

The background of the entire page is a photograph of a sunset or sunrise. The sun is a large, bright, glowing orb in the center of the frame, partially obscured by thin, wispy clouds. The sky is a deep orange-brown color. In the foreground, there is a dark, silhouetted horizon line. On the left side of the horizon, there is a small, dark structure that looks like a lighthouse or a small building with a few lights on top. The overall mood is dramatic and somewhat ominous.

# FOREIGN VIEWS OF ELECTROMAGNETIC PULSE ATTACK

by

Dr. Peter Vincent Pry

July 2017

Report to the Commission to Assess the Threat to the United States  
from Electromagnetic Pulse (EMP) Attack

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**July 2017**

This paper was drafted to inform the work of the EMP Commission during 2001-2008, but could not be published because the Commission was terminated before Staff Papers could be submitted for security classification review. It is offered now for completeness of the analytical record.

The cover photo depicts Fishbowl Starfish Prime at 0 to 15 seconds from Maui Station in July 1962, courtesy of Los Alamos National Laboratory.

This report was produced to support the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack. The Commission was established by Congress in the FY2001 National Defense Authorization Act, Title XIV, and was continued per the FY2016 National Defense Authorization Act, Section 1089.

The Commission completed its information-gathering in June 2017. The report was cleared for open publication by the DoD Office of Prepublication and Security Review on July 16, 2018.

This report is unclassified and cleared for public release.

## Acronyms and Abbreviations

ABM	anti-ballistic missile
ASW	anti-ship warfare
DE	directed energy
DPRK	Democratic People's Republic of Korea
EMP	electromagnetic pulse
GPS	global positioning system
HPM	high power microwave
ICBM	intercontinental ballistic missile
IW/C2W	Irregular warfare / command and control warfare
KT	kiloton
MRBM	medium range ballistic missile
MT	megaton
NATO	North American Treaty Organization
PLA	People's Liberation Army
RDT&E	research, development, test, and evaluation
RF	radio frequency
SRBM	short range ballistic missile
STRATCOM	U.S. Strategic Command
WMD	weapons of mass destruction

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## Key Judgments

The physics of electromagnetic pulse phenomenon and the military potential of an electromagnetic pulse (EMP) attack are widely understood in the international community, as reflected in official and unofficial writings and statements. Indeed, the technical and military possibilities presented by non-nuclear "radio frequency (RF) weapons" and "information warfare" are among the foremost preoccupations of foreign military scientists and defense theorists, who frequently equate these new threats with nuclear EMP attack. A survey of open source writings over the past decade finds that these themes appear in the literature of at least Britain, France, Germany, Israel, Egypt, Taiwan, Sweden, India, Pakistan, Cuba, North Korea, Iran, Iraq, China, and Russia.

Numerous foreign governments have invested in hardening programs to provide some protection against nuclear EMP attack, indicating that this threat has broad international credibility. At least some of the new nuclear weapon states, notably India, are concerned that their military command, control, and communications may be vulnerable to EMP attack.

Some foreign analysts perceive nuclear EMP attack as falling within the category of electronic warfare or information warfare, not nuclear warfare. Indeed, the military doctrines of at least Russia and China appear to define information warfare as embracing a spectrum ranging from computer viruses to nuclear EMP. North Korea, Iran, and other rogue states tend to follow the lead of Russia and China when formulating their military doctrines.

Some foreign analysts, judging from open source statements and writings, appear to regard EMP attack as a legitimate use of nuclear weapons, because EMP would inflict no or few casualties. EMP attack appears to be a unique exception to the general stigma attached to nuclear employment by most of the international community in public statements. Significantly, even some analysts in Japan and Germany—nations that in recent decades have been most condemnatory of nuclear and other weapons of mass destruction (WMD) in official and unofficial forums—appear to regard EMP attack as morally defensible.

Some foreign analysts—particularly in Russia, China, North Korea, and Iran—view the United States as a potential aggressor that would be willing to use its entire panoply of weapons, including nuclear weapons, in a first strike. At least Russian and Chinese analysts perceive the United States as having contingency plans for a nuclear EMP attack, and as probably being willing to execute those plans under a broad range of circumstances.

Russian and Chinese military scientists appear to understand at least the basic principles of nuclear weapons designed for enhanced-EMP that could place at risk all exposed U.S. military and civilian electronic equipment. Enhanced-EMP weapons could conceivably proliferate from Russia or China to rogue states.

The nuclear weapon programs of North Korea and Iran are clandestine. Therefore, little direct evidence—such as military writings or statements by high ranking officials—exists about their thinking or planning for nuclear weapons employment. Nonetheless, compelling

circumstantial evidence, not least the capabilities inherent in their nuclear missile programs, suggests that the rogue states probably have or will develop contingency plans for EMP attack.

Although Pakistan and India are not rogue states, they all presently have missiles and nuclear weapons giving them the capability to make EMP attacks against their regional adversaries. An EMP attack by any of these states—even if targeted at a regional adversary and not the United States—could collaterally damage U.S. forces in the region, and would pose an especially grave threat to U.S. satellites.

China and Russia probably have contingency plans for nuclear EMP attack regionally and intercontinentally against the United States. Chinese and Russian military writings are replete with references to the dependency of the United States military forces and civilian infrastructure upon sophisticated electronic systems, and to the potential vulnerability of those systems to attack. Russian Duma members explicitly made an EMP threat against the United States, during a meeting of high-ranking U.S. and Russian representatives in Vienna to discuss the Balkans crisis, in May 1999.

### C3 Disruption: The Key to Victory

Russian and Chinese military writings are replete with technical and doctrinal analysis of RF weapons and information warfare that implicitly or explicitly compare these new technologies to a small-scale version of nuclear EMP attack. Russian and Chinese writings view disruption of the adversary's electronic systems as the key to victory in future war. North Korea, Iran, and Iraq—who are more secretive than Russia and China about their military doctrines—tend to follow the lead of Moscow and Beijing in matters of military doctrine, often relying on Russian and Chinese manuals to train their troops:

- Russia: "Weapons developed on the basis of previously unused physical principles attract special attention from the military, since they promise great advantages to those who are first to introduce the innovations. At the same time, physics imposes considerable constraints in the path of development of microwave weapons operating close to the Earth's surface...Complication of weapons has meant that more and more potential targets of engagement for microwave weapons have begun to appear on the battlefield. So military departments have put a lot of effort into developing various means to protect weapons systems and subsystems from such effects. The concept of the electromagnetic pulse is usually associated with nuclear explosions, but at the present level of technical development, it can also be achieved with non-nuclear sources."<sup>1</sup> (**Anatoliy Gannota, *Nezavisimoye Voyennoye Obozreniye*, 13 April 2001**)
- Russia: "Research to create weapons using different kinds of emissions of non-nuclear origin, including electromagnetic, began considerably earlier than work using other non-lethal technologies, and so turned out to be more developed and closer to completion...This also is connected to the fact that microwave weapon systems essentially are electronic warfare...weapons, and the problem of combating various kinds of electronic equipment that controls state and military information systems, provides command and control, and controls precision weapons always has been considered urgent and a top priority in the West....As a result of high radiated power, RF/HPM systems can interfere substantially in the functioning of friendly electronic equipment....Another shortcoming is that countermeasures employed to protect against EMP from a nuclear explosion and which are a mandatory and inalienable part of all state civilian and military electronic equipment for communications and command and control will have a substantial influence on the effect of microwave emissions."<sup>2</sup> (***Yadernyy Kontrol*, May-June 1998**)
- Russia, from the official journal of the Russian Navy: "A particular kind of information war is the destruction by non-lethal weapons (read: electronic weapons) of the most important elements of military industry and the civilian regional infrastructure by disabling, for example, power supply, communications, transportation and other

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<sup>1</sup> Anatoliy Gannota, "Destruction Objective—Electronics," ***Nezavisimoye Voyennoye Obozreniye*** (13 April 2001), p. 6.

<sup>2</sup> Unattributed, "Selected Issues of the Creation, Characteristics and Prospects of Nonlethal Weapons," ***Yadernyy Kontrol*** (May-June 1998), pp. 55-75.



installations....Superiority in IW/C2W permits ensuring surprise and the possibility of delivering a knock-out blow even before a formal announcement of the beginning of combat operations...and it will permit seizing and holding the initiative and concluding the crisis or military conflict as fast as possible on terms most favorable to yourself....Making simultaneous and maximum possible use of all means and methods of warfare...for achieving highest results and concentrating main efforts on destroying the most important vulnerable links of the enemy information infrastructure and command and control system are a guarantee of success here. Radars, surveillance and reconnaissance equipment, communications centers and lines...radio-relay stations, fixed navigational equipment, television and radio broadcasting stations and so on can be included among vulnerable links of the information infrastructure. Other vulnerable links are elements of the support infrastructure—electrical power stations, power supply lines and so on. And critically important vulnerable links include the most important components of the command and control system, destruction or annihilation of which will entail an immediate decrease in capabilities for command and control of troops and forces for effective conduct of combat operations....Try to imagine the chaos that would arise as a result of a shutdown of computers and technical information systems serving, for example, a city's municipal economy."<sup>3</sup> (Major M. Boytsov, **Morskoy Sbornik**, 19 October 1995)

- China, from a senior officer, Commander of the Chengdu Military Region, writing in the official journal of the People's Liberation Army (PLA) Academy of Military Science, that treats doctrine and strategy in depth: "How war develops, how people's air defense is constructed, what people's air defense requires under high-technology conditions...are all basic questions that must be followed in developing the people's air defense undertaking....Under high-technology conditions, there should be extreme emphasis on application of stealth aircraft, cruise missiles, electromagnetic pulse bombs, and other high-technology weapons...."<sup>4</sup> (General Liao Xilong, **Zhongguo Junshi Kexue**, 20 February 2001)
- China, from the official newspaper of the PLA: "The 'high-energy microwave weapons' are essentially 'super jammers.' They are radiofrequency weapons systems comprising super-high microwave transmitters...it can meet and destroy the electronic devices of incoming missiles resulting in control over the attacking missiles being lost. This type of weapon uses a high strength radiation field to surround the target, so that the sensitive electronic components suffer a deadly dose of voltage and electric current which destroys their functions. Thus...these weapons can effectively destroy the majority of military systems, which mostly rely on electronic equipment....This sort of weapon is characterized by a large attack area and a long operating distance, and it is little affected by the weather."<sup>5</sup> (Ding Bo, Xi Xue, and Yan Ren, **Jiefangjun Bao**, 25 December 1995)

<sup>3</sup> Major M. Boytsov, **Morskoy Sbornik** (19 October 1995), pp. 69-73.

<sup>4</sup> General Liao Xilong, **Zhongguo Junshi Kexue** (20 February 2001), pp. 53-61.

<sup>5</sup> Ding Bo, Xi Xue, and Yan Ren, "Beam Energy Weaponry, Powerful Like Thunderbolts and Lightning," **Jiefangjun Bao** (25 December 1995), p. 7.

- China, from the official newspaper of the PLA: "Experts predict that computer warfare weapons will enter strategic arsenals in the 21st century. At a high-level international telecommunications conference held in Morocco, a senior adviser to an American company bluntly said: 'Fighting a war with computers is more effective than fighting a war with nuclear weapons. To destroy the United States, an enemy state will now just try to disrupt the U.S. computer system in a high-tech fashion and steal \$160 billion in one second so that the entire U.S. economy will fall apart.'"<sup>6</sup> (Geng Haijun, **Jiefangjun Bao**, 20 August 1996)

Numerous other nations also, judging from open source writings, are interested in RF weapons and information warfare, and see such capabilities as analogous to nuclear EMP attack, but on a smaller scale. A survey of open source writings over the past decade finds that these themes appear in the literature of at least Britain, France, Germany, Israel, India, Pakistan, Iran, Egypt, Taiwan, Sweden, and Cuba.<sup>7</sup>

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<sup>6</sup> Geng Haijun, **Jiefangjun Bao** (20 August 1996).

<sup>7</sup> For example: Kim Il-kon, "The ROK Army's Grand Vision for the 21<sup>st</sup> Century Disclosed for the First Time—'Digital Division' Project," **Wolgang Chungang** (1 October 2001), pp. 202-216. Manuel Cereijo, "Radio Frequency Weapons Technology," **Guaracabuya** (May 2001). Per Mortensen, "Microwaves in the Service of Peace," **Dagens Nyheter** (Sweden: 7 April 2000), p. 6. Roger Fontaine, "EMPs No Longer Science Fiction," **Tiempo Del Mundo** (14 July 1997). "Potential Cyberwarfare Weapons Examined," **International Policy Institute for Counterterrorism** (Israel: 23 April 1998). Ira W. Merrit testimony before the Joint Economic Committee, U.S. House of Representatives, **Proliferation and Significance of Radio Frequency Weapons Technology** (26 February 1998).

## Hardening against EMP Attack

Numerous nations currently have active programs to harden key parts of their electronic infrastructure from a nuclear EMP attack, according to open source writings and statements, indicating that they regard as credible the possibility of a nuclear EMP attack:

- Russia, from an interview with managers of Russian missile design bureaus: "We have offered the Navy a new ballistic missile...that is called the RSM-54 'Sineva.' This vehicle's fundamental distinction from its predecessor consists of the fact that the dimensions of the stages have been changed, 10 nuclear warheads are installed, the system's level of protection from electromagnetic pulse has been enhanced, and a system for penetrating an enemy PRO [ballistic missile defense] has been installed."<sup>8</sup> (Vladimir Grigoryevich Degtyar, **Nezavisimoye Voyennoye Obozreniye**, 18 May 2000)
- Russia, from a senior officer of the Air and Space Force: "[The SS-25 ICBM] is a solid-fuel missile, which makes it relatively safe to operate. It has a range of more than 10,000 miles. The missile is not vulnerable to electromagnetic pulses and can deliver a warhead without problems to any point on the globe."<sup>9</sup> (General Valentin Boris, **Strana.ru National Information Service**, 31 July 2001)
- Russia, from interviews with senior Russian scientists and program directors: "In the homeland, due to the lack of money, once again they are testing the systems created at the association for strength and endurance. An example of this may be the Poberezovik radar...installed on the *Kerch*, a large ASW ship of the Black Sea Fleet. There has been no money for its maintenance for five years now....The degree of reliability is tested not only by the economic difficulties in supporting the fleet but also by numerous tests. Thus, the majority of antenna posts and instrument part of the radars were tested for durability during simulation of an atomic explosion. The tests confirmed that the radars can not only hold up during the onslaught of a shock wave but also continue to operate, despite the effect of electromagnetic pulse. Victor Pavlovich was silent about how it was possible to achieve this..."<sup>10</sup> (Dmitriy Litovkin, **Voyennyye Znaniya**, December 1996)
- China, from a leading daily on science and technology: "NINT, Northwest Institute of Nuclear Technology, is located at the foot of Lishan in Xian....In the electromagnetic radiation effect laboratory, a large harp-shaped device almost takes the entire space available in the room. This is an EMP boundary wave simulator. In recent years, this laboratory has conducted a large number of electromagnetic compatibility tests for various electronic devices. It has served a large number of clients in areas such as electromagnetic interference, electronic warfare, and electromagnetic calibration. It is the leader in China in areas such as radioactive environment measurement, EMP research,

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<sup>8</sup> Vladimir Grigoryevich Degtyar interviewed by Dmitry Litovkin, "The 'Sineva' Will Rise over the Sea," **Nezavisimoye Voyennoye Obozreniye** (18 May 2000), pp. 1, 6.

