THE EMERGING EMP THREAT TO THE UNITED STATES

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Foreword By
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U.S. House of Representatives

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Foreword

A high-altitude nuclear-generated electromagnetic pulse (EMP) attack can have devastating consequences on our society by destroying the electronic systems that support our critical infrastructures for power, transportation, telecommunications, banking and finance, and food and water.

Government, commerce, and our way of life depends upon these critical infrastructures, and cannot continue without them.

Accordingly, *The Emerging EMP Threat To The United States* by Dr. Mark Schneider, formerly of the Office of the Secretary of Defense, should be required reading for every policymaker, and for every American. Dr. Schneider demonstrates that an EMP attack on the United States, its military forces overseas, or on U.S. allies is not merely a theoretical possibility. Dr. Schneider demonstrates that potential adversaries are openly writing and actively thinking about and attempting to acquire the means to perform an EMP attack against the United States.

Concerned that terrorists, rogue states, China or Russia might seek to destroy the United States by means of EMP attack, I established the EMP Commission in 2001 to assess the threat and the possibility of protecting the United States, U.S. overseas military forces, and U.S. allies from EMP.

Establishing the EMP Commission was not easy, as the Cold War with Russia was over, and many in the U.S. Defense and Intelligence Communities believed that EMP attack was too sophisticated for the understanding or technical capabilities of rogue states and terrorists.

The EMP Commission delivered its first report to Congress in July 2004. The Commission found that terrorists and rogue states do indeed understand the devastating consequences of EMP attack, and could acquire the means to make an EMP attack by developing, buying, stealing, or receiving from another party a ballistic missile and a nuclear weapon.

A sophisticated intercontinental ballistic missile is not required to make an EMP attack. The EMP Commission found that a short- or medium-range missile, like a Scud or Iran's Shahab-3, launched off a freighter, could be used for an EMP attack on the United States. Iran has practiced such a launch-mode, firing a missile off a vessel in the Caspian Sea.

A high-yield or very sophisticated nuclear weapon is not necessary for an EMP attack. Any nuclear weapon will create enough EMP to pose a threat to U.S. critical infrastructures. According to the EMP Commission report:

> *Certain types of relatively low-yield nuclear weapons can be employed to generate potentially catastrophic EMP effects over wide geographic areas, and designs for variants of such weapons may have been illicitly trafficked for a quarter-century.*

Russia and China have developed contingency plans for making EMP attacks. The EMP Commission report notes:

> *China and Russia have considered limited nuclear attack options that, unlike their Cold War plans, employ EMP as the primary or sole means of attack.*

The EMP Commission report warns that, as the U.S. grows ever more dependent upon increasingly sophisticated electronic technology, so too the United States becomes increasingly vulnerable to EMP attack. However, the Commission also concludes that the United States can and should take steps to protect its critical infrastructures from EMP attack.

The EMP Commission encourages the U.S. Government to continue its current policies promoting ballistic missile and nuclear weapon non-proliferation, and developing ballistic missile defense for the United States and its allies, as part of the solution to the EMP threat.

The EMP Commission recommends protecting the electric power grid by hardening key nodes and providing spares for a relatively small number of absolutely indispensable components, such as high-energy transformers that can take over a year to build and replace.

The EMP Commission also makes many specific recommendations for protecting and recovering all of the critical infrastructures: transportation, telecommunications, banking and finance, emergency services, and food and water. These recommendations are too numerous and detailed to be fully described here.

Collectively, the EMP Commission recommendations for protecting critical infrastructures do not entail an unreasonably large expenditure. Indeed, the cost of the EMP Commission plan would be modest, especially compared to the capital investment at risk unprotected from EMP.

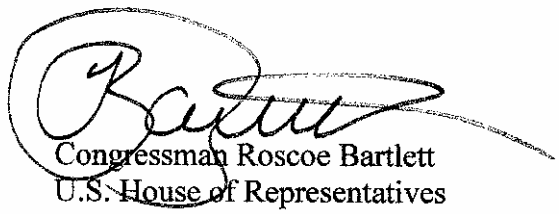
The EMP Commission plan would protect the United States not only from EMP attack, but from lesser threats to our critical infrastructures, including natural disasters, like hurricanes.

In 2006, I re-established the EMP Commission to continue monitoring the threat, to monitor the progress of the United States Government and the private sector in protecting critical infrastructures, and to advise Congress on how to implement the Commission's plan to protect and recover the United States from EMP attack.

In 2007, I directed the United States Nuclear Strategy Forum—an advisory body to the U.S. Congress—to establish a Working Group on EMP. The Working Group on EMP has as its objective the promotion and implementation of the EMP Commission's 5-year plan to protect the United States.

I am presently organizing a Congressional Caucus on EMP, perhaps to be named officially the "Congressional Caucus on Critical Infrastructure Protection." The Caucus will unite the Congress behind a bipartisan effort to rapidly implement the EMP Commission's plan to protect and recover U.S. critical infrastructures from EMP and other threats, including national disasters.

We must move swiftly to protect the United States from the EMP threat, that is described and documented so convincingly, first by the EMP Commission, and now by Dr. Schneider in his study for the United States Nuclear Strategy Forum.



