. They are waging a covert war on the West.”⁵⁵

Warned the Cybersecurity Subcommittee’s Senator Ed Markey: “Unless we act now, the United States will continue to remain vulnerable to the 21st Century cyber-armies looking to wage war by knocking out America’s electricity grid.”⁵⁶

Russia during VOSTOK-18 “coincidentally” conducted a major exercise recovering electric grids in regions where are located Strategic Rocket Forces Missile Armies and their headquarters, according to Russian press: “The Ministry of Energy...conducted a large-scale complex special training on the topic Ensuring The Security Of Power Supply.”⁵⁷

Significantly, Moscow tried to conceal the purpose of the grid recovery exercise and divorce it from VOSTOK-18 by suggesting it was to prepare for the Siberian winter.⁵⁸

However, the Russian Energy Ministry scenario entailed “an emergency situation associated with a massive de-energization of consumers” that “exercised rapidly replacing transformers, towers, powerlines and temporary re-routing.”⁵⁹

⁵³EMP Commission, *Assessing the Threat from EMP Attack* (July 2017) p. 5. EMP Commission, *Chairman’s Report* (July 2017) pp. 18-20. EMP Commission, *Nuclear EMP Attack Scenarios and Combined-Arms Cyber Warfare* (July 2017) pp. 1-6.

⁵⁴ Rebecca Smith, “Russian Hackers Reach U.S. Utility Control Rooms” Wall Street Journal (July 23, 2018). Yen Nee Lee, “Russian Hackers Are Said To Have Infiltrated U.S. Electric Utilities” CNBC (July 23, 2018).

⁵⁵ “Russian Hackers Penetrate U.S. Power Stations” BBC News (July 24, 2018).

⁵⁶ “Senator Markey Demands Answers About Russian Cyberattacks on Electric Utilities” Press Release (August 13, 2018) www.markey.senate.gov

⁵⁷ TIA and PJSC, “Power Engineers of IDGC of Center and Volga Region Too Part in Large-Scale Joint Exercise of Ministry of Energy and EMERCOM of Russia” (September 12, 2018) <https://tvernews.ru/news/235475/>. Dr. Peter Vincent Pry, “The Danger of Russia’s Largest Military Exercise: Understanding Vostok-18” Newsmax (October 8, 2018).

⁵⁸ Ibid.

⁵⁹ Ibid.

Moreover: “Power engineering specialists...carried out work on replacement of power transformers and supports, power transmission lines...and installing a quick-erect and dismountable support of the 35-110 kV air line, which allows reducing time for emergency repairs.”⁶⁰

Unmanned aerial vehicles helped repair electric grids rapidly. College students were drafted to help military engineer units.

Moscow’s purpose is: “To develop the most effective approaches to mobilizing technical, material, and human resources for eliminating technological disruptions in networks and maximizing the rapid restoration of electricity supply.”⁶¹

Non-Nuclear EMP Weapons (NNEMP)

Russia probably remains the world’s leader in Non-Nuclear EMP (NNEMP) weapons, more commonly called Radio-Frequency Weapons (RFWs), which have been the focus of “intense effort aimed at the development of high-power microwave and millimeter-wave sources for radio frequency weapons” since the Cold War, to the continuing alarm of the Department of Defense.⁶²

Russia apparently has developed and deployed NNEMP weapons significantly more powerful and with longer range than any other nation. Russian military and technical sources often describe their NNEMP weapons as having ranges of 10-20 kilometers or more, while Western NNEMP weapons rarely have a range exceeding 1 kilometer in radius.⁶³

For example, according to a Sputnik article “Russia’s Electromagnetic Weapons Could Be ‘More Efficient Than Nuclear Weapons’”:

--“Russia is developing radio-electronic weapons, which use powerful UHF impulse capable of destroying all electronic equipment miles away and even changing the course of a war.”

--“The unique radio-electronic weapons based on new physical principles, which were successfully tested in Russia last fall, use mobile electromagnetic emitters to disable missile warheads and onboard aircraft electronics miles away.”

--“The electromagnetic bombs developed by Russia can be more effective than nuclear weapons because they are able to neutralize entire armies with just one short electromagnetic impulse.”

⁶⁰ Ibid.

⁶¹ Ibid.

