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BLUE PAPER 1-1

Novel High-altitude Delivery Platforms for Weapons of Mass Destruction/Weapons of Mass Effect

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By David Stuckenberg, Chairman, ALPF

Can a state, pseudo-state or non-state actor(s) deliver Weapons of Mass Destruction (WMD)/Weapons of Mass Effect (WME) to strategically impact America's infrastructure absent employment of Inter-continental Ballistic Missiles (ICBM), Submarine-Launched Ballistic Missiles (SBLM), or other conventional means? The answer is "yes." Thus, the feasibility of using novel delivery platforms to achieve offensive capabilities against the United States should be examined and understood by the emergency management and national security communities.

Over the past 40 years, the strategic threat reduction community has been occupied with confronting challenges presented by conventional Cold War platforms such as ICBMs, SLBMs, cruise missiles or bomber-based delivery of WMD/WME. While legacy and derivative systems such as Russia's (oceanic multi-purpose Status-6 system) nuclear torpedo continue to present strategic threats to the U.S., their proliferation has proven somewhat predictable over time. However, the rise of global terrorism has created a new dimension of risk to the U.S. in particular – one that presents itself in a chaotic, innovative and ill-defined manner. Consequently, planners should begin addressing novel strategic threats by understanding what can be done rather than what has been done. Such an approach is critically important to protecting America's society and critical infrastructure.

Innovating Evil

Given access to a WMD/WME (i.e. ballistic nuclear warheads or chemical, biological, radiological, nuclear and high-explosives (CBRNE)), adversaries can use low-tech inventive delivery methods to inflict harm on the U.S. absent attributable conventional platforms. The U.S. is a system of systems.[1] Thus, our defense enterprise and society depends on the electric power grid, GPS, and other technologies for sustainment. Consequently, the asymmetric application of high-altitude electromagnetic pulse (EMP/HEMP) or CBRNE as a strategy of weakening a technologically superior U.S. is repeatedly addressed in Russian, Chinese, North Korean and Iranian military doctrine.[2]

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[1] The Commission to Assess the Threat to the United States from Electromagnetic Pulse Attack. *Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse Attack, 2008.* Technical paper. Washington, D.C.. Accessed, 11 February, 2016. http://www.empcommission.org/docs/A2473-EMP_Commission-7MB.pdf.

Aside from the intrinsic instabilities of these nations, the growing terrorism threat and an understanding of EMP dating back to the 1960s, EMP threats are often dismissed by U.S. planners. For instance, planners frequently assume that although a high-altitude warhead detonation and consequent (non-kinetic) HEMP would be devastating to the U.S., the risks can be largely dismissed because such a scenario would only arise from a nuclear exchange between peer competitors with an ability to deliver high-altitude conventional strikes. While such scenarios may have been limited to this classical view for a time, the threat climate has drastically changed. Today, America's traditional and non-traditional enemies are increasingly sophisticated, educated, well funded and organized. Still worse, they are increasingly innovative.

Not a Clancy Novel

Aside from states which already possess WMD/WME, the likelihood terrorists or radical elements have already obtained nuclear material or one of Russia's 30,000 nuclear warheads is not remote.[3] Recently, the Associated Press reported after investigating a series of stings conducted jointly by the FBI and Moldavian authorities, "[I]n most of the operations, arrests were made after samples of nuclear material had been obtained rather than the larger quantities… That means that if smugglers did have access to the bulk of material they offered, it remains in criminal hands."[4]

Although nuclear arms treaties, such as New START, foster cooperation and goodwill, treaty protocols do not allow inspectors to physically verify the presence or quantity of warheads in any nation. Thus, where accountability is concerned, no treaty, past or present, ensures positive control has or will be maintained over nuclear warheads.

