

# The Dragon's Tail: Deterring China in an Era of Maneuverable Hypersonic Weapons

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## ABSTRACT

Maneuverable hypersonic weapons can travel at five to twenty-five times the speed of sound and maneuver along pre-planned routes prior to striking their assigned target(s), unlike traditional ballistic missiles. These weapons are extraordinarily powerful even without a warhead, as the energy of a 20-kilogram brick at Mach 6 would have the same explosive force as a Mk-84 2,000lb bomb. As this new technology matures, paradigm shifts in how great powers deter and conduct warfare will mandate reevaluation of deterrence concepts and theory. This research presents and analyzes three distinct options for U.S. deterrence theory against five Joint Planning Process evaluation criteria. The study finds that developing and deploying a dual-capable Hypersonic Cruise Missile leverages mutual vulnerability and escalation dominance to mitigate the asymmetric benefit gained by China as the best course of action.

**Keywords:** Hypersonic Weapons, nuclear deterrence, great power competition, China, Warfare

## La cola del dragón: disuadir a China en una era de armas hipersónicas maniobrables

### RESUMEN

Las armas hipersónicas maniobrables pueden viajar entre cinco y veinticinco veces la velocidad del sonido y maniobrar a lo largo de rutas planificadas previamente antes de alcanzar sus objetivos asignados, a diferencia de los misiles balísticos tradicionales. Estas armas son extraordinariamente poderosas incluso sin una ojiva, ya que la energía de un ladrillo de 20 kilogramos a Mach 6 tendría la misma fuerza explosiva que una bomba Mk-84 de 2.000 libras. A medida que esta nueva tecnología madure, los cambios de paradigma sobre cómo las grandes potencias disuaden y conducen la guerra exigirán una reevaluación de los conceptos y la teoría de la disuasión. Esta investigación presenta y analiza tres opciones distintas para la teoría de la disuasión estadounidense frente a cinco criterios de evaluación del Proceso de Planificación Conjunta. El estudio encuentra que el desarrollo y despliegue de un misil de crucero hipersónico de doble capacidad aprovecha la vulnerabilidad mutua y el dominio de la escalada para mitigar el beneficio asimétrico obtenido por China como el mejor curso de acción.

**Palabras clave:** Armas hipersónicas, disuasión nuclear, competencia entre grandes potencias, China, Guerra

## 惹麻烦：在可操纵高超音速武器时代下威慑中国

### 摘要

与传统弹道导弹不同，可操纵高超音速武器能以5到25倍的音速行进，并在打击指定目标之前沿着预先计划的路线进行操纵。即使没有弹头，这些武器的威力也非常强大，因为20公斤重的砖块在6马赫时的能量与Mk-84 2,000磅炸弹的爆炸力相同。随着这项新技术的成熟，大国在阻止和发动战争的方式上所出现的范式转变将要求重新评价威慑概念及理论。本研究根据5项联合规划过程(Joint Planning Process)评价标准，提出并分析了美国威慑理论的三种独特选择。研究发现，开发和部署双功能高超音速巡航导弹是最佳的行动方案，其能利用相互脆弱性和（冲突）升级优势来减轻中国获得的不对称利益。

**关键词：**高超音速武器，核威慑，大国竞争，中国，战争

## Introduction

“The nature of war is immutable because it involves human beings. The character of war changes. Frequently, **oftentimes, by technologies,** sometimes by demographics or politics.”

—General Mark Milley, 20<sup>th</sup> Chairman of the Joint Chiefs of Staff

During the recent commissioning of an Australian hypersonics research center, Australian Defense Minister Peter Dutton described the development of Maneuverable Hypersonic Weapons (MHWs) as “the most strategic change to the strategic environment since the end of World War II.”<sup>1</sup> Further, the Missile Defense Agency (MDA) Director, Vice Adm John Hill, noted that though they can detect the initial launch of a maneuverable hypersonic weapon, the United States cannot currently track, target, or engage MHWs employed against the United States or its vital interests.<sup>2</sup> Such an exposed vulnerability is especially concerning as MHWs are “dual-capable” of either conventional or nuclear payloads and represent a new, exotic means of providing immediate regional or global strike that is entirely different from nuclear intercontinental ballistic missiles (ICBMs) and sub-sonic, air-breathing cruise missiles.

The central question is: *In an environment of long-term “Strategic Competition,” under what conditions can the United States successfully deter China from employing dual-capable, maneuver-*

*able hypersonic weapons?* This question requires exploring classical and contemporary deterrence theory and considering the Chinese perspective regarding conventional and nuclear MHW development, purpose, and use of such weapons. Accordingly, this research offers deterrence posture options the United States should consider in forming a modern deterrence framework addressing the vulnerabilities presented by dual-capable MHWs employed against the U.S. interests. The purpose of this research is to investigate a deterrence solution until an available, cost-effective, and reliable solution is available to defend against Chinese employment of dual-capable MHWs against the United States or its interests.

By definition, MHWs are weapons capable of traveling at five to twenty-five times the speed of sound and maneuvering along pre-planned routing before striking their assigned target(s), unlike traditional ballistic missiles that follow a predictable ballistic profile from launch to impact<sup>3</sup> (Fig. 1). In this new class of weapon, there are three predominant types of delivery methods: air-breathing hypersonic cruise missile (HCM), boost-glide hypersonic glide vehicle (HGV), and fractional orbital bombardment system (FOBS).<sup>4</sup> First, an air-breathing HCM may be launched from an airplane, ship, or vehicle and utilizes a scramjet engine, which propels the cruise missile to hypersonic speeds. Historically, igniting such an engine is extremely difficult and described as lighting a match in a 2,000-mph wind storm.<sup>5</sup> Once the

scramjet engine is “lit,” the weapon can fly at low-level altitudes, using its speed and the curvature of the Earth to delay detection by early warning radars until just before reaching its target.<sup>6</sup> Second, the boost-glide HGV can be launched from an airplane, ship, or missile silo. To launch the weapon, the HGV payload is boosted by a rocket motor similar to a ballistic missile, and upon re-entry into Earth’s atmosphere, the HGV payload is released, executes a “pull-up” maneuver, and aerodynamically

skips unpowered along the upper atmosphere at hypersonic speeds and maneuvers in the “glide phase” towards its intended target before transitioning to the “terminal phase” (or delivery) of the strike.<sup>7</sup> Finally, the FOBS uses an ICBM-class rocket booster to place the HGV payload in a fractional low-earth orbit (i.e., less than one complete orbit), intentionally de-orbits, re-enters the atmosphere, and initiates the same “pull-up” maneuver accomplished by the non-orbital HGV weapon.

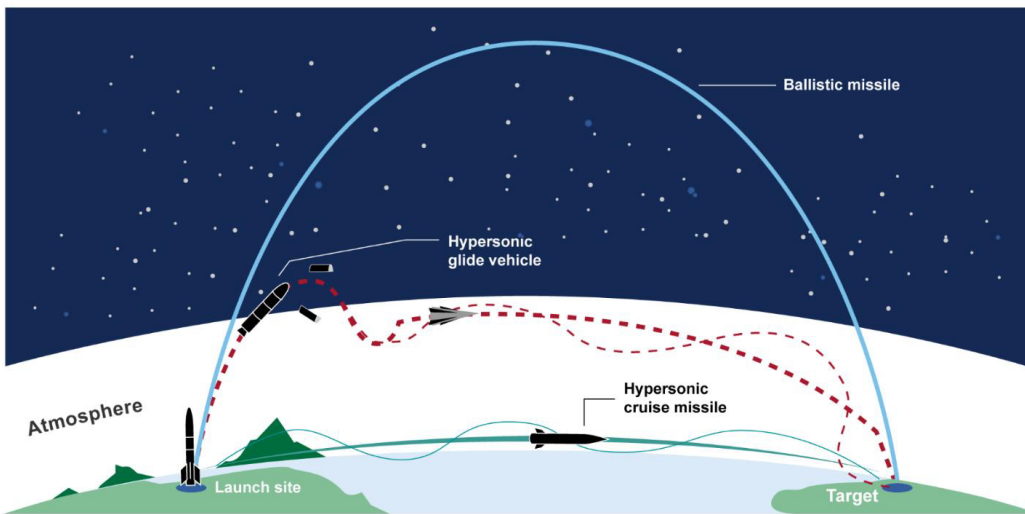


Figure 1. Maneuverable Hypersonic Weapon profiles compared to a traditional ballistic missile profile. Note: the FOBS profile is not depicted. (Reprinted from report, Shannon Bugos and Kingston Reif, Arms Control Association, subject: Understanding Hypersonic Weapons, September 2021.)

The Joint Chiefs of Staff Chairman, General Milley, recently described the Chinese FOBS test as a “Sputnik Moment.”<sup>8</sup> The Chairman went further, describing China and Russia’s recent MHW technological advances as unprecedented technological developments.<sup>9</sup> These comments echo Giulio Douhet’s warning that the character of future conflict would be entirely dif-

ferent from previous conflict and that “victory smiles upon those who anticipate the changes in the character of war.”<sup>10</sup> However, in light of the Chairman’s beliefs and these prophetic words, the USAF has not incorporated MHWs into its Strategic Attack Doctrine.

This revolutionary technological advance presents the United States Government (USG) with the extreme chal-

lenge of defending against such weapons. Firstly, HCMs penetrate an A2/AD environment by exploiting a low-level approach with blistering speed and maneuverability, compressing an enemy's reaction time and ability to execute a meaningful defense. Secondly, an HGV employed by the FOBS is uniquely troubling because while space-based assets may easily detect its launch, it can exploit the north-facing, early-warning radar system by delivering the HGV on an avenue of approach "behind" the detectable region.<sup>11</sup> Moreover, in both cases of an HCM or HGV attack, the distinctive maneuverability of the weapon adds ambiguity to the intended target because traditional ballistic missile detection and tracking systems cannot predict where the weapon will hit. Adding to their complicated nature, MHWs can be extraordinarily powerful even without a warhead, as the energy of a 20-kilogram brick at Mach 6 would have the same explosive force as a Mk-84 2,000lb bomb.<sup>12</sup>

In response to the Chinese FOBS test, the Commander of NORAD and United States Northern Command, Gen Glen VanHerck, commented that Chinese capabilities would "provide significant challenges to my NORAD capability to provide threat warning and attack assessment."<sup>13</sup> Adm Charles Richard, commander of U.S. Strategic Command, recently testified to Congress that the FOBS weapon "flew over 25,000 miles for more than 100 minutes."<sup>14</sup> Douhet comically predicted attempts to shoot down an airplane, much like a ground-based interceptor might currently attempt to intercept

a MHW: "like a man trying to catch a homing pigeon by following him on a bicycle."<sup>15</sup> In a recent interview, Amb Robert A. Wood noted that "[w]e just do not know how we can defend against that [hypersonic] technology. Neither does China or Russia."<sup>16</sup> For these reasons, the problems created by these new MHWs as they relate to a new era of long-term "Strategic Competition" (formerly, "Great Power Competition").<sup>17</sup> Moreover, MHWs are currently uncontested by traditional ballistic missile defense (BMD) systems, given their unique maneuvering capability, blistering speed, and ability to exploit over-the-horizon early-warning blind spots. MHWs tend to operate "in the seams" between space-based sensors and ground-based radars, and even if the detection and tracking systems could effectively forewarn against such a weapon, the new U.S. Navy SM-6 GBI missile may not be able to engage an MHW in the terminal phase. Because of this, the MDA recently funded three GBI missile contracts and two Hypersonic and Ballistic Tracking Space Sensor (HBTSS) satellites to present a reliable defense by the decade's end.<sup>18</sup>

In his most recent publication on the return of great power rivalry, Dr. Matthew Kroenig echoed Douhet by saying, "[s]tates that push the technological frontier of military technology and, importantly, that can develop the new operational concepts to employ the technology on the battlefield, have an advantage over those that do not."<sup>19</sup> Unfortunately, in 2021, the former Vice Chairman of the Joint Chiefs of Staff, General John Hyten, acknowledged

the United States is trailing China specifically by noting, “China has accomplished hundreds of hypersonic weap-

ons tests compared to only 9 U.S. tests in the last five years.”<sup>20</sup>

**Table 1.** Maneuverable Hypersonic Weapons Programs in Development

Weapon	Country	Type	Delivery Platform	Range (km)	Speed (Mach)	Nuc/Conv	IOC Date
DF-ZF (WU-14)	China	HGV	DF-17/DF-26	1,800-2,500	5-10M	Nuc/Conv	2020
FOBS	China	HGV	Long March-2F Y13	Unlimited	UNK	UNK	UNK
Xing Kong-2 (Starry Sky-2)	China	"Waverider"	UNK	UNK	6M	Nuc	2025
AVANGARD (Yu-71 or '4202')	Russia	HGV	ICBM	6,000+	20M+	Nuc	2019
TSIRKON (or ZIRCON)	Russia	HCM (anti-ship)	Submarine	500-1,000	5-8M	Conv	2023
KINZHAL (Kh-47M2)	Russia	ALBM	Airplane	2,000	10M	Nuc/Conv	2018
Hwasong-8	DPRK	MaRV (HGV?)	IRBM	700	10M	Nuc/Conv	2021
ARRW (Lockheed Martin)	US	HGV	Airplane	1,600	6.5-8M	Conv	UNK
HAWC/HACM (DARPA)	US	HCM	Airplane	UNK	5M+	Conv	UNK
USA LRHW (Dark Eagle)	US	HGV	Vehicle	2,775	5M+	Conv	2023
USN Conventional Prompt Strike	US	HGV	Destroyer/SSGN	UNK	5M+	Conv	2025/2028
Southern Cross Integrated Flight Research Experiment (SCIFIRE)	US/AUS	Boosted/A-B HCM	F-18/F-35/P-8	UNK	5M	Conv	2027-2032

*Adapted from* Shannon Bugos and Kingston Reif, Arms Control Association, subject: Understanding Hypersonic Weapons, September 2021.

