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## Cadet Voice: Hypersonic Weapons' Effect on Strategic Stability

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## Cadet Voice

# Hypersonic Weapons' Effect on Strategic Stability

Darren Sency

*Initial exploration of the relationship between new technologies and strategic stability finds that hypersonic weapons, regardless of which power deploys them, first, could raise the probability of nuclear war.*

The United States Air Force's high speed/hypersonic integration and demonstration line of budgeting nearly tripled for fiscal year 2017. The \$92.8 million displays intensifying interest in the realm of hypersonic research.<sup>1</sup> Without providing details, the level of classified work being done in developing this technology has been said to be "far more extensive."<sup>2</sup> The era of hypersonic weapons is underway. With the introduction of new military technology, the effects on the methods by which future wars are fought and the political arena which will frame these conflicts should be considered. The strategist Colin Gray offers, "All military behavior is tactical in execution, but must have operational and strategic effect, intended and otherwise."<sup>3</sup> The purpose of this paper is to suggest that the capabilities presented by hypersonic weapons are inherently destabilizing at the strategic level.

During testimony to the United States Congress in December 2015, leading policy expert James M. Acton of the Carnegie Endowment for International Peace opened by stating, "Let me emphasize from the start that I am genuinely undecided about whether the United States should acquire CPGS (Conventional Prompt Global Strike) weapons. The capability would unquestionably convey potential benefits, but it would also carry potential risks. Today, in my opinion, the relative magnitudes of those benefits and risks are unclear."<sup>4</sup> It is important to note at the onset that this study aimed neither to find an answer to that question nor form any opinion on

the issue. The aim has been and remains to objectively weigh capabilities presented by this technology and assess the strategic implications.

A level of difficulty exists in assessing weapons capability of a developing technology. Open source information leaves something to be desired in that it can be outdated or fails to reflect what a fielded weapons system may eventually look like. The desire to determine the effects of specific capabilities while remaining broad about what said capabilities look like on paper proved challenging.

For this reason, it is important to outline the parameters of this discussion. The definition of strategic stability that will be referenced will be from scholar Elbridge Colby.<sup>5</sup> He counts as stable any scenario providing "no incentives for *nuclear* use save for vindication of vital interests." While there are a variety of systems being researched, hypersonic weapons will be broadly defined as any weapon travelling in excess of Mach 5—to exclude intercontinental ballistic missiles. Finally, the effects of these weapons systems on strategic stability will be viewed in a generic sense on the state level from no parochial perspective—statements from different state perspectives will be utilized to frame the strategic environment and hypersonic weapons' potential effects.

### STRATEGIC STABILITY

The 2010 U.S. Nuclear Posture Review uses the words "stable," "stability," and

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<sup>1</sup> Giangreco 2016.

<sup>2</sup> Gertz 2016.

<sup>3</sup> Gray 2015, p. 48.

<sup>4</sup> Acton 2015.

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<sup>5</sup> Colby was recently Robert Gates Senior Fellow at the Center for a New American Security, Washington, D.C. and is now U.S. Deputy Assistant Secretary of Defense for Strategy & Force Development (ed.).

“instability” forty-nine times in the main text, but governments around the world aspire to achieve “strategic stability”—an end which is as easily defined as it is attained.<sup>6</sup> Certain forces, certain force employment postures, and certain kinds of negotiated agreements could be the means by which this goal is attained. The abovementioned definition that we will focus on, again, is “no incentives for nuclear use save for vindication of vital interests.”<sup>7</sup> This definition reflects the intellectual marriage between strategic thought and nuclear weapons—the domain which hypersonic weapons will affect, intentionally or not.

Gregory Koblentz’s *Strategic Stability in the Second Nuclear Age* outlines myriad reasons why the strategic environment is less certain now than it was during the Cold War. The same psychological imperatives that existed during the Cold War prevail in a less certain, more complex strategic environment involving new dynamics and technologies.

Fifty-five years ago, Thomas Schelling and Morton Halperin defined strategic nuclear stability in a bilateral standoff between the Soviet Union and the United States as requiring reduction in incentives for preemptive strike. They added that strategic stability should be “reasonably secure against shocks, alarms and perturbations.”<sup>8</sup> Since the fall of the USSR, it had seemed unlikely that great power conflict would erupt along the lines premised by Schelling/Halperin. “As the memories of the terrors of the world wars and the nuclear fears of the Cold War fade,” the legacy of the strategic nuclear environment persists, certainly in the US-Russian relationship but also in the relations of all nuclear powers.<sup>9</sup>

As Koblentz notes, today’s strategic environment is characterized by an “explosive mixture of unresolved territorial disputes, cross-border terrorism, and growing nuclear arsenals.”<sup>10</sup> He

argues that compared to the Cold War bilateral dynamic, the world is complicated by, his term, “security trilemmas”—a traditional security dilemma in which there are unintentional tertiary effects.