<sup>9</sup> General Valentin Boris, "No Way the SS-25 Can Be Described as a 21<sup>st</sup> Century Missile," **Strana.ru National Information Service** (31 July 2001).

<sup>10</sup> Dmitriy Litovkin, "Salyut's Lace," **Voyennyye Znaniya** (December 1996).

radiation testing of electronic components and computers, and reinforcement of radiation resistance for satellites."<sup>11</sup> (Liu Cheng, **Keji Ribao**, 20 August 1996)

- China, from a science journal: "Biomaterials with very large structures such as biochromes, etc. are able to carry out electronic information transmission, storage and processing at high speeds, and they are not influenced by electromagnetic interference and nuclear electromagnetic pulses. By using this type of electronic device to build radar, one can discover targets and distinguish the enemy and oneself through all-weather, omnibearing, and long distance searching under strong electromagnetic interference."<sup>12</sup> (Wu Dongwan and Ban Dingjun, **Kexue Shibao**, 25 July 2000)
- China, from the official technical journal of the Navy Academy of Engineering: "By analyzing the frequency and amplitude characteristics of the electromagnetic pulse accompanying a nuclear explosion, one can conduct scientific evaluation of the nature of explosion. For example, the EMP of an atomic bomb and a hydrogen bomb has almost no overlap on the probability distribution curve; they can therefore be differentiated using the position of the center frequency and the frequency bandwidth. This paper describes an automatic measurement system for recording the near-field EMP signal of a nuclear explosion."<sup>13</sup> (Zhou Yongqiang, **Haijun Gongcheng Xueyuan Xuebao**, March 1998)
- Taiwan: "Defense sources said yesterday that the military has earmarked around \$3 billion for investments in electronic information warfare this year....the plan includes the development of a security system for computer networks in use in the armed forces and a protective shield to defend computer systems against possible electromagnetic pulse (EMP) bomb attacks."<sup>14</sup> (Brian Hsu, **Taipei Times**, 15 October 2000)
- Britain: "Paul Lightfoot, operations manager, leads the way into a 60,000 square foot labyrinth. On the upper levels are telephone fibre-optics and electricity mains cables filtered behind blast-proof doors in Faraday Cages. These steel boxes are capable of withstanding the electromagnetic pulses (EMPs) after a nuclear explosion which would wipe out any electrical equipment in their path."<sup>15</sup> (Keith Poole, **Evening Standard**, 9 August 2001)
- France, from an interview with a senior defense program director, Michel Bourzeix, chief of electromagnetics for the General Directorate of Armaments: "Our expertise lies in determining where the vulnerability frequencies of aircraft, missiles and microwave tanks are located and to come up with solutions...The principle here of armoring against attacks is based quite closely on those used to protect against nuclear electromagnetic pulse....Such activities, put under the aegis of the DGA and Directorate of test and expert

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<sup>11</sup> Liu Cheng, "Feature on Shanguang-II High Intensity E-Beam Accelerator at NINT," **Keji Ribao** (20 August 1996), p. 8.

<sup>12</sup> Wu Dongwan and Ban Dingjun, "Mysterious Military-Application Biotechnologies," **Kexue Shibao** (25 July 2000), p. 3.

<sup>13</sup> Zhou Yongqiang, "Measuring Nuclear Explosive EMP," **Haijun Gongcheng Xueyuan Xuebo** (March 1998), pp. 19-24.

<sup>14</sup> Brian Hsu, "Taiwan Military to Invest in E-Warfare," **Taipei Times** (15 October 2000). According to the article, Taiwan's EMP protection program is codenamed "Maihu."

<sup>15</sup> Keith Poole, "Journey to the Centre of the Web: Giant Bunker Provides Nuclear Defence for Internet," **Evening Standard** (9 August 2001), p. 18.

centers (DCE), are performed in the Hyperion facility..."<sup>16</sup> (Serge Brosselin, **Air and Cosmos**, 26 May 2000)

- Yugoslavia, from an interview with a member of the General Staff and Chief of Ground Forces, General Miodrag Simic: "The Ground Forces Technical Experimental Center is part of the Ground Forces sector of the Yugoslav Army General Staff....For the past 27 years, personnel and laboratory/range resources have been developed so as to make it possible to carry out the most complex tasks in the field of testing and evaluating weapons and military equipment [NVO]....Particularly significant is the development of electronic surveillance and jamming, which requires that NVO equipment be resistant to counter-electronic operations, the effect of electromagnetic pulses from a nuclear explosion, and the effect of an e-bomb."<sup>17</sup> (Mira Vucinin, **Vojska**, 16 March 2000)
- Finland, from an interview with the chief of Army R&D, General Kalle Ukkola: "One of the newest inventions is an HPM weapon, an equipment developing high-power electromagnetic signals. If you load it on a pick-up truck and give an electromagnetic pulse on Kasarmi Square, there probably goes the information network of the general staff headquarters, which is protected against nuclear attacks, as well as the telephone network of Helsinki Telephone Company and a lot of other technology. According to General Ukkola, the Russians have such a device."<sup>18</sup> (Arto Astikainen, **Helsingin Sanomat**, 31 December 1998)

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<sup>16</sup> Serge Brosselin, "France Speeds Up Its Defense Against Microwave Weapons," **Air and Cosmos** (26 May 2000), p. 33.

<sup>17</sup> Mira Vucinin, "The Mainstay in Evaluating Quality," **Vojska** (16 March 2000), pp. 24-25.

<sup>18</sup> Arto Astikainen, "Electronic Warfare Center Being Set Up In Riihimakii: Feverish Search By Army For Electronic Warfare Researchers," **Helsingin Sanomat** (31 December 1998).

## Vulnerability to EMP Attack

At least some of the nascent nuclear weapon states are concerned that their military command, control, and communications may be vulnerable to EMP attack. For example, Indian analysts fear that military C3 may be India's Achilles' heel, enabling an adversary to deliver a decisive blow through an EMP attack:

- India, from an article citing the views of the Defense Minister and senior officers, including General V. R. Raghavan, former Director of Military Operations: "The most complicated, costly, controversial and critically important elements of [nuclear] weaponisation are the C3I systems....Mr. Stephen Schwartz, Director of the Brookings Institution study of the U.S. nuclear programme, says that in spite of spending \$700 billion on the C3I systems, 'the U.S. was never able to solve the problem of designing a system robust enough to survive a nuclear attack and coordinate a retaliatory launch.'....According to Brig. Nair, while some more money has certainly to be spent in India, the ongoing process of modernization of the conventional forces is going to provide command shelters and satellite communication that can be integrated into a nuclear force....However, saving on a C3I system could be suicidal. With a no-first-use policy, the Indian communications systems have to be hardened to withstand the electromagnetic pulses generated by an adversarial nuclear first strike. Otherwise, no one will be fooled by the Indian deterrent."<sup>19</sup> (C. Rammanohar Reddy, **The Hindu**, 1 September 1998)
- India, from a senior scientist, in the most influential and respected daily in south India: "The ability to quickly respond, i.e. after [a nuclear] attack, would require those possessing the weapons, for example, a military officer, to be able to launch these weapons at short-notice. If the attack were to either destroy the political leadership, i.e., the Prime Minister and the designated successor(s), or cripple the communication system (through, for example, the electromagnetic pulse set off by a nuclear explosion under some circumstances), such retaliation would either be impossible or would require that the military officer had access to the necessary code to launch the weapons in the first place."<sup>20</sup> (M. V. Ramana, **The Hindu**, 9 September 1999)

Most foreign analysts more often write about their national vulnerability to RF weapons and information warfare rather than about nuclear EMP attack explicitly, although their descriptions of the profound and widespread consequences expected from an attack by "information weapons" is often identical to the kind of threat posed by nuclear EMP:

- Ukraine: "Targets that should be assured of uninterrupted operability or functionality in real time are the most vulnerable to [information weapons]. The likelihood of the restoration of automated early warning complexes of ABM systems and other systems of strategic significance is quite low, in the estimation of foreign specialists, and the results of deliberate interference in their operation could be of a catastrophic nature and

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<sup>19</sup> C. Rammanohar Reddy, "The Wages of Armageddon—II," **The Hindu** (1 September 1998), p. 10.

<sup>20</sup> M. V. Ramana, "A Recipe for Disaster," **The Hindu** (9 September 1999), p. 12.

comparable to the possible damages caused as a consequence of the use of nuclear weapons."<sup>21</sup> (Oleksandr Manachynskyy, **Narodna Armiya**, 1 February 1996)

- Taiwan, from official views of the Taiwan military cited in a leading newspaper: "Most military experts have shared the view that once a war breaks out in the Taiwan Strait, the first strike launched by the People's Liberation Army will be decisive to the outcome of the war. Aside from lobbing missiles and cruise missiles at Taiwan, the PLA forces are also expected to launch their first strike through both an information attack and an electronic attack, for such attacks comply with the PLA principle of 'within a short time, within limited space and with fewer casualties.' Over the past few years, the communist forces have built up with strenuous efforts capabilities for 'fighting an asymmetric war' with both information warfare and electronic warfare....A 'hard strike' is likely to be launched with non-nuclear electromagnetic pulse bombs or with an attack on the Nationalist Forces' command, control, telecommunication, and intelligence center with cruise missiles or millstone bombs, focusing on vital facilities, whereas a 'soft strike' is likely to be launched with an attack on the Nationalist Forces' computer networks...with computer viruses, with an eye on paralyzing the Nationalist Forces' command, control, telecommunication, and intelligence center."<sup>22</sup> (Wu Ming-chieh, **Tzu-Yu Shih-Pao**, 20 June 2001)

Some foreign programs putatively for defense against non-nuclear information warfare sound similar to programs that would be pursued for hardening against nuclear EMP attack:

- Taiwan, from official views of the Taiwan military cited in a leading newspaper: "Over the past few years, the Nationalist Forces have rapidly developed research on information warfare and electronic warfare. Separate from civil information networks, the Nationalist Forces' internal information networks are...virtually immune to a 'soft strike' [by computer viruses] launched by the communist forces. In the meantime, the Nationalist Forces have also formulated a series of special defense programs, including 'The Pulse Protection Program,' in order to fend off a possible 'hard strike' launched by the communist forces. Apart from a command, control, telecommunication, and intelligence center complete with multi-route computer networks, the Nationalist Forces have also implemented a program aimed at building a diversified command, control, telecommunication, and intelligence center, and have reorganized telecommunication and information networks for the three services..."<sup>23</sup> (Wu Ming-chieh, **Tzu-Yu Shih-Pao**, 20 June 2001)

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<sup>21</sup> Oleksandr Manachynskyy, "Information Warfare: Myth and Reality," **Narodna Armiya** (1 February 1996), pp. 3-4.

<sup>22</sup> Wu Ming-chieh, "Enhancing Nationalist Forces Deterrent Through Effective Electromagnetic Control," **Tzu-Yu Shih-Pao** (20 June 2001).

<sup>23</sup> Ibid.

## EMP Attack for Information Warfare

Some foreign analysts perceive nuclear EMP attack as falling within the category of electronic warfare or information warfare, not nuclear warfare. Indeed, the military doctrines of at least China and Russia appear to define information warfare as embracing a spectrum ranging from computer viruses to nuclear EMP. Note that Taiwan's General Lin, chief of the Telecommunications and Electronic Information Bureau of the Ministry of National Defense, who is cited below, also includes among information warfare a nuclear EMP attack by "neutron bombs." Some Chinese and Taiwanese analysts appear to use the phrase "neutron bombs" as a synonym for nuclear EMP weapons:

- China, from an official newspaper of the PLA: "An information offensive takes two forms, namely, physical and logical. A physical offensive is composed of electronic warfare, biological warfare, missile warfare, directed energy weaponry, and nuclear weaponry with its electromagnetic pulse effect....A logical offensive means that one party tries to...sabotage the other party's military information systems...by virtue of computer viruses..."<sup>24</sup> (Zhu Chonguo, **Jiefangjun Bao**, 27 August 1996)
- China, from a major book by one of the most senior and prolific academic military theorists, credited by China with inventing "information warfare," Shen Weiguang: "With their massive destructiveness, long-range nuclear weapons have combined with highly sophisticated information technology and computer technology to shape warfare today and warfare of the looming 21st century: information war under nuclear deterrence....Information war and traditional war have one thing in common, namely that the country which possesses the critical weapons such as atomic bombs will have 'first strike' and 'second strike retaliation' capabilities....As soon as its computer networks come under attack and are destroyed, the country will slip into a state of paralysis and the lives of its people will ground to a halt. Therefore, China should focus on measures to counter computer viruses, nuclear electromagnetic pulse, laser, bunch of particles, and other photoelectric wave weapons and quickly achieve breakthroughs in those technologies in order to equip China without delay with equivalent deterrence that will enable it to stand up to the military powers in the information age and neutralize and check the deterrence of Western powers, including the United States."<sup>25</sup> (Shen Weiguang, **World War, the Third World War—Total Information War**, 1 January 2001)
- China: "The methods used to achieve destruction or manipulation of the 'byte' can be 'atomic'—such as electromagnetic pulse bombs and so on—or can be 'byte' type—such as computer viruses....The so-called strategic information warfare is the use of destruction or manipulation of the flow of information on a computer network to destroy the enemy's telephone network, fuel pipelines, electric grid, transportation control system, national funds transfer system, various bank clearance systems, and health and sanitation systems,

<sup>24</sup> Zhu Chonguo and Liang Yongchang, "On Information Offensive, Defensive," **Jiefangjun Bao** (27 August 1996).