As the world’s front-runner on MHW developmental technology, China’s current hypersonic weapons testing demonstrates unprecedented capability in hypersonic weapons development. Many have claimed (including the current Secretary of the Air Force, Mr. Frank Kendall) that the United States is now in a “hypersonic arms race” with China.<sup>21</sup> China is the top pacing challenge for the United States, and analysts predict China is intentionally adding MHWs to its deterrence posture to disrupt the U.S. strategic superiority mindset.<sup>22</sup> China showcased its premier hypersonic weapon, the DF-17, with a DF-ZF HGV payload during a parade in October 2019.<sup>23</sup> Mounted on a medium-range ballistic missile rocket similar to the DF-15, this new weapon system could serve as a dual-capable weapon to defeat U.S. missile defense systems. Of note, U.S. senior military leaders assess that only eight conven-

tional DF-ZF HGV weapons would be needed to sink a U.S. aircraft carrier successfully.<sup>24</sup> China’s FOBS test used an HGV deployed from a Long-March-2F Y13 rocket in their most recent test. This test was astounding because it likely released an unknown projectile from the HGV during the glide phase, which was previously considered an impossible task.<sup>25</sup> Finally, FOBS vehicles present an unexpected problem to U.S. early warning and missile defenses because they can approach from “behind” the early-warning, over-the-horizon radar system.

The United States re-ignited its pursuit of an air-breathing hypersonic cruise missile program from 2005-2010 in the form of the Boeing X-51 “Wave Rider.” The “Wave Rider” served as a scramjet-powered hypersonic capability demonstrator but, unfortunately, was canceled after one successful test flight and a litany of previously failed flight

tests. It was not until 2018 that the U.S. re-branded its pursuit of a hypersonic weapon through both the U.S. Air Force's AGM-183 Advanced Rapid Response Weapon (ARRW, pronounced "arrow"; boost-glide HGV) program and the Hypersonic Conventional Strike Weapon (HCSW, pronounced "hacksaw"; HCM). Both platforms are air-launched and have suffered under receding defense funding after several failed flight tests. Only since late 2021 has the Defense Advanced Research Projects Agency's (DARPA) Hypersonic Air-breathing Weapon Concept (HAWC, pronounced "hawk," also known as the "Hypersonic Air-breathing Conventional Munition," HACM; HCM) designed by Raytheon and Lockheed Martin passed full-scale flight tests, of which Lockheed Martin's design set a new record in March 2022 for sustained hypersonic flight. The weapon flew for 327 seconds at 65,000 ft for 300 miles.<sup>26</sup> In a parallel joint effort, the Army and Navy are developing a "surface-to-surface" long-range MHW capability which will yield 18 U.S. Army "DARK EAGLE" weapons (HGV) valued at \$7B and 240 U.S. Navy Conventional Prompt Strike (HGV, also known as the "Conventional - Hypersonic Glide Body;" C-HGB) missiles valued at \$21.5B.<sup>27</sup> These weapon systems will be fielded by 2023 and 2025, respectively, as part of the Pentagon's effort to speed the development of MHWs.<sup>28</sup> In total, the Pentagon's request for \$3.8B in hypersonic development spending for five programs across all services in FY22 is a clear sign of the importance of this technology.<sup>29</sup> While the U.S. re-

mains late to need in this renewed effort to develop MHW technology, China, Russia, and recently North Korea have touted the development, successful testing, and operational deployment of their MHWs, as shown in Table 1. These technological leaps ahead of the United States by China and Russia offer a fresh opportunity to consider a modern nuclear deterrence posture to address the future nuclear stability paradigm in the liberal, rules-based, international world order.

## Theory & Analysis

"Deterrence is the art of producing in the mind of the enemy ... the fear to attack."

—Dr. Strangelove

### *Deterrence Theory*

In Latin, "deterrence" means "to frighten from or away."<sup>30</sup> As such, it works by retraining or preventing an adversary from acting because of perceived danger or trouble.<sup>31</sup> Thus, to be effective, deterrence is the "manipulation of an adversary's estimation of the cost/benefit calculation of taking a given action ... thereby convincing the opponent to avoid taking that action."<sup>32</sup> Joint Publication 1, *Doctrine for the Armed Forces of the United States*, summarizes "deterrence" as "a state of mind brought about by the existence of a credible threat of unacceptable counteraction."<sup>33</sup> In considering various forms of deterrence, Thomas Schelling describes deterrence as a "threat that leaves something to chance."<sup>34</sup> The un-

certainty of a deterrent threat allows for a competition in risk-taking by adversaries as they both may choose to manipulate the risk in a crisis to accomplish their own political goals.<sup>35</sup>

First, to effectively apply a deterrent threat in a strategic environment, the deterrer may choose to deter by denial or punishment. Deterrence by denial leverages doubt that a particular action by the adversary will succeed by placing obstacles or threatening force which would inhibit the action.<sup>36</sup> This form of deterrence focuses on coercion and makes success doubtful by driving up the cost of the operation.<sup>37</sup> It denies the adversary the ability to achieve their desired goals through preferred or available means. Likewise, deterrence by punishment raises the perception of the resultant costs above what the adversary views as an acceptable, expected cost for the behavior.<sup>38</sup> In this form of deterrence, the deterrer holds something the aggressor values (e.g., civilian population) at risk as a powerful incentive to make another choice.<sup>39</sup> Second, deterrence must be considered credible in order for it to have its desired influence on the adversary. Credibility, in this instance, is a combination of the demonstrated capability to accomplish the communicated threat and communicated will of the deterrer to act on the threat. Lawrence Freedman frames the question as, “Does the enemy believe that the threats would be enforced?”<sup>40</sup> Finally, the deterrer must understand the nature of escalation in a deterrence relationship.

Herman Kahn defines this concept of escalation as “a competition in risk-taking, or resolve and matching local resources, in some form of limited conflict between two sides.”<sup>41</sup> Mueller expounds on this by identifying that the “first goal” of escalation is to “make the target choose not to attack even though it has the ability to do so.”<sup>42</sup> Likewise, Schelling argues that the nature of escalation increases the shared risk of escalation with each action and reaction by the adversaries.<sup>43</sup> While escalation is naturally understood to ascend vertically (i.e., increasing intensity or lethality), escalation can also occur horizontally (i.e., additional targets in a theater or expanding conflict to additional theaters and domains).<sup>44</sup> To better understand the nature of escalation, Kahn describes vertical escalation as a metaphorical “escalation ladder.”

On this ladder, Kahn illustrates how escalation can incrementally rise along each of the 44 rungs he identifies.<sup>45</sup> These 44 rungs offer a conduit to exercise deterrence at any level while confining the enemy to a level far below its capability.<sup>46</sup> Consequently, Bernard Brodie’s conceptualization of escalation aids Kahn’s perspective on escalation theory by establishing clear thresholds by which a deterrer can set clear precedents in how they articulate their escalation strategy.<sup>47</sup> In doing so, Larsen and Kartchner describe how escalation dynamics can cause intense pressure for hesitancy or restraint in a conflict, further strengthening the nature of deterrence.<sup>48</sup> Figure 2 below depicts Kahn’s famous escalation ladder.



**AN ESCALATION LADDER**  
**A Generalized (or Abstract) Scenario**

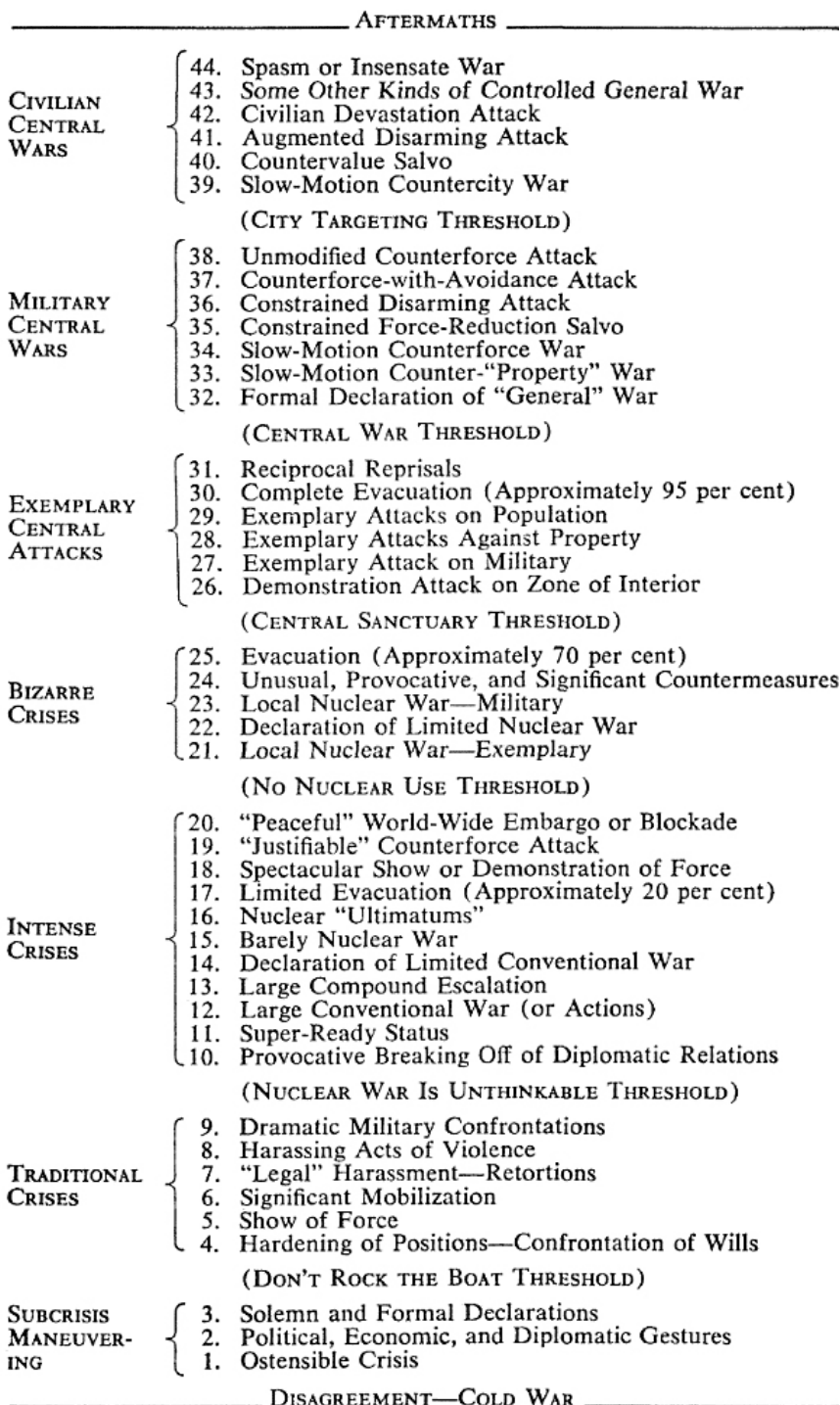


Figure 2. Kahn's Escalation Ladder.