Contrary to what is true in the physical world, where three points provide more stability than two, in the international arena, triangles may make a situation more unstable and difficult to control (escalation dominance) as they introduce more variables into the algebra of deterrence.<sup>11</sup>

While the immediate threat of major power, nuclear war is not of immediate concern, the playing field is more crowded and less certain, and strategic theory has not kept pace. The strategic environment demands attention to various capabilities, which all provide “different levels of utility for deterrence, war-fighting, coercion, and assurance.”<sup>12</sup>

The ability to deter, to coerce, or to assure all depend upon one’s ability to effectively communicate. The lack of balance presented by the states with strategic—nuclear and otherwise—capabilities complicates the ability of any to effectively communicate. Over seventy years of cold war rivalry, a relationship gradually developed between the USSR and USA, but today’s environment provides no such relationships between strategic partners, save the enduring US-Russian legacy.

At the same time, there remains a common and necessary thread of vagueness surrounding the policies of nuclear states. The US, Britain, and France all have limiting but nonbinding descriptions as to when they would resort to nuclear force if at all. Russia, for example, “reserves the right to use nuclear weapons in response to the use of nuclear and other weapons of mass destruction against Russia and/or its allies...[and in conventional war] when the very existence of the State is under threat.”<sup>13</sup>

<sup>6</sup> Colby 2013, p. 118; Acton 2015.

<sup>7</sup> Colby 2013, p. 51.

<sup>8</sup> Koblentz, 2014, p. 19.

<sup>9</sup> Colby 2013, p. 71.

<sup>10</sup> Koblentz 2014, p. 3.

<sup>11</sup> Delpech 2012, p. 39.

<sup>12</sup> Koblentz 2014, p. 31.

<sup>13</sup> Koblentz 2014, p. 13.

In efforts to reduce the threat of nuclear use, the United States, and other powerful adversaries, are pursuing “non-nuclear precision-guided weapons...for striking critical, time-sensitive targets...[creating] new risks to strategic stability and [making] other states less willing to reduce their own reliance on nuclear weapons.”<sup>14</sup> In regards to strategic weapons, it is the capability rather than the intent of a system that matters for national security policy makers.

In the modern strategic environment, even a bilateral relationship in pursuit of strategic stability is complicated:

The essential idea of strategic stability is that if both sides field forces that are capable of surviving a first strike and can credibly demonstrate to one another that their current and future capabilities cannot deny the other side a viable strategic deterrent, this confidence would eliminate the fear of preemption and the need to launch weapons early, either as irritants in a crisis or as dangers in conflict. This would reduce the danger that nuclear war might begin because of essentially technical “use or lose” or “itchy trigger-finger” fears—concerns that can become very real in crises and conflicts.<sup>15</sup>

Confusion, ambiguity, and pressure are the nemesis of strategic stability. Repercussions of these qualities are a function in part of fundamental aspects of deterrence thought that grew out of the Cold War. Certain modes of thought developed in those years still apply in the current environment. A brief discussion of these principles is thus essential in determining the potential destabilizing effects of hypersonic weapons.

### DETERRENCE THEORY

Nuclear deterrence depends upon psychological elements of calculation for which there are no physical proofs, and it is therefore

<sup>14</sup> Koblentz 2014, p. 24.

<sup>15</sup> Colby 2016.

precarious by nature.<sup>16</sup> Deterrence calculations are made in the context of the strategic environment and the perceived threat from adversaries. At the root of formulating offensive and defensive security measures, as Admiral Richard Mies notes, “Nations don’t distrust each other because they are armed; they are armed because they distrust each other.”<sup>17</sup>

In 2016, policy support for tactical and operational employment of *strategic systems* seems to mirror Spurgeon Keeny’s mapping from the 1980s: those attempting to deter a wider range of actions and “those who are simply trying to carry out their military responsibilities in a more “rational” or cost-effective manner.”<sup>18</sup> The patterns learned in the Cold War still provide lessons for the modern day.