<sup>25</sup> Shen Weiguang, **World War, the Third World War—Total Information Warfare** (Beijing: Xinhua Publishing House, 1 January 2001).



in order to achieve a strategic goal.”<sup>26</sup> (Wang Xiaodong, **Jianchuan Zhishi**, 30 June 1999)

- Taiwan: INTERVIEWER—“What is 'information warfare'? What is Taiwan doing about it? We interviewed Air Force Major General Lin Chin-ching, chief of the Telecommunications and Electronic Information Bureau of the Ministry of National Defense, who is in charge of this area.”....GENERAL LIN—“The CPC (China) started working on information warfare in 1985. Since 1995, it has been conducting various types of actual experiments. In 1997, it conducted a mock computer virus attack at the Nanjing Military Region, and in the same year, the Beijing Military Region conducted an experiment on attacking a broadcasting station with viruses. In summer 1999, the Lanzhou Military Region also conducted various exercises in information warfare. The National Defense Science and Technology Information Center is the core component of information warfare development efforts. It has made significant achievements. Electromagnetic pulse weapons, such as neutron bombs, constitute a special threat. These devices are able to destroy computers and electronic equipment in a split second without wounding human beings.”<sup>27</sup> (Seiji Yajima interviews General Lin, **Sankei Shimbun**, 5 November 1999)
- Russia, from a book by one of Russia’s chief military theorists, General Vladimir Slipchenko: “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 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...”<sup>28</sup> (General Vladimir Slipchenko, **Noncontact Wars**, 1 January 2000)
- France, from an article citing the views of senior French Defense Ministry officials and scientists, including the Director of Gramat weapons laboratory, Michael-Georges Joubert: “Tomorrow's wars could be won thanks to the use of new electromagnetic weapons capable of paralysing a country's defence's by annihilating their electronic systems....The most concrete threat is that caused by a weapon capable of provoking an electromagnetic pulse produced by a nuclear blast above the atmosphere, at an altitude of more than 100 km. The effect would be similar to that of lightning, but much more

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<sup>26</sup> Wang Xiaodong, “Special Means of Warfare in the Information Age,” **Jianchuan Zhishi** (30 June 1999).

<sup>27</sup> Seiji Yajima interviews General Lin, **Sankei Shimbun**, (5 November 1999).

<sup>28</sup> General Vladimir Slipchenko, **Noncontact Wars** (Moscow: 1 January 2000).

powerful and covering a surface of more than 1,000 sq. km. Without protection, all communications systems would be destroyed, including those with submarine carrying nuclear ballistic missiles, something which would jeopardize the credibility of the French nuclear deterrent..."<sup>29</sup> (Paris AFP, **Research Center Working on Electronic Warfare**, 13 May 2000)

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<sup>29</sup> Paris AFP, **Research Center Working on Electronic Warfare** (13 May 2000).

## EMP Attack Is Legitimate Nuclear Use

Some foreign analysts, judging from open source statements and writings, appear to regard EMP attack as a legitimate use of nuclear weapons, because EMP would inflict no or few casualties. EMP attack appears to be a unique exception to the general stigma attached to nuclear employment by most of the international community in public statements. Significantly, even some analysts in Japan—the nation that traditionally has been most condemnatory of nuclear and other WMD in official and unofficial forums—appear to regard EMP attack as morally defensible. Although the German analyst's "E-bomb" may refer to non-nuclear radiofrequency weapons—the context, a discussion of weapons of mass destruction, implies a nuclear weapon may be meant—his advocacy of attacking technology instead of people at least logically extends to EMP attack. Note that the Indian analyst below characterizes EMP attack as India's "most powerful incentive for a preemptive attack:"

- Japan, from an in depth scholarly article citing senior political and military officials:  
"Although there is little chance that the Beijing authorities would launch a nuclear attack, which would incur the disapproval of the international community and which would result in such enormous destruction that it would impede post-war cleanup and policies, a serious assault starting with the use of nuclear weapons which would not harm humans, animals, or property, would be valid. If a one kiloton nuclear warhead was detonated 40 kilometers above Taiwan, an electromagnetic wave would be propagated which would harm unprotected computers, radar, and [integrated] circuits on the ground within a 100 kilometer radius, and the weapons and equipment which depend on the communications and electronics technology whose superiority Taiwan takes pride in would be rendered combat ineffective at one stroke. It would only take two 1 kiloton warheads to render all the military and civilian communications and electronics equipment throughout the island powerless in an instant, and if they were detonated in the sky in the vicinity of Ilan, the effects would also extend to the waters near Yonakuni [in Okinawa], so it would be necessary for Japan, too, to take care. Those in Taiwan, having lost their advanced technology capabilities, would end up fighting with tactics and technology going back to the 19th century...they would inevitably be at a disadvantage with the PLA and its overwhelming military force superiority."<sup>30</sup> (Su Tzu-yun, **Jadi**, 1 June 2000)
- Germany, from an interview with the director of a military think tank serving the Ministry of Defense, Wolfgang Haas: INTERVIEWER—"Should not weapons of this nature, which could of course destroy not only military computer systems, but also hospital or traffic control systems not be proscribed by international law? Such E-bombs almost remind me of biochemical weapons." WOLFGANG HAAS—In my opinion, biological or chemical weapons are entirely different, because man is their sole target. This is without a doubt inhumane warfare. I consider it much more 'humane' for us to

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<sup>30</sup> Su Tzu-yun, **Jadi** (1 June 2000).

destroy each other's technology than to put up with something that results in a huge loss of human life."<sup>31</sup> (Wolfgang Haas interview, **Telepolis**, 23 November 1998)

- India, from an academic with India's Institute of Defense Studies Analysis: "A study conducted and published in the U.S. during the late 1980s reported that a high-yield device exploded about 500 km above the ground can generate an electromagnetic pulse of the order of 50,000 volts over a radius of 2,500 km around the point of burst which would be collected along any exposed conductor. Such an attack will not cause any blast or thermal or radiation effects on the ground below but it can produce a massive breakdown in the communications system. The complexities of this phenomenon and the difficulties in testing them in full scale make accurate assessments impossible. But it is certain that most of the land communication networks and military command control links will be affected and it will undermine our capacity to retaliate. This, in fact, is the most powerful incentive for a preemptive attack. And a high-altitude exo-atmospheric explosion may not even kill a bird on the ground."<sup>32</sup> (Dean Mathew, **The Indian Express**, 17 September 1999)

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<sup>31</sup> Wolfgang Haas interview, "Infowarfare and the Military Strategy of the Bundeswehr," **Telepolis** (23 November 1998).

<sup>32</sup> Dean Mathew, "A Suicidal Doctrine," **The Indian Express** (17 September 1999).

## The U.S. Nuclear "Threat"

Some foreign analysts—particularly in Russia, China, North Korea, and Iran—view the United States as a potential aggressor that would be willing to use its entire panoply of weapons, including nuclear weapons in a first strike. Some Russian and Chinese analysts see U.S.-led peacekeeping operations as acts of aggression, and as pretexts for testing advanced U.S. weapons, including non-nuclear and possibly nuclear weapons. Some Chinese analysts predicted that the U.S. might test a "neutron" bomb in Afghanistan that in both Chinese and Taiwanese military writings is sometimes equated with a "super-EMP" weapon:<sup>33</sup>

- Russia, from an article citing views of Defense Ministry officials: "The STRONG RESOLVE 2002 NATO exercises which began 1 March is continuing in Poland....U.S. generals, without informing their partners, conducted an independent, secret command-staff training exercise relating to the transfer, deployment, and combat use of tactical nuclear weapons on Polish territory. The Americans also rehearsed the issue of firing nuclear missiles at installations of the likely enemy....The independent 'nuclear attack' caused irritation in Paris and Berlin, although attempts were made to conceal it....Commenting on the events, sources at the Russian Defense Ministry pointed out that the actions of the U.S. military indirectly confirm the readiness and intention of the United States to be the first to use nuclear weapons against 'rogue countries.'"<sup>34</sup> (Moscow, **Utro**, 14 March 2002)
- China: "NPC delegates for the armed forces yesterday urged the Government to beef up legislation to prepare for the possibility of nuclear attack. The move follows revelations in the past week in a leaked U.S. report stating that China was on a list of countries that could be targeted by Washington's nuclear arsenal."<sup>35</sup> (Fong Tak-ho, **South China Morning Post**, 15 March 2002)
- China: "On 9 March, the *Los Angeles Times* in the United States disclosed the U.S. Defense Department's classified report on 'Nuclear Posture Review.'....This indicates that how to effectively use nuclear weapons during possible wars and conflicts in the future has become an issue under conscientious consideration by the U.S. strategic circle. This also means that the U.S. advanced, giant nuclear arsenal is not only of 'strategically deterrent value' but it also has still more 'value applicable to battlefields.'....'Nuclear Posture Review' has...clarified the shift of the U.S. strategy from the nuclear balance of 'mutual assured destruction' to 'absolute nuclear superiority.'"<sup>36</sup> (Zhu Ming, **Jiefang Ribao**, 12 March 2002)

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<sup>33</sup> For an example of this last, see bullet #8 in the next section "Super-EMP Weapons," the **Renmin Wang** article of 21 September 2001.

<sup>34</sup> "United States Has Used Nuclear Missiles—At Present Only On Paper," **Utro** (Moscow: 14 March 2002).

<sup>35</sup> Fong Tak-ho, **South China Morning Post** (15 March 2002), p. 7.

<sup>36</sup> Zhu Ming, "'Be Prepared To Use Nuclear Weapons—Logic of 'Absolute Security,'" **Jiefang Ribao** (12 March 2002).

### “Super-EMP” Weapons

Russian and Chinese analysts appear to understand at least the basic principles of nuclear weapons designed for enhanced-EMP. Moreover, they claim the United States is developing or has developed EMP “super” nuclear weapons. This claim is used, explicitly or implicitly, to justify Russian and Chinese development of such weapons.

Foreign sources, such as Russian General Vinogradov, describe an enhanced-EMP weapon as a nuclear warhead of special design to maximize electromagnetic pulse as the primary lethal effect: “the main casualty and damage producing element of this munition is a selectively enhanced electromagnetic pulse with high field intensity that knocks out any electronic equipment in a sector with a diameter around 1,000 kilometers.”<sup>37</sup>

Russian, Chinese, and even Taiwanese sources, such as Russian General Vladimir Belous and Taiwan’s General Lin Chin-ching, suggest that a “super-EMP” weapon could in design resemble a neutron bomb. For example, according to Taiwan’s General Lin Chin-ching, Taiwan’s chief expert on electronic warfare: “Electromagnetic pulse weapons, such as neutron bombs, constitute a special threat. These devices are able to destroy computers and electronic equipment in a split second without wounding human beings.”<sup>38</sup>

Foreign military scientists understand that the neutron bomb, more accurately described as an “enhanced radiation” weapon, emits both increased levels of neutrons and gamma radiation, an observation made pointedly by General V. Belous in an article on Russia’s new generation of small, low-yield neutron weapons: “The explosion of a neutron charge is accompanied by the emission of gamma radiation.... Thus, for a 1 KT charge, doses of gamma quanta and neutrons initially even out beginning at distances of approximately 1,500 m, and then the former begin to surpass the latter.”<sup>39</sup> That there is a relationship between gamma rays and EMP has been a matter of public record for decades, described in such authoritative works as the U.S. Department of Defense’s **The Effects of Nuclear Weapons**: “The free electrons resulting from gamma-ray ionization of the air in a high-altitude explosion may also interact with the earth’s magnetic field to generate strong electromagnetic fields capable of causing damage to unprotected electrical or electronic equipment located in an extensive area below the burst.”<sup>40</sup>

Whereas a nuclear weapon of conventional design could probably produce EMP field strengths of tens of kilovolts per meter, an enhanced-EMP weapon, according to foreign military writings, could produce field strengths of “several hundred kilovolts per meter.”<sup>41</sup>

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<sup>37</sup> General Mikhail Vinogradov, “On the Need for Limiting Work of Modernizing Existing Nuclear Weapons and Developing New Nuclear Munitions,” *Yaderny Kontrol* (4 April 2000).

<sup>38</sup> Seiji Yajima interviews General Lin, *Sankei Shimbun* (5 November 1999).

<sup>39</sup> General Vladimir Belous, “Characteristics and Missions of Modern Neutron Weapons,” *Yaderny Kontrol* (May-June 1999), pp. 61-66.

<sup>40</sup> Samuel Glasstone and Philip J. Dolan (eds.), **The Effects of Nuclear Weapons** (Washington, D.C.: U.S. Government Printing Office for the U.S. Department of Defense and the Energy Research and Development Administration, 1977), p. 11 and Chapter XI.

<sup>41</sup> General Vladimir Belous, “Third Generation Nuclear Weapons,” *Military Thought* (12 December 1991), pp. 117-121.

If the U.S. standard for hardening military equipment against EMP effects is 50 kilovolts per meter, as some foreign analysts claim, then a “super-EMP” could produce field strengths far in excess of the U.S. hardening standard and place at risk all exposed U.S. military and civilian electronic equipment.<sup>42</sup>

One of Russia’s foremost military scientists, General V. Belous, in a 1991 article entitled “Third Generation Nuclear Weapons” appearing in **Military Thought**, the flagship journal of the Russian General Staff, describes an alleged U.S. program to develop an enhanced-EMP nuclear weapon. Attributing to the United States, or to other potential adversaries, intentions or military programs that are, in fact, Russian, is a common literary device for denial and deception in Russian military writings. According to General Belous, an EMP attack could “lead to the disruption of the operation of electronic equipment on almost the [United States’] entire territory for the time necessary to disrupt retaliatory measures.”<sup>43</sup>

Russia’s then First Deputy Minister of Defense, Andrey Kokoshin, in a 1997 interview, claimed Russia was developing nuclear weapons “that have no counterparts in the world,” including something that sounds suspiciously like an enhanced-EMP weapon: “ultra-small nuclear warheads weighing less than 90 kilograms, which are already being manufactured...and radiofrequency weapons.”<sup>44</sup> In Russian military writings, the phrase “radiofrequency weapons” is used to describe nuclear or non-nuclear weapons designed to destroy enemy electronics by means of enhanced-EMP.

Chinese military writings sometimes describe the neutron bomb as an enhanced-EMP weapon. This apparent “confusion” on the part of Chinese specialists more likely indicates that the Chinese understand the close technological relationship between neutron weapons and enhanced-EMP weapons.

Since Russia and China both developed neutron bombs many years ago, both nations probably are also capable of building enhanced-EMP warheads, if they have not done so already.

Russian and Chinese military analysts both appear to believe that enhanced-EMP nuclear weapons could be decisive in war. Indeed, Russian General Vinogradov, a senior Russian military theoretician, has proposed an international ban on what he calls “super-EMP” weapons, that Vinogradov claims manifests “readiness for aggression” and a “first disarming strike” strategy. China’s Defense Science and Technology Center sees “third generation nuclear weapons such as electromagnetic pulse bombs” as a means by which the United States might seek “nuclear dominance” and attempt “winning a nuclear war.” If enhanced-EMP weapons are viewed as so threatening and potentially decisive, Russian and Chinese nuclear weapons programs probably have not neglected their research and development.

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<sup>42</sup> Su Tzu-yun, *op. cit.*, see fn 34.

<sup>43</sup> Belous, “Third Generation Nuclear Weapons,” *op. cit.*, pp. 117-121.

<sup>44</sup> Denis Baranets, *Komsomolskaya Pravda* (7 August 1997), p. 1.