(Reprinted from *On Escalation* by Herman Kahn, 1965, p. 39)

A key feature in Kahn and Schelling's escalation theories is the concept of "escalation dominance." Formally stated, "escalation dominance relies on superior brute force and war-winning strategy coupled with a credible threat" to communicate resolve in escalating to a level that the adversary will not.<sup>49</sup> Similarly, Larsen and Kartchner emphasize the importance of asymmetry paired with a credible ability to dominate conflict at any level of violence.<sup>50</sup> Because of this, in a future contingency, the United States might leverage an asymmetric nuclear capability to establish escalation dominance against a future adversary.<sup>51</sup> If used correctly, escalation dominance can eliminate the adversary's desire to escalate by raising the stakes enough to force capitulation instead of continued aggression. Thus, Kahn theorizes there is greater capability in a deterrence posture than a capability in being.<sup>52</sup> Moreover, to set the necessary conditions for escalation dominance, Kahn recommends a state achieve strategic superiority, secure a second-strike capability (e.g., SSBN or mobile ICBM), and provide relative safety for the civilian population.<sup>53</sup> MHWs can offer exquisite asymmetry and capability in posture, further strengthening a state's capacity for establishing escalation dominance at the outset of a conflict. However, in managing escalation, three critical considerations should be understood.

First, Larsen and Kartchner caution against inadvertent escalation based on miscalculation, miscommunication, or misunderstanding of enemy "red lines."<sup>54</sup> According to Miller, a state must foster the enemy's percep-

tion of the penalty for these errors to combat this possibility.<sup>55</sup> Second, Kahn offers that if a state chooses to de-escalate a conflict, there are three predominant avenues. These avenues are for a state to escape the costs of escalation, receive insurance from the adversary against the possibility of future escalation, or engage in bargaining with the adversary.<sup>56</sup> Third, Kahn acknowledges an unlikely possible paradox in escalation, specifically as it relates to nuclear conflict, that due to the fear caused by a nuclear attack, there might be no actual escalation between the adversaries.<sup>57</sup>

### ***Understanding the Operational Environment: China***

In analyzing the OE, the results provide an awareness of the strategic environment, defined as the "conditions, circumstances, and influences that [a]ffect national interest in and beyond the OE."<sup>58</sup> This analysis is critical to understanding relevant relationships and the interconnected nature of an adversary as a more extensive "system of systems" with factors that influence its behavior.<sup>59</sup> Thus, it is vital to understand China's perspective on strategic deterrence, Chinese aspirations and fears, and how China views the deployment of U.S. MHW technology.

Historically, China views itself as a regional hegemon with thousands of years of history and influence in the Indo-Pacific region. Neil Munro describes China's "geo-body" as constructed Chinese homeland territory in the region and instrumental in rejuvenating China's regional power.<sup>60</sup> This "geo-body" is

defined as Tibet, Taiwan, Hong Kong, and Xinjiang.<sup>61</sup> As China persists in its domination of East Asia, Munro contends that China would not risk war over a territorial objective that falls outside of the “geo-body.”<sup>62</sup> Therefore, as the sole territory outside of Chinese influence and control, Taiwan presents an essential objective for China to pursue. President Xi Jinping continues to tout a “China Dream” in 2049 as an impetus for reversing the “Century of Humiliation” suffered by China until 1949.<sup>63</sup> With this in mind, it is imperative to understand the views that shape China’s nuclear deterrence rationale, which informs why China is pursuing MHWs in the face of a strategically superior United States and what the United States can do to establish an effective deterrence posture with China.

China’s view of nuclear deterrence is fundamentally different from the United States’ view of deterrence.<sup>64</sup> Specifically, China sees nuclear deterrence as defensive in nature, and they criticize the United States’ “offensive” perspective in using nuclear weapons to establish deterrence.<sup>65</sup> The root of this perspective traces back to Chairman Mao Zedong, who believed China needed a small nuclear force to achieve “minimum deterrence” while avoiding the nuclear arms race between the United States and the Soviet Union.<sup>66</sup>

Viewed as part of the “third technological revolution” along with quantum computing and artificial intelligence, China is pursuing a new idea of “rapid response” within active defense (i.e., missile penetration capability) to deter the United States from threaten-

ing Chinese interests by having a means to defeat U.S. missile defense measures.<sup>67</sup> This “rapid response” capability also defends Chinese state interests and anticipated military conflict in the SCS and ECS.<sup>68</sup> MHW technology provides national prestige and security by building “strategic reassurance and mutual strategic restraint” in the Indo-Pacific.<sup>69</sup> Thus, the current assessment of Chinese hypersonic thinking is that China is not seeking parity with the United States but is not allowing itself to be limited to parity. In doing so, China’s stated focus is pursuing performance over size in their nuclear requirements.<sup>70</sup> Because of this, China is focusing on building credible escalation management capabilities in place of a posture of strategic equivalence.<sup>71</sup> When paired with the recent Chinese FOBS demonstration, this affirms the Chairman’s belief that China desires to achieve parity with the United States in the Indo-Pacific region by 2027 and parity, or even superiority, with the United States military by 2040.<sup>72</sup>

In developing MHWs for its use, China views the critical benefit of extreme speed, maneuverability, intercontinental range, precision, and penetration survivability as critical capabilities that can ensure the Chinese strategic nuclear deterrent while also delivering conventional strikes against heavily defended high-value targets.<sup>73</sup> Ironically, China appears to view dual-capable MHW technology as an opportunity to enable asymmetric escalation in a conflict with the United States, yet they do not consider escalation something that can be controlled in a nuclear war.<sup>74</sup>

Thus, China sees adopting innovative military technology, such as MHWs, as part of a broader effort to increase its hegemony in the Indo-Pacific while simultaneously restabilizing the strategic balance between itself and the United States.<sup>75</sup> This regional expansion and effort to stabilize their relationship with the U.S. might be why China is pursuing expanding its MHW arsenal by retrofitting DF-21 intermediate-range and DF-26 intercontinental-range ballistic missiles with HGV payloads for preemptive global strike capability.<sup>76</sup> In summary, China's nuclear strategy, historical fears, and perceived utility of MHWs in their conventional and nuclear forces presents the United States with a tremendous problem in light of a current inability to defend against such a threat. Thus, the United States requires a strategic deterrence posture that can credibly deter China from leveraging its asymmetric advantage to capture regional hegemony in the Indo-Pacific.

### ***Defining the Problem, Identifying Assumptions, and Developing COAs***

Secretary of the Air Force, Mr. Frank Kendall, recently said, "The United States needs deterrence that defeats aggression."<sup>77</sup> The United States must also maintain the ability to reestablish strategic deterrence should it fail. In doing so, a deterrence posture should provide the President two fundamental paths when attempting to restore deterrence: (1) impose a cost on the adversary they did not calculate (punishment) or (2) hold a vital target at risk the adversary did not

know the United States could hold at risk. Finally, the nature of establishing a deterrence posture should consider the impact of various assumptions.

### ***Identifying Assumptions***

The JPP methodology uses assumptions to discover how certain beliefs about the OE "enables the operational design to identify the areas of greatest risk to a mission."<sup>78</sup> Dr. Reilly describes the key characteristics of assumptions as "logical, realistic, and enable planning to continue."<sup>79</sup> Assumptions about U.S. strategy and capability in the analysis include the following. First, Air Force doctrine emphasizes rapid power projection from the United States has become our predominant defense strategy.<sup>80</sup> Second, long-range systems are essential to crisis management because they respond rapidly without the chaotic and slow mobilization of traditional land or naval forces.<sup>81</sup> Third, there is a prevalent assumption that new technology, such as MHWs or BMD, will allow great powers to escape from mutual deterrence (i.e., stalemate) with other nations that have a nuclear deterrent.<sup>82</sup> Finally, it is assumed that the operational deployment of such exquisite capabilities as MHWs offers the user the leverage needed to broker important power transitions regionally or in the international system.<sup>83</sup> While not comprehensive, critical assumptions that equally apply to the United States and China influence COA development.

In evaluating the effect of MHW technology in the United States and China, Dr. Acton notes that both na-

tions appear to be developing the nascent weapons as an outgrowth of the broader technological surge in the field rather than a function of a strategic plan.<sup>84</sup> As such, as the Congressional Research Service notes, the tremendous growth of MHW technology is not a traditional numerical “arms race” like what was experienced during the Cold War but rather a competition in technology development.<sup>85</sup> Additionally, developing a military-specific application of MHW technology is assumed to be cost-prohibitive in large volume and, thus, only fielded in quantities for either state in the “tens” to “hundreds” category. A recent Sandia National Laboratory report estimated an HGV’s “per unit” cost at \$26-36M.<sup>86</sup> While comparable in size to the AGM-158 Joint Air-to-Surface Standoff Missile (JASSM), an HGV or HCM requires highly sophisticated design, heat-resistant construction, and materials that will exorbitantly drive production, maintenance, and supporting infrastructure costs to levels that cannot support more than a “niche” capability. Lastly, two factors are assumed to directly influence a nation’s offensive/defensive advantage: technology and geography.<sup>87</sup>

## ***COA Presentation***

### **COA 1: Conventional Standoff Munitions**

Theory: The nature of this posture focuses on speaking to enemy fears, identifying specific targets, and setting thresholds (i.e., “red lines”) under which the United States will attack.<sup>88</sup> While China has a demonstrated FOBS HGV

capability, the United States enjoys significant strategic superiority in all three legs of the nuclear triad. As such, this posture uses the current nuclear triad as a compilation of assured retaliation, strategic superiority, and a flexible, visible, and recallable force. This posture reflects Bernard Brodie’s advice to establish a focus on “prevention of conflict” as its primary purpose.<sup>89</sup> Additionally, Brodie’s perspective offers a posture of assured destruction enabled by the nuclear triad is sufficient for nuclear deterrence. However, as a counterbalance to this posture, former Secretary of State Henry Kissinger notes that there is a point at which additional strategic superiority in destructive power does not add additional strategic benefit.<sup>90</sup> Finally, in promoting deterrence, the United States must understand that deterrence stability is reinforced by degrading any confidence the adversary may have in an attack’s coercive or strategic intent.<sup>91</sup>

#### **Offensive Posture:**

- Conventional standoff munitions such as the JASSM and Tomahawk Land Attack Missile (TLAM) provide long-range, moderate penetrating capability as conventional options below the nuclear threshold.
- ICBMs provide mutual vulnerability with Chinese mobile ICBMs.
- Submarine-launched Ballistic Missiles (SLBMs) provide assured retaliation to a large nuclear strike.
- Bombers (B-52/B-2) provide visibility, flexibility, dispersibility, and recallability.

**Table 2.** COA 1 Offensive Deterrence Posture Matrix (Response Options)

	<b>US Indo-Pacific Regional Interest or Territory</b>	<b>CONUS/Hawaii or NC3 Systems</b>
<b>Adversary Conventional MHW Attack</b>	JASSM/TLAM	(Strategic Ambiguity)
<b>Adversary Nuclear MHW Attack</b>	SLBM/B-52/B-2	ICBM/SLBM/B-52/B-2

Policy Recommendation:

- DoD would continue to fund the modernization of the nuclear triad with continued funding for defensive posture measures to bolster deterrence by denial strategy against the MHW threat from China.
- DoD would not continue to fund Hypersonic Weapons technology development and realign programmed money to defensive posture measures like the Hypersonic and Ballistic Tracking Space Sensor (HBTSS) and RQ-4 “Range Hawk” hypersonic sensors.<sup>92</sup>
- A dual-capable MHW attack on the Continental United States (CONUS), Hawaii, or Nuclear Command, Control, and Communications (NC3) capabilities (i.e., conventional or nuclear warhead) will be assessed as a nuclear attack on the homeland.