The first principle of importance to note is the fact that, “requirements of deterrence are not static. Rather, technology provides a dynamic variable which affects both the deterrer and the state to be deterred.”<sup>19</sup> This reality is enduring. Policy makers still have to consider the strategic implications of new weaponry.

This dynamic was foretold in writings from the Cold War. “This situation is not peculiar to present force structures or technologies; and, regardless of future technical developments, it will persist as long as substantial nuclear weapon stockpiles remain.”<sup>20</sup> While this new wrinkle—hypersonic weapons—is not necessarily a nuclear weapon issue, the existence of nuclear stockpiles by countries pursuing these technologies necessitates the consideration of these theories.

Perhaps the most telling statement explaining this dynamic is as follows:

Over time, aided by technological advancements in targeting accuracy, new delivery means, and improved command and control mechanisms,

<sup>16</sup> Shultz, et al. 2011.

<sup>17</sup> Mies 2013, p. 43.

<sup>18</sup> Keeny 1981.

<sup>19</sup> Foerster 1982.

<sup>20</sup> Ibid.

competing notions of deterrence have evolved which are more traditional in their roots... *deterrence by denial*... emphasizes the traditional objective of military defense threatening to deny the attacker success in the achievement of military and political objectives, thereby deterring an attempt that would be not only costly but, more to the point, unsuccessful.<sup>21</sup>

A stable dynamic, then, would be one in which neither side saw an incentive to strike first. The advent of an offensive weapon system that could disarm the adversary preemptively is incredibly destabilizing. “If *either* side feels that it could be deprived of a retaliatory capability, then there is a powerful incentive for *both* sides to strike first.”<sup>22</sup>

The duality of the offensive/defensive nature of nuclear weapons is made more complex in that any use would be “physically indistinguishable from weapons which are designed for a disarming first strike.”<sup>23</sup> The new capabilities and resulting considerations coming from the development of hypersonic weapons requires a deeper understanding of the technology itself.

## HYPERSONICS

The deterrent value of hypersonic weapons is summarized by former Assistant Secretary of Defense for International Security Policy Peter C.W. Flory in the following manner:

In this new and uncertain environment, a “one size fits all” approach to deterrence is no longer appropriate; we must re-think our approach to 21st Century threats and tailor deterrence to assure our allies and friends, and achieve specific effects against a wide array of potential adversaries and circumstances, such as advanced military competitors, regional WMD states, and non-state terrorist networks. To do this we must have a

broad range of credible strategic capabilities—including nuclear and non-nuclear Global Strike capabilities, defenses, and a revitalized . . . infrastructure.<sup>24</sup>

There is a value at the strategic level provided by hypersonic weapons. They could provide policy makers with an added dimension of options in a crisis or conflict. From a US perspective there exist “important political and strategic advantages . . . in being able to strike high-value targets having time-sensitive urgency that could not be effectively engaged by currently available conventional strike systems.”<sup>25</sup>

As mentioned before, a great deal of strategic and deterrence thinking comes from the domain of nuclear weapons and policy. For example, a 2014 RAND report on hypersonic technology suggested that hypersonics could be fitted to become a new type of unstoppable nuclear weapon.<sup>26</sup> Interesting, though, Assistant Secretary of Defense for Research and Engineering Stephen Welby said, “There’s nothing in the budget” related to modeling, researching, or exploring nuclear-armed hypersonics by the United States.<sup>27</sup>

The United States Air Force does have a long-term plan for the development of hypersonic technology. The timeframe suggests that a “tactical strike missile” would be the first operational military asset, ready around year 2020. Future plans include an intelligence, surveillance, and reconnaissance (ISR) platform around 2030, and the USAF aspires to produce a “reusable and persistent ISR and strike craft by 2040.”<sup>28</sup>

These systems represent the emerging hypersonic cruise missile variety of weapon. However, two primary categories emerge within the literature: hypersonic cruise missiles and hypersonic maneuvering reentry vehicles. The latter category

<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

<sup>23</sup> Ibid.

<sup>24</sup> Bunn 2011, p. 3.

<sup>25</sup> Bunn 2011, p. 6.

<sup>26</sup> Tucker 2016.

<sup>27</sup> Ibid.

<sup>28</sup> Ibid.



—commonly referred to as boost glide reentry—is the primary focus of concern for this study.