It must be understood, terrorists will, at some point, access a WMD/WME by whatever means whether by theft, sale, trade or alliance. This view is in keeping with the U.S. National Security Strategy which states: "The American people face no greater or more urgent danger than a terrorist attack with a nuclear weapon."[5]

The Worst Case

If a nuclear warhead were detonated at a height of 200 miles above the U.S., according to the National Technical Information Service: "For an explosion of high yield at sufficient altitude, the area covered by the high-frequency EMP extends in all directions on the ground as far as line-of-sight above the center of the United States, almost the whole country as well as parts of Canada and Mexico could be affected by the EMP."[6]

The EMP would devastate most of the critical infrastructure located within the deposition area (Figures 1 and 2).

[3] Kathy Gilsinan. "Why Moldavia May be the Scariest Country on Earth." The Atlantic. October 8, 2015. Accessed 6 February, 2016. http://www.theatlantic.com/international/archive/2015/10/moldova-nuclear-weapons-isis/409456/.

[4] Ibid.

[5] The White House. "National Security Strategy" 2010. Accessed 6 February, 2016. https://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf.

[6] The National Technical Information Service. *The Electromagnetic Pulse and Its Effects*. Technical paper. Springfield, VA: U.S. Department of Commerce. Chapter 11.15, p.519. Accessed 5 February, 2016. https://www.fourmilab.ch/etexts/www/effects/eonw_11.pdf.

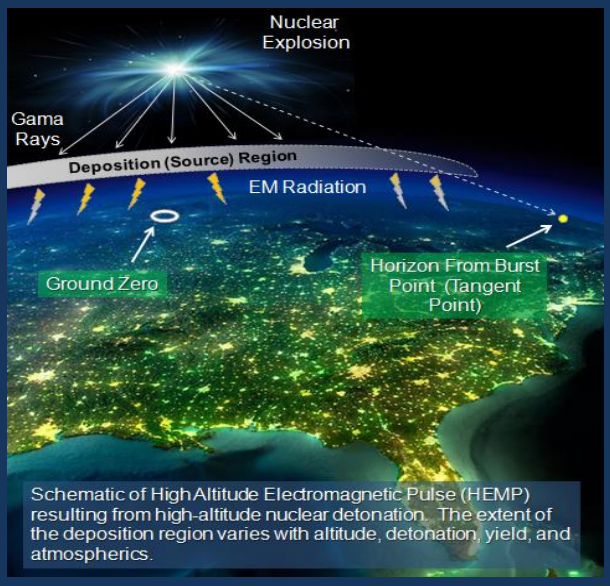

Figure 1. In addition to weapons yield, an ability to put WMD/WME at high-altitudes allows a wider impact.

While this is a worst-case scenario, it is possible, and increasingly probable. All non-hardened critical infrastructure elements including those required to sustain the populace (power, food, water, sanitation etc.) would be incapacitated.[7] Electronic and solid-state devices (i.e. computers, SCADAS [Supervisory Control and Data Acquisition Systems], power transformers, etc.) would be disabled within a millisecond.

Additionally, research by the American Leadership & Policy Foundation reveals nuclear power station cooling will be adversely impacted, and, in some cases, fail after a prolonged loss of grid power (Station Blackout).[8] The scale of the EMP area presents a risk of meltdown at multiple nuclear power stations simultaneously.[9]

These scenarios and an increasingly innovative enemy warrants planners putting themselves in the enemy's frame of mind to understand optimum weapons delivery modes and strategies. In some cases these will be kinetic, in others, non-kinetic.

Conventional views on EMP tend to assert the impracticalities of hardening America's civil and defense infrastructures since offensive use of nuclear weapon(s) or CBRNE would invariably bring U.S. retaliation or, in some cases, risk of "MAD" (mutually assured destruction). However, this view is no longer relevant as rogue states routinely use proxies to achieve desired ends. A preemptive WMD/WME attack on the U.S. employing proxies who use non-conventional delivery methods would create both fog and chaos – making attribution and retaliation difficult.