Congressman Roscoe Bartlett
U.S. House of Representatives

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Introduction

High altitude nuclear electromagnetic pulse (EMP) attacks have the potential to cause catastrophic damage, effectively crippling the ability of modern societies and their military forces to function because of their dependence on sophisticated electronics. Dr. Lowell Wood, a nuclear weapons designer and member of the Congressional Commission on EMP, describes the EMP phenomena as "really severe static electricity, everywhere, all at once."[1] According to Dr. Michael P. Bernardin of the Los Alamos National Laboratory, "A high-altitude nuclear detonation would produce an electromagnetic pulse that would cover from one- to several-million square kilometers, depending upon the height of burst, with electric fields larger than those typically associated with lightning."[2]

All nuclear weapons detonated at high altitude produce EMP, but some types of nuclear weapons are designed specifically to be efficient at producing EMP. In 2004, Clay Wilson of the Congressional Research Service reported that "A HEMP [high altitude electromagnetic pulse] attack directed against the United States might involve a one-megaton nuclear warhead, or a smaller warhead that is specially-designed [to produce EMP], using a burst several hundred miles above the mid-western states to affect computers on both coasts." [3]

While the high altitude EMP phenomenon is not completely understood, we know enough about it to be extremely concerned about its potential impact on our national infrastructure and our military capabilities. Even the relatively primitive electronics of the early 1960's were sometimes damaged by low levels of EMP from nuclear weapons that were not designed to produce enhanced EMP effects. For example, in 1962 the U.S. Starfish thermonuclear weapon detonated at a 400-km altitude over the Pacific disrupted electronics in Hawaii 1,400-km away, and resulted in the "failure of street-lighting, systems, tripping of circuit breakers, triggering of burglar alarms and damage to a telecommunications relay facility."[4] In the same year, Soviet 300-kt weapons tested in space damaged "over head and buried cables at [a] distance of 600-kilometers," and resulted in "surge arrestor burnout, spark-gap breakdown, blown fuses, and power supply breakdowns."[5]

Modern electronics are particularly vulnerable to EMP effects. In 2004, the report from the Congressional Commission on the Threat to the United States from Electromagnetic Pulse (EMP) warned that:

> Depending on the specific characteristics of the attacks, an unprecedented failure of our major infrastructures could result. In that event, a regional or national recovery would be long and difficult and would seriously degrade the safety and overall viability of our nation . . . The longer the outage, the more problematic and uncertain the recovery will be. It is possible for the functional outages to become mutually reinforcing until at some point the degradation of the infrastructure could have irreversible effects on the country's ability to support its population.[6]

While there would be little or no immediate loss of life resulting from this type of attack, modern electronic equipment would be damaged or destroyed over a large area with tremendous economic, political and military consequences for the nation. The Congressional EMP Commission concluded that nuclear EMP attack is currently a feasible option for Russia or China and a future capability for rogue states, such as Iran and North Korea. These nations could use EMP attacks to degrade the effectiveness of deployed U.S. forces by knocking out or disrupting their electronics and communications.

In the words of Dr. William Graham, Chairman of the EMP Commission:

> One possible use of EMP would be against U.S. forces stationed overseas, for example on the Korean Peninsula or in the Persian Gulf. By exploding a nuclear weapon over the theater, the ability of U.S. and allied forces to make full use of their electronic systems, including communications systems, fire control systems, radar systems, and certainly the networked systems envisioned for our 21st-Century forces, would be degraded to some degree. Depending on the yield of the weapon, the height at which the weapon was detonated, and the degree of EMP hardening enjoyed by U.S. and allied systems, such degradation could range from a nuisance to a major hindrance in the employment of electronic systems throughout the theater.[7]

Thus, even the tactical use of high altitude nuclear weapon detonations generating EMP could be disastrous to our forces. The EMP Commission report posits that "our increasing dependence on advanced electronics systems results in the potential for increased EMP vulnerability of our technically advanced forces, and if unaddressed makes EMP employment by an adversary an attractive asymmetric option."[8] Furthermore, there is also the risk of a surprise EMP attack by an orbiting nuclear weapon that is detonated above the United States. This could be accomplished by any nuclear-armed nation with a space launch capability.[9]

Members of Congress have questioned whether more should be done to protect key U.S. assets from the threat of EMP. In May 2005, the House Armed Services Committee, in its press release on the FY 2006 Defense Authorization Bill, stated that: "The committee directs the re-establishment of the Commission to Assess the Threat to the United States from Electromagnetic (EMP) Attack . . . The Committee is very

concerned that asymmetric and disruptive threats using EMP weapons are not receiving the continued attention they require."[10]

This paper provides a summary of the writings and capabilities of countries that are currently capable of launching a damaging EMP attack on the U.S., our forces, and our allies. This paper also identifies others that could pose an EMP threat in the near-term.

Russian EMP Capabilities

Anti-American feelings, a legacy from the Cold War, remain strong in Russia. Indeed, during the period of NATO military operations against Serbia in 1999, Russian Duma members threatened a U.S. Congressman with a nuclear EMP attack against the United States. Congressman Roscoe G. Bartlett (R-MD), records this encounter in 1999:

> We met with three of our Russian counterparts on the Duma International Affairs Committee, including its chairman, Vladimir Lukin, and senior Communist Party member Aleksandr Shabonov. On May 2, [1999] the Russians chastised the United States for military aggression in the Balkans and warned Russia was not helpless to oppose Operation Allied Force. Lukin said, 'If we really wanted to hurt you with no fear of retaliation, we would launch an SLBM [submarine launched ballistic missile] and detonate a single nuclear warhead at high altitude over the United States and shut down your power grid and communications for six months or so.' Shabonov added, 'And if one weapon wouldn't do it, we have some spares.'[11]

Despite the reduction in the size of the Russian strategic nuclear force, Russia is apparently not neglecting the EMP attack potential of its strategic missile force. Dr. Lowell Wood has stated that Russia has continued to maintain the ability to launch a massive EMP attack on the United States. In testimony before the House Armed Services Committee, Dr. Wood observed that: "Soviet strategic strike forces characteristically have featured weaponry well-suited to efficient EMP generation over exceptionally wide areas. ***That EMP strike component exists today in the Russian strategic order-of-battle, moreover likely at its maximum Cold War strength. I very confidently predict that it will be one of the last features of Soviet strategic nuclear weaponry to be retired from the Russian strategic force structure*"**[12] (Emphasis as in the original).