**COA 2: Integrated Deterrence**

Theory: The concept of “Integrated Deterrence” leverages a “whole of government” approach with all elements of the DIME Model (Diplomacy, Information,

Military, and Economics).<sup>93</sup> The Inter-organizational Cooperation doctrine published by the Joint Chiefs of Staff describes the “whole of government” approach as “integrates the collaborative efforts of USG departments and agencies to achieve unity of effort. Under unified action, a whole-of-government approach identifies combinations of USG capabilities and resources that could be directed toward the strategic objectives supporting U.S. regional goals as they align with global security priorities.”<sup>94</sup> As a single strategy, “Integrated Deterrence applies deterrent force across all combatant commands, allies, partners, and services to create a deterrence message” to our adversaries.<sup>95</sup>

Secretary of Defense Austin defined Integrated Deterrence as “using existing capabilities and building new ones and deploying them all in new and networked ways. All tailored to a region’s security landscape and in growing partnerships with our friends.”<sup>96</sup> Secretary Austin further describes Integrated Deterrence as a way of networking tighter and innovating faster while modeling transparency and communication with other powerful nations.<sup>97</sup> Likewise, General VanHerck recently comment-

ed on the need for credible deterrence options below the nuclear threshold when deterring adversaries like China from attacking the homeland.<sup>98</sup> As the nascent theory continues to establish itself, “Integrated Deterrence” as a concept builds upon a couple of timeless deterrence principles. First, it is entirely based on the nature of “strategic ambiguity” where a deterrer will not provide specific details on what kind of response would be expected, yet clearly articulates the scope, scale, and the inevitable response of which the deterrer cannot be sure, nor could they be able to prevent. Second, Integrated Deterrence provides an opening for the idea of “escalation dominance” as previously noted. In escalating a crisis, the United States has the credibility, capability, and the will to escalate, and it must discover new means of dominating escalation while China maintains its “entangled” conventional and nuclear force posture.

Third, in dominating escalation, the United States must have options that are “severe and highly punitive in one sense, yet as non-escalatory as possible in another.”<sup>99</sup> This form of asymmetric posture can offer leaders options that are “significantly more helpful and useful than a sledgehammer approach.”<sup>100</sup> Finally, Integrated Deterrence as an offensive posture must threaten an adversary’s values and must be adaptable as the adversarial landscape and leadership changes.<sup>101</sup>

**Offensive Posture:**

- “Whole of Government” approach with all options available at the conventional and nuclear levels. This option includes all elements of the DIME model, which can be employed individually or in combination to achieve a compounded kinetic, non-kinetic, or combined effect.

**Table 3. COA 2 Offensive Deterrence Posture Matrix (Response Options)**

	<b>US Indo-Pacific Regional Interest or Territory</b>	<b>CONUS/Hawaii or NC3 Systems</b>
<b>Adversary Conventional MHW Attack</b>	Integrated Deterrence	Integrated Deterrence
<b>Adversary Nuclear MHW Attack</b>	SLBM/B-52/B-2	ICBM/SLBM/B-52/B-2

**Policy Recommendation:**

- The USG approach to China would offer cooperative Arms Control options such as limited MHW testing, sharing HGV and HCM technology, and focusing on demonstrating

capability while utilizing confidence-building measures that aid mutual trust and understanding.

- The USG would leverage arms control cooperation to ban Anti-Satellite (ASAT) weapons.

- The USG would limit the proliferation of MHW technology to other countries by banning hypersonic weapon technology exportation and materials necessary to build them.

### **COA 3: Hypersonic Cruise Missile—Conventional and Nuclear**

Theory: “Where there is mutual fear, men think twice before they make aggressions on one another.”<sup>102</sup> In pursuing “parity” in weapon-class capability, the United States can offset China’s strategic asymmetric advantage while allowing for mutual vulnerability to stabilize the strategic environment in the Indo-Pacific. Moreover, using parity with China on MHW capability would give the United States the freedom to operate vertically and horizontally on Kahn’s escalation ladder.<sup>103</sup> This capacity to dominate in escalation will also foster continued strategic superiority with China, which would also continue to drive a stable strategic environment.<sup>104</sup> As the preeminent world leader, the United States must also consider the various implications on the world stage should it choose not to pursue MHW technology.<sup>105</sup> As it currently stands, for any asymmetric capability that enables preemption as a “first choice” in seizing the initiative, a nation

attempting to defend itself must consider that the adversary is likely targeting the most dangerous capabilities.<sup>106</sup> Thus, the United States can secure the strategic balance by establishing mutual deterrence and posturing with the ability to strike first in a conflict against an adversary’s counterforce capabilities.<sup>107</sup> Henry Kissinger offers a meaningful caution, “technical parity does not equal strategic parity.”<sup>108</sup> Likewise, the United States must be cautious in operational deployments of these weapons in the Indo-Pacific, as excessive numbers of conventional or nuclear variants may have implications for strategic deterrence by undermining strategic stability.<sup>109</sup> This response can be mitigated by only developing a “niche” capability and limiting deployments to strategic bases in the United States.

#### **Offensive Posture:**

- Conventional and nuclear versions of DARPA’s HAWC HCM are aided conventionally by U.S. Navy’s CPS. Fielding a conventional and nuclear variant of the HAWC would provide operational planning or deployment flexibility and enable escalation dominance while leveraging the traditional nuclear triad.



**Table 4.** COA 3 Offensive Deterrence Posture Matrix (Response Options)

	<b>US Indo-Pacific Regional Interest or Territory</b>	<b>CONUS/Hawaii or NC3 Systems</b>
<b>Adversary Conventional MHW Attack</b>	HCM-C (USAF)	CPS (USN)
<b>Adversary Nuclear MHW Attack</b>	SLBM/B-52/B-2	HCM-N (USAF)

Policy Recommendation:

- The DoD must fund a new dual-capable Hypersonic Cruise Missile. In doing so, the \$399M programmed funds for ARRW can be reallocated to support DARPA’s successful Hypersonic Air-Breathing Weapons Concept (HAWC) program with a revised dual-capable design to support conventional and nuclear deterrence options.<sup>110</sup> The Army’s Long-Range Hypersonic Weapon (LRHW) program would also be canceled, with remaining funds transferred to support the Navy’s Conventional Precision Global Strike program portion.
- The USG should also pursue a tri-lateral arms control initiative with China and Russia. Tri-lateral arms control would focus on nonproliferation efforts limiting the exportation of MHW technology through the Missile Technology Control Regime (MTCR). In concert with this nonproliferation

focus, the United States could align efforts to ban Anti-Satellite missile tests and FOBS tests while setting limits on fielded quantities of MHWs. The arms control options may also form an opportunity to establish a “hotline” between the United States and China similar to the current “hotline” between the United States and Russia. Finally, as an incentive to disentangle conventional and nuclear systems, the arms control agreement may foster a desire to specifically disentangle conventional and nuclear MHWs as a “first step” in a broader effort to draw more evident lines and firebreaks between nonstrategic and strategic nuclear forces.

The table below provides a summary of the deterrence posture COAs presented above. These COAs will be evaluated against each other in the “Strengths and Weaknesses” analysis and independently in the “Potential Risk” analysis in this paper.

**Table 5.** Summary of COA Descriptions

Course of Action	Description
COA 1: Conventional Standoff Munitions	Conventional standoff missiles such as the JASSM or TLAM provide a capability for the United States to either hold targets at risk with significant weapon volume or threaten to impose costs in conflict to deter China from using MHWs against the United States. Focuses development on space-based and point-defense capabilities to defeat an enemy MHW strike. Backed by the nuclear triad, this option provides the President with preexisting kinetic capabilities.
COA 2: Integrated Deterrence	Integrated Deterrence as a “whole of government” capability enables the United States with the strategic deterrence leverage to sufficiently threaten individual or compounded costs that target an enemy’s values and drive perceived costs above the potential benefit. The use of the entire DIME model, while backed with the nuclear triad and the possibility of bilateral arms control as a central policy objective, this option provides the President with an innovative approach to strategic deterrence with nearly unlimited kinetic, non-kinetic, or combined options.
COA 3: HCM-C/N	Developing and deploying a dual-capable Hypersonic Cruise Missile leverages mutual vulnerability and escalation dominance to mitigate the asymmetric benefit gained by China. The DoD would consolidate existing MHW programs into a dual-capable HCM program (HAWC) and the U.S. Navy’s CPS. The President would pursue an opportunity to facilitate tri-lateral arms control of MHWs and MHW technology between Russia, China, and the United States. Simultaneously, the United States would pursue banning the proliferation of MHW technology and setting limits on fielded MHW weapons, ASAT launches, and further FOBS testing.

**Defined Criteria and Risk for COA Analysis**

The analysis and evaluation of the defined COAs above are measured against several key weighted criteria. These criteria serve as factors that influence each COA, and they are given a percentage of “weight” based on the predetermined importance of how the criteria influ-

ence the defined COAs. Criteria for use in this analysis must be applicable for all three COAs, and they must be the most significant factors for consideration to prevent a dilution of effect if the number of criteria was unbounded. The five most important criteria for evaluating the deterrence posture COAs are: U.S. Government Deterrence Values, Flexible Deterrence Options, Surprise, De-

feat Enemy Centers of Gravity (COGs), and Credibility. These criteria are defined below in Table 6, along with a de-

termined “weight” to describe the amount of influence each criterion will have.

**Table 6.** Defined Evaluation Criteria

<b>Criteria</b>	<b>Definition</b>
U.S. Government Deterrence Values	<p>Values that the USG favors in the formulation and execution of the current nuclear deterrence posture. These values, common across presidential administrations, are based on accepted deterrence theory. They provide insight into the likelihood of COA adoption and the possibility of broader influence on national deterrence strategy.</p> <p><b>Weight: 10% (Marginal Importance)</b></p>
Flexible Deterrence Options (FDO)	<p>“FDOs are preplanned, deterrence-oriented actions tailored to signal to and influence an adversary’s actions. They are established to deter actions before or during a crisis. FDOs may be used to prepare for future operations, recognizing that they may create a deterrent effect. They are most effective when combined with other elements of national power (i.e., DIME).”<sup>141</sup></p> <p><b>Weight: 20% (Moderate Importance)</b></p>
Surprise	<p>The element of surprise provides a key strategic advantage to its user in promoting unexpected effects on an adversary while leveraging the nature of surprise on the adversary to drive towards a defensive focus. Additionally, surprise can be used to increase the effectiveness of a tool because it can attack an enemy when they are least prepared.</p> <p><b>Weight: 10% (Marginal Importance)</b></p>
Defeat Enemy COGs	<p>A Center of Gravity (COG) is “the source of power that provides moral or physical strength, freedom of action, or will to act.”<sup>142</sup> Therefore, an effective deterrence strategy must significantly defeat an adversary’s COGs if there is a chance of success in the conflict.</p> <p><b>Weight: 20% (Moderate Importance)</b></p>
Credibility	<p>Credibility requires capability and will (i.e., resolve) for a deterrent threat of denial or punishment to be effective. Moreover, it is the combination of the demonstrated capability of a tool, and the communicated will use the tool that creates the necessary credibility to foster deterrence against an adversary.</p> <p><b>Weight: 40% (Significant Importance)</b></p>

## **“Strengths and Weaknesses” COA Analysis**

### 1. USG Deterrence Values: 10%

USG Deterrence Values are rooted in political values and informed by decades of deterrence theory. These values tend to remain consistent with slight variance on major deterrence theory applications, but in formulating meaningful deterrence postures, these values can shift towards a particular theorist such as Brodie, Schelling, Kahn, or Kroenig. In this way, each deterrence posture’s value has been standard across presidential administrations since the Cold War’s end and provides the greatest utility.

### 2. Flexible Deterrence Options: 20%

Flexible deterrence options are the third most important criterion to evaluate deterrence postures. This is primarily because each posture must have a flexible nature that the USG can use to form deterrence threats or leverage influence for various possible adversaries. As conditions change, the United States may also need to adjust the scale, breadth, or depth of a deterrence threat that the postures are designed to support.