If Russia or China has developed enhanced-EMP weapons, the United States would face a significantly heightened EMP threat in the event of a future confrontation with these powers. More immediately, enhanced-EMP weapons or technology could conceivably proliferate from Russia or China to rogue states. Any nation or non-state actor having a short-range missile such as a Scud, that is commonplace armament in the Third World, would have means to deliver an enhanced-EMP weapon against U.S. forces in a theater of operations. A Scud loaded on a freighter—a launch mode for Scuds tested successfully by Iran—could deliver an enhanced-EMP warhead against the U.S. homeland.<sup>45</sup>

- Russia, according to General Vladimir Belous, a leading military scientist and theoretician: “From the early 1980s, U.S. military scientists...aimed at creating...a super-EMP [weapon] with intensified electromagnetic radiation output...They figure to use it to increase the intensity of the field at the Earth’s surface to several hundred kilovolts per meter. In their calculations, the explosion of a 10 MT warhead at an altitude of 300-400 km above the geographic center of the United States (state of Nebraska) can lead to the disruption of the operation of electronic equipment on almost the country’s entire territory for the time necessary to disrupt retaliatory measures.”<sup>46</sup> (General V. Belous, **Military Thought**, 1991)
- Russia, according to the GRU (Russian military intelligence): “The ‘information war’ concept is one of the latest ones developed in the Pentagon. The U.S. classification of wars provides in particular for singling out the main kind of weapons which dominate combat operations: biological war (if biological weapons are employed), chemical war (chemical weapons), nuclear war (nuclear weapons)...It is assumed that information war can be waged either independently...or in combination with other kinds of combat operations....The Pentagon is developing large-scale plans for making a revolution in military affairs using information technologies similar to what occurred with tanks...or with nuclear weapons following World War II....In addition, it is proposed to use special devices which create a powerful electromagnetic pulse when exploded (such devices...already have been developed in the U.S, Los Alamos National Laboratory)...”<sup>47</sup> (Major D. Pozhidayev, **Zarubezhnoye Voyennoye Obozreniye**, February 1996)
- Russia: “Two future [U.S.] nuclear weapon projects presently are in the RDT&E stage: a so-called high-power nuclear-pumped radiofrequency weapon (an order of the Air Force Space Command and the Strategic Command) and a weapon being developed for the Navy...”<sup>48</sup> (I. Sutyagin, **Zarubezhnoye Voyennoye Obozreniye**, 18 May 1995)

<sup>45</sup> David R. Tanks, **National Missile Defense: Policy Issues and Technological Capabilities** (Washington, D.C.: Institute for Foreign Policy Analysis, 2000), p. 1.21. Scott McMahon, “Ship-Based Missiles Surface as Potential Terror Weapon,” **Defense News** (15 March 1999), p. 27. “Iran Tested Sea-Launched Ballistic Missile,” **Iran Brief** (8 March 1999), p. 1.

<sup>46</sup> Belous, “Third Generation Nuclear Weapons,” op. cit., pp. 117-121.

<sup>47</sup> Major D. Pozhidayev, **Zarubezhnoye Voyennoye Obozreniya** (February 1996).

<sup>48</sup> I. Sutyagin, **Zarubezhnoye Voyennoye Obozreniye** (18 May 1995), pp. 8-11.



- Russia, from the Deputy Director of a scientific institute and former member of the General Staff, General Mikhail Vinogradov: "There is information that the U.S. Department of Energy assigned research of a so-called *radio-frequency weapon* for Air Force ICBMs based on an order of the Air Force Space Command and the Strategic Command. With detonation at an altitude of 50-100 km, the main casualty and damage producing element of this munition is a selectively enhanced electromagnetic pulse with high field intensity that knocks out any electronic equipment in a sector with a diameter of around 1,000 km. Insofar as is known, the beginning of experimental development work was postponed, but the intention to develop a weapon for a first *blinding* strike speaks for itself....[The international community should] determine measures for preventing modernization not only of delivery vehicles, but also of munitions as a counterforce means of delivering a first *disarming* strike (a means...manifesting readiness for aggression); for example, a ban on creating penetrators, super-EMP..."<sup>49</sup> (General Mikhail Vinogradov, **Yadernyy Kontrol**, 4 April 2000)
- Russia, from General V. Belous, a leading military scientist and theoretician, on the capability of neutron bombs to produce gamma rays: "The explosion of a neutron charge is accompanied by the emission of gamma radiation....At close distances the proportion of neutrons in the general flux of penetrating radiation considerably predominates over the gamma radiation, but this ratio gradually changes with distance from the center of the explosion. Thus, for a 1 KT charge, doses of gamma quanta and neutrons initially even out beginning at distances of approximately 1,500 m, and then the former begin to surpass the latter."<sup>50</sup> (General Vladimir Belous, **Military Thought**, 1999)
- China, from the official newspaper of the Communist Party Central Committee: "The eye-catching item replacing the 'Battleaxe' is a new type of bomb carried by the B-2 bomber. The Russian Defense Ministry has revealed that when it explodes this type of bomb gives off a kind of electronic pulse like the electromagnetic wave released in a nuclear explosion; this causes tremendous damage to electronic equipment, and its power is somewhere between a conventional and a nuclear weapon, and it is a new type of weapon of mass destruction; and the Los Alamos Laboratory, which has developed this bomb, is precisely the maker of the first atomic bomb....A Russian official said angrily that 'the United States is turning the FRY [Former Republic of Yugoslavia] into a test site for new weapons of mass destruction.'"<sup>51</sup> (He Gang, **Renmin Ribao**, 8 April 1999)
- China, from the official institute journal of the China Defense Science and Technology Center: "There has been no change in the goal of contending for nuclear supremacy, and the United States has not shifted in its refusal to undertake 'not to be the first to use nuclear weapons and not to use nuclear weapons against a non-nuclear

<sup>49</sup> Vinogradov, op. cit.

<sup>50</sup> Belous, "Characteristics and Missions of Modern Neutron Weapons," op. cit., pp. 61-66. Here Belous argues for reliance on neutron mini-bombs to damage communications and reduce collateral damage from nuclear fallout—an EMP weapon, Belous surely knows, would accomplish the same more effectively.

<sup>51</sup> He Gang, "Bloody Exercise with Live Ammunition," **Renmin Ribao** (8 April 1999), p. 6. See also a similar Russian view in Ivan Shvarts, "Electromagnetic Bomb Tested in Yugoslavia," **Kommersant** (17 April 1999).

country.'....Changes in the global strategic setup have yet to induce the United States to give up its policy of vying for nuclear supremacy. On the contrary, the United States is taking advantage of this opportune moment to strengthen its nuclear monopoly....According to preliminary calculations, from the year 2003 and on, the operational capabilities of U.S. strategic nuclear arms will fully surpass those of Russia. America's overall ability to destroy area targets will exceed that of Russia by 20 percent, and its ability to wipe out reinforced targets will be eight times that of Russia. This could possibly eliminate the nuclear parity...which has been viewed as an important precondition for strategic stability. In addition, the U.S. continues to actively develop third generation nuclear weapons such as electromagnetic pulse bombs....On the one hand, the U.S. declares its abandonment of 'winning a nuclear war,' while on the other hand it desperately strives for a clearly-directed nuclear dominance."<sup>52</sup> Zhao Xudong, **Hsien-Tai Chun-Shih**, 11 March 1998)

- China: "In addition to using Stealth warplanes and conventional weapons [in Afghanistan], the United States is considering the possible use of so-called 'clean, low-pollution and killing without shedding blood' nuclear weapons such as neutron bombs...because intelligence says that conventional bombs cannot destroy the hiding place of Usama Bin Ladin....In order to understand the power of the neutron bomb, it is necessary to first understand the killing power of nuclear weapons....The main factors that cause death and destruction of people and articles include blast wave, ray radiation, early nuclear radiation, radioactive contamination and nuclear electromagnetic pulse....A neutron bomb is a weapon of mass destruction with intensified early nuclear radiation and lower radioactive contamination."<sup>53</sup> (Man Duo, **Renmin Wang**, 21 September 2001)
- Taiwan, General Lin Chin-ching, chief of the Telecommunications and Electronic Information Bureau of the Ministry of National Defense: "Electromagnetic pulse weapons, such as neutron bombs, constitute a special threat. These devices are able to destroy computers and electronic equipment in a split second without wounding human beings."<sup>54</sup> (General Lin interviewed in **Sankei Shimbun**, 5 November 1999)

<sup>52</sup> Zhao Xudong, "The 'Self-Contradictory' U.S. Nuclear Policy," **Hsien-Tai Chun-Shih** (11 March 1998), pp. 44-46.

<sup>53</sup> Man Duo, "The U.S. Has Four Plans To Fight Against Terrorism," **Renmin Wang** (21 September 2001).

<sup>54</sup> Yajima, op. cit..

## Rogue States and EMP Attack

The nuclear weapon programs of North Korea and Iran are clandestine. Therefore, little direct evidence—such as military writings or statements by high ranking public officials—exists about their thinking or planning for nuclear weapons employment. Nonetheless, compelling circumstantial evidence, not least the capabilities inherent in their nuclear missile programs, suggests that the rogue states probably have or will develop contingency plans for EMP attack.

EMP effects and the technical, operational, military, and political advantages of EMP attack are widely known. North Korea and Iran rely heavily on acquisition of foreign technology and information to support their nuclear weapon programs. Both nations have aggressive intelligence programs to acquire relevant knowledge and materials. Since EMP is described in virtually every handbook on nuclear weapons and their effects, including for example in the U.S. Government's **The Effects of Atomic Weapons** and **The Effects of Nuclear Weapons**, both of which have been publicly available for decades, it is a certainty that rogue state scientists know about EMP and its military potential.<sup>55</sup>

The technical and operational limitations of rogue state missiles, U.S. development of missile defenses, and the advantages of EMP attack over other methods of employing nuclear weapons all provide powerful incentives for the rogue states to plan an EMP option.

North Korea and Iran over the next 15 years are expected to acquire primitive nuclear missiles having poor accuracy and very limited capability to strike moving targets.<sup>56</sup> *EMP attack can compensate for missile inaccuracy, uncertainty about target location, and for many other technical and operational shortcomings.*

The rogue states are certainly aware of the United States' programs for theater and national missile defense. U.S. missile defenses have been justified primarily by the existence of rogue state missile programs. Missile defenses threaten the heavy investment by rogue states in nuclear weapons and missiles, and challenge the credibility of rogue state nuclear missile threats against the United States and U.S. allies. *EMP attack does not require a warhead to re-enter the atmosphere, and so provides less opportunity for the U.S. to intercept a rogue state warhead, and threatens radars and (through collateral effects) satellites that are indispensable to missile defense.*

North Korea and Iran compared to the official nuclear weapon states—the United States, Russia, China, Great Britain, and France—have invested disproportionately in acquiring nuclear missiles, beyond reasonable defensive needs, and despite other pressing priorities, such as the starvation of their peoples. Such commitment to the acquisition of nuclear missiles suggests the rogue states expect a very substantial return from their investment in terms of enhanced security and international influence. Further, the history of rogue state interest in nuclear weapons, and

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<sup>55</sup> Samuel Glasstone (ed.), **The Effects of Nuclear Weapons** (Washington, D.C.: U.S. Government Printing Office for U.S. Department of Defense and U.S. Atomic Energy Commission, April 1962).

<sup>56</sup> National Intelligence Council, **Foreign Missile Developments and the Ballistic Missile Threat Through 2015** (Central Intelligence Agency: National Intelligence Estimate, December 2001), pp. 4, 6, 7, 14, 15. Hereinafter NIE (December 2001).

their actual or threatened use of weapons of mass destruction, indicates that North Korea and Iran see nuclear missiles less as battlefield weapons and more as strategic and diplomatic instruments. *EMP attack, because of the wide breadth of EMP effects and its lethality against technology instead of people, offers the greatest strategic or diplomatic utility for the employment or threatened employment of one or a small number of nuclear missiles.*

Further, a successful EMP attack presents rogue regimes with an opportunity that goes well beyond the possible political acceptability of a “non-lethal” attack. *The image of suffering in the United States arising, not from nuclear blast and fallout, but from EMP induced malfunctioning of American infrastructure could “vindicate” the rogue regime view of a morally weak America propped up by a precarious materialism, and validate the strictures and sacrifices of rogue regime ideology.*

North Korea and Iran are expected to acquire only small numbers of nuclear armed missiles over the next 15 years. The numbers of rogue state missiles and nuclear weapons would prove inadequate to prevail over the United States and its allies on the battlefield, and would be vastly overmatched by U.S. nuclear and advanced conventional weapons in tactical applications. Nor will rogue states have enough nuclear missiles to credibly underwrite strategic deterrence by threatening the destruction of most of the United States’ cities. *EMP attack, compared to other options, offers the “biggest bang for the buck.”*

Moreover, North Korea and Iran see the United States as their greatest and most likely potential enemy, and understand the military necessity of somehow confronting U.S. power asymmetrically. The rogue states are well aware from the 1991 Persian Gulf War and subsequent U.S. military operations that advanced technology is the key to U.S. superiority. They are also certainly aware from open source U.S. Government and academic literature that technology is the self-acknowledged Achilles’ heel of the United States. *EMP offers the most direct and encompassing attack that rogue states could attempt against U.S. technology in a theater of operations, or beyond.*

Indeed, EMP is the most promising, perhaps the only, nuclear option that offers nations like North Korea or Iran some realistic hope of inflicting widespread and potentially crippling damage on the United States.

### ***North Korea***

The history of North Korean experience with and perceptions of nuclear weapons has conditioned Pyongyang to view nuclear weapons as an imminent threat, a necessary guarantor of regime survival, and above all as instruments of strategic and diplomatic coercion.<sup>57</sup> The EMP threat, with its ability to place at risk the U.S.-South Korean-Japan coalition with a single nuclear

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<sup>57</sup> Joseph S. Bermudez, Jr., “The Democratic People’s Republic of Korea and Unconventional Weapons” in Peter R. Lavoy et al., **Planning the Unthinkable: How New Powers Will Use Nuclear, Biological, and Chemical Weapons** (Ithaca and London: Cornell University Press), pp. 182-201. Hereinafter **Planning the Unthinkable**.

weapon, while sparing lives and reducing the risk of U.S. massive retaliation, should be a logical favorite among North Korean practitioners of atomic diplomacy.