Russian Major General Vladimir Belous has openly advocated an "asymmetric response" against deployed U.S. missile defense capabilities. In a December 2004

article, he included the option (which he qualified as “strictly hypothetical”) of detonating nuclear weapons pre-positioned in orbit above the United States.[13] He wrote:

> Space-based and ground facilities of the information-reconnaissance system, without which the missile defense system will prove to be “blind,” are especially vulnerable in this sense. During a crisis situation period, “space” mines can be inserted into space. They are dispersed in orbit around enemy objects and, detonating on command from Earth, disable them at the necessary moment. The ‘blinding’ of enemy territory by disabling his electronic and power network also is possible. American specialists determined that in case a large nuclear charge were detonated at an altitude of hundreds of kilometers above the geographic center of the United States, the state of Nebraska, a powerful electromagnetic pulse will disable electronic and power systems on the territory of the entire country for a certain time.[14]

Russia is reportedly developing new types of advanced nuclear weapons, including those designed to produce EMP. Two Russian generals told the EMP Commission that “Russia designed an ‘enhanced EMP’ nuclear weapon.”[15] In December 2004, a Finnish researcher, Markku Saloma, described Russian nuclear weapon developments that included a relatively clean, enhanced EMP weapon:

> Russia is trying to develop a third generation (fission/fusion) type of nuclear weapon, which would have the power of present nuclear weapons, but which would have a polluting impact that is but a fraction of the consequences from using present weapons. In this way, it could be used in any conflict whatsoever and wherever on land, or sea, in the air or space.
>
> It must be possible to direct the power that the detonation of these releases to selected targets. They have been compared to the use of a surgeon's scalpel.
>
> The released energy is directed at the target by the consequences of, for example, a laser ray, x-ray, microwave radiation, neutron radiation, an electromagnetic shockwaves etc. These weapons are no longer considered, by Western predictions, to be futuristic fantasies, but it is expected that these kinds of things will be created within ten years. [16]

In March 2005 Russian Captain, First Rank, H. Rezyapov wrote an article in a Russian Defense Ministry publication entitled, “Asymmetric Threats to the National Security of the United States.” He concluded that it was possible to defeat the United States by asymmetric attack, including a nuclear EMP attack Implicit in this analysis was the view that it was possible to launch nuclear EMP attacks against the United States without nuclear retaliation. Captain Rezyapov wrote:

> Such a blast would simultaneously take out of action almost all of the satellites orbiting above the United States. It is thought that a nuclear blast over the territory of the state of Nebraska at an altitude of 300 km would be able to affect up to 90% of the territory of the United States by the action of its EMP.[17]

In November 2006, Aleksy Vashchenko, writing in an influential Russian leftist daily newspaper, stated that "the Russian nuclear component relies on the Super-EMP factor, which is the Russian response to U.S. nuclear blackmail."[18] He described the EMP effect of a high altitude 10-megaton detonation over the United States and how a specialized nuclear weapon could convert neutron energy into EMP effects.[19]

In June 2004, two Russian scientists, B.I. Semenov and V. V. Trekin, published a technical paper on high altitude EMP.[20] Russian writings on EMP note the limitations of non-nuclear weapons designed to produce very localized EMP effects, and emphasize the unique ability of nuclear weapons to produce high levels of EMP over a large area. For example, Dr. Boris Osadin, an official of the Moscow Institute of Electromechanics, was quoted as saying that: "At the present technical level it is practically impossible for non-nuclear means to concentrate energy that is in any way comparable with that of a nuclear burst."[21]

Russia very clearly takes the threat of EMP attack extremely seriously. There have been many statements by Russian military and defense industry officials that their new strategic missiles are completely hardened against EMP effects.[22]

The Threat of EMP Attack by China

There is concern about Chinese preparations for a nuclear electromagnetic pulse attack against Taiwan, the United States, and Japan as part of China's strategy to facilitate the conquest of Taiwan. Chinese interest in EMP goes back decades. In 1998, Zhou Yongqiang of Wuhan University wrote a technical paper on "Measuring Nuclear Explosive EMP," an interesting development in light of the fact that China claimed it was no longer testing nuclear weapons.[23] Technical papers on nuclear EMP appear regularly in Chinese open sources.[24]

The Congressional Commission on the Threat to the United States from Electromagnetic Pulse (EMP) reported that "China and Russia have considered limited nuclear attack options that, unlike Cold War plans, employ EMP as the primary or sole means of attack."[25] The 2005 Pentagon report on Chinese military power observed that: "Some PLA [People's Liberation Army] theorists are aware of the electromagnetic

effect of using a high-altitude electromagnetic pulse (HEMP), and might consider using HEMP in an unconventional attack, believing that the United States and other nations would not consider it as a use of force and a crossing of the nuclear threshold."[26] A 2005 Congressional Research Service report by Ronald O'Rourke concluded that a U.S. naval force coming to the aid of Taiwan against a Chinese attack would have to be prepared for use of nuclear weapons and EMP because, "China could also use a nuclear-armed ballistic missile to detonate a nuclear warhead in the atmosphere to create a high-altitude electromagnetic pulse (EMP) intended to temporarily or permanently disable the electronic circuits of U.S. or other civilian and military electronic systems."[27] A Hong Kong based Chinese military analyst has reported that China has "developed electromagnetism pulse bombs."[28] Certainly the multi-megaton weapons that the Chinese now deploy have great EMP potential and their lower yield weapons could have tactical battlefield utility.