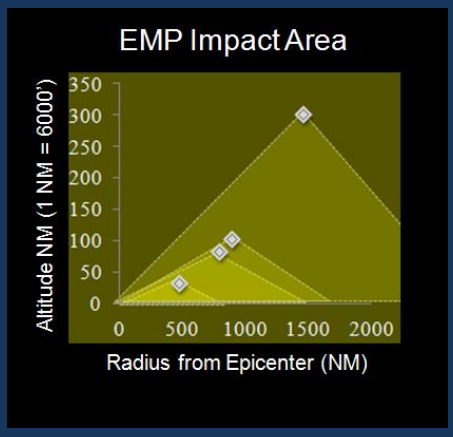

Figure 2. EMP Impact Area. There is a near direct correlation between the altitude of a nuclear detonation and resulting EMP impact area.

[7] The Commission to Assess the Threat to the United States from Electromagnetic Pulse Attack. *Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse Attack, 2008*. Technical paper. Washington, D.C..Accessed, 11 February, 2016. http://www.empcommission.org/docs/A2473-EMP_Commission-7MB.pdf.

[8] Campbell, Hershel, and David Stuckenberg. *Electromagnetic Pulse and Space Weather and the Strategic Threat to America's*. Technical paper. Washington, D.C.: American Leadership & Policy Foundation, 2015. Available at: http://www.alpf.org/wp-content/uploads/2016/01/The-Strategic-Vulnerabilities-of-Nuclear-Plants-to-EMP-and-Solar-Events.pdf.

[9] Ibid.

A red-team exercise in this vein nets several potential mechanisms by which adversaries may deliver non-kinetic effects at high-altitude:

1. **Commercial or experimental aircraft (estimated 45,000 feet - maximum undefined)**

2. **Balloons (5,000 - estimated 200,000 feet†) ~ or 40 miles equates to an approximate impact radius of 500 miles.***

3. **High-altitude drones (estimated 10,000 - maximum undefined)**

Of these methods, the easiest to resource, equip, and launch is also the least understood – balloons.

Balloons for Any Occasion

Balloons are narrowly thought of as scientific research or adventure platforms used for thrill seekers such as Brian Jones - the first balloon pilot to circle the globe non-stop - or Virgin Galactic's Sir Richard Branson. However, balloons also have proven capabilities; lighter than air vehicles have traversed the globe at tens of thousands of feet carrying multi-person crews and thousands of pounds of payload (Figure 3). Using a balloon as a WMD/WME platform could provide adversaries with a pallet of altitudes and payload options with which to maximize offensive effects against the U.S.

According to Andrew Baird, a competition balloon pilot with more than 30 years experience and owner of Cameron Balloons USA, a leading global balloon manufacturer, "It is quite feasible for an individual to design, build and launch a balloon to reach altitudes from 35,000–200,000 feet carrying a payload of several hundred pounds. It's not complicated to do."[10] Baird also believes individual(s) can seek out commercial support to build and launch customized high-altitude balloons under the guise of scientific research [11] While Baird thinks the commercial support scenario is less likely, the discussion reminded him of a situation in 1980's when his company was approached by Saudis seeking to build balloons for operations at night.

While some aspects of balloon equipage are potentially difficult to resource, few elements required to create or launch designs are either monitored or regulated. In fact, a high-altitude balloon could be designed, created, and launched in a matter of months. There is nothing to prevent several hundred pounds of weapons material from being delivered to altitude.[12]

Balloon pilot Brian Jones agreed noting, "While difficult to do depending on the goal, it's not impossible." [13] Aside from the somewhat technical builds required for high-altitude balloons, Jones believes an adversary could find more success with net-balloons, "In theory, you could use pressurized balloons; they are more predictable…"[14] Jones also points to the historic use of balloons as weapons platforms, "The Japanese used thousands of pressurized balloons to deliver bombs to America in WWII." Under PROJECT

Note: During the Star Fish Prime Tests in 1965 at the Johnston Islands, one high altitude nuclear detonation at 80 miles altitude netted EMP effects that impacted Honolulu, Hawaii 850 miles from the epicenter.