North Korean attitudes toward nuclear weapons were forged under Kim Il-song, the leader of the Democratic Peoples' Republic of Korea (DPRK) for 46 years, until his death in 1994. Kim Il-song, and the small clique of fellow Stalinist elites who surrounded him, viewed the United States as an aggressive capitalist power willing and able to use nuclear weapons with decisive strategic effect against its enemies, as at Hiroshima and Nagasaki. This view was reinforced by Soviet military advisors who helped train the Korean People's Army, teaching through courses and manuals the effects of nuclear weapons on the battlefield.<sup>58</sup>

During the Korean War, North Korean fears of a U.S. nuclear attack escalated because of U.S. threats to employ nuclear weapons to end the war. These threats proved an important factor in bringing about the 1953 armistice that ended the fighting, thwarting North Korea's attempt to conquer South Korea and reunify the peninsula. From Pyongyang's perspective, after enormous human and material sacrifice, North Korea, China, and the Soviet Union were defeated by U.S. atomic diplomacy. According to a leading scholar of North Korean affairs, "Since then, a nuclear inferiority complex has pervaded DPRK strategic thinking and foreign policy, leading DPRK leaders to spend their lives and their nation's resources to make sure they never again experience this type of coercion."<sup>59</sup>

North Korea's massive investment in underground facilities was a response to the U.S. nuclear threat. Kim Il-song: "The entire nation must be made into a fortress. We do not have an atomic bomb. Therefore, we must dig ourselves into the ground to protect against the threat of atomic bombs."<sup>60</sup> Likewise, North Korea's military strategy has been influenced by their perception that the United States will use nuclear weapons. That strategy calls for first use of conventional forces massed on the border and weapons of mass destruction for a "one-blow nonstop" attack to overrun the South before the United States can intervene.<sup>61</sup>

North Korea's attitudes toward nuclear weapons and the "U.S. threat" continued after the death of Kim Il-song, inherited by his son and political successor, Kim Chong-il. Under Kim Chong-il, North Korea's nuclear weapon and missile programs have been used to conduct "atomic diplomacy" against the United States. Although North Korea claimed to have terminated its nuclear weapons program under the Agreed Framework signed with the United States in October 1994, and has pledged not to flight-test its Taepo Dong-2 ICBM, both programs continued.<sup>62</sup> Pyongyang admitted that it has been conducting a clandestine nuclear weapons program, and nullified the Agreed Framework, in October 2002.<sup>63</sup> North Korea continues trying

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<sup>58</sup> Ibid, pp. 183-184.

<sup>59</sup> Ibid, p. 185.

<sup>60</sup> So Yong-ha, "Capacity for Nuclear Weapons Development," *Hoguk* (July 1989), pp. 119-122.

<sup>61</sup> Bermudez, op. cit., p. 201.

<sup>62</sup> Benjamin A. Gilman, Chairman, **North Korea Advisory Group Report to the Speaker U.S. House of Representatives** (Washington, D.C.: U.S. Government Printing Office, November 1999), pp. vii., 1-8, 13-22.

<sup>63</sup> David E. Sanger, "North Korea Says It Has A Program On Nuclear Arms," *New York Times* (17 October 2002), p. 1.

to use the threat of its nuclear weapon and ICBM programs to leverage escalating foreign policy and economic concessions from the United States and its allies.<sup>64</sup>

If North Korea is practicing atomic diplomacy in peacetime, in a war or crisis it is likely to continue taking the “high road” in thinking about how to employ nuclear weapons for strategic and diplomatic advantage, as opposed to merely tactical battlefield advantage. EMP attack offers potentially great utility for both, but especially for strategic and diplomatic uses of nuclear weapons because of its broad area coverage, the asymmetrical vulnerability of technically superior U.S. forces, and the potential to contain nuclear escalation by avoiding mass casualties.

North Korea presently has the means to execute an EMP attack:

- The U.S. intelligence community openly acknowledges that North Korea probably has a small number of nuclear weapons, one or two. North Korea’s No Dong MRBM, with a 1,300 km range, could deliver a nuclear weapon anywhere in South Korea or Japan. The No Dong could make an EMP attack against U.S. military forces and U.S. allies in the region. North Korea’s Taepo Dong-2, which the U.S. intelligence community publicly acknowledges could be flight-tested by North Korea at any time, is an ICBM that “could deliver a several-hundred-kg payload up to 10,000 km—sufficient to strike Alaska, Hawaii, and parts of the continental United States. If the North uses a third stage similar to the one used on the Taepo Dong-1 in 1998 in a ballistic missile configuration, then the Taepo Dong-2 could deliver a several-hundred-kg payload up to 15,000 km—sufficient to strike all of North America.”<sup>65</sup> Thus, the Taepo Dong-2 could make an EMP attack on the United States homeland.
- North Korean medium- and long-range missiles have experienced flight failures during the ascent phase. The Taepo Dong-1 flight-test in August 1998 failed near apogee.<sup>66</sup> Some No Dongs exported to other countries for their missile programs have also failed in flight, apparently self-destructing at high-altitude.<sup>67</sup> A back-up fusing option for EMP could transform such high-altitude missile failures into successful attacks.
- North Korea’s 1998 flight-test of the Taepo Dong-1, launched to high-altitude in an attempt to orbit a satellite, involved a trajectory that was also consistent with a simulated EMP attack on Japan.
- North Korea’s objective in the Taepo Dong-2 program is to develop an ICBM capable of reaching the United States.<sup>68</sup> If the Taepo Dong-2 in a 3-stage configuration is beyond Pyongyang’s capability and they must deploy the range-limited 2-stage configuration, North Korea could, in effect, extend the range of the Taepo Dong-2 by planning to use it

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<sup>64</sup> Ibid. Andrew Ward, “The Bomb as Bargaining Chip: North Korea,” **Financial Times** (11 July 2002), p. 10.

<sup>65</sup> NIE (December 2001), op. cit., p. 9.

<sup>66</sup> National Intelligence Council, North Korea’s TD-1 Launch and Some Implications on the Ballistic Missile Threat to the United States (Central Intelligence Agency: 8 December 1998), p. 1.

<sup>67</sup> Andrew Koch and Steve Rodan, “Iran Tests Latest Ballistic Missiles,” **Jane’s Defense Weekly** (19 September 2002).

<sup>68</sup> National Intelligence Estimate (December 2001), op. cit., p. 9.

for an EMP attack. The radius of the EMP effect could add potentially thousands of kilometers to the reach of Taepo Dong-2, placing much more of the United States at risk.

- According to North Korean press, the DPRK has an ongoing program to replace or provide redundant communications lines, especially for government ministries, using fiber optic cables.<sup>69</sup> This would help harden North Korea from a U.S. EMP attack, and help protect the North from collateral damage from a DPRK initiated EMP attack in the region.
- The North Korean armed forces are developing doctrine and capabilities for information warfare, and have founded an Automation College under the Ministry of the People's Armed forces "for the purpose of turning out manpower needed for waging electronics information warfare."<sup>70</sup> North Korean military doctrine and practice usually closely follows the lead of Russia and China. Both nations in their doctrine for information warfare include the option for EMP attack.
- North Korean academic writings subscribe to the view, also prevalent among many Western academics, that computers and advanced communications have inaugurated an "information age" during which the greatest strength, and greatest vulnerability, of societies will be their electronic information infrastructures. According to North Korean press, Chairman Kim Chong-il is himself supposedly an avid proponent of this view.<sup>71</sup> The role that nuclear weapons can play in the "information age," their capability to threaten vital electronic infrastructures with EMP, has probably been anticipated by the North Korean military, as it has been in China and Russia.
- The highest ranking official ever to defect from North Korea, Hwang Chang-yop, claimed in 1998 that North Korea has nuclear weapons and explained his defection as an attempt to prevent nuclear war. According to Hwang, in the event of war, North Korea would use nuclear weapons "to devastate Japan to prevent the United States from participating. Would it still participate, even after Japan is devastated? That is how they think."<sup>72</sup> Although Hwang does not mention EMP, it is interesting that he describes North Korean thinking about nuclear weapons use as having strategic purposes—nuclear employment against Japan—and not tactical purposes—nuclear employment on the battlefield in South Korea. It is also perhaps significant that, according to Hwang, North Korea thinks it can somehow "devastate" Japan with its tiny nuclear inventory, although how precisely this is to be accomplished with one or two nuclear weapons is unknown. Further, note that the alleged purpose of a North Korean nuclear strike on Japan would be to deter the United States. At the time of Hwang's defection, in 1998, North Korea's longest-range missile then operational, the No Dong, limited North Korean strategic

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<sup>69</sup> Yim Ul-chul, "Internet Business of North Korea," *Seoul Tongil Kyongje* (1 May 2000), pp. 78-85.

<sup>70</sup> Ibid. *Seoul Choson Ilbo* (19 May 2002).

<sup>71</sup> M.A. Kim Sang-hak, "Development of Information Industry and Construction of Powerful Socialist State," *Pyongyang Kyongje Yongu* (20 May 2002).

<sup>72</sup> "Defector Hwang Chang-yop Interviewed," *Sindong-A* (July 1998), pp. 328-345. See also Bermudez, op. cit., p. 194.

reach to a strike on Japan. Today, the Taepo Dong-2 is estimated to be capable of delivering a nuclear weapon to the United States.

## *Iran*

Iranian thinking about employment of weapons of mass destruction is shaped both by pragmatic political-military concerns and ideological concerns rooted in Islam. Some scholars argue convincingly that Iran's pragmatic and ideological response to chemical weapons will probably be paradigmatic for Iranian planning for the employment of nuclear weapons, once these are acquired. Military concerns have moved Iran to embrace chemical and other weapons of mass destruction for deterrence and as an asymmetric means of coping with superior enemies, especially the United States. Political concerns about the vulnerability to weapons of mass destruction of Iran's urban poor—the power base of the Mullahs, Iran's political-religious leaders—gives Teheran a potent interest in avoiding attacks on cities that produce mass casualties, or at least in seeking ways to escape retribution against Iranian cities. Islam's strictures against mass murder and making war on civilians have been and probably will be significant in the decision making of the Mullahs.<sup>73</sup>

EMP attack, with its potential to asymmetrically threaten the technologies vital to U.S. military and societal strength, while avoiding mass casualties, would appear to be the nuclear employment option best suited to the political-military-ideological needs of Iran.

Prior to the Iranian Revolution, under the Shah, Iran had no significant chemical or biological warfare program. The Shah had instituted a clandestine nuclear weapons program, under the cover of a civilian project for developing nuclear power.<sup>74</sup>

After the revolution of 1979 that brought the Mullahs to power, Iran's clerical leaders demonstrated no interest in chemical, biological, or nuclear weapons. They canceled the Shah's nuclear program. The new Islamic order sought a complete break with Iran's monarchical past and its Western orientation. Iran's armed forces were purged and re-educated in the Islamic military precepts of *Maktabi*.<sup>75</sup>

Consequently, when Saddam Hussein invaded Iran in 1980, the Mullahs and their Revolutionary Guard were unprepared to cope with Iraq's modern army equipped with weapons of mass destruction. Iran paid an enormous price to stop the Iraqi offensive, employing "human wave" attacks to drive Saddam's divisions back to their own territory. But Iranian revolutionary fervor proved no match for Iraq's missiles and chemical weapons that turned the war into a bloody stalemate, with most of the casualties, about 50,000 from chemical attacks, on the Iranian side.<sup>76</sup>

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<sup>73</sup> Gregory F. Giles, "The Islamic Republic of Iran and Nuclear, Biological, and Chemical Weapons" in **Planning the Unthinkable**, op. cit., pp. 79-103.

<sup>74</sup> Ibid, p. 81. Gordon M. Burck and Charles C. Flowerree, **International Handbook on Chemical Weapons Proliferation** (New York: Greenwood Press, 1991), p. 252. Leonard S. Spector, **Going Nuclear** (Cambridge, MA: Ballinger, 1987), p. 50.

<sup>75</sup> Giles, op. cit., p. 81.

<sup>76</sup> Ibid, pp. 81-83.



After Iranian appeals to the United Nations and international community failed to stop Iraq's chemical attacks, in 1983 Iran launched crash programs to acquire chemical, biological, and nuclear weapons. The Mullahs were especially alarmed by Iraqi missile attacks on their cities that threatened the political survival of their regime, according to scholars of the war:

*Iran's leaders were particularly unnerved by the prospect of Iraqi chemical weapons attacks against Teheran and other major cities. The mere threat of such attacks triggered massive disruptions, and millions of people evacuated Teheran. For a regime whose support is drawn from poor urban dwellers, the protection of Iranian cities from unconventional weapon attacks is of utmost importance. Reports during the war indicate that Iranian leaders were trying desperately to fashion a chemical warhead for their remaining Scuds to deter the Iraqi countervalue threat.*<sup>77</sup>

In retaliation for Iraq's missile attacks on their cities, Iran purchased Scud missiles from Libya and commenced the missile "war of the cities" between Baghdad and Teheran in 1985. This reversed the Ayatollah Khomeini's religious-derived directive to the Iranian military at the beginning of the war to "do nothing to harm the cities which have no defense...Our hands are tied, because we do not wish ordinary people, the innocent people, to be hurt."<sup>78</sup> Iran commenced chemical attacks against Iraqi troops in 1984-85, notably during Iran's Karbala-5 offensive of 1987.<sup>79</sup> This reversed the Iranian policy against employment of weapons of mass destruction, despite protests from a number of prominent clerics, and despite a possible *fatwa*, or religious edict, from the Ayatollah Khomeini, prohibiting such use. Khomeini, at the request of the Iranian military, secretly authorized chemical attacks. Thus began Iran's present dual policy on chemical, biological, and nuclear weapons of mass destruction: a declaratory policy calling for their global abolition, and a secret policy to acquire weapons of mass destruction.<sup>80</sup>

Iraq's chemical and missile attacks on Iran appear to have been decisive in bringing Iran to the negotiating table and the cease fire that ended the conflict. Iran's Speaker of the Parliament, Hashemi Rafsanjani, in October 1988 described weapons of mass destruction as "very decisive" in war: "With regard to chemical, bacteriological and radiological weapons training, it was made very clear during the war that these weapons were very decisive....We should fully equip ourselves in the defensive and offensive use of chemical, bacteriological and radiological weapons."<sup>81</sup>

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<sup>77</sup> Ibid, pp. 92-93.

<sup>78</sup> Shahram Chubin and Charles Tripp, **Iran and Iraq at War** (Boulder: Westview, 1988), p. 50.

<sup>79</sup> David B. Ottoway, "In Mideast, Warfare with a New Nature," **Washington Post** (5 April 1988), p. A1.

<sup>80</sup> Giles, op. cit., pp. 82-83.

<sup>81</sup> Ibid, p. 84. Anthony H. Cordesman, **Weapons of Mass Destruction in the Middle East** (London: Brassey's, 1991), p. 93.