There is concern in Taiwan that China will use EMP weapons as part of a Chinese invasion of Taiwan, or even against the United States if the U.S. intervenes to defeat a Chinese attack.[29] Chung Chien, writing in the *Taiwan Defense Review*, outlines, in some detail, the threat posed by an EMP attack by Chinese armed forces using very low yield nuclear devices:

> The PRC, now possessing a formidable military muscle,…is ready to fight an asymmetric war next century. The worst asymmetric scenarios that can bring the ROC [Republic of China] to heel without bloodshed are: (1) the long range blockade of Taiwan's SLOC [sea lines of communication] far away in the South China Sea at one extreme, and (2) a lightening strike over Taiwan by nuclear EMP at the other.
>
> The PLA [People's Liberation Army] now possesses a matured vehicle carrying [a] low-yield nuclear weapon to detonate at the appropriate height, that is the battle-tested, combat-ready Dong Fong-15 (M-9 for export version) short range ballistic missile (SRBM) . . . The nuclear EMP attack creates an extremely high electric field of 10,000 volts per meter, covering up to 100 km from ground zero. The sudden onset of electric field can cause permanent damage on electronic devices containing micro memory chip, logic circuit, integrated circuit, diode, transistor, and amplifier as well, virtually shut down all C4ISR equipment used by both military and civilian communities.
>
> During the nuclear EMP attack, the ion density within the EMP-generated air layer changes drastically. This change will severely hamper the wireless communication using radio frequency (RF) and microwave (MW) bands. The interruption on RF/MW communication can last, depending upon the recombination rate between free electrons and ionized air particles, for about one hour.
>
> The lightening strike by nuclear EMP inflicts little casualty on human beings . . . nuclear explosion effects such as fireball, shock wave, and radioactive fallout can

> not reach the ground and therefore cause no harm to people. But, unprotected electronic devices such as mobile phone, computer, television set, electric power grid, radar, missile, and parked aircraft will be either dead or malfunctioned. The modern society and all military hardware could become completely blind, deaf, and losing of hearing within seconds after the nuclear EMP attack. A tandem nuclear EMP attack over Taiwan, one in [the] north and one in [the] south, could knock out an OISR system island wide, covering the whole Taiwan and including the Peng-hu Islands in the strait.[30]

Chinese publications frequently address the potential for EMP attacks and the vulnerability of modern electronics to EMP. An October 2003 report on *China Military Strength* by Taiwan's Democratic Progressive Party goes further, asserting that China is "engaged in quantitative production and deployment of electro-magnetic pulse (EMP) micro . . . nuclear warheads."[31] According to an official at the Taiwanese Defense Ministry, the Chinese M-11 missile "can fire a variety of warheads ranging from nuclear and chemical warheads to electromagnetic pulse warheads."[32] In May 2001, Lin Chong, Vice Chairman of Taiwan's Mainland Affairs Council, warned the public to "pay special attention to the so-called EMP (electronic magnetic pulse) tactics." In an English-language article published in 1992, Lin pointed out that Beijing is seeking to develop "small nuclear warheads that can be detonated in the skies above Taiwan."[33] Wang Chuo-chung, writing in November 2003, stated that China would have military superiority over Taiwan in 2007, and that sources, presumably in the Taiwanese Government, "claimed that by then, the CPC [Communist Party of China] military will have the capacity to launch electromagnetic pulse attacks against Taiwan. It was said that pulse attacks are sufficient to paralyze 65 percent of Taiwan's forces."[34] A report on a Hong Kong Web-site (owned by China's official news agency) quoted an unidentified Chinese official as saying that China might not only stage two EMP attacks against Taiwan, but also might "conduct an announced nuclear EMP 'test' 1,200 km east of Taiwan to keep US forces at bay."[35] In January 2007, Hong Kong-based Chinese military analysts stated that "three electromagnetic pulse bombs from the mainland will be enough to cover the entire island, destroying Taiwan's air defense capability in just a few minutes."[36] In March 2007, Ma Ting-sheng talked about a large expansion of Chinese nuclear weapons capability, which he characterized as "one of China's dreadful trump cards against the United States."[37]

There is concern in Taiwan about Chinese EMP attack. The Taiwanese military, reportedly, "secretly carried out an 'EMP protection plan' several years ago. This involved using metal, protective netting, or other electromagnetic wave absorbing materials to put a protective screen around the Hengshan Command Post. Reflection or absorption of electromagnetic waves stops EMP before it penetrates. Also, an earthing network directs excess electromagnetic energy into the ground."[38] However, the threat of EMP attack on modern military equipment cannot be completely negated by hardening a command facility.

China expert Dr. Michael Pillsbury has linked nuclear EMP attack to the Chinese "Assassin's Mace" concept of defeat of the superior by the inferior. He stated to the U.S.-China Security Review Commission in August 2001 that the Chinese "write a lot about EMP effects that could be achieved by assassin's mace weapons on U.S. forces because the U.S. depends so heavily on, not vacuum tubes, which tend to be less affected [by an EMP strike], but on circuit boards."[39] According to Dr. Pillsbury, high altitude EMP weapons are seen "as a natural enemy of more technological advanced militaries and an 'electronic Assassin's Mace'."[40] He also noted that the March 2000 issue of China's *Military Digest* featured an article, which argued that "EMP warheads will make it much easier to cross the nuclear threshold."[41] Pillsbury observed that Chinese military writings on EMP are often ignored in the West because of the technical nature of the Chinese writings on EMP and the fact that the Chinese language symbols for EMP technical terms do not normally appear in English-Chinese dictionaries. The Chinese may have recently decided to advertise their capabilities more directly to the United States. According to the *Wall Street Journal*, "China and Russia have the capability to launch EMP weapons – and have let us know it. China recently published an article on EMP in a Chinese-language technical journal. To make sure the U.S. got the message, the article appeared in English."[42]