⁶² Department of Defense, *Soviet Military Power 1984* (1984) p. 108. “The Russian Lead in Radio Frequency Weapons” EIR Science and Technology (July 3, 1987) see quote from Lawrence Livermore National Laboratory, Energy and Technology Review (March 1987): “A high-intensity burst of electromagnetic energy can pose a threat to military systems, such as aircraft and satellites. The source of the high-intensity, high-frequency pulse can be either a nuclear detonation or a micro-wave generating weapon.”

⁶³ “Range of Russian EMP Weapons Increased to 10 km” Russia Today Military News TASS (July 5, 2020). Yuri Tkach, one of the lead designers in the USSR’s NNEMP weapons program, claimed Soviet NNEMP weapons achieved ranges of 20 kilometers or more, during late-1990s interviews by myself and others in the USG unsuccessfully attempting to persuade Tkach to defect.

--“Moreover...they can completely take out or seriously damage even off-line weapons like tanks, grounded planes, and missiles in silos.”⁶⁴

Russian technology for NNEMP weapons appears to be proliferating from Ukraine via Yuri Tkach, Director of the Kharkov Institute of Electromagnetic Research. During the Cold War, Tkach and the Kharkov Institute were among the scientific and design leaders for the USSR’s NNEMP weapons program.⁶⁵

Independently of Russia, the U.S. and other nations are achieving a technological revolution in Non-Nuclear EMP weapons, which are becoming more powerful, more miniaturized and lighter-weight, and deliverable by cruise missiles or drones. The marriage of NNEMP to drones or cruise missiles, preprogrammed or equipped with sensors to follow high-power electric lines and to target control centers and transformers, introduces a major new threat to national power grids.⁶⁶

Relatively small numbers of NNEMP cruise missiles or drones—perhaps only one capable of protracted flight—could inflict a long nationwide blackout. Reportedly, according to a classified study by the U.S. Federal Energy Regulatory Commission, disabling just 9 of 2,000 U.S. EHV transformer substations could cause cascading failures that would crash the North American power grid.⁶⁷

Thus, NNEMP might be able to achieve results similar to a nuclear HEMP attack in blacking-out power grids, though the NNEMP attack would probably take hours instead of seconds.

Moreover, the technology for non-nuclear EMP generators and drones is widely available for purchase as civilian equipment which can easily be weaponized, even by non-state actors.

For example, one U.S. company sells a NNEMP device for legitimate industrial purposes called the “EMP Suitcase” that looks like a suitcase, can be carried and operated by one person, generates 100,000 volts/meter over a short distance, and can be purchased by anyone. NNEMP devices like the EMP Suitcase could become the Dollar Store version of weapons of mass destruction if turned against the national electric grid by terrorists.⁶⁸

Design information for NNEMP weapons is available on the internet.

Twenty years ago, in 2000, the House Armed Services Committee (HASC) sponsored an experiment that proved a small team, led by a competent electrical engineer, could build NNEMP weapons using unclassified design information available on the internet and using parts purchased

⁶⁴ Alexandr Khrolenko, “Russia’s Electromagnetic Weapons Could Be ‘More Efficient Than Nuclear Weapons’” Sputniknews.com and RIA Novosti (September 29, 2017).

⁶⁵ “Kiev Gave Riyadh Technology To Create Microwave Weapons” en.TopWar.ru (January 23, 2019).

⁶⁶ Carlo Kopp, *The Electromagnetic Bomb – A Weapon of Electrical Mass Destruction* (February 8, 2003). Though dated, Kopp is still among the best for background.

⁶⁷ Rebecca Smith, “U.S. Risks National Blackout From Small-Scale Attack” Wall Street Journal (March 12, 2014).

⁶⁸ Applied Physics Electronics, “High-Power RF Suitcase EMP Pulse Generator” www.apelc.com/rf-suitcase.

from an ordinary electric supply store. In one year, the team produced two NNEMP weapons that were demonstrated successfully before the HASC at the U.S. Army Aberdeen Proving Ground.⁶⁹

In 2020, Northeastern University's Global Resilience Institute (GRI) tested in an EMP simulator numerous electronic components vital to the operation of electric grids and other critical infrastructures. The GRI tests "confirmed the ability for non-state actors to outfit commercially-available platforms to conduct localized tactical EMI attacks against electronics that support critical systems...identified the thresholds at which the functioning of representative electronics in common use across multiple infrastructures could become compromised, generating catastrophic outcomes. This includes, but is not limited to, disruption in cybersecurity safeguards for critical infrastructure to include key components of the electric power grid and telecommunications system."⁷⁰

GRI's tests of the non-nuclear EMP threat "confirm that a small EMI emitter that could be carried on a commercially-available drone or terrestrial vehicle, is capable of compromising electronic components, in common commercial use, at very low-energy levels from a considerable distance."⁷¹

NNEMP generators have limited range, but if mated to a cruise missile or drone capable of protracted flight to target electric grid key nodes, the results can be spectacular.