Iraq's defeat by the U.S. and allied coalition in 1991 further convinced Iran that its national security depends upon chemical, biological, and nuclear weapons. After the Persian Gulf War, Iran accelerated its chemical, biological, nuclear and missile programs.<sup>82</sup>

Some Iranian leaders have implied that the purpose of their nuclear weapon program is to destroy Israel, a mission more consistent with "city-busting" than with EMP attack. Other Iranian leaders have stated that their objective is strategic deterrence, a mission more consistent with EMP attack. For example, in December 2002, former Iranian President Rafsanjani told a Teheran University audience, according to press reports, "the vast Muslim world could easily survive nuclear war, while tiny Israel would be destroyed." Rafsanjani: "The founding of the state of Israel is the worst event in all of history. If the day comes when the world of Islam is equipped with weapons similar to those that Israel possesses...nothing will remain after one atom bomb is dropped on Israel."<sup>83</sup> However, Iranian Chief Justice Ayatollah Mohammed Yazdi has described Iran's Shahab-3, the most likely delivery system for a regional nuclear strike, as a "strategic weapon meant to guarantee the defense of the nation in face of any external threat" and as intended to "strengthen the defense of the Islamic world against any possible threat" by "creating a military balance in the world."<sup>84</sup> This duality of purpose for Iran's nuclear missiles is also reflected in messages displayed on the Shahab-3 in parades, some reading: "Israel must be wiped off the map." Other messages suggest a purpose of strategic deterrence: "The United States can do nothing."<sup>85</sup>

According to unclassified estimates by the U.S. intelligence community, Iran could develop a nuclear weapon "by the end of the decade," or "several years" earlier with foreign assistance. Iran already has medium-range missiles, and could develop by mid-decade or acquire within one year an ICBM.<sup>86</sup> Therefore, Iran could pose a regional or intercontinental EMP threat by or before 2010:

- A timeline for Iran's capability to pose an EMP threat can be inferred from the unclassified National Intelligence Estimate, **Foreign Missile Developments and the Ballistic Missile Threat Through 2015**: "Iran's missile inventory is among the largest in the Middle East and includes some 1,300 km-range Shahab-3 MRBMs, a few hundred SRBMs, and a variety of unguided rockets....All agencies agree that Iran *could* attempt to launch an ICBM/SLV about mid-decade, although most agencies believe Iran is *likely* to take until the last half of the decade to do so. One agency further judges that Iran is unlikely to achieve a successful test of an ICBM before 2015....If Iran were to acquire complete TD-2 systems from North Korea, it could conduct a flight-test within a year of delivery....The Intelligence Community judges that Iran does not yet have a nuclear

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<sup>82</sup> Giles, op. cit., p. 93.

<sup>83</sup> Yossi Klein Halevi, "Stop Terror At Its Source: Iran," **Los Angeles Times** (8 January 2002), p. 11.

<sup>84</sup> Marc Daugherty, "How to Counter the Iranian Threat," **Jerusalem Post** (21 July 2000), p. 6B.

<sup>85</sup> Ibid. George Jonas, "Evil Intentions," **Montreal Gazette** (24 February 2002), p. A19. An alternative interpretation of the slogan "The United States can do nothing" is that this is a statement of fact—absent deployment of effective defenses, the U.S. cannot protect Israel.

<sup>86</sup> National Intelligence Estimate (December 2001), op. cit., pp. 9-10.

weapon. Most agencies assess that Teheran could have one by the end of the decade, although one agency judges it will take longer. All agree that Iran could reduce this time frame by several years with foreign assistance.”<sup>87</sup>

- Iran has surely noticed that their missile programs, notably the Shahab-3 MRBM, has experienced flight failures during the ascent phase, 5 of 7 missiles self-destructing at high-altitude.<sup>88</sup> A back-up fusing option for EMP, that triggers the warhead in the event of a high-altitude missile failure, could transform such failures into successful attacks. One report suggests that the explosion of a Shahab-3 at high-altitude may not have been accidental, but the deliberate triggering of a self-destruct mechanism on the missile.<sup>89</sup> If married to a nuclear warhead, this would constitute the capability to perform an EMP attack.
- Iran has reportedly flight-tested an SRBM from a ship in the Caspian Sea.<sup>90</sup> Such a launch mode might so degrade missile accuracy that virtually the only way of striking a target would be through EMP attack. A nuclear missile concealed in the hold of a freighter would give Iran the capability to perform an EMP attack against the United States homeland, without developing an ICBM, and with some prospect of remaining anonymous.
- Iran, though not yet a nuclear weapon state, has produced some analysis weighing the use of nuclear weapons to destroy cities, as “against Japan in World War II,” compared to “information warfare” that includes “electromagnetic pulse...for the destruction of unprotected circuits.” Although the Iranian analyst does not specifically mention *nuclear* EMP, the 2001 article is suggestive: “Nuclear weapons and atomic power can be used to determine the outcome of a war, but although it brings victory officially, it casts a deep shadow of wickedness and moral defeat on the victorious power for a long time....On the other hand, the advent of a type of strategic information warfare [has]....’without inflicting serious human damage, neutralizes strategic and information networks and leaves them idle’ changed the face of warfare....The Americans...are faced with serious ambiguities concerning this type of warfare....It must be said that the most important goal in destroying financial systems or any military, political, intelligence, or economic complex or organization is to damage that system in the shortest possible time.” The same Iranian analyst describes “terrorist information warfare” as involving not just computer viruses but a range of increasingly sophisticated attacks, including “cutting telephone lines, bombing the telephone network, and assassination of key technical personnel...using the technology of directed energy (DE) weapons or electromagnetic pulse (EMP).”<sup>91</sup>

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<sup>87</sup> Ibid.

<sup>88</sup> Koch and Rodan, op. cit..

<sup>89</sup> Ibid.

<sup>90</sup> Tanks, op. cit., p. 1.21.

<sup>91</sup> Teheran, *Siyasat-e Defa-I* (1 March 2001), pp. 27-54.

- The official journal of the Foreign Ministry of Iran, in an Autumn 2001 article, sees information warfare as a revolution in military affairs: “Similar to World War I, which introduced new weaponry and modern warfare to the 20<sup>th</sup> century, the information age is now revolutionizing warfare for the 21<sup>st</sup> century. Around the world, information technology increasingly pervades weapon systems, defense infrastructures, and national economies. As a result, cyberspace has become a new international battlefield.”<sup>92</sup>
- An Iranian political-military journal, in an article entitled “Electronics to Determine Fate of Future Wars,” suggests that the key to defeating the United States is “electronics warfare.” According to the article: “Advanced information technology equipment exists which has a very high degree of efficiency in warfare. Among these we can refer to communication and information gathering satellites, pilotless planes, and the digital system....They enable every army to achieve wider vision, faster reaction, and stronger combat capability....Once you confuse the enemy communication network you can also disrupt the work of the enemy command and decisionmaking center. Even worse, today when you disable a country’s military high command through disruption of communications you will, in effect, disrupt all the affairs of that country....If the world’s industrial countries fail to devise effective ways to defend themselves against dangerous electronic assaults, then they will disintegrate within a few years....150,000 computers [belong] to the U.S. Army....if the enemy forces succeeded in infiltrating the information network of the U.S. Army, then the whole organization would collapse...the American soldiers could not find food to eat nor [w]ould they be able to fire a single shot.”<sup>93</sup>
- Analysis of Iranian military exercises indicate that Iran anticipates a future war will involve weapons of mass destruction, most likely against the United States: “Since 1992, most major Iranian exercises have incorporated nuclear, biological, and chemical operations...The exercises indicate that the Iranian military expects nuclear, biological, and chemical weaponry to be likely in future warfare. The upswing in the number of exercises after Operation Desert Storm suggests that the Iranian armed forces are looking to nuclear, biological, and chemical weapons to offset the U.S. advantage in high-technology conventional weapons. Of the twenty-one chemical exercises...two-thirds were held in and along the waters of the Persian Gulf where Iranian and U.S. forces operate in proximity to one another.”<sup>94</sup>
- Iran reportedly has attempted to purchase radiofrequency weapons from Russia, displaying interest in the kind of capability that nuclear EMP would better provide.<sup>95</sup>

<sup>92</sup> Foreign Ministry of Iran, “Theoretical and Basic Issues,” *Journal of Foreign Policy* (Autumn 2001).

<sup>93</sup> Teheran, “Electronics to Determine Fate of Future Wars,” *Nashriyeh-e Siasi Nezami* (December 1998 – January 1999), pp. 27, 29.

<sup>94</sup> Giles, op. cit., p. 93.

<sup>95</sup> Roger Fontaine, “Iran Said to be Developing New Class of Weapons,” *Washington Times* (14 July 1997), p. A10. *Iran Brief* (Middle East Data Project: 3 July 1997).

## *Iraq*

Now that Saddam Hussein has been removed from power, Iraq no longer poses a threat to its neighbors or to the United States. Nonetheless, as a threat that has been recently eliminated, it may be useful to consider how Saddam Hussein's Iraq thought about nuclear weapons and EMP attack. Iraq's former thinking and planning for WMD employment may also be revelatory of the threat from other rogue states.

As a totalitarian state dominated by a single individual, Iraq's arsenal of weapons of mass destruction developed and would have been employed at the behest of Saddam Hussein. As academics Timothy McCarthy and Jonathan Tucker observe: "Saddam's vision of Iraq and his own place in history, as well as the state security apparatus he created to realize that vision, provide the unique domestic and strategic milieu in which Iraq's behavior must be understood. This is *Saddam's* arsenal. Iraq's strategic doctrine and command and control structures are shaped by his idiosyncrasies."<sup>96</sup>

What was Saddam Hussein's vision, his idiosyncrasies? According to McCarthy and Tucker:

*Saddam's Weltanschauung has several components. His calculations are conditioned by his desire to remain in power and to ensure the continued dominance of his Baathist regime. In keeping with Baathist ideology, however, Saddam promotes the popular dream of the rebirth (baath) of a united Arab-Muslim empire. This dream remains a rallying cry for the Baathist revolution and a legitimizing force for Saddam's policy initiatives. Saddam Hussein also views himself as a great military leader and strategist, supreme leader of a reborn Arab-Muslim empire, and heir to the legacy of great Arab and Middle Eastern rulers such as Salah al-Din and the Abbasid caliphs.*<sup>97</sup>

McCarthy and Tucker concluded: "He [Saddam] seeks to dominate the entire Arab world economically, politically, and militarily. This near boundless ambition provides a rationale to seek the most powerful weapons available."<sup>98</sup>

In the aftermath of the second Persian Gulf War, inspections have cast serious doubts over the accuracy of intelligence community estimates of the status of Iraq's missile and WMD programs. The actual robustness and progress of those programs is now a matter of grave controversy. However, what is not in doubt is that Saddam Hussein continued to aspire to eventually develop or acquire weapons of mass destruction.

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<sup>96</sup> Timothy V. McCarthy and Jonathan B. Tucker, "Saddam's Toxic Arsenal: Chemical and Biological Weapon in the Gulf Wars" in **Planning the Unthinkable**, op. cit., pp. 48-49.

<sup>97</sup> Ibid.

<sup>98</sup> Ibid.

There are reasons for thinking that Saddam Hussein, if he eventually developed or acquired nuclear missiles, would have considered among his more attractive nuclear employment options EMP attack:

- Defector Khidir Hamza, former director of Iraq's nuclear weapons program, stated in a September 2002 interview that Iraqi scientists and the military were aware of nuclear EMP effects and their potential strategic and tactical utility. Hamza said that during the 1991 Persian Gulf war, Iraqi nuclear specialists held frequent meetings to "brainstorm" possible uses of an Iraqi first generation A-bomb. However, according to Hamza, EMP attack was not considered a viable option for that rudimentary Iraqi bomb, which was designed in an emergency and expected to have a very low yield, 1-3 kilotons. Hamza said EMP would be an option for later generation, more powerful, Iraqi nuclear weapons. Hamza stated that the Iraqi military was concerned about a U.S. nuclear EMP attack, and undertook measures to harden equipment and communications against EMP attack.<sup>99</sup>
- It is a matter of public record, widely reported in the press, that during the 1991 Persian Gulf War the United States contemplated the possibility of making an EMP attack against Iraq, but concluded that such an attack could pose a greater threat to the United States' own forces, which rely heavily on satellites and advanced electronic technologies.<sup>100</sup> Iraqi intelligence surely took notice of these reports and of the potential vulnerability of Iraqi forces, and of the greater vulnerability of U.S. forces, to EMP attack.
- Iraq reportedly attempted to purchase radiofrequency weapons from Russia, displaying interest in the kind of capability that nuclear EMP would better provide.<sup>101</sup>
- Iraq invested heavily in modernizing its military C3 networks with fiber optic cables and relied increasingly on underground facilities.<sup>102</sup> This had the effect of making Iraq's military more survivable against EMP attack.
- Saddam Hussein's wartime employment of missiles tended heavily toward strategic as opposed to tactical and battlefield purposes, a preference that should have disposed him toward the EMP option. During the war with Iran, Iraq used missiles to attack Iranian cities in order to undermine national morale and threaten the political survival of the regime. This strategy succeeded, forcing Iran to end the war. During the 1991 Persian Gulf War, Saddam made missile strikes on Israel hoping to provoke Israeli retaliation, and so split the allied coalition. This strategy so worried the allies that the United States deployed Patriot missile batteries to Israel. Iraq's missile strikes on Riyadh, the capital of

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<sup>99</sup> Khidir Hamza interview with EMP Commission staff (25 September 2002).

<sup>100</sup> "The Nuclear Option: Thinking the Unthinkable," **Newsweek** (14 January 1991), p. 17. Jack Anderson and Dale Van Atta, "Nuclear Options Against Iraq Considered," **Washington Post** (16 October 1990), p. D1. William M. Arkin, "Calculated Ambiguity: Nuclear Weapons and the Gulf War," **The Washington Quarterly** (Center for Strategic and International Studies and the Massachusetts Institute of Technology, Autumn 1996).

<sup>101</sup> Fontaine, op. cit., p. A10 and **Iran Brief**, op. cit.

<sup>102</sup> David E. Sanger and Steven Lee Myers, "Chinese Fiber-Optic Work Linked to Raided Iraqi Sites," **New York Times** (21 February 2001), p. A8. Gregory R. Copley, "Iraqi Move to Accept UN Weapons Inspectors Unlikely to Severely Disrupt U.S. Strategic Momentum," **Defense and Foreign Affairs Daily** (18 September 2002). Bill Gertz, "Iraq Seeks Chemical For Arms From China," **Washington Times** (16 October 2002), p. A1.

Saudi Arabia, had little military significance. Rather, Saddam's objective against Riyadh was strategic, to undermine Saudi Arabia's support for the allied coalition. Yet, at the same time, Saddam scrupulously avoided using chemical or biological weapons of mass destruction, fearing nuclear retaliation from the United States.<sup>103</sup> Given Saddam's history of exploiting his strategic reach to the maximum for political effect, and his fear of provoking lethal nuclear retaliation, if Saddam acquired powerful enough nuclear weapons, an Iraqi EMP attack might have been more likely than other, more provocative, nuclear options.