### 3. Surprise: 10%

The element of surprise is the least influential in evaluating the strengths and weaknesses of the deterrence postures. While important, surprising the adversary does little to prevent deterrence failure

though it may be necessary for a successful preemptive or preventive conflict. However, it is essential to note that the USG does not view the prospective benefits of preemption or prevention as reasonable at present. Thus, surprise is considered, but it does not warrant substantial emphasis.

### 4. Defeat Enemy COGs: 20%

In accomplishing a meaningful strategy, each deterrence posture should be able to defeat enemy COGs to increase costs beyond the perceived adversary benefit of the unwanted behavior. Likewise, should deterrence fail, defeating enemy COGs can aid escalation dominance by continually imposing unacceptable costs to an adversary’s COGs early in the conflict or holding an adversary’s COGs at risk not previously assessed as vulnerable to cause substantial fear of loss should the conflict continue. Thus, this criterion is the second most vital factor in evaluating a deterrence posture’s strength or weakness.

### 5. Credibility: 40%

The credibility of a deterrence posture is essential to enable a strong deterrent. Without credibility, the preexisting deterrence environment or deterrent threat issued by the USG would be met with doubt by the target state. This doubt emanates from either doubting the USG’s capability to act or willingness to commit (i.e., national resolve) should deterrence fail.

In order to evaluate the three deterrence postures based on the weighted criteria above, the JPP methodology offers a means of comparing and analyzing the COAs against important predetermined criteria with a “Strengths and Weaknesses” format. Below, Table 7 focuses explicitly on the strengths and weaknesses of each deterrence posture

across the evaluation criteria selected from JP 5-0 and defined above. Of note, while each COA has strengths and weaknesses, some strengths and weaknesses are more consequential to establishing the conditions under which China would be deterred from using a MHW against the United States.

Table 7. ‘Strengths and Weaknesses’ Summary

	COA 1: Conventional Standoff Munitions		COA 2: Integrated Deterrence		COA 3: HCM/C/N	
USG Deterrence Values	<b>Strengths:</b> 1) Secure Second Strike 2) Strategic superiority 3) Flexible/Visible force (Bombers/Slips)	<b>Weaknesses:</b> 1) Not strategically symmetric 2) No credible homeland defense for nonnuclear attack 3) Not expedient	<b>Strengths:</b> 1) Strategic Ambiguity 2) 'Integrated' Approach 3) Escalation Dominance	<b>Weaknesses:</b> 1) Requires agreement amongst participants 2) Ambiguous nature 3) Requires strategy at outset	<b>Strengths:</b> 1) Mutual vulnerability 2) Escalation Dominance 3) Rapid, precision strike	<b>Weaknesses:</b> 1) Relies on Tri-Lateral Arms Control with RS and CH 2) Escalation Dominance not guaranteed 3) Possible misperception
Flexible Deterrence Options	<b>Strengths:</b> 1) Triad offers tiered options 2) Bombers are flexible, visible, and recallable 3) Standoff munitions enable some amount of escalation control	<b>Weaknesses:</b> 1) Cannot directly respond in kind to MHIW threat 2) Strategic ambiguity may force 'Red Line' response 3) Large gap between standoff munitions and nuclear triad	<b>Strengths:</b> 1) Wide variety of options and combinations 2) Scalable level of intensity 3) Strategic ambiguity exploits adversary fears of capabilities	<b>Weaknesses:</b> 1) Ambiguity of threatened capabilities may be misinterpreted 2) Escalation Dominance complicates de-escalation 3) Choosing I.D. strategy difficult without integrator	<b>Strengths:</b> 1) Enables 'tit-for-tat' mutual vulnerability 2) Bomber-focused delivery is fundamentally flexible or recallable 3) Dual-use weapon system provides nonnuclear option	<b>Weaknesses:</b> 1) Limited to only HCM and Triad options 2) Not as expeditious as alternative options 3) Requires overseas basing and support
Surprise	<b>Strengths:</b> 1) Low-observable standoff munitions delay detection 2) Active Defense diminishes adversary response ability 3) SSBN can patrol/launch in close proximity undetected	<b>Weaknesses:</b> 1) Modern SAM capability can engage standoff weapons 2) Insufficient penetration to achieve surprise on HVTs 3) Large force difficult to conceal from detection	<b>Strengths:</b> 1) Immediate to delayed effect 2) Can operate in unexpected domains 3) Fundamental to unknown combination and desired effect until used	<b>Weaknesses:</b> 1) Clandestine or innocuous onset of effects not noticed 2) Delay caused in executing I.D. could lose effect 3) If uncoordinated, I.D. effort could be spoiled	<b>Strengths:</b> 1) Speed of positioning bomber with weapon 2) Secluded HVTs exposed 3) Denies enemy ability to adjust posture prior to strike	<b>Weaknesses:</b> 1) Easily spoiled with satellite imagery during weapon load 2) Weapon is still detectable (not stealthy) 3) Requires strategic warning to avoid misperception
Defeat Enemy COGs	<b>Strengths:</b> 1) Capable standoff munitions can strike front-line defenses 2) Nuclear EMP options 3) Triad can hold all COGs at risk if escalates to nuclear	<b>Weaknesses:</b> 1) Unable to conventionally strike all enemy COGs 2) High quantity of standoff munitions required 3) May hit entangled targets	<b>Strengths:</b> 1) Capabilities not limited to kinetic strikes 2) Adversary unable to plan for predictable response 3) Able to put effects on non-traditional targets to achieve strategic paralysis	<b>Weaknesses:</b> 1) Capabilities may not have desired effect 2) Effects may not be immediately observable 3) Capabilities may have civilian impacts (CDE)	<b>Strengths:</b> 1) Penetrating capability of HCM holds HVTs at risk 2) HCM enables defense suppression for 'night 1' force 3) Triad holds entire nation at risk if nuclear deterrence fails	<b>Weaknesses:</b> 1) Focused on kinetic strikes 2) May require significant quantity of HCMs for hardened or redundant targets 3) HCM use against COGs may cause undesired escalation
Credibility	<b>Strengths:</b> 1) Triad remains cornerstone 2) JASSM/TLAM used in conventional regional crisis 3) Regional allies would support U.S. involvement	<b>Weaknesses:</b> 1) Policy of 'strategic ambiguity' for attack on the homeland remains in doubt 2) Defense is not currently credible against MHWs	<b>Strengths:</b> 1) Communicated resolve strengthens deterrent threat 2) Range of nonnuclear options increases likelihood 3) Strategic communication must leave "all options on the table"	<b>Weaknesses:</b> 1) Undemonstrated capability weakens deterrent threat 2) Excessive rhetoric by political leaders may cause doubt in ability to employ 3) Can't hesitate or retreat in Escalation Dominance	<b>Strengths:</b> 1) Strong resolve for use in regional crises 2) Dual-use enables selectable option for strike on homeland 3) HAWC successful test lends to growing capability of HCM weapon technology	<b>Weaknesses:</b> 1) Fledgling HGV program shows low capability 2) Not credible to threaten nuclear attack for conventional attack on U.S. 3) Non-triad HCM degrades view of capability

Using the “Strengths and Weaknesses” format in Table 7, each COA is rank-ordered below, along with justification for its assigned ranking for each criterion. As a result, Table 8 summarizes the rankings and multiplies the rank with the criterion’s “weight.” The results across all five criteria are then added to yield a “total” for each COA.

### USG Deterrence Values

**COA 1:** The deterrence posture presented in this COA focuses on using fielded conventional standoff munitions, underpinned by strategic superiority and a secure second-strike capability while eliminating the incentive for the United States to continue the “arms race” in hypersonic weapons development. This posture also enables the United States to continue to fund the nuclear triad mod-

ernization efforts while exploring avenues to defend the homeland and U.S. interests from MHW threats. This posture does not present a symmetric response capability to offset China's technological advances in MHW weapons, nor does it provide a credible solution for addressing the potential for a conventional attack on the homeland. The deterrence posture of this COA continues the "status quo" strategic posture formed by the nuclear triad to deter adversaries while assuring U.S. allies and those that the United States has extended the umbrella of nuclear deterrence.

**COA 2:** The deterrence posture presented in this COA uses an "integrated" approach across the broadest spectrum of military services and government agencies to determine a central strategy and synchronized effort. It utilizes strategic ambiguity in its posture while leveraging the ability to dominate escalation should conflict occur. However, the COA may cause unintentional escalation should the United States intentionally or unintentionally attack some of China's entangled strategic forces. Second, the deterrence posture presented in COA 2 opens the strategic aperture to include all options, levers, and combinations of the instruments of national power and its alliances in a singular strategic effort. This COA requires a determined strategy and agreement amongst the key participants before applying resources in conflict.

**COA 3:** The deterrence posture presented in this COA uses developing and deploying a dual-capable HCM weapon system. This posture uses the concept

of mutual vulnerability and escalation dominance to counterbalance the strategic asymmetric advantage sought by China with their deployed MHWs. This COA's nature directly offsets Chinese MHW capability, while the dual-capable weapon system allows for necessary kinetic strike capability below the nuclear threshold that the other COAs do not provide in sufficient strength. Where this option shows possible weakness is in the reliance on a possible tri-lateral arms control agreement between Russia, China, and the United States (which may no longer be an option after February 2022). Moreover, it may engender a larger potential for misperception by the Chinese in developing and deploying HCMs to establish the deterrence posture.

### ***Flexible Deterrence Options***

**COA 1:** This COA leverages the nuclear triad to provide a robust, tiered series of flexible and scalable options should a nuclear conflict occur with China. Likewise, the conventional standoff munitions capability provides escalation control below the nuclear threshold. Yet a shift in U.S. focus may diminish the strategic ambiguity required in establishing a deterrent threat because of an international crisis, failing to respond when an adversary crosses a "red line," or an inability to "respond in kind" to a Chinese MHW threat.

**COA 2:** This integrated approach utilizes the compounding effect of multiple capabilities across a "whole of government" scope that is scalable to any crisis or conflict. Additionally, this posture

uses the nature of strategic ambiguity to exploit an adversary's fears about U.S. capabilities. Unfortunately, while this option uses a "whole of government" approach, it does not offer a "response in kind" capability before crossing the nuclear threshold. However, it can be expanded to include the additional capabilities and resources of the United States' allies and partners, which provides a strategic advantage that China does not currently enjoy. Of note, this COA enables tremendous flexibility and capacity for deterrence, yet its effects may require significant time to achieve the desired effect or may not be immediately observable. This option offers scalable intensity against an adaptable adversary, which provides a capacity to operate in unexpected domains, but in doing so, this posture requires synchronized coordination and strategic communication to achieve the most potent deterrent effect.

**COA 3:** Developing and fielding a dual-capable HCM weapon system in this posture would enable the USG to foster a strategic environment of mutual vulnerability with China. Moreover, should hostilities ensue, the bomber-centric delivery capability provides inherent flexibility and recallability to aid escalation dominance. Additionally, the dual-capable nature of the weapon system offers options that span both conventional and nuclear spectrums of conflict. Key weaknesses with this option include operational latency to generate combat capability at bomber bases and necessary overseas basing and support requirements.

## **Surprise**

**COA 1:** This posture provides the element of surprise to enemy forces, provided by low-observable munitions and submarines patrolling nearby without detection. Moreover, the funds saved by canceling MHW programs will enable "active defense" research and development efforts to expedite the United States' ability to detect and respond to a MHW attack. However, this posture is weak against a robust surface-to-air missile (SAM) defense network capable of engaging these conventional munitions. With that in mind, the large force required to penetrate and defeat an enemy defense posture would be easily detected and spoil any chance of surprise.

**COA 2:** Integrated Deterrence exploits the element of strategic surprise by operating in unexpected domains with unpredictable combinations of elements of power. In doing so, these effects can be employed immediately or with strategic delay to achieve a desired response from the adversary. However, a delay in communicating a deterrent threat could lose the desired efficacy, much like applying economic sanctions on the eve of hostilities. Moreover, if a posture of Integrated Deterrence is not thoroughly coordinated, any unsynchronized actions could result in spoiling the compounded effect against the adversary.