For example, Boeing's Counter-electronics High Power Microwave Advanced Missile Project (CHAMP) cruise missile can be viewed on the internet where CHAMP "navigated a pre-programmed flight plan and emitted bursts of high-powered energy, effectively knocking out the target's data and electronic subsystems."⁷² The U.S. Air Force has purchased CHAMP cruise missiles, deployed to Japan, reportedly to prevent North Korean missile attacks by "frying" their missiles, command and control, and power grid electronics.⁷³

Russia is probably still be the world leader in NNEMP weapons, as was the USSR during the Cold War. Russia's nuclear-powered cruise missile, the Burevestnik (Storm Petrel, NATO designation SSC-X-9 Skyfall), now under development, makes little sense as yet another missile to deliver nuclear warheads, as advertised by Moscow. The Storm Petrel's engines, powered by a nuclear reactor, theoretically will give it unlimited range and limitless flying time for crossing oceans and cruising over the U.S. The Storm Petrel could be a nuclear-powered version of CHAMP, able to

⁶⁹ I managed the HASC EMP demonstration at Aberdeen. Kenneth R. Timmerman, "U.S. Threatened With EMP Attack" ktimmerman@InsightMagazine.com and EMPwar.com. See also U.S. Congress, "Radio Frequency Weapons and Proliferation: Potential Impact on the Economy" Hearing before the Special Oversight Panel on Terrorism, House Armed Services Committee (February 25, 1998) www.house.gov/jec/hearings/02-5-8h.htm.

⁷⁰ Global Research Institute Northeastern University, *Mobilizing a National Response to the Vulnerability of Critical Infrastructure to Non-nuclear Electromagnetic Pulse/Electromagnetic Interference Attacks* (April 2020) p. 4.

⁷¹ Ibid.

⁷² "Boeing: CHAMP – Lights Out" www.boeing.com.

⁷³ Ron Kessler, "USAF Deploys New CHAMP Missile" (May 17, 2019) www.neogaf.com/threats/usaf-deploys-new-champ-missile. Dave Majumdar, "CHAMP: America's EMP Missile that Might Be Able to Fry North Korea's Nukes" *The National Interest* (December 11, 2017).

fly much farther and longer and armed with a more potent NNEMP warhead, electrically supercharged by the nuclear reactor.⁷⁴

Russian HEMP Defenses

Moscow spent decades and vast resources protecting its critical infrastructures from nuclear effects. Russia today has hundreds of deep underground command posts and thousands of other underground shelters designed to survive and recover from an all-out nuclear war. Even Moscow's subway system is equipped with nuclear blast doors. Moscow cheated on the ABM Treaty and deployed thousands of anti-missile systems and radars all over the USSR, in addition to the permitted Moscow ABM system that can protect European Russia—where lives most of the population. Russia inherited from the USSR, and continues to improve, a vast network of power grids, communications, and other critical infrastructures designed to survive and prevail through a nuclear World War III.⁷⁵

It is probably no accident that Russia leads all other nations in the production of vacuum tubes, Svetlana Tubes in St. Petersburg being the largest manufacturer of vacuum tubes in the world. Vacuum tube electronics are over ten million times less vulnerable to HEMP than the advanced semiconductors and microchips that are the sinews of economic and military power in the United States.⁷⁶

EDICT OF THE PRESIDENT OF THE RUSSIAN FEDERATION ON NUCLEAR DETERRENCE (June 2, 2020)

On June 2, 2020, Russian President Vladimir Putin issued an unclassified edict “Foundations of the State Nuclear Deterrence Policy of the Russian Federation” describing the purpose of nuclear weapons in Russia’s national security policy and some circumstances that could move Russia to use nuclear weapons⁷⁷:

⁷⁴ Dr. Peter Vincent Pry, “When Will DC Awaken To Putin’s Nuclear Aim For US?” Newsmax (August 21, 2019).