EMP Attacks by the Rogue States

Weapons of mass destruction are potentially attractive to rogue states because these weapons can provide an asymmetric response to U.S. conventional superiority. International arms control treaties have made chemical and biological weapons the nearly exclusive prerogative of rogue states. However, the ability of rogue states to inflict effective attacks, even with WMD payloads, requires certain technical capabilities in the delivery systems. Good accuracy is minimally necessary for WMD attacks on major urban industrial centers and for EMP attacks.[43] According to Dr. Lowell Wood, "Because a very small number – potentially one – nuclear weapon exploded at high altitude over an American expeditionary force attempting forced entry against a major regional power could potentially tip the balance against our efforts, all such powers who contemplate confronting us will be incentivized to develop, acquire or retain nuclear weaponry."[44] A key conclusion of the EMP commission report was that, "A determined adversary can achieve an EMP attack capability without having a high level of [technical] sophistication."[45]

From a political standpoint, including alliance cohesion, the most damaging form of attack by a rogue state would be WMD attacks, or EMP attacks launched against the capitals or the major cities of the United States, its friends or allies. The U.S. *National*

Strategy for Combating the Proliferation of Weapons of Mass Destruction recognized that we must respond to any WMD attack rapidly and that "the primary objective of a response is to disrupt an imminent attack or an attack in progress, and eliminate the threat of future attacks."[46] The objective of rogue state WMD attacks could possibly be to shock the attacked populations into demanding that the war be ended promptly. It would be the intent of such adversaries that such attacks would be so destructive that they would break up coalitions and cause our allies to deny the U.S. critical basing rights. Attacks might even be directed against nations that were not active participants in the conflict, much as in the way Saddam Hussein attacked Israeli cities during Operation Desert Storm.

Catastrophic attacks using modern weapons of mass destruction can inflict casualties at levels that have not been experienced since World War II. Nuclear EMP attack could be attractive to the less technically sophisticated rogue states because of the extensive damage that could be inflicted on a technologically superior adversary with a relatively crude ballistic missile. In order to be able to employ high altitude EMP strikes, the rogue state would not have to develop reentry vehicles or ballistic missiles with precision accuracy.

North Korean EMP Threat

North Korea is a Stalinist type dictatorship, in which the supreme leader is virtually worshiped as a God. A Korean People's Army Publishing House document, intended for political indoctrination, declared:

> The great leader [*widaehan ryo'ngdoja*] Comrade Kim Jong Il . . . the respected and beloved general defined the People's Army as the main force of the revolution and groomed the army into an ***invincible and ever-victorious strong army*** in accordance with the demands of our revolution and the military-first era . . . Under the untiring leadership of the great leader [*widaehan suryo'ngnim*] and the respected and beloved general, our People's Army has grown up robustly into the loyal revolutionary ranks death-defying safeguarding the nerve center of the revolution at the forefront, keeping the strongest revolutionary faith in ***worshiping and protecting the leader*** [*suryo'ng*] and a firm determination that is as unwavering as a gun even in the face of the worst hardship.[47] (Emphasis added)

North Korea's detonation of a nuclear device on October 9, 2006, makes it the first rogue state with a demonstrated nuclear weapon capability. The North Korean nuclear test was assessed by the office of the DNI (Director of National Intelligence) as a sub-kiloton weapon,[48] and probably does not have significant potential as an EMP weapon.

However, the EMP Commission reports that, "certain types of relatively low yield nuclear weapons can be employed to generate potentially catastrophic EMP effects over wide geographic areas, and designs for variants of such weapons may have been illicitly trafficked for a quarter century."[49] It is probably only a matter of time before North Korea develops nuclear weapons suitable for use in either a strategic or tactical EMP attack. We really do not know if the weapon tested in October, 2006 was a dud as reported in the press, or was a deliberate low yield test. North Korea reportedly obtained nuclear weapons design information from the A.Q. Kahn network.[50] A North Korean defector who was a Deputy in the Supreme People's Council reported that:

> North Korea built a one-tonne nuclear weapon with 4 kg of plutonium. However, there is not confidence in the performance of the manufactured bomb. North Korea is building a small nuclear weapon weighing 500 kg.[51]

The EMP Commission was briefed by two retired Russian Generals who reported that "Russian, Chinese and Pakistani scientists are working in North Korea and could enable that country to develop an EMP weapon in the near future."[52] They concluded that "North Korea, armed with an EMP weapon, would constitute a grave threat to the world."[53]

In February 2005, General Richard B. Myers, then Chairman of the Joint Chiefs of Staff, observed that, "North Korea is expected to increase its nuclear weapons inventory by the end of the decade and continues to invest heavily in ballistic missiles and their infrastructure to support them. Taken together, North Korea's actions constitute a substantive threat to global security."[54] Admiral Lowell Jacoby, then Director of the Defense Intelligence Agency (DIA), told the Senate Armed Services Committee in 2005 that irrespective of the outcome of the current negotiations "we judge that Kim is not likely to surrender all his nuclear weapons capabilities."[55]

EMP Commission Chairman William Graham told the House Armed Services Committee that "one possible use of EMP would be against U.S. forces stationed overseas, for example on the Korean Peninsula or in the Persian Gulf. By exploding a nuclear weapon over the theater, the ability of U.S. and allied forces to make full use of their electronic systems, including communications systems, fire control systems, radar systems, and certainly the networked systems envisioned for our 21st century forces, would be degraded to some degree."[56] A 2004 report by Clay Wilson of the Congressional Research Service pointed out that "creating a HEMP [high-altitude EMP] effect over an area 250 miles in diameter, an example size for a battlefield, might only require a rocket that could lift a relatively small nuclear device."[57]

As Dr. Lowell Wood told the House Armed Services Commission:

> ***The ability of North Korea to attack the continental United States in the very near term with small nuclear weapons thrown with advanced variants of the***

> ***current Taepo Dong missiles is well known to the Washington national security community*** *. . . Thus, for several reasons, each one good-and-sufficient, the U.S. would be well-advised to manifest far more effective concern than prevails at present regarding its national territory* and *against its forces abroad.*"[58] (Emphasis as in the original.)