- If Iraqi doctrine for chemical and biological operations was extended to their planning for nuclear operations, a disposition toward nuclear EMP attack is suggested. An official manual of the Iraqi Chemical Corps, **Chemical, Biological and Nuclear Operations** (1984), recommended the use of biological weapons of mass destruction to injure and incapacitate, rather than kill enemy troops, on the theory that this would more effectively exhaust enemy resources and demoralize him: "It is possible to select antipersonnel biological agents in order to cause lethal or incapacitating casualties in the battle area or in the enemy's rear areas....Incapacitating agents are used to inflict casualties which require a large amount of medical supplies and treating facilities, and many people to treat them. Thus it is possible to hinder the opposing military operations."<sup>104</sup> Iraq successfully implemented this doctrine during its chemical war with Iran, preferring to inflict mass injuries with mustard and similar chemical agents rather than mass fatalities with the nerve agents it had at its disposal. Of the 50,000 Iranian casualties inflicted by Iraqi chemical attacks, only 5,000 were fatalities.<sup>105</sup> If the operational preference for mass disruption, as opposed to mass destruction, was extended to nuclear doctrine, the logical choice for nuclear weapons employment would have been EMP attack.

### *Pakistan and India*

Although Pakistan and India are not rogue states, they all presently have missiles and nuclear weapons giving them the capability to make EMP attacks against their regional adversaries. These attacks almost certainly would not be deliberately intended to harm U.S. forces or interests. Nonetheless, an EMP attack by any of these states—even if targeted at a regional adversary and not the United States—could collaterally damage U.S. forces in the region, and would pose an especially grave threat to U.S. satellites.

For all of these states, EMP attack is likely to be an attractive employment option in almost any future conflict or crisis where nuclear weapons are used. For example, Pakistan might make an EMP attack to defend themselves from the conventional forces of a numerically superior foe.

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<sup>103</sup> McCarthy and Tucker, op. cit., pp. 53, 55, 67-69.

<sup>104</sup> Ibid, pp. 61-62. Colonel Sameem Jalal Abdul Latif, **Chemical, Biological and Nuclear Operations** (Iraqi Chemical Corps, 1984) p. 6; see Armed Forces Medical Intelligence Center (AFMIC), Fort Detrick, MD: Foreign Armies Studies Series, No. 21, AFMIC-HT-101-92. See also Iraqi Army General Staff, **Principles of Using Chemical and Biological Agents in Warfare** (1987), AFMIC-HT-099-92.

<sup>105</sup> Giles, op. cit., p. 83. Shahram Chubin, **Iran's National Security Policy** (Washington, D.C.: Carnegie Endowment for International Peace, 1994), p. 24.

EMP attack might be the only practical way to preempt an impending enemy chemical, biological, or nuclear attack from mobile missiles hidden in the desert. EMP attack would likely be an attractive way of disrupting, and so defeating, the strategic C3 of an adversary about to launch a chemical, biological, or nuclear attack. Indeed, some Indian analysts have called upon New Delhi to “refine its nuclear deterrent capability” so that India can “block enemy use of GPS, satellites and commercial communications in the event of war”—an obvious allusion to EMP attack.<sup>106</sup>

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<sup>106</sup> Avinash Shirodkar, “India Should Carry Out Subcritical Tests,” *Jammu Daily Excelsior* (13 October 2000).



## China and EMP Attack

China probably has contingency plans for nuclear EMP attack regionally and intercontinentally against the United States. Chinese military writings are replete with references to the dependency of the United States military forces and civilian infrastructure upon sophisticated electronic systems, and to the potential vulnerability of those systems to "information warfare." As demonstrated earlier, Chinese military doctrine for "information warfare" includes nuclear EMP attack. Numerous Chinese military writings explicitly call for, in the event of a war over Taiwan, non-nuclear and nuclear EMP attack as a way of defeating U.S. aircraft carriers. A senior Chinese nuclear scientist has publicly discussed nuclear EMP attack as a possible option against Taiwan. Some Chinese military exercises are suggestive of possible training for a nuclear EMP attack against U.S. aircraft carriers and Taiwan. The order of battle for Chinese ICBMs is suggestive of plans for an EMP attack against the United States. Chinese military doctrine calls for using "information warfare" to destroy enemy satellites and gain "control" of space, a goal that could be accomplished by collateral effects from EMP attack:

- *U.S. Vulnerability.* From an official newspaper of the PLA: "Some people might think that things similar to the 'Pearl Harbor Incident' are unlikely to take place during the information age. Yet it could be regarded as the 'Pearl Harbor Incident' of the 21st century if a surprise attack is conducted against the enemy's crucial information systems of command, control, and communications by such means as the electronic warfare, electromagnetic pulse weapons, telecommunications interference and suppression, computer viruses, and if the enemy is deprived of the information it needs as a result. Even a super military power like the United States, which possesses nuclear missiles and powerful armed forces, cannot guarantee its immunity...In their own words, a highly computerized open society like the United States is extremely vulnerable to electronic attacks from all sides. This is because the U.S. economy, from banks to telephone systems and from power plants to iron and steel works, relies entirely on computer networks....When a country grows increasingly powerful economically and technologically...it will become increasingly dependent on modern information systems....The United States is more vulnerable to attacks than any other country in the world..."<sup>107</sup> (Zhang Shouqi and Sun Xuegui, **Jiefangjun Bao**, 14 May 1996)
- *U.S. Vulnerability.* From a major book by one of China's chief military theorists: "Before the world is wired to the Internet, the more information-based a country is, the more vulnerable it is to attack and the greater the danger it is exposed to, whereas Third World nations are in much less danger of being hit hard by an information war. According to a report by the National Scientific Research Committee in the United States, the computer systems of the U.S. military are becoming more and more vulnerable. It said....'The Department of Defense (DoD) is in an increasingly vulnerable situation. The extent the information system is protected trails the degree of dependency on it...Presently the

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<sup>107</sup> Zhang Shouqi and Sun Xuegui, "Be Vigilant Against 'Pearl Harbor' Incident in the Information Age," **Jiefangjun Bao** (14 May 1996).

United States is highly dependent on information systems. An attack on these systems will constitute a real threat to U.S. security.’”<sup>108</sup> (Shen Weiguang, **World War, the Third World War—Total Information Warfare**, 1 January 2001)

- *Information Warfare, Nuclear EMP, and Preemption*. From an official newspaper of the PLA: "An information offensive takes two forms, namely, physical and logical. A physical offensive is composed of electronic warfare, biological warfare, missile warfare, directed energy weaponry, and nuclear weaponry with its electromagnetic pulse effect....An information defensive takes two forms, active and passive. Active defensive means that one party tries to launch a preemptive attack on the other party's information center..."<sup>109</sup> (Zhu Chongduo and Liang Yongchang, **Jiefangjun Bao**, 27 August 1996)
- *Nuclear Use against Taiwan*. Japanese Press: "The latest internet versions of *Jiangting Zhishi*, which is a military magazine that seems to reflect the intentions of the People's Liberation Army, made a proposal for use of nuclear weapons concerning attacking Taiwan, saying: 'The best way to destroy enemy aircraft on the ground and vessels in naval bases is to use strategic nuclear weapons.'...the latest edition of the military magazine *Guofang Bao* argued for the use of neutron bombs, which kill and wound only soldiers but leave most buildings undamaged, saying they would be effective in attacking Taiwan."<sup>110</sup> (Yoshihisa Furumori, **Sankei Shimbun**, 6 August 1999)
- *Nuclear Use against Carriers*. Australian Press: "China warned yesterday that it was ready to fight over Taiwan and that its nuclear weapons could 'deal with' aircraft carriers if the United States dared to interfere. A hard-hitting editorial in the official *Global Times* newspaper, a subsidiary of the Communist Party mouthpiece, the *People's Daily*, said the U.S. and other Western countries were mistaken if they believed China lacked the ability or will to use force in a dispute over Taiwan. [According to China's *Global Times*], "China's neutron bomb can deal with aircraft carriers easily and medium- and short-range missiles will be useful too."<sup>111</sup> (David Lague, **The Sydney Morning Herald**, 20 August 1999)
- *EMP Against Carriers*. From the official newspaper of the Shanghai Communist Party Central Committee: "The weak points of a modern aircraft carrier are: 1) As a big target, the fleet is easy for a satellite to reconnoiter and locate it, and for missiles to conduct saturation attacks; 2) A high degree of electronization is like an 'Achilles' heel' for an aircraft carrier fleet, which relies heavily on electronic equipment as its central nervous system. These two characteristics determine one tactic....Electromagnetic pulse bombs (missiles) bear the characteristics that meet those requirements: 1) The strong magnetic field and electromagnetic pulse caused by an explosion can destroy all important integrated circuits and chips...thus paralyzing the radar and telecommunications system of the aircraft carrier and vessels around it as well as the ship-mounted missiles and

<sup>108</sup> Shen Weiguang, op. cit.

<sup>109</sup> Zhu Chongduo, op. cit., see fn 91.

<sup>110</sup> Yoshihisa Furumori, op. cit., see fn 6.

<sup>111</sup> David Lague, "China's Nuclear Threat To U.S.," **The Sydney Morning Herald** (20 August 1999).

aircraft. 2) The scope of demolition and effective action are wide, reaching dozens of kilometers. 3) The equipment is damaged without casualties. 4) An electromagnetic pulse bomb...does not have to hit the aircraft carrier but only needs to explode within dozens of kilometers around the aircraft carrier....As long as an electromagnetic pulse bomb can successfully explode, an aircraft carrier will be paralyzed. 5) If the central nervous system of an aircraft carrier is paralyzed, even a comparatively backward naval vessel or aircraft...will be able to aim at the aircraft carrier as a conventional target, thereby thoroughly changing the balance between the strong and the weak. The possession of electromagnetic pulse bombs (missiles) will provide the conditions to completely destroy an aircraft carrier fleet, and the way to complete victory in dealing with aircraft carrier fleets."<sup>112</sup> (Ye Jian, **Jiefang Ribao**, 12 February 2000)

- *EMP Against Taiwan.* From an interview with a senior nuclear scientist, a founder of the PRC's nuclear weapons program, and Deputy Director of the Institute of Theoretical Physics, He Zuoxiu: INTERVIEWER—"Revered He...how great do you think the chances are for the outbreak of 'restricted nuclear war theory?'" HE ZUOXIU—"It is very possible to see the outbreak of restricted nuclear war, because there are no technical problems at all. You said that units at the division level in Russia have mini-sized nuclear tactical training courses. It is very possible. In general, the nuclear explosion equivalent weight of the hydrogen bomb is about 1 million tons (TNT); that of atomic bombs, 50,000-100,000 tons; and that of some mini-sized nuclear bombs, less than 1,000 tons. It is difficult for the outside to recognize whether or not the testing of mini-sized nuclear bombs is a nuclear explosion."...INTERVIEWER—"Experts said that a 10,000 tons TNT mini-sized nuclear bomb was tested some 40 miles above the ground of Chiayi. People in Taiwan could avoid the harms caused by high-temperated fireballs, shock waves, and radiation. But, the electronic equipment was all down. There was an outside rumor that the mainland might use such a method to attack Taiwan in order to attain the goal of paralyzing Taiwan. Did China have such technology?" HE ZUOXIU—"...When testing a nuclear bomb 40 km above the ground, its high temperature and radiation during explosion will still affect people on the ground. I think, if the testing takes place 10,000 km above the ground, the impact will be smaller, but satellites will be affected."<sup>113</sup> (Qi Leyi interviews He Zuoxiu, **Chung-Kuo Shih-Pao**, 26 November 2000)
- *Information Warfare and Nuclear EMP.* Taiwan Press: "[China is] now preparing to set up an 'information warfare simulation center' to create information warfare and corresponding simulated battlefield environments in which confrontation exercises can be conducted. Moreover, the Chinese Communists established a special high-tech unit in the Guangzhou Military Region and then conducted exercises in information operations of all types. They have conducted appraisals and tests of the damage of the command and control center's electronic devices caused by the resulting electromagnetic pulse of

<sup>112</sup> Ye Jian, "Armchair Strategy: Using A Bomb To Deal With Aircraft Carrier," **Jiefang Ribao** (12 February 2000). See also: Feng Changsong, "Six Aircraft Carrier 'Busters,'" **Zhongguo Guofang Bao** (5 March 2002), p. 4. Wang Jiasuo, "Aircraft Carriers: Suggest You Keep Out of the Taiwan Strait!" **Junshi Wenzhai** (1 April 2001), pp. 58-59.

<sup>113</sup> Qi Leyi, "It Is Impossible To Steal Top Secrets of Nuclear Weapons," **Chung-Kuo Shih-Pao** (26 November 2000), p. 13.

nuclear explosion or electromagnetic bombs and achieved initial results in the research on tactical electromagnetic pulse weapons which are nuclear and radiation-pollution free."<sup>114</sup> (Wang Chiung-hua, **Chung-Yang Jih-Pao**, 22 November 1999)

- *Electronic Warfare Exercise by Strategic Missile Corps.* Taiwan press cites leaked intelligence reports from Taiwan armed forces on PLA exercise of March 2002, "According to intelligence data gathered by the...United States and Taiwan," China's PLA conducted an "electronic warfare" exercise "to aim at forming an 'electronic wall' in the Taiwan Strait" as part of a combined arms exercise, that included "strategic missiles." The exercise reportedly involved three phases: "Phase One—information warfare...Phase Two—joint three-dimensional landing...Phase Three—attacking targets at sea...long-range operations...and attacking aircraft carriers." Reportedly participating in the exercise were, "Units from the 2nd Artillery Corps...various types of tactical missiles and Dongfeng-21C and Dongfeng-31 strategic missiles." China's 2nd Artillery Corps is roughly equivalent to STRATCOM in that it controls the PRC's nuclear missile forces, including ICBMs.<sup>115</sup> (Chen Tung-lung, **Tung-sen Hsin-Wen Pao**, 3 March 2002; Chen Tung-lung, **Tung-sen Hsin-Wen Pao**, 17 March 2002)
- *Chinese ICBMs and EMP Attack.* The order of battle of China's ICBM forces is suggestive of possible plans for an EMP attack against the United States. China has 18 ICBMs capable of targeting the entire United States. These are silo-based CSS-4s, each armed with a single 5-megaton warhead, according to unclassified estimates. Press reports, allegedly citing classified intelligence studies, claim that most of these missiles are aimed at the most populous U.S. cities. This is consistent with Chinese military doctrinal writings that call for placing 10 percent of the U.S. population at risk. A notional targeting plan for China's ICBM force against the United States population would allocate 15 CSS-4s against the 15 most populous U.S. cities—New York, Los Angeles, Chicago, Houston, Philadelphia, San Diego, Phoenix, San Antonio, Dallas, Detroit, San Jose, San Francisco, Indianapolis, Jacksonville, and Washington. Such an attack would kill or injure almost exactly 10 percent of the total population of the United States. If standard targeting procedures are followed, two CSS-4s would be withheld as a reserve to compensate for launch failures, assuming system reliability is 80 percent. That would leave one of the ICBMs unallocated. A single CSS-4 could be used in an EMP attack against the entire North American military and civilian infrastructure—its high-yield warhead would be well-suited for such an attack. Alternatively, the missile could be used to destroy the 16th most populous U.S. city, Baltimore, and kill an additional 0.2 percent of the U.S. population.
- *Information War in Outer Space.* From a senior officer of the General Staff, in the official journal of the PLA Academy of Military Science, providing in depth analysis of

<sup>114</sup> Wang Chiung-hua, **Chung-Yang Jih-Pao** (22 November 1999).