**COA 3:** This posture uses the speed and flexibility of an intercontinental bomber force to rapidly project power from the United States or within the Pacific

AOR. Because of this, and due to the nature of using an HCM instead of an HGV, the United States can avoid overflight of uninvolved nations, focus on regional employment, and leverage the level trajectory of a cruise missile to not confuse the adversary by appearing like a nuclear submarine-launched ballistic missile or an intercontinental ballistic missile. However, with persistent overhead satellite imagery, robust radar, satellite tracking systems, and pervasive social media, the element of surprise related to this COA may be spoiled while the weapons are loaded on the airplane or once the weapons are released from the aircraft.

### ***Defeat Enemy COGs***

**COA 1:** This posture leverages conventional standoff munitions to strike against front-line adversary defenses while utilizing nuclear strike and electromagnetic pulse (EMP) capabilities to achieve effects against enemy COGs should the conflict escalate beyond the nuclear threshold. However, this option requires a significant number of conventional standoff weapons because they do not have the survivability and penetration capability to hold HVTs at risk in the same manner as MHWs. Additionally, conventional standoff munitions could target entangled targets and elicit an unintended escalatory response. Finally, this option cannot strike all of China's COGs with only conventional weapons and could leave the United States incapable of containing the conflict below the nuclear threshold in a conflict.

**COA 2:** The nature of this posture enables its user with capabilities not limited solely to kinetic effects. Moreover, it complicates the adversary's ability to predict how the United States might respond to a particular escalatory action. Because of this, it allows the United States to place effects on non-traditional targets in a coordinated fashion to achieve strategic vulnerabilities that may not have been evident prior to the conflict. However, the counterbalance to these advantages is that the employed capabilities may not have the desired effect against enemy COGs. Along this line, because the effects may not be immediately observable and wide-sweeping, the effects created by the strategic nature of Integrated Deterrence may result in unacceptable civilian collateral damage.

**COA 3:** Dual-capable HCMs in this posture can penetrate enemy defenses to hold a significant portion of enemy COGs at risk. Likewise, the posture leverages the survivability and extreme range of dual-capable HCMs to hold distant targets that are out of reach of other strategic weapons. However, while this posture focuses primarily on kinetic options to respond in kind to Chinese aggression, it does not leverage the key capability of a "whole of government" approach as described by the deterrence posture in COA 2. As such, a significant volume of extremely expensive assets will likely be procured to support a low-density stockpile. Finally, should the United States employ a dual-capable HCM against an enemy COG, the "entangled" nature of Chinese



strategic forces may provoke an escalated retaliation. In this instance, the United States must be prepared to threaten additional, unacceptable costs to their COGs with nuclear HCMs to promote reestablishing strategic deterrence.

### ***Credibility***

**COA 1:** This COA focuses on using conventional standoff munitions in regional conflict, backed by the strategic nuclear triad. This option's credibility requires both the technological capability and the regional support for U.S.-led strikes to cement U.S. resolve to respond should China cross a "red line." Additionally, the savings achieved by realigning the \$3.8B DoD budget for hypersonic research and development program is balanced by the lack of a credible deterrent for a conventional MHW attack on the US homeland.<sup>111</sup> Moreover, while the nuclear triad remains the cornerstone of American national security, this COA does not offer a comparable offensive capability to Chinese MHWs, nor is there an ability to defend U.S. countervalue interests.

**COA 2:** This posture's key strength is the wide range of nonnuclear options to meet any threat and threaten costs on an adversary asymmetrically. Because of this, the posture requires a strong communications strategy to demonstrate both capabilities and will to strengthen the deterrence environment. As such, strategic communication must retain all options "on the table" to best facilitate the strategic ambiguity of Integrated Deterrence. Likewise, credibility established by

this COA might have the opposite effect if the United States provides excessive communication or an inability to de-escalate in an escalation dominance environment because of the limitations of the options and combinations available for use. As such, this posture requires a delicate balance with little hesitation to remain credible in the face of a MHW threat.

**COA 3:** While this posture does not guarantee escalation dominance, it enables a credible conventional or nuclear option as a response in kind or engaging in "tit-for-tat" escalation control to foster bargaining to resolve the conflict on terms favorable to the United States. Moreover, this option focuses on regional U.S. interests while offering a credible response to a strike on the US homeland by posturing with conventional and nuclear capability to "respond in kind." In doing so, this COA advances U.S. deterrence credibility and perceived costs to enemy forces. However, the posture may require a significant volume of HCMs beyond a "niche" capability which could exceed political support and budgetary fiscal constraints.

This analysis in Table 8 provides an objective/subjective evaluation to determine the best COA without considering the effect of risk in applying the deterrence posture. The evaluation of the potential for risk across each posture in four major categories of risk is presented in the following sub-section.

**Table 8.** “Strengths and Weaknesses” Weighted Evaluation

	COA 1: Conventional Standoff Munitions			COA 2: Integrated Deterrence			COA 3: HCM-C/N		
	Rank Score	Weight	Result	Rank Score	Weight	Result	Rank Score	Weight	Result
USG Deterrence Values	3	0.10	<b>0.3</b>	2	0.10	<b>0.2</b>	1	0.10	<b>0.1</b>
Flexible Deterrence Options	3	0.20	<b>0.6</b>	1	0.20	<b>0.2</b>	2	0.20	<b>0.4</b>
Surprise	3	0.10	<b>0.3</b>	1	0.10	<b>0.1</b>	2	0.10	<b>0.2</b>
Defeat Enemy COGs	3	0.20	<b>0.6</b>	1	0.20	<b>0.2</b>	2	0.20	<b>0.4</b>
Credibility	2	0.40	<b>0.8</b>	3	0.40	<b>1.2</b>	1	0.40	<b>0.4</b>
<b>Total</b>			<b>2.6</b>			<b>1.9</b>			<b>1.5</b>

Rank Score: 1 "Best" | 2 "Better" | 3 "Satisfactory"  
 (Rank Score) \* (Weight) = Result (lower score indicates superior option)

**COA Risk Analysis**

In addition to the selected criteria listed above, the COA analysis assesses the importance of risk that could result from each deterrence posture. While there are several potential risks, this analysis focuses on the four potential risk areas

defined in Table 9 below. These are the most significant risks that will impact the success or failure of a selected deterrence posture. As such, the risks are not “weighted” against each other until the final COA analysis as they are distinct and equally influential in the success or failure of a deterrence posture COA.

**Table 9.** Defined Areas of Potential Risk

Area of Potential Risk	Definition
Additional Excess Cost	Additional Excess Cost occurs when the development, application, or effect of a COA results in a cost of resources that surpasses the desired cost threshold or degrades the efficiency of the COA in order to achieve the desired effect.
Excess (Unacceptable) Collateral Damage	Excess (Unacceptable) Collateral Damage is an unpredicted increase in undesired collateral damage against an adversary that might cause the unintended escalation of hostilities in a conflict or an unfavorable international public opinion of the United States.
Deterrence Failure	Deterrence Failure occurs when the adversary’s perception of the perceived benefit will exceed the perceived cost of a potential action/behavior after the United States has issued either a deterrence by denial threat or deterrence by punishment threat.
Escalation Dominance Failure	Failure of an escalation dominance strategy to control and defeat increasing escalation at every level after deterrence has failed is evident when the adversary continues to escalate the conflict vertically (intensity) or horizontally (breadth).

Presented below, each deterrence posture is evaluated based on the expected probability of occurrence and the severity of potential consequences. The COAs are scored independently of each other and are evaluated in Table 10 based on their average probability-consequence product across the four areas of potential risk.

### **Additional Excess Cost**

**COA 1:** The probability is assessed as “improbable” (21-50%) because current conventional standoff munitions (e.g., JASSM, TLAM) are already developed and fielded as operational systems with little additional costs required for additional production and deployment. Moreover, the consequence factor is “minor harm” because of the relatively low per-unit cost compared to other more niche or exquisite weapon systems. The DoD would easily absorb any additional excess cost in the COA.

**COA 2:** The probability is assessed as “probable” (51-80%) because the nascent nature of Integrated Deterrence may foster unexpected cost increases in developing the concept of applying the deterrence posture as a “whole of government” model. Interestingly, the consequence of the COA is “minor harm” because of the flexible nature of the concept and its ability to adapt rapidly to the strategic deterrence environment.

**COA 3:** The probability is assessed as “probably” (51-80%) because of the significant research and development costs required to design, test, and field a low-density, highly complex weapon system. As expected, with such a high per-unit cost with little flexibility in programmed funding for any developmental setbacks, the consequence is assessed as “moderate harm” should further delays or program deviations occur.

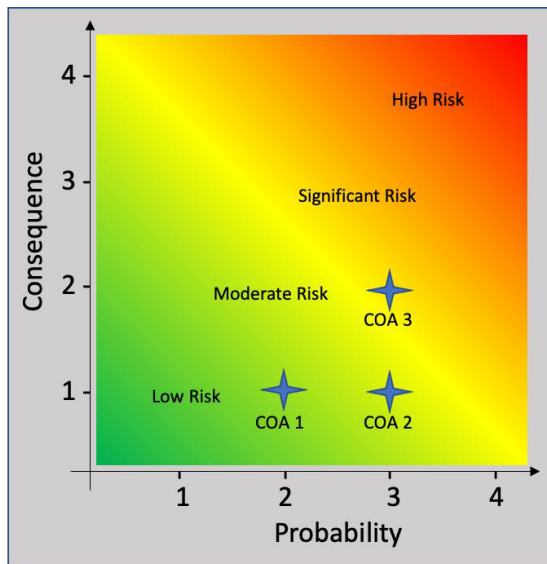


Figure 3. Risk of Additional Excess Cost

**Excess (Unacceptable) Collateral Damage**

**COA 1:** The probability is assessed as “highly unlikely” (0-20%) because of U.S. efforts to focus on counterforce targeting and the surgical precision of conventional standoff munitions. However, should unacceptable collateral damage occur, the consequence is assessed as “major harm” because of significant U.S. public sensitivity and the potential for an unintended Chinese escalated response.

**COA 2:** The probability is assessed as “probable” (51-80%) because of the potential for significant second and third-order effects caused by national instruments of power. These effects may include unintended impacts on civilian populations in China, such as food shortages or economic collapse. As such, the consequence of this criterion is rated as “major harm” because of

the potential for widespread impacts on civilian populations.

**COA 3:** The probability is assessed as “improbable” (21-50%) because of the potential for collateral damage caused by the weapon failing in flight due to the extreme speed or not receiving an accurate position of itself during the time of flight due to the ionization of the plasma field surrounding the vehicle. Moreover, it is worth acknowledging that in the event of a conflict where the United States were to use a nuclear HCM against China, there would assuredly be collateral damage, yet it may not be considered “unacceptable” given the nature of the conflict and decision to employ such a devastating weapon. Finally, the rated consequence of such an occurrence is “extreme harm” because of the possibility of a nuclear HCM striking the wrong target or having sufficient yield to have excess collateral damage that was not intended.

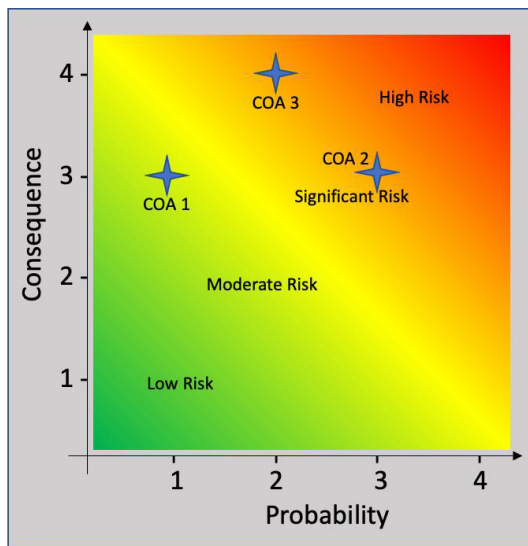


Figure 4. Risk of Excess (Unacceptable) Collateral Damage

## Deterrence Failure

**COA 1:** The probability is assessed as “improbable” (21-50%) because of the lack of strategic parity or sufficient defense capability to offset the advantage of China’s MHWs. Though U.S. conventional standoff munitions are highly capable weapons, the United States must strategically communicate its deterrent threats to foster an environment as Schelling would advise that “leaves something to chance.” The consequences of deterrence failure are catastrophic and are assessed as “extreme harm” as deterrence failure would almost certainly result in a nuclear weapons exchange with China, which has the potential to be extremely costly to both countries.