The development process for this technology will likely mirror that for all nations pursuing these capabilities. The technology’s effect on strategic stability will likely center on its strike role—i.e., a boost glide weapon launched via ballistic missile. Existing infrastructure for launching a boost-glide weapon would suggest this would also be the first capability to become operational. Potential effects on strategic stability are therefore most easily framed via boost glide reentry vehicles, although some effects may be true for the cruise missile variety as well.

In assessing possible upsides for the weapon system, a January 2016 Mitchell Institute for Aerospace Studies report offered the following:

Hypersonic weapons offer advantage in four broad areas for US combat forces. They can project striking power at range without falling victim to increasingly sophisticated defenses; they compress the shooter-to-target window, and open new engagement opportunities; they rise to the challenge of addressing numerous types of strikes; and they enhance future joint and combined operations. Within each of these themes are other advantages which, taken together, redefine military power projection in the face of an increasingly unstable and dangerous world.<sup>29</sup>

## CAPABILITIES AND CONSEQUENCES

Operational and tactical competencies provided and enhanced by hypersonic strike systems alone—future developments notwithstanding—are indeed impressive, exciting, and arguably necessary in a modern war scenario. Nevertheless, utilizing these weapons carries risks for those considering the strategic nuclear aspects of warfare.

The speed at which hypersonic weapons travel could have negative *strategic* effects in terms of stability. The *operational* and *tactical* asset of

<sup>29</sup> Hallion 2016, p. 2.

“[shrinking] the ‘time to target’ window” creates a problem in the strategic nuclear domain.

“Fourth dimension” effects of “[getting] inside an adversary’s command, control, and battle management cycle” are also a tremendous asset at the operational and tactical level.<sup>30</sup>

The speed of a hypersonic weapon greatly compresses the so-called “find, fix, track, target, engage, and assess” (F2T2EA) process, enabling US commanders the ability to penetrate an opponent’s decision making process, and as a result, rapidly put an adversary on the defensive.<sup>31</sup>

However, regarding escalation control and incentives to strike first, the same capability becomes dangerous. By forcing an adversary’s decision making process, a rushed choice could lead to mistakes or misinterpretations. This is not desirable at the strategic level. An adversary fearing the destruction of its strategic weapons could feel the need to employ those weapons preemptively. “‘Strategic’ does not just mean nuclear.”<sup>32</sup>

Hypersonic weapons provide unprecedented promptness and global reach. “A theater-ranging hypersonic missile will reach a target 1,000 miles distant within 17 minutes or less.”<sup>33</sup> The range of these weapons compounded with accuracy creates further pressure on decision makers in a crisis to feel as though their interests are held at immediate risk.

Hypersonic weapons could effectively prosecute command, control, and communications (C3) points, key leadership, and key ground, naval, and maritime targets. Hypersonic strike weapons could more effectively engage high value targets... The speed and reach of hypersonic strike could preempt the launch of a theater ballistic missile. Hypersonic weaponry could also address

<sup>30</sup> Ibid., p. 13.

<sup>31</sup> Ibid., p. 8.

<sup>32</sup> Bunn 2011.

<sup>33</sup> Hallion 2016, p. 13.

the challenge of hardened and buried targets.<sup>34</sup>

In the context of a nuclear crisis or the mindset of a strategic adversary, these aforementioned capabilities are themselves a forcing function for fearful, mistake-prone, and escalatory reactions. The mere perception of a capability regardless of intent is potentially destabilizing at the strategic level.

The payload along with the kinetic ability of the weapon system is also concerning at the strategic level. A hypersonic weapon could be nuclear armed or provide combat effects like an anti-ship ballistic missile (ASBM).<sup>35</sup> The capability to strike at hypersonic speed creates devastating effects: when dropped on one's foot, a bowling ball inflicts a great deal of pain; the effect of a conventional payload, though, is amplified greatly once the "bowling ball" is shot from a cannon.

Concerns about nuclear ambiguity have been at the forefront of hypersonic debate in the United States since "2006, when President George W. Bush's administration first announced plans to replace the nuclear warheads on some Trident II D5 ballistic missiles with conventional weapons."<sup>36</sup> Inability to distinguish launch of a conventional versus nuclear missile resulted in Congress halting the program. Hypersonic weapons might also be indistinguishable between nuclear and non-nuclear variants—especially when launched from great distances. The strategic effects of conventional hypersonic weapons in any case complicate the analysis, which favors the argument that instability after deployment by any state party would increase.