An EMP attack would probably be very attractive to North Korean leaders because the technology used by its primitive economy is not nearly as vulnerable to EMP as advanced industrial nations. The threat of North Korean EMP attack was cited in an August 2005 article that appeared in a South Korean Defense Ministry journal. It stated:

> What North Korea's Kim Jong Il would do is to first explode nuclear weapons at a high altitude . . . while destroying electronic devices and computers and paralyzing the functions of military strongpoints, logistics plants, and cities . . . [If] it is exploded at a high altitude of 100km or so . . . all kinds of electrical machinery and, in particular, electronic devices are damaged. More seriously, many of the artificial satellites orbiting from 400 to 800km above the earth get demolished. Then, neither satellite telephone nor GPS could be used, so while the US military, which depends on satellites, immediately falls into a panic and becomes combat incapable, other nations around the world that used these satellites would also be greatly affected.[59]

The Iranian EMP Threat

Iran is a theocratic dictatorship, which has institutionalized hostility to the United States. The U.S. has believed for many years that Iran is attempting to develop a nuclear weapon, a view that is now endorsed by the United Nations Security Council. In July 2005, the U.S. reportedly briefed the International Atomic Energy Agency (IAEA) on Iranian ballistic missile programs. The briefing, reportedly, stated that Iran was designing "its Shahab-3 missile to deliver a 'black box' that experts at the U.S. nuclear weapons laboratories believe almost certainly is a nuclear warhead" because "the specifications for the size, shape, weight and detonation height don't vary throughout more than two years of work and make no sense for conventional explosives."[60] Estimates of how soon Iran might be able to produce a nuclear weapon vary. In January 2007, Major General Amos Yadin, the chief of Israeli intelligence, stated that "barring delays and accidents, Iran will have a nuclear bomb within two and a half years."[61] Around the same time, *The Daily Telegraph* reported that "[U.K.] defence officials monitoring the growing co-operation between North Korea and Iran believe the Iranians could be in a position to test fire a low-grade device — less than half a kiloton — within 12 months."[62] The pace of the Iranian nuclear program will undoubtedly be affected by the degree of technical assistance by others, such as North Korea. Close

cooperation between Iran and North Korea has been periodically reported. For example, the South Korean press reported that Iranians were invited to view the effects of the North Korean nuclear test.[63]

A nuclear-armed ballistic missile capability, inherently, creates the ability to launch EMP attacks. Indeed, the EMP Commission reported that "rogue states such as North Korea and Iran, may also be developing the capability to pose an EMP threat to the United States, and may be unpredictable and difficult to deter."[64]

Terrorist EMP Attack

The possibility of a terrorist group obtaining a nuclear weapon, particularly from a rogue state, and launching an EMP attack with a crude ballistic missile, such as a Scud missile, is certainly within the realm of possibility. Cooperation with terrorists may be attractive to nuclear-armed rogue states because of the lesser risk of attribution. Indeed, in March 2001, an Iranian journal stated that "terrorist information warfare [includes] using the technology of directed energy weapons (DEW) or electromagnetic pulse (EMP)."[65]

Conclusion

The 2006 *Quadrennial Defense Review (QDR) Report* of the Department of Defense recognized the threat posed by nuclear EMP attack. It stated that "expanded reliance on sophisticated electronic technologies by the United States, its allies and partners increase their vulnerability to the destructive effects of electromagnetic pulse (EMP) – the energy burst given off during a nuclear explosion. The effect of a nuclear blast could be catastrophic to both military forces and civilian populations."[66] It concludes that we need "the capability to shield critical and vulnerable systems and technologies from the catastrophic effects of EMP."[67] The report of the Congressional Research Service cited above further adds that "the possibility that China's People's Liberation Army (PLA) might use nuclear weapons or high-powered microwave (HPM) weapons to generate electromagnetic pulse (EMP) effects against the electronic systems on U.S. naval ships and aircraft raises a potential question regarding the adequacy of the Navy's efforts to harden its systems against EMP effects."[68] The risk of EMP attack can be mitigated by measures that include deterrence, interdiction, and active and passive

defenses.[69] It is imperative to do so. It is clear that we ignore the EMP threat at our peril.

Notes

[1] "Statement by Dr. Lowell Wood," available at: <http://www.house.gov/hasc>.

[2] "Written Statement by Dr. Michael Bernardin," available at: <http://www.house.gov/hasc/testimony/106thcongress/99-10-13graham.htm>.

[3] Clay Wilson, *High Altitude Electromagnetic Pulse (HEMP) and High Powered Microwave (HPM) Devices: Threat Assessment* (Washington D.C.: Congressional Research Service, August 20, 2004), p. CRS-4.

[4] *Report of the Commission To Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, Volume 1: Executive Summary*, op. cit., p. 4.

[5] Ibid.

[6] *Report of the Commission To Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, Volume 1: Executive Summary*, op. cit. p. 47.