⁷⁵ On the Soviet programs for surviving and recovering from a nuclear war see: Department of Defense, *Soviet Military Power 1987* (Washington, D.C.: U.S. Government Printing Office, 1987), p. 52 and passim. Central Intelligence Agency, *Soviet Civil Defense* (Washington, D.C.: July 1978). Dr. William R. Van Cleave, *Fortress USSR* (Stanford, CA: Hoover Institution, Stanford University, 1986). Leon Goure, *Soviet Civil Defense Shelter Program* (Coral Gables, FL: Center for Advanced International Studies, University of Miami, 1977). House Armed Services Committee, *Civil Defense Review, Hearings by the Civil Defense Panel of the Subcommittee on Investigations of the Committee on Armed Services* (Washington, D.C.: U.S. Government Printing Office, 1976). Dr. Peter Vincent Pry, *The Strategic Nuclear Balance: And Why It Matters* (New York and London: Crane Russak, Taylor and Francis, 1990), pp. 82-89. Dr. Peter Vincent Pry, *Nuclear Wars: Exchanges and Outcomes* (New York and London: Crane Russak, Taylor and Francis, 1990), Chapter 7 Societal Survival.

⁷⁶ Jerry Emanuelson, "Soviet Test 184" Futurescience <http://www.futurescience.com/emp/test184.html>. During the 1980s, even the most advanced Soviet fighter aircraft, like the MiG-25, used vacuum tube technology so they could survive and operate in a nuclear environment. See Major R.D. Erick, *EMP* (Quantico, VA: The Marine Corps Command and Staff College, April 6, 1984).

⁷⁷ [Static.kremlin.ru/media/events/files/ru/lluTKhAiabLzOBjlfBSvu4g3bcl7AXd7.pdf](http://static.kremlin.ru/media/events/files/ru/lluTKhAiabLzOBjlfBSvu4g3bcl7AXd7.pdf). “Putin Approves State Policy On Nuclear Deterrence—Text” BBC Monitoring Former Soviet Union (June 4, 2020).

“12. Main military dangers which, depending on changes in the military and political and strategic situations, may develop into military threats to the Russian Federation...which nuclear deterrence is implemented to neutralize, are:

a) the expansion by a potential adversary of general-purpose groupings of forces into territories adjacent to the Russian Federation and its allies and into adjacent maritime regions that have the means of delivering nuclear weaponry;

b) the deployment of ballistic missile defense systems and assets, medium- and short-range cruise and ballistic missiles, precision non-nuclear and hypersonic weapons, strike unmanned aerial vehicles, and directed energy weapons by states that view the Russian Federation as a potential adversary;

c) the creation and placing into space of ballistic missile defence assets and strike systems;

d) the presence in states of nuclear weaponry and (or) other types of weapons of mass destruction which may be used against the Russian Federation and (or) its allies, and the means for delivering these types of weapons;

e) the uncontrolled delivery of nuclear weaponry, means of its delivery and the technology and equipment for their development;

f) the placement of a nuclear weapon and the means of its delivery on the territories of non-nuclear states.”

Moreover:

“III. Conditions for the Transition of the Russian Federation to the Use of Nuclear Weaponry

17. The Russian Federation reserves the right to use nuclear weapons in response to the use of nuclear weapons and other types of weapons of mass destruction against it and/or its allies, and in the event of aggression against the Russian Federation using conventional weapons which threatens the existence of the state itself.

18. The decision to use nuclear weapons is made by the President of the Russian Federation.

19. The conditions which determine the possibility for the use by the Russian Federation of nuclear weapons are:

a) the receiving of creditable information concerning the launch of ballistic missiles attacking the territories of the Russian Federation and (or) its allies;

b) the use by an enemy of a nuclear weapon or other types of weapons of mass destruction against the territories of the Russian Federation and (or) its allies;

c) enemy actions against critically important state or military facilities of the Russian Federation, the disablement of which will lead to a disruption of retaliatory operations of the nuclear forces;

d) aggression against the Russian Federation involving the use of conventional weaponry which threatens the existence of the state itself.”

Clarification of Russia’s nuclear doctrine was subsequently provided by officers of the Russian General Staff and President Vladimir Putin.