†Record set by Japan's BU60-1 gas balloon 2002.

[10] "Interview with Andy Baird." Phone interview by author. 8 February, 2016, 09:00 ET.
[11] Ibid.
[12] Ibid.
[13] "Interview with Brian Jones." Skype interview by author. 9 February, 2016, 09:00 ET.
[14] Ibid.

FUGO, "…balloons, or 'envelopes', designed by the Japanese army were made of lightweight paper. Attached were bombs comprised of sensors, powder-packed tubes, [and] triggering devices…" launched into the jet stream toward the United States.[15] Radio controlled burners and control functions could be used to control altitude during unmanned flights.[16] However, Jones believes the likelihood of successful employment would be increased with manned flight due to weather. "The obvious way [to achieve effects], pilot a hot air balloon to 20,000 feet with the pilot on oxygen and then sacrifice himself; he may even go as high as 30,000..."[17]

In 2003, the Great Northeast Blackout started from a single-point of failure. A tree branch fell onto a power line triggering a cascade of failures that blacked-out the Northeastern U.S. and 50 million Americans.[18] When asked to assess the potential impacts of a balloon-borne WMD/WME, Dr. Peter Pry, a former CIA analyst and member of the Congressional Commission to Assess the Threat to the United States from EMP Attack, stated, "Imagine the consequences of a balloon EMP attack that damages and destroys electronic systems at the speed of light within an EMP field with a radius of hundreds of kilometers. The Eastern Grid generates 75 percent of U.S. electricity and supports most of the population…" [19] Pry also notes, "Virtually any nuke detonated anywhere over the Eastern Grid will collapse the entire Eastern Grid, not just the area within the EMP field, because of cascading failures that will ripple outward…"[20]

After resourcing required components, it is conceivable both the construction and deployment of balloon(s) could escape all notice. According to Baird, the area required to manufacture and launch a balloon is small.[21] With respect to radar signatures, Jones believes net-balloons would be almost impossible to see while high-altitude balloons like Breitling Orbiter 3 may have a signature.[22]

Figure 3. The Breitling Orbiter 3, built by Cameron Balloons, was the first balloon to circumnavigate the world non-stop. It was piloted by Brian Jones and Bertrand Piccard. [23]

[15] Linton Weeks. "Beware Of Japanese Balloon Bombs." NPR. January 22, 2015. Accessed February 9, 2016. http://www.npr.org/sections/npr-history-dept/2015/01/20/375820191/beware-of-japanese-balloon-bombs.
[16] Ibid.
[17] "Interview with Brian Jones." Skype interview by author. 9 February, 2016, 09:00 ET.
[18] "Interview with Dr. Peter Pry" Email interview with author. 8 Feb, 2016.
[19] Ibid.
[20] Ibid.
[21] "Interview with Andy Baird." Phone interview by author. 8 February, 2016, 09:00 ET.
[22] "Interview with Brian Jones." Skype interview by author. 9 Feb, 2016, 09:00 ET.
23 "The Flight." Orbiter Balloon. Accessed January 6, 2016 http://www.orbiterballoon.com/Gallery.aspx?path=The Flight.

Closing the Loop on Creative Evils

A deeper understanding of potential asymmetric adversary capabilities with respect to low-tech strategic delivery options will aid planners in mitigating "bolt from the blue" scenarios that could arise of state, non-state, or pseudo-state actors who have expressed the desire, intent and determination to strategically harm the U.S. However, an unwillingness to explore novel and less technical approaches to WMD/WME delivery and/or a refusal to cast off Cold War dispositions concerning strategic threats could, similar to Pearl Harbor, allow an enemy to inflict deep trauma.

In the case of EMP, the consequences of a failure to anticipate ALL delivery modes within the reach of an imaginative enemy could be immediate and widespread. As guardians of our nation's future, planners must leave no stone unturned in the effort to deprive America's enemies of low cost, low-tech, high-consequence military options.

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