[7] William Graham. "Statement of Dr. William Graham, Ph.D.," available at: <http://house.gov/hasc/testimony/106thcongress/99-10-13graham.htm>.

[8] *Report of the Commission To Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, Volume 1: Executive Summary*, 2004, p. 1-2.

[9] "Statement by Dr. Lowell Wood," op. cit.

[10] "Press Release, House Armed Services Committee Approves Fiscal Year 2006 Defense Authorization Bill," May 19, 2005, available at: <http://armed services.house.gov>.

[11] Congressman Roscoe G. Bartlett, "A Single Nuclear Weapon Could Produce an Electromagnetic Pulse Attack that Damages or Destroys Electronic Systems Across the Entire Continental United States," available at: <http://johnshadegg.house.gov/rsc/word/Bartlett--EMP.pdf.>.

[12] "Statement by Dr. Lowell Wood," op. cit.

[13] "Russia: Belous Advocates Asymmetrical Response to US Missile Defense Capability," Moscow, *Trud*, December 22, 2004. Translated in Open Source Center, Doc. ID: CEP20041221000377. Comment: Gen. Belous neglected to point out in his article that pre-positioning nuclear weapons in space would be in violation of the 1965 Space Treaty.

[14] Ibid.

[15] Commission to Assess the Threat from High Altitude Electromagnetic Pulse (EMP), "Protecting The Infrastructure And Military on a National Scale," February 2007).

[16] "Finnish Researcher Examines Russian Countermeasures, Response to NATO Expansion," Helsinki Sotilasaikakauslehti, December 1, 2004. Translated in Open Source Center, Doc. ID: EUP20050124000396

[17] "Asymmetric Threats to U.S. National Security," Moscow, *Zaurbezhnoye Voyennoye Obozreniye*, March 31, 2005. Translated in Open Source Center, Doc. ID: CEP20070112322002.

[18] "Russia: Nuclear Response to America Possible Using Super-EMP Factor," op. cit.

[19] Ibid.

[20] "Russia: Modeling Out Space Electromagnetic Pulse," Moscow, *Radiotekhnika I Electronika*, June 30, 2004. Translated in Open Source Center, Doc. ID: CEP20040722000323.

[21] "U.S. Electromagnetic Pulse Bomb Eyed," Moscow, *Kommersant (Electronic Version)*, April 17, 1999. Translated in Open Source Center, Doc. ID: FTS19990423000061.

[22] "BBC Monitoring: Focus on the Military in Russia," Caversham, *BBC Monitoring,* December 28, 2006. Transcribed in Open Source Center, Doc. ID: CEP20070103419001; "Russian Strategic Missile Troops commander unveils plans for 2007," Moscow *Agentstvo Voyennykh Novostey*, December 15, 2006. Translated in Open Source Center, Doc. ID: CEP20061226950236.

[23] "Measuring Nuclear Explosive EMP," Wuhan, *Haijun Congcheng Xueyuan*, March 1998. Translated in Open Source Center, Doc. ID: FTS19981222000656.

[24] "Measuring Nuclear Explosive EMP," Wuhan, *Haijun Gongcheng Xueyuan Xeubao* , March 1998. Translated in Open Source Center, Doc. ID: FTS19981222000656; and "Simulation of Electromagnetic Fields in EMP," *Chengdu, Qiang Jiguang yu Lizi Shu*, August 1, 1998. Translated in Open Source Center, Doc. ID: FTS19990317001689.

[25] *Report of the Commission To Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, Volume 1: Executive Summary*, op. cit.

[26] *Military Power of the People's Republic of China 2006*, op. cit., p. 40.

[27] Ronald O'Rourke*, China's Naval Modernization: Implications for U.S. Navy Capabilities – Background and Issues for Congress* (Washington D.C.: Congressional Research Service, November 18, 2005), p. CRS-15.

[28] "HK Phoenix TV on Nuclear Terrorism, Suitcase Bombs, Precautions Taken," Hong Kong, *Feng Huang Wei Shih Chung Wen Tai*, January 4, 2006. CPP20060106502008.

[29] "Part 1: Striking the US Where it Hurt'," Taipei*, Asia Times*. online edition, October 18, 2006. Transcribed in Open Source Center, Doc. ID: CPP20061019715038

[30] "Taiwan Report On PLA Preparation for War 'Without Bloodshed'," Taipei, *Taiwan Defense Affairs*, September 1, 2000. Transcribed in Open Source Center, Doc. ID: CPP20050411000204.

[31] "Taiwan: DPP Report on China's Military Strength: 'Software Development'," Taipei, *Tung –Sen Hsin-Wen Pao*, December 20, 2003. Translated in Open Source Center, Doc. ID: CPP200401106000205.

[32] "Taiwan Report on PRC Missile Buildup to 'Deter U.S. Forces," Taipei, *Taipei Times*, May 7, 2001. Transcribed in Open Source Center, Doc. ID: CPP20010507000114.

[33] "Expert Warns Against PRC's Information Warfare," Taiwan, *Taiwan Central New Agency*, May 31, 1999. Transcribed in Open Source Center, Doc. ID: FTS199905310001044.

[34] "PRC: PLA Accelerates Military Deployment Against Taiwan," Taipei, *Chung-Kuo Shih-Pao*, November 30, 2003. Translated in Open Source Center, Doc. ID: CPP20031201000168.

[35] "Netizens Discuss UK Espionage Against China, Taiwan War Plans on China. Com Military Forum 31 January-2 February," Hong Kong, *China .com*, February 3, 2005. Translated in Open Source Center, Doc. ID: CPP20050203000240.