**COA 2:** The probability is assessed as “highly unlikely” (0-20%) because of the emphasis on strategic ambiguity and the combined effects of any number of

combinations of scope and scale of the elements of national power. However, the consequences of deterrence failure remain grim, and the assessment of “extreme harm” applies given the complexity of using Integrated Deterrence to deter; its ability to punish and control escalation is not immediate and carries some doubt about its effectiveness.

**COA 3:** The probability is assessed as “highly unlikely” (0-20%) because of the strength provided by mutual MHW vulnerability and the resultant environment of stalemate. While no exact “parity” between Chinese and United States MHWs, the capability for either side to successfully use an MHW is sufficient for “parity” in this research. The consequences of deterrence failing are also assessed as “extreme harm” because of the severe potential costs of a tit-for-tat escalation between the United States and China.

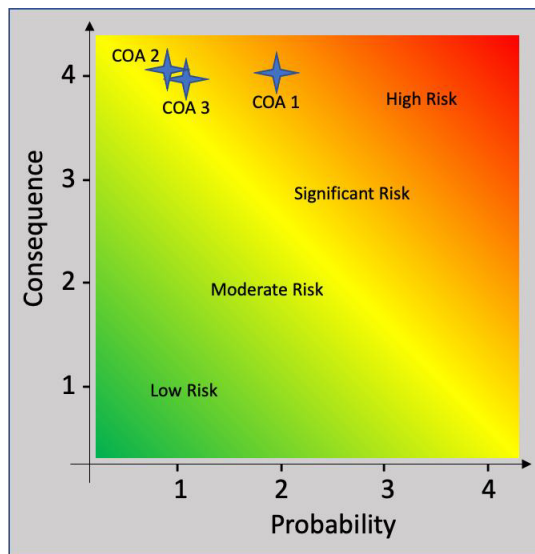


Figure 5. Risk of Deterrence Failure

### ***Escalation Dominance Failure***

**COA 1:** The probability is assessed as “probable” (51-80%) because of the Chinese perception of the United States’ inability to credibly dominate escalation in a conflict with conventional standoff munitions across the Pacific Ocean. Moreover, should the conflict escalate beyond the nuclear threshold, the United States might succeed in escalation dominance, but it would require a significant escalation strategy with the nuclear triad to ensure success. This escalation strategy might result in extreme costs to the United States homeland, allies and partners, and deterrence capability with Russia or North Korea. As a result, the consequences of escalation dominance failure are assessed as “major harm” because of the likely costs imposed on the United States in escalating the conflict.

**COA 2:** The probability is assessed as “probable” (51-80%) because of the Chinese perception of the United States’ inability to credibly dominate escalation due to the ambiguous and complex nature of Integrated Deterrence. Though Integrated Deterrence uses a “whole of

government” approach, it likely cannot convey the compounded effect of multiple instruments of national power to establish escalation dominance at the outset of a conflict effectively. For this reason, the consequences of escalation dominance failure are assessed as “major harm” as in COA 1 because of the severe potential costs imposed by China if the United States were to attempt to dominate escalation and fail.

**COA 3:** The probability is assessed as “highly unlikely” (0-20%) because of the capacity of the United States to credibly threaten mutual vulnerability and dominance in escalation throughout a conflict. This is reinforced by the superior strategic advantage enjoyed by the United States in the present time, which may not continue well into the future. Nevertheless, while the likelihood of U.S. escalation dominance in a conflict with China in COA 3, there is always a chance that the strategy could fail. Because of this, the consequences assessed in escalation dominance failing are “major harm” as in the previous two COAs because of the significant potential damage and costs incurred by China on the United States.

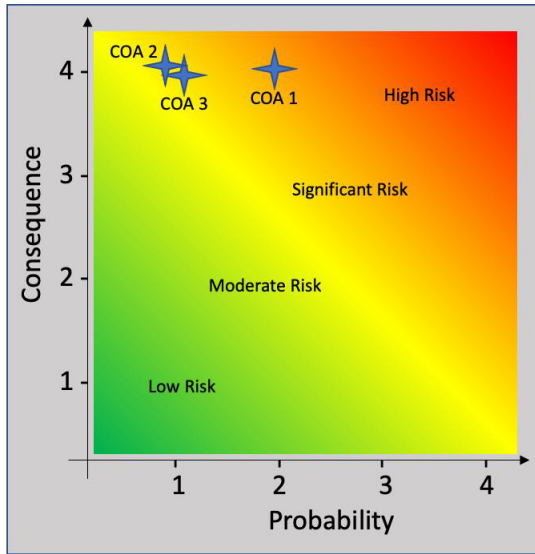


Figure 6. Risk of Escalation Dominance Failure

The following table (Table 10) shows the predicted probability and potential consequence severity of the four potential risk areas on each deterrence posture COA. The predicted probability is multiplied by the consequence sever-

ity to determine a risk assessment for each posture in each potential risk area. Each of the four assessed scores is then averaged together for a deterrence posture to give an average risk assessment.

Table 10. Potential Risk Analysis Summary

	COA 1: Conventional Standoff Munitions			COA 2: Integrated Deterrence			COA 3: HCM-C/N		
	Probability	Consequence	Assessment	Probability	Consequence	Assessment	Probability	Consequence	Assessment
Additional Excess Cost	2	1	2	3	1	3	3	2	6
Excess (Unacceptable) Collateral Damage	1	3	3	3	3	9	2	4	8
Deterrence Failure	2	4	8	1	4	4	1	4	4
Escalation Dominance Failure	3	3	9	3	3	9	1	3	3
<b>Average Risk</b>			<b>5.5</b>			<b>6.25</b>			<b>5.25</b>

Probability: 4 "Very Likely" (81-100%) | 3 "Probable" (51-80%) | 2 "Improbable" (21-50%) | 1 "Highly Unlikely" (0-20%)  
 Consequence: 4 "Extreme Harm" | 3 "Major Harm" | 2 "Moderate Harm" | 1 "Minor Harm"  
 (Probability) \* (Consequence) = Assessment (lower score indicates lower risk)

The results of Table 10 above show how the potential risk of excess cost, excess (unacceptable) collateral damage estimate (CDE), failure of deterrence, or failure of escalation dominance affect each deterrence posture COA. While evaluating the probability of occurrence and severity of the consequence of these criteria is subjective, the quantitative rating and equal weighting allow for a comparative view of the combined potential risk for each deterrence posture. To this end, the deterrence posture that best minimizes the total potential and severity of risk is COA 3 (avg risk 5.25). COA 1 (avg risk 5.5) and COA 2 (avg risk 6.25) follow with higher amounts of average risk across the four criteria.

## Findings

The combined results of the two analysis tables above showcase how COA 3 (HCM-C/N) exceeds the alternative COAs (see Table 11). However, though COA 2 (Integrat-

ed Deterrence) accumulated the highest average risk, as evidenced in the “strengths and weaknesses” analysis, it offers promise as an improved deterrence posture beyond COA 1 (Conventional Standoff Munitions).

These deterrence postures are fundamentally different from each other in their offensive orientation and policy recommendations. Nevertheless, they all share the same defensive posture due to the asymmetric characterization of how the People’s Republic of China (PRC) might use a MHW against the United States or its vital interests. The “strengths and weaknesses” analysis above evaluates the various elements in favor of and against each posture for a particular criterion. However, assessing the overall “average risk” associated with each COA is crucial as it relates to the marginally understood view of Chinese deterrence theory. Table 11 applies a 70/30 weight ratio to the “strengths and weaknesses” and “potential risk” analyses to compute the total value to assess the COAs.

Table 11. Comprehensive Deterrence Posture Analysis

	COA 1: Conventional Standoff Munitions			COA 2: Integrated Deterrence			COA 3: HCM-C/N		
	Total Score	Analysis Weight	Result	Total Score	Analysis Weight	Result	Total Score	Analysis Weight	Result
Strengths & Weaknesses Analysis	2.6	0.70	1.82	1.9	0.70	1.33	1.5	0.70	1.05
Potential Risk Analysis	5.5	0.30	1.65	6.25	0.30	1.875	5.25	0.30	1.575
<b>Total</b>			<b>3.5</b>			<b>3.21</b>			<b>2.63</b>

(Total Score) \* (Analysis Weight) = Result (lower score indicates superior option)

Finishing in third place, COA 1 (Conventional Standoff Munitions) focused on using long-range, low-observable, conventional standoff munitions, underpinned with the nuclear triad, to enable a deterrence environment with

China that would allow the DoD the opportunity to focus research and development spending on defense capability designed to defeat MHWs. Dr. Brad Roberts mentions that nuclear weapons “cast a shadow over the red zone of con-



flict by creating doubt about what price an adversary might pay for aggression in a way that defensive measures of the victim state do not.”<sup>112</sup> However, Dr. Roberts also contends that the genuine concern is that nuclear deterrence may not retain credibility across the full spectrum of conflict.<sup>113</sup> Thus, as the “Strengths and Weaknesses” analysis discovered, the posture trailed COAs 2 and 3, but interestingly, this posture was assessed as a close second to COA 3 in the “Potential Risk” analysis. Likewise, in Table 11, the COA appears as a “moderate risk” alternative that relies on existing offensive capabilities to deter China from using a MHW against the United States. The Achilles’ heel in this posture is the lack of credibility in retaliation in kind for a conventional strike on the homeland or naval task force while also presenting sufficient doubt in using conventional standoff munitions to strike at enemy COGs and the possibility of losing control of an Escalation Dominance strategy in conflict. COA 1 finished with the highest (i.e., worst) total score in the combined analysis, trailing the lead posture (COA 3) close to an entire point.

Finishing in second place, COA 2 (Integrated Deterrence) provided a novel approach to applying the DoD’s perspective of using a “whole of government” approach to create a strategic deterrence environment with the ability and agility to simultaneously maximize the effect of the elements of national power. Of note, this posture reflects Ryan Henry’s recommendation that “the United States must (1) have the means to determine what the en-

emy values, (2) determine what tools can hold those things at risk, and (3) an effective ability to communicate our ability to destroy those valued targets with our unique capabilities.”<sup>114</sup> Said differently, the United States could adopt an Integrated Deterrence strategy that builds off its ability to credibly and capably impose negative costs without dramatically escalating the political stakes involved.<sup>115</sup> A vital benefit of this posture, an Integrated Deterrence strategy could use its indirect, asymmetric, and non-kinetic approach to rally more robust international support rather than quickly applying military force to complex problems.<sup>116</sup> Unsurprisingly, COA 2’s use of Integrated Deterrence to form the foundation of the posture yields the highest average risk of the three postures because of its unique ambiguity and requirement to align all key decision-makers involved in the strategy collectively. As such, the risk inherent in Integrated Deterrence drives a tremendous benefit if China remains deterred while allowing for catastrophic failure should the United States expose an unsynchronized approach or any internal debate that China could exploit in seeking its strategic objective. Likewise, pursuing a bilateral MHW arms control agreement with China in this COA presents the most likely opportunity to establish mutual trust and restraint from escalatory behavior while inhibiting undesired proliferation. COA 2’s “Strengths and Weaknesses” analysis demonstrated favorable results in a close second position because of the unique capabilities and effect of compounding multiple elements of power.

However, the “Potential Risk” analysis highlighted the significant risk of the posture’s likelihood of causing excess CDE and loss of Escalation Dominance.