One solution to the warhead ambiguity issue was the suggestion that a state could observe the flight path of a weapon and determine that non-ballistic reentries were non-nuclear. This is complicated for a number of reasons, the first of which being that there may be no reason to assume non-ballistic, boost-glide trajectories carry only conventional weapons. Further, given the current

technology, "[the state] would see the launch of a weapon that would quickly disappear from view, and the remainder of the flight path would be untraceable given current technology."<sup>37</sup> Another mitigating factor offered by the Air Force would be segregation. Ballistic missiles containing conventional, boost glide reentry vehicles would be positioned far and apart from the nuclear arsenal. "Two potential bases included Vandenberg Air Force Base on the West Coast and Cape Canaveral on the East Coast."<sup>38</sup>

Maneuverability of reentry vehicles is a double-edged sword. Boost-glide reentry vehicles could allow a hypersonic weapon "to avoid flight over third party nations when approaching the target."<sup>39</sup> This same quality would permit the weapon after launch to "radically change its trajectory to avoid missile defenses."<sup>40</sup> These tactical advantages are sometimes referred to as destination ambiguity, which, unfortunately, at the strategic level "could potentially lead a different adversary to conclude that they were under attack, risking inadvertent escalation. (The risk would be even greater if the observing state also misidentified [a conventional] weapon as nuclear armed.)"<sup>41</sup>

Lockheed Martin's Skunk Works® conception of a hypersonic weapon advertises "responsive strike capability on time-critical, heavily defended targets and...high survivability through altitude, speed and stealth."<sup>42</sup> Such capability at the tactical level would overwhelm or evade enemy air defense systems. Yet, these same systems *of the adversary* provide mutual strategic benefit in terms of psychological reassurance. A single target, removed by a hypersonic weapon in a successful tactical strike could have drastically different, destabilizing consequences at the strategic level.

<sup>34</sup> Ibid., p. 17.

<sup>35</sup> Fisher 2015.

<sup>36</sup> Bunn 2011, p. 17.

<sup>37</sup> Ibid., p. 17. This is accurate as of 2011; the capability may or may not have advanced since then.

<sup>38</sup> Woolf 2015, p. 14.

<sup>39</sup> Kable Intelligence Ltd. 2016.

<sup>40</sup> Fisher 2015.

<sup>41</sup> Bunn 2011, p. 17.

<sup>42</sup> Lockheed Martin 2016.

## CONCLUSION

Viewed through the lens of a tactical/operational versus a strategic mindset, the same set of capabilities can be either encouraging or terrifying.

Instead of working to establish air superiority, establish tanker support, position personnel recovery assets, establish airborne command and control networks, prosecute electronic warfare, and infiltrate attack platforms through myriad defenses, a hypersonic strike would unfold far more rapidly, with far fewer support requirements. Unable to intercept these high speed weapons, a first strike wave could simultaneously eliminate the most heavily defended enemy nuclear facilities and key targets in a fraction of the time, at a much lower threshold of risk to attackers.<sup>43</sup>

The development of hypersonic weapons technology is likely to be perceived as an effort to deny other states their retaliatory nuclear capability—and achieve a splendid first strike, one of Schelling and Halperin’s conditions for strategic instability.<sup>44</sup> In fact, nearly every provocative narrative warned of by Schelling and Halperin at the start of the Cold War is revisited in the modern security environment by today’s nonnuclear strategic weapons, which lie outside the nuclear “taboo” established gradually after 1945.

While the strategic arena is complex, with new players and new capabilities, it is important to recognize that strategic stability and deterrence principles have the same roots as during the Cold War and before that in the history of warfare. “To modify and adapt Clausewitz, nuclear weapons changed the grammar of deterrence, not its character.”<sup>45</sup>

Hypersonic weapons—conventional or nuclear, ours or theirs—further complicate the equation. Efforts to ease strategic miscalculation must also be stressed in coming years as the global security environment continues to shift.

As Dr. Acton advocates, all parties pursuing hypersonic weapons should take steps to assess the full range of escalation risks.<sup>46</sup> And as industry experts state, “Hypersonics technologies and weapons are both vitally important and inevitable.”<sup>47</sup> This being the case, statesmen, military professionals, and industry leaders should consider the strategic implications of serving tactical and operational targets with hypersonic weapons.

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<sup>43</sup> Hallion 2016, p. 4.

<sup>44</sup> Koblentz 2014, p. 26.

<sup>45</sup> Colby 2013, p. 87.

<sup>46</sup> Acton 2015.

<sup>47</sup> Hallion 2016, p. 25.



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