<sup>115</sup> Chen Tung-lung, "Secret Intelligence: Summary of Exercises Shows the Purpose Is To Attack the Island and Strike At Warships," **Tung-sen Hsin-Wen Pao** (3 March 2002). Chen Tung-lung, "PLA To Conduct Air-Naval Integrated Exercise At the End of April: Exercise to Aim at Forming an 'Electronic Wall' in the Taiwan Strait," **Tung-sen Hsin-Wen Pao** (17 March 2002).

doctrine and strategy: "We should own arms and equipment for fighting an all-round information war so as to contend with an enemy for information superiority in all-dimensional space. Now that information operations are moving towards outer space at an accelerating pace, future information operations will certainly focus on developing superiority in the air or space...to focus on developing synthesized arms and equipment for information operations in the air or space."<sup>116</sup> (General Dai Qingmin, **Zhongguo Junshi Kexue**, 20 August 2000)

- *EMP To Destroy Satellites*. From a Taiwan military academic serving at Taiwan's Air Force Academy: "Aerospace Operations....the Chinese Communists are using foreign investment in technology to develop a series of high-tech weapons capable of attacking satellites (such as laser, and electromagnetic pulse weapons), and intends to achieve military and political aims through control of space."<sup>117</sup> (Colonel Lo Ch'eng-lieh, **Kuo Hun**, 1 April 1999)

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<sup>116</sup> General Dai Qingmin, "Innovating and Developing Views on Information Operations," **Zhongguo Junshi Kexue** (20 August 2000), pp. 72-77.

<sup>117</sup> Colonel Lo Ch'eng-lieh, "The Chinese Communist Military Revolution and Inherent Threat," **Kuo Hun** (1 April 1999), pp. 42-45.

## Russia and EMP Attack

Russia probably has contingency plans for nuclear EMP attack regionally and intercontinentally against the United States and against other possible adversaries. The Soviet Union had contingency plans for an EMP attack as the leading edge of a large-scale nuclear strike in the event of war with the United States, according to open sources. Russia has inherited Soviet strategic forces and operational plans, still perceives the necessity of deterring nuclear war with the United States, and so probably retains plans for an EMP attack. Indeed, in a departure from declaratory Soviet doctrine, the new Russian military doctrine allows nuclear first use, and places heavier reliance on nuclear weapons to cope with a broad range of scenario conditions, including limited nuclear use in regional conflicts. As shown earlier, EMP attack is widely regarded in the international community as among the most politically acceptable, and potentially effective, limited nuclear options.

Russian military writings are replete with references to the dependency of the United States military forces and civilian infrastructure upon sophisticated electronic systems, and to the potential vulnerability of those systems to "information warfare." Russian military doctrine for "information warfare" includes nuclear EMP attack, as demonstrated earlier. Russian officials have stated publicly that Moscow is developing a new generation of nuclear weapons for "electronic warfare" including "radiofrequency weapons." Some Russian analysts have justified the Moscow ABM system because of its ability to shoot down ICBMs and its hardness against EMP, apparently alluding to the 1995 Norwegian missile incident as an example of an EMP threat that "might have been." Russian military doctrine gives great weight to anti-satellite operations—some writings assert the existence of "nuclear war" plans for EMP attack against satellites. On May 2, 1999, Russia's Duma Defense Committee addressed an EMP threat to members of the U.S. Congress during a meeting in Vienna to discuss the Balkans crisis. It is unlikely that the Duma would make an EMP threat unless Russian forces and operational plans could credibly implement that threat:

- *Soviet Plans for EMP Attack.* According to open sources, during the Cold War, Soviet plans for nuclear conflict included an EMP precursor attack. As many as a dozen SS-18 ICBMs, carrying single warheads having an estimated yield of 25 megatons each, and a number of SLBMs, were reportedly dedicated to the precursor attack. The objective of the EMP attack was to damage or destroy U.S. strategic C3 and forces, and so degrade U.S. operational capabilities.<sup>118</sup>
- *U.S. Vulnerability to EMP and U.S. Super-EMP Weapons.* From one of Russia's chief military scientists and theoreticians: "EMP proved especially effective in high-altitude bursts. The frequency spectrum of the EMP, corresponding to the radio waveband, is capable of disabling electronic gear, communications and power transmission lines, radios and radars at great distances. Therefore, U.S. military specialists devote great

<sup>118</sup> **Nuclear Wars**, op. cit., pp. 24-27. HASC Hearing (7 October 1999), op. cit., pp. 77, 79. Kenneth R. Timmerman, "U.S. Threatened with EMP Attack," **Insight** (28 May 2001), p. 16. Steven L. Katz and Andy Messing Jr., "Taking The Pulse of a New Threat," **Washington Times** (16 August 2000), p. A19.

attention to studying the physical nature of this phenomenon, its casualty effect, and methods of protecting friendly combat and support systems. One can judge the importance which the United States attaches to EMP if only from the fact that a special EMP Committee was established as part of the National Research Council in 1982. Not satisfied with what had been achieved, from the early 1980s, U.S. military scientists unfolded explorations aimed at creating one more kind of nuclear weapon (third generation), a super-EMP with intensified electromagnetic radiation output. They figure to use it to increase the intensity of the field at the Earth's surface to several hundred kilovolts per meter. In their calculations, the explosion of a 10 MT warhead at an altitude of 300-400 km above the geographic center of the United States (state of Nebraska) can lead to disruption of the operation of electronic equipment on almost the country's entire territory for the time necessary to disrupt retaliatory measures."<sup>119</sup> (General Vladimir Belous, **Military Thought**, 1991)

- *Russian Nuclear and Radiofrequency Weapons High Priority.* General Slipchenko, cited in the article, is a leading military scientist and theoretician: "Major General Slipchenko, the recent director of the Research Department of the General Staff, told *Komsomolskaya Pravda* that such classes of arms as directed energy weapons, automatic precision weapons, and equipment for conducting so-called electronic warfare are being created at this time. Andrey Kokoshin, first deputy minister of defense, boasted in an interview that the program of military development up to the year 2005 would provide Russia with 'weapons that have no counterparts in the world.'...*Komsomolskaya Pravda* has managed, however, to ascertain some of our military secrets. The present high-priority strategic programs, according to Rosvooruzheniye information, include: Topol-M2 mobile intercontinental ballistic missiles...a new tactical nuclear arms system capable under combat conditions of firing nuclear warheads over a distance of 400 kilometers...ultra-small nuclear warheads weighing less than 90 kilograms, which are already being manufactured; seven Borey-class submarines armed with the D-31 new ballistic missiles. In addition, Russia's military laboratories are developing laser and radiofrequency weapons."<sup>120</sup> (Denis Baranets, **Komsomolskaya Pravda**, 7 August 1997)
- *U.S. Vulnerability.* The authors are senior academic military theorists with the Russian Center for Strategic and International Studies: "Experts know that under the Pentagon's 'Force XXI' plan the Army command and control and information structure will turn as it were into an electronic system of Internet communications...It is proposed to have over two million computers (i.e., over one per person) in the U.S. Army. Experiments are being conducted within the scope of the 'Battle Labs' program, and the creation of special 'Force XXI' battalions, divisions, and even corps on their basis is coming. What really

<sup>119</sup> General Vladimir Belous, "Third Generation Nuclear Weapons," **Military Thought** (12 December 1991), pp. 117-121. Elsewhere General Belous notes that neutron bombs also emit enhanced gamma rays, key to understanding that neutron weapons can be modified to make an enhanced-EMP weapon. Belous also argues for reliance on neutron mini-bombs to damage communications and reduce collateral damage from nuclear fallout—an EMP weapon, Belous surely knows, would accomplish the same more effectively. See: General Vladimir Belous, "Characteristics and Missions of Modern Neutron Weapons," **Yaderny Kontrol** (May-June 1999), pp. 61-66.

<sup>120</sup> Denis Baranets, **Komsomolskaya Pravda** (7 August 1997), p. 1.

was shown by experiments to check the effectiveness of computerization of units and subunits?....An improvement in such indicators as damage and casualty effect, survivability or speed of the operation was not registered during special exercise IVY FOCUS. At the same time, there was an increased number of 'victims' of friendly fire, and computers showed poor survivability on the battlefield because of dirt, heat, and cold. Similar exercises of the German ground forces demonstrated approximately the same results....Let us turn to the Persian Gulf War experience....It turned out that stealth aircraft destroyed not 90, but only 60 percent of the most important targets. The effectiveness of Tomahawk missiles in destroying especially important targets was even lower at 50 percent. The newest communications, target designation and reconnaissance systems did not permit avoiding destruction of allied equipment from the fire of their own aircraft, tanks, and helicopters...Only about 30 percent of all aerial bombs used by aviation hit the target....Copperhead guided artillery projectiles proved entirely ineffective....Just what proved effective? It was the traditional electronic warfare jamming equipment that permitted blinding enemy air defense, as well as secret software plants...cruise missile warheads with radiofrequency electromagnetic pulse generators to damage electronic command and control and communications systems, as well as warheads with carbon fibers for disabling wire communications and power supply lines..."<sup>121</sup> (Dmitry Borisov and Vitaliy Koreshkov, **Nezavisimoye Voyennoye Obozreniye**, 22-28 May 1998)

- *Russian Military Doctrine and Nuclear Dependency*. From a book by General Slipchenko, one of Russia's leading military scientists and theoreticians: "At a 12 July 1999 press conference the RF defense minister gave a briefing on the ZAPAD-99 strategic command and staff exercise that had been held (21-26 June) and confirmed that this exercise was a practical implementation of state policy in military organizational development for the period up to 2005. It should be emphasized that this strategic exercise took place immediately following the end of the war in Yugoslavia....There was everything here: over 50 formations and military units were in action and there were field firings and real launches of air-launched, sea-launched, and ground-launched missiles....a provision on the use of nuclear weapons was rehearsed during the exercise....There were numerous launches of missiles which in a threat period can deliver a nuclear warhead. In the Northern Fleet submarines actually fired Vodopad antisubmarine missiles, which in a nuclear version can very successfully combat enemy submarines....during the exercise air launched cruise missiles [were fired] from Tu-160 aircraft, which flew to strategic range for the first time in the last eight years. It should be emphasized especially that after the exercise the RF defense minister unexpectedly admitted that Russia's security now can be protected only by nuclear weapons....There are no funds for adequate symmetrical responsive measures in training the armed forces of many weak nuclear-weapon and non-nuclear weapon countries for new-generation wars. And it is clear that all asymmetrical measures in nuclear-weapon countries certainly will involve only

<sup>121</sup> Dmitry Borisov and Vitaliy Koreshkov, "Wars Are Changing Their Look: The Growing Role of Nonlethal Weapons in Methods of Combat Operations," **Nezavisimoye Voyennoye Obozreniye** (22-28 May 1998), pp. 1, 2.



increased reliance on nuclear weapons. One should expect a further modernization of missile/nuclear weapons as well as a toughening of the provision in military doctrines about rejecting principles of nonfirst use of nuclear weapons....It appears a situation is being created artificially in Russia in which it is simply forced to continue to place reliance on nuclear weapons and nuclear deterrence....where it inevitably will be faced with the forced need of first use of nuclear weapons, since all other capabilities...will be ineffective or entirely absent."<sup>122</sup> (General Vladimir Slipchenko, **No-contact Wars**, 1 January 2000)

- *Russian Nuclear First Use*. "Everyone must know that in the event of a direct challenge our response will be fully-fledged, and we are to choose the use of means...including nuclear weapons."<sup>123</sup> (Ivan Rybkin, Secretary of the Russian Security Council, 11 February 1997)
- *Limited Nuclear War*. From a journalist well connected to the General Staff: "Russia's new defense concept [detailed in a secret decree calls for] radical modernization of Russia's existing nuclear arsenal, both tactical and strategic...to make limited nuclear war possible."<sup>124</sup> (Pavel Felgengauer, May 1999)
- *Moscow ABM and EMP Threat*. From an interview with officers of the Moscow ABM system, in the official newspaper of the Russian Army: "[The Moscow ABMs] can operate under conditions of a nuclear explosion and are protected against its destructive effects, including an electromagnetic pulse....Ballistic missiles launched on the optimal trajectory from the Norwegian Sea area reach the central region of Russia in 11 minutes....in close approximation this is the not-so-distant example of the Norwegian missile that flew higher than it was supposed to, and fell into the class of medium-range ballistic missiles....Only we have a full-fledged ABM defense system today....Our ABMs could, by and large, destroy strategic ICBMs both over the Norwegian Sea and over the Urals."<sup>125</sup> (Nikolay Poroskov, **Krasnaya Zvezda**, 4 April 1996)
- *Nuclear EMP against U.S. Satellites*. "There are now 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-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."<sup>126</sup> (Aleksandr Khokhlov, **Novyye Izvestiya**, 5 November 1997)

<sup>122</sup> Slipchenko, op. cit., see fn 28.

<sup>123</sup> "Russia May Use Nuclear Arms In A Conventional War," **Reuters** (11 February 1997). **War Scare**, op. cit., p. 263.

<sup>124</sup> **War Scare**, op. cit., p. 265.

<sup>125</sup> Nikolay Poroskov, "Revealing for the First Time: Eighth Wonder of the World From ABM Defense," **Krasnaya Zvezda** (4 April 1996).

<sup>126</sup> Aleksandr Khokhlov, "If There Are Star Wars Tomorrow," **Novyye Izvestiye** (5 November 1997), p. 2.

- *Russian EMP Threat to U.S. Congress.* Russia made a thinly veiled EMP threat against the United States on May 2, 1999. During the spring of 1999, tensions between the United States and Russia rose sharply over Operation ALLIED FORCE, the NATO bombing campaign against Yugoslavia. A bipartisan delegation from the House Armed Services Committee of the U.S. Congress met at Vienna with their Russian counterparts on the Duma International Affairs Committee, headed by Chairman Vladimir Lukin. The object of the meeting was to reduce U.S.-Russia tensions and seek Russian help in resolving the Balkans crisis. On May 2, during the Vienna meeting, Chairman Lukin and Deputy Chairman Alexander Shabanov chastised the United States for military aggression in the Balkans, and warned that Russia was not helpless to oppose Operation ALLIED FORCE. 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."<sup>127</sup>

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<sup>127</sup> **HASC Transcript On Vienna Conference** (2 May 1999). Interview with Vienna Conference participants Rep. Curt Weldon and Rep. Roscoe Bartlett. Timmerman, op. cit., p. 16.