Finishing in first place, COA 3 (HCM-C/N) broke new ground in offering a dual-capable hypersonic cruise missile to establish a strategic deterrence environment built on mutual vulnerability, rapid precision strike, and Escalation Dominance. First, this posture leveraged a form of strategic parity in weapon class with an overall strategic superiority to drive towards a tri-lateral MHW arms control opportunity between the United States, China, and possibly Russia (if hostilities with Ukraine cease). Furthermore, should the United States successfully negotiate a tri-lateral MHW arms control treaty, the conditions will be ripe for adding China to a new tri-lateral strategic arms reduction treaty in 2026. Second, HCMs provide unique advantages in this posture over the more widely touted Chinese HGVs and FOBS capabilities by resolving many potential areas for misperception that HGVs could present, including overflying other adversarial nations, flight trajectories resembling ICBM or SLBM profiles, and the ambiguity of the target. Nevertheless, maneuverability, speed, penetration, survivability, and extreme range manifest a profound psychological effect on the target state’s leaders by exposing them to the possibility of previously unlikely attacks.<sup>117</sup> Likewise, as Terry and Cone note, MHWs do not increase the first strike advantage for large and diverse arsenals such as the United States.<sup>118</sup> However, what dual-capable

HCMs can offer, according to Dr. Roberts, is the ability for a conventional HCM to form the basis of what would become a prenuclear deterrence system that amplifies the nuclear deterrence system.<sup>119</sup> Thirdly, as the “Strengths and Weaknesses” analysis showcased, a dual-capable HCM was the lead option of the three postures and provided the most credible capability to respond in kind to either a regional attack on U.S. territories and interests in addition to an intercontinental attack on the US homeland. In the “Potential Risk” analysis, COA 3’s posture, underpinned by the nuclear triad, presented the lowest average risk because of its offensive, mutually vulnerable posture. The posture edged out COA 1 in the assessment but was not without concern as the likelihood for excess CDE was much higher than COA 1 and similar to COA 2. Finally, in the combined analysis, COA 3 presented the clear advantage as the most assertive posture with the least potential for risk compared to the other deterrence posture COAs. However, as capabilities mature and the international political landscape shifts, COA 3 may not remain the superior choice in ten or twenty years as the concept of Integrated Deterrence matures into a more credible and capable tool.

## Conclusions

“Disruptive technology in the military domain should be viewed as instruments to assist humans in ensuring peace.”

—Ajey Lele

The nearly overnight development and successfully demonstrated capability of Chinese MHWs has squarely put the United States in an uncomfortable and unfamiliar position in the Indo-Pacific and the broader world stage. At present, the United States remains unable to defend against, nor able to respond in kind to, a Chinese MHW attack either in the Indo-Pacific or at home in North America. Since the X-51 Waverider’s only successful flight test, China and Russia have surpassed the United States in developing and fielding maneuverable hypersonic missile technology. s Russia remains embroiled in its ongoing war against Ukraine, China continues to focus on reasserting itself as a regional hegemon as it pursues the “China Dream” by 2049. As such, the United States must establish a deterrence posture to set the conditions under which China remains deterred from employing dual-capable MHWs against the United States and its interests.

With such a strategically complex problem in mind, this research greatly benefitted by using the Joint Planning Process to evaluate three possible courses of action against five important criteria (i.e., USG Deterrence Values, Flexible Deterrence Options, Surprise, Defeat Enemy COGs, and

Credibility). These criteria were selected intentionally before COA development to assess each deterrence posture against these critical features. Additionally, the resultant COAs used elements of deterrence theory to formulate a potential deterrence posture with unique offensive capabilities and policy-based elements that could set the conditions for a strategic environment to foster the desired end state. These COAs were also assessed in a subsequent risk analysis to evaluate the probability, consequences, and combined potential for risk across four key criteria (i.e., additional excess cost, excess (unacceptable) collateral damage, deterrence failure, Escalation Dominance failure). Nevertheless, should the DoD implement a dual-capable HCM strategic deterrence posture as recommended by this research, and if Congress is to realign funds to support the program, necessary implications require consideration to fulfill the recommended deterrence posture.

Pursuing COA 3 and its implementation strategy should be considered for two main reasons before the operational deployment of the dual-capable HCM. First, funding for the HAWC program must provide essential research and development money to continue flight testing and develop a nuclear physics package. While reallocating the procurement funds for FY23 to research and development costs, the ARRW development program should be indefinitely postponed along with the Army’s portion of the joint Army-Navy C-HGB program to consolidate as much as \$7B in requested US Army funding to bolster DARPA’s HAWC and the U.S.

Navy's CPS in the short term.<sup>120</sup> Though the Army will bristle at the request to cancel the LRHW program, the tested range of 1,725nm is more helpful in the European theater. However, it comes up short in the more urgent Pacific theater where territory is sparse, and the distance from Guam to Taiwan is more than 1,700nm, and from Guam to the Spratly and Paracel Islands is beyond 2,000nm.<sup>121</sup> Furthermore, the nearly \$400M saved by shelving the ARRW program altogether will afford the National Nuclear Security Administration (NNSA) and USAF the program design funding to integrate the preexisting W80-4 Life Extension Program (LEP) warhead, valued at \$11.2B, for use in both the Long-Range Standoff Weapon (LRSO) and the physics package of the nuclear variant of the HAWC HCM.<sup>122</sup> As former senior officials in the Defense Department from 2018-2020 suggest, the Long-Range Strike portfolio must be "affordably scaled to compelling numbers" to generate sufficient deterrence capability against Chinese aggression in the Western Pacific.<sup>123</sup> Such affordable scaling aligns with Lockheed Martin's Skunk Works' Vice President and General Manager, John Clark, who contends, "air-breathing hypersonic systems are a cost-effective solution to address the rapidly emerging threats in the global security arena."<sup>124</sup>

The second implication to consider is that research and development costs must continue to focus on investing in succeeding programs, given the current trailing position of the United States. In a 2021 GAO report, the DoD funded over 70 long-range strike

programs from 2015 to 2024 totaling nearly \$15B in defense spending.<sup>125</sup> By shaping the defense budget to a smaller number of MHW programs, the DoD can pursue developing future MHW requirements much like Porter and Griffin offer for long-range strike systems in the Indo-Pacific such as flying at Mach 17+, withstanding reentry conditions, refining the accuracy of a maneuverable reentry vehicle.<sup>126</sup> Likewise, George Leuenberger offers that MHWs principle utility will require rapid flight planning capability, navigation without GPS, sense-and-avoid self-detection, and mutually-cooperative functionality with other MHWs.<sup>127</sup> It is essential to weigh research and development costs against "per unit" production costs for such exquisite weapons systems. As Dr. Roberts points out, the United States must determine the correct number of HCM-C/Ns to produce to foster a "niche" MHW capability, which will serve as a deterrence hedge against the rapidly growing Chinese nuclear posture.<sup>128</sup> Therefore, given sufficient realignment of budget resources, setting appropriate requirements, and determining a production and sustainment volume based on a strategic plan, the United States could harness this emerging technology similarly to how the Rapid Capabilities Office (RCO) or DARPA pursues and refines new technology. While this posture is not a panacea for future nuclear deterrence, consideration of several anticipated counterarguments is necessary.

First, with the United States in such a disadvantageous position, proponents of the fledgling ARRW pro-

gram may highlight the implicit value in pursuing both the ARRW and HAWC programs simultaneously as a hedge to ensure the success of one of the programs as the United States struggles to catch up to China and Russia. In doing so, Congress would continue to throw good money after bad. In a 2021 appropriations committee report, members noted their concern with ARRW's underwhelming progress. They raised an issue about the possibility of "concurrency" in the program, whereby the testing and correction of problems may occur during the initial production lot and generate additional costs.<sup>129</sup> Funding these expensive developmental programs in parallel will continue to limp the ARRW program while not sufficiently feeding a successful HAWC program with already limited fiscal resources. Thus, Congress must put our limited resources behind a succeeding program and re-evaluate the ARRW boost-glide program once HAWC is operationally fielded.

Second, many will contend that adding a new nuclear weapon to the U.S. strategic arsenal is untenable. While the 2011 New START treaty limited the number of deployed weapons to 1,550, it did not limit the type or number of weapons "counted" on a nuclear bomber, which was only counted as "1" under the treaty.<sup>130</sup> Furthermore, the 1993 Spratt-Furse Law prohibited the research and development of "tactical nuclear weapons," defined as nuclear weapons with an explosive power of less than 5 Kilotons.<sup>131</sup> In light of this, Keith Payne notes that a "no new nuclear weapons policy" is ill-suited

for our current realities and that the United States must be able to adapt its nuclear capabilities to address shifting adversary threats.<sup>132</sup> With this in mind, the current development of DARPA's HAWC program is cultivating a promising technology that drives an advantage for its user by exploiting technology that easily penetrates A2/AD environments and striking HVTs that are typically beyond the reach of most modern weapons.

Third, in the ongoing debate about continuing to fund the modernization of the nuclear triad, the proponents of eliminating the Long-Range Standoff (LRSO) nuclear cruise missile could use the opportunity to cancel the ARRW, HAWC, and LRSO programs simultaneously in order to pursue a dual-capable HGV for an ICBM or SLBM delivery. This option fails to consider that while the New START does not prohibit either side from deploying conventional warheads on ICBMs or SLBMs, the weapons would be counted under the limitations of the treaty regardless of their mated conventional or nuclear warhead, which may have an unforeseen impact on strategic stability due to issues of conventional-nuclear entanglement.<sup>133</sup> Additionally, the State Department previously stated that "there is no military utility in carrying nuclear-armed and conventionally-armed reentry vehicles on the same ICBMs or SLBMs."<sup>134</sup> As a result, Congress should fund a dual-capable HCM independently and in parallel with the LRSO program if the DoD is to construct the strategic deterrence posture selected in COA 3.

The significant attention garnered by MHWs by both government officials and news media gives further compulsion to the importance of additional research. Conducting future research on this subject matter will inevitably vary with interest, scope, and scale. However, there are several areas where additional research is essential. First, as previously mentioned, a study should be accomplished to evaluate how many of these exotic weapons the United States arsenal requires to successfully achieve a “niche” capacity while deterring China from using an MHW against the United States. The following question would be, how many weapons would the United States require to deter China and Russia successfully? Would these new HCM-C/N weapons also be blended into the current nuclear Operations Plans (OPLAN), and if so, what would be the appropriate ratio? Second, there is an ongoing debate about “long-range fires” in the DoD, and as a long-range weapon, MHWs are hotly contended by USAF, USN, and USA services for research and development funds. Military strategists and planners must write new doctrine that draws appropriate lines and defines necessary means for how these services might use their future MHWs in coordination. Third, researchers must conduct a thorough analysis to determine if the United States should continue to invest in HGV technology or if HCM technology is sufficient for deterrence with the technology’s resources, capabilities, and utility as is currently planned. Likewise, in an already austere budgetary environment, these research and develop-

ment choices are paramount because of the unusually high cost of the programs. Finally, studies must conduct and evaluate new, innovative methods for defeating MHWs. Defense strategy may favor “area denial” or “point defense” capabilities as hypersonic detection and tracking technology mature, and it is incumbent on researchers to offer strategies that offer the greatest utility for the least investment cost. For example, there may be a future opportunity in the U.S. Navy’s SM-6 interceptor missile as a “point defense” capability in regional “hot zones” for MHW attacks in the terminal phase before striking the target. Unfortunately, this new missile’s capabilities are unproven and still a decade or more from fielding.<sup>135</sup>

Ajey Lele said best, “[t]echnology may change warfare, but it doesn’t determine warfare.”<sup>136</sup> The advent of MHWs has ushered in a new class of weapons, but it has not fundamentally altered the principles of strategic deterrence. Underscoring the implications of China’s 2021 hypersonic FOBS test, Admiral Richard testified to Congress that China’s hypersonic FOBS weapon flew “the greatest distance and longest flight time of any land attack weapon system of any nation to date.”<sup>137</sup> The impact of his testimony was reinforced with a stark reminder that “every other capability we have, rests on the assumption that strategic deterrence, and in particular nuclear deterrence, will hold.”<sup>138</sup> Simultaneously, as the Biden administration crafts its Nuclear Posture Review goals, their priorities are straightforward: emphasize strategic stability, avoid arms racing, facilitate

risk reduction, and promote arms control agreements.<sup>139</sup> The USG must use competition in fielding dual-capable MHW technology to guide how the State Department reassures and uses confidence-building measures within the mutual deterrence framework. Without such measures and dialogue to foster mutual trust, the United States and China have opportunities for misjudgment, misperception, fear, hostility, and deep mistrust.<sup>140</sup> Nevertheless, in a

persistently cost-conscious budgetary environment, there must be no mistake that the cost of deterrence failure dwarfs the costs of maintaining deterrence, which indelibly underscores the unimaginable costs of deterrence failure. In summary, as the complex, rules-based, international world order continues to shift, the United States must be willing to invest in a strategic posture today that will enable the necessary deterrence for a peaceful tomorrow.

## Endnotes

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