Major General Andrei Sterlin and Colonel Alexander Khryapin in their article published in the official newspaper of the Russian Armed Forces, *Krasnaya Zvezda* (Red Star), warned that any incoming missile will be regarded as nuclear and prompt a nuclear response.⁷⁸

Two months after publication of Russia's nuclear doctrine, on August 4, 2020: "President Vladimir Putin on Tuesday endorsed Russia's nuclear deterrent policy, which allows him to use atomic weapons in response to a conventional strike targeting the nation's critical government and military infrastructure."⁷⁹

Russia's new doctrine on nuclear deterrence and employment is widely interpreted by Western analysts as significantly lowering the threshold, to the lowest point in Russian or Soviet history, whereby Moscow may initiate a nuclear first-strike—including against measures the U.S. and NATO allies would probably regard as non-aggressive and defensive. (See for example provisions 12a-d and f.) Such is the interpretation of some of the best U.S. nuclear strategists, including former Defense Department senior official Dr. Mark Schneider and Dr. Stephen Blank, formerly of the U.S. Army War College.

According to Schneider: "...the Russians are talking about more than nuclear responses to conventional attacks on nuclear forces which results in a lower nuclear use threshold...this may include cyber-attack. [See provision 19c.] This clearly is not limited to attacks on strategic nuclear forces. Since essentially every Russian missile is nuclear capable, this could justify a nuclear response to just about any attack on a Russian military facility that has missiles. This would be a very low nuclear use threshold."⁸⁰

The Russian edict on nuclear deterrence and employment does not mention HEMP or any other specific employment option for a nuclear weapon (exoatmospheric burst, atmospheric burst, surface burst, earth-penetrating-burst, underwater-burst, counterforce or countervalue attacks). But the edict is consistent with, and by lowering the nuclear threshold reinforces and furthers, the Russian military doctrinal concept of "de-escalation" whereby limited nuclear first-use by Russia will by "shock and awe" achieve victory.⁸¹

⁷⁸ "Russia Warns It Will See Any Incoming Missile As Nuclear" AP (August 7, 2020). Vladimir Isachenkov, "Russia Warns It Will See Any Incoming Missile As Nuclear" *MilitaryTimes.com* and AP (August 9, 2020).

⁷⁹ Vladimir Isachenkov, "New Russian Policy Allows Use of Atomic Weapons Against Non-Nuclear Strike" AP (August 9, 2020).

⁸⁰ Dr. Mark Schneider, correspondence (June 4, 2020). Dr. Mark Schneider "Putin's New Nuclear Doctrine" *RealClearDefense.com* (June 23, 2020).

⁸¹ *Ibid.* Dr. Mark Schneider, "Russian 'De-Escalation' of Future War" *Comparative Strategy* (March 25, 2019). Dr. Stephen Blank, "Getting Russia's Nuclear Strategy Mostly Right" *The Hill* (February 25, 2018).

HEMP attack, by minimizing adversary immediate casualties and maximizing damage to the electronics of adversary military forces and critical infrastructures, seems ideal for a “de-escalatory” strategy. Moreover, since Russian military doctrine categorizes HEMP attack as Information, Electronic or Cyber Warfare, Russia’s already very loose strictures for nuclear employment may not even apply to HEMP.



Source: "Missile Threat: CSIS Missile Defense Project"
<https://missilethreat.csis.org/country/russia>

RUSSIA: MISSILES CAPABLE OF EMP ATTACK

MISSILE	TYPE	RANGE
SS-18 "Satan"	Heavy ICBM	10,200-16,000 kms
SS-19 "Stiletto"	ICBM	10,000 kms
SS-25 "Topol"	ICBM	10,500-11,000 kms
SS-27 "Topol-M"	ICBM	11,000 km
RS-24 "Yars"	ICBM	10,500 km
RS-26 "Rubezh" (in development)	IRBM/ICBM	2,000-5,800 km
RS-28 "Sarmat" (in development)	Heavy ICBM	10,000+ km
SS-N-18 "Stingray"	SLBM	6,500 km
SS-N-23 "Skiff"	SLBM	11,000 km
SS-N-32 "Bulava"	SLBM	8,300 km
SS-N-30A "Kalibr"	LACM	1,500-2,500 km
Kinzhal	ALBM	1,500-2,000 km
Kh-101/Kh-102	ALCM	2,500-2,800 km
SSC-8 (9M729)	GLCM	2,500 km
SS-26 "Iskander"	SRBM	500 km
SS-N-26 "Strobile"	ASCM	300 km
SS-21 "Tochka"	SRBM	70-120 km

All Russia's missiles are listed here, as all are potentially capable of EMP attack if armed with a nuclear weapon or non-nuclear EMP warhead.