[36] "HK Phoenix TV on Taiwan's Anti-Missile System, India's Massive Arms Purchases," Hong Kong, *Feng, Huang Wei Shih Chung Wen Tai*, January 31, 2007. Translated in Open Source Center, Doc. ID: CPP20070202721027

[37] "H.K. Phoenix TV Discusses U.S. Intelligence Report on PLA's Five Nuclear Submarines," Hong Kong, *Feng, Huang Wei Shih Chung Wen Ta*i, March 7, 2007. Translated in Open Source Center, Doc. ID: CPP20070312715004.

[38] "Taiwan Military Can Defend itself Against Electromagnetic Pulse; Civilians at Risk," Taipai, *Chung-Kuo Shih-Pao*, July 21, 2005. Translated in Open Source Center, Doc. ID: CPP20050721000181.

[39] "Security Issues: Strategic Perceptions," August 3, 2001, p. 410, available at: <http;//www.uscc.gov/hearings/2001_02hearings/transcripts/01_0803tran.pdf.>.

[40] Ibid.

[41] Michael Pillsbury, *China's Military Strategy Toward the U.S. A View from Open Sources*, November 2, 2001, p. 17, available at: <http://www.strategycenter.net/research/pubID.65/pub_detail.asp>.

[42] "Mother of All Blackouts," *The Wall Street Journal*, August 12, 2004, p. 10.

[43]*Ballistic Missile and Cruise Missile Threat* (Wright-Patterson Air Force Base, Ohio: September 2000), p. 2.

[44] "Statement by Dr. Lowell Wood," op. cit.

[45] "Abstract" in *Report of the Commission To Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, Volume 1: Executive Summary*, op. cit.

[46] *National Security Strategy to Combat Weapons of Mass Destruction* (Washington D.C.: The White House, 2002), p. 3, available at: <http://www.whitehouse.gov/news/releases/2002/12/WMDStrategy.pdf>.

[47] "People's Army, Groomed Under the Care of a Great Brilliant General, Is the Main Force Behind the Great Cause of the Chuch'e Revolution and the Pillar of the Revolution," Pyongyang *Workers Party of Korea*, January 2003. Translated in Foreign Broadcast Information Service, Doc. ID: KPG20050516000045.

[48] "Statement of the Office of the Director of National Intelligence on the North Korean Nuclear Test," October 16, 2006, available at: <http://www.dni.gov/announcements/20061016_release.pdf>.

[49] *Report of the Commission To Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, Volume 1: Executive Summary*, op. cit., p. 2.

[50] David Sanger and Jim Yardley, "U.S. Offers North Korea Evidence That Nuclear Secrets Came from Pakistani's Network," *New York Times*, July 29, 2005.

[51] ROK Month Reveals Details of Ex-DPRK SPA Deputy's Defection to ROK," Seoul *Monthly Chosun*, August 1 2005. Translated in Foreign Broadcast Information Service, Doc. ID: KPP20050718000019[0]. August 1, 2005 is in error. The transcription date is July 18, 2005.

[52] "Protecting The Infrastructure And Military on a National Scale," op. cit.

[53] Ibid.

[54] "Posture Statement of Richard B. Myers, USAF Chairman of the Joint Chiefs of Staff Before the 109th Congress Senate Services Committee," February 17, 2005, p. 14, available at: <http://armed-services.senate.gov/statemnt/2005/February/Myers%2002-17-05.pdf>.

[55] Vice Admiral Lowell E. Jacoby, Director, Defense Intelligence Agency, "Projected National Security Threats to the United States, Statement for the Record Senate Armed Services Committee," (Washington D.C.: Department of Defense, March 17, 2005), p. 10.

[56] William Graham, "Statement of Dr, William Graham, Ph.D.", available at: < hpp://www.house.gov/testimony/106th Congress/99-10-13.graham.htm>.

[57] Clay Wilson, *High Altitude Electromagnetic Pulse (HEMP) and High Powered Microwave (HPM) Devices: Threat Assessment* (Washington D.C.: Congressional Research Service, August 20, 2004), p. CRS-4.

[58] "State of Dr. Lowell Wood," op. cit.

[59] "North Korea's Military Science, Technology (Part 2)," Seoul *Kunsa*, August 26, 2005 - August 31, 2005. Translated in Foreign Broadcast Information Service, Doc. ID: KPP20060929311002.

[60] Carla Anne Robbins, "U.S. Gives Briefing On Iranian Missile to Nuclear Agency," *Wall Street Journal*, July 27, 2005, p. 3.

[61] "Israeli MI Chief: Iran To Have Bomb in 2.5 years; Al-Qa'ida Cell Nabbed in W Bank," *OSC Report*, January 9, 2007. Translated in Foreign Broadcast Information Service, Doc. ID: GMP20070109.

[62] Con Couglin, "N Korea Helping Iran With Nuclear Testing," London, *Daily Telegraph*, January 25, 2007, available at: < http://www.telegraph.co.uk/news/main.jhtml;jsessionid= EJD25LSWMZAEPQFIQMGSFGGAVCBQWIV0?xml=/news/2007/01/24/wiran24.xml>.

[63] "BBC Monitoring North Korea Briefing 1 Feb 07," Caversham, *BBC Monitoring*, February 1, 2007. Transcribed in Foreign Broadcast Information Service, Doc. ID: KPP20070201950001.

[64] "Statement of William R. Graham, Ph.D." op. cit.

[65] "Protecting the Infrastructure And Military on a National Scale," op. cit.

[66] *QDR Report*, (Washington D.C.: Department of Defense, 2006), p. 33.

[67] Ibid.

[68] *China's Naval Modernization: Implications for U.S. Navy Capabilities – Background and Issues for Congress*, op. cit., p. CRS-59.

[69] *Report of the Commission To Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, Volume 1: Executive Summary*, op. cit., pp. 7-10.