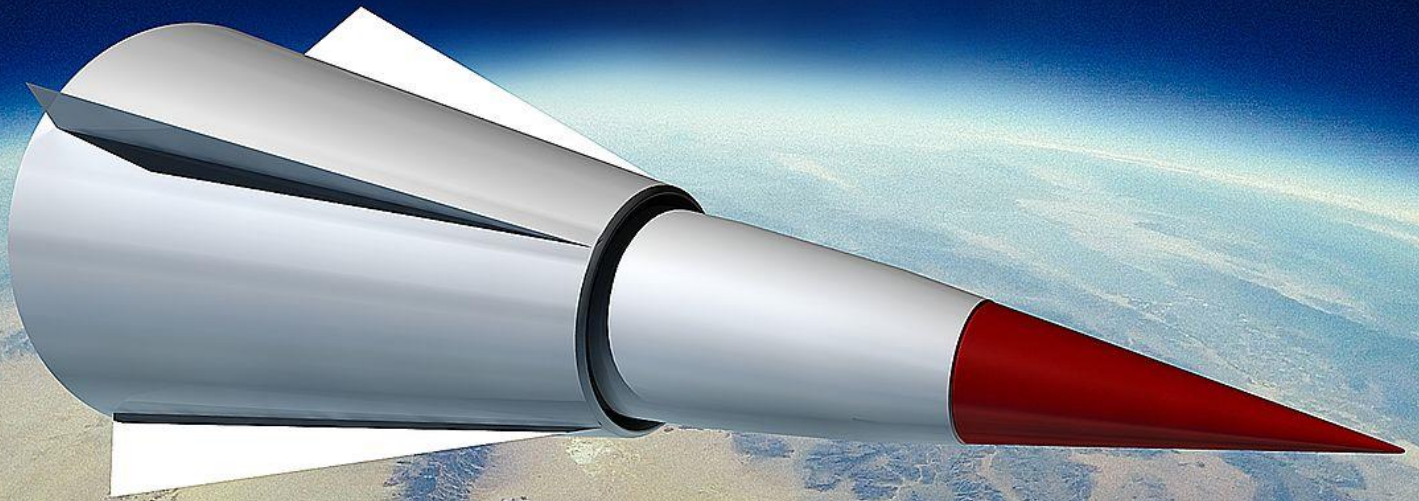


# The Strategic Implications of Hypersonic Missiles



**Artistic rendering of an HGV.**

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25/02/2019

Updated on 11/04/2020

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## Introduction

In a context of mounting international tension, the world's leading military powers (namely the **United States** and its near-peer competitors, **Russia** and **China**) are engaged in an effort to develop new weapons systems. Among them, **hypersonic missiles** are playing an increasingly important role. This paper examines the **strategic impact** of hypersonic missiles, in particular in the event of a major **crisis** involving the three aforementioned powers, in order to **raise the awareness** on the risks that the deployment of such weapons could have.

## Types of Hypersonic Missiles

By definition, hypersonic missiles are **vectors capable of travelling at Mach 5.0 or higher**, meaning they can reach speeds equal to five times or more that of sound. They can be divided into two categories. The first is made of **hypersonic glide vehicles (HGVs)**, which are launched to a high altitude by a rocket and then glide to their target. The second group is formed by relatively slower vectors known as **hypersonic cruise missiles (HCMs)**, which exploit scramjet engines to reach the required speed and travel to their target following an aircraft-like flight path. Compared to ballistic missiles which follow a higher parabolic flightpath, hypersonic vectors can be detected by ground-based radars only much later and much closer to the target due to their lower trajectory. Combined with their extremely elevated speed and the ability to perform

evasive manoeuvres, this means that they are **capable of bypassing the large majority of existing anti-missile defences – if not all**.<sup>1</sup> The world's three main military powers (along with others)<sup>2</sup> are all developing such weapons, albeit with different purposes.

The **United States** have considered hypersonic missiles as a possible solution to meet the requirements of the **Conventional Prompt Global Strike (CPGS)** concept, whose objective is to enable the US to conventionally attack a target located anywhere in the world within one hour. Dating back to the George W. Bush administration, the CPGS has gained greater importance since 2008; with a growing attention to hypersonic missiles. In a context of mounting rivalry with China and Russia, the concept was revived to counter the **Anti-Access / Area Denial (A2/AD)** systems that these two powers are deploying to create "bubbles" around their territory in order to undermine the ability of American forces to operate within certain areas. Hypersonic weapons would preserve the ability of the US military to project its power by enabling it to fire from beyond the range of enemy defences either to target the A2/AD assets themselves or to destroy sensible targets such as Command, Control, and Communication (C3) centres, military bases, critical infrastructures and other strategic facilities to compromise the opponent's warfighting capabilities.

The US is currently funding several experimental programmes aimed at producing operational prototypes, meaning that no procurement plan exists yet. In 2018 a Navy-led joint programme to develop a common HGV for the three branches of the

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<sup>1</sup> Speier, Richard H.; Nacouzi, George; Lee, Carrie; Moore, Richard M. "Hypersonic Missile Nonproliferation: Hindering the Spread of a New Class of Weapons" (Key Findings); RAND Corporation, 2017; last access December 30, 2018. [https://www.rand.org/pubs/research\\_reports/RR2137.html](https://www.rand.org/pubs/research_reports/RR2137.html)

<sup>2</sup> These include Australia, France, Germany, India and Japan. Other countries like Iran, Israel, and South

Korea have conducted experiments on hypersonic airflows and propulsion, but it is not certain they are developing hypersonic armaments. Saylor, Kelley M. "Hypersonic Weapons: Background and Issues for Congress"; Congressional Research Service; R45811; Updated March 17, 2020; last access April 8, 2020. <https://fas.org/sgp/crs/weapons/R45811.pdf>

armed forces was announced.<sup>3</sup> This vector is the basis of two programmes. The first is the Navy's own **Conventional Prompt Strike (CPS)**, meant to equip a Virginia-class submarine with hypersonic missiles. The second is the **Long-Range Hypersonic Weapon (LRHW)** of the Army, aiming at developing a land-based mobile vector with a range of 2,200 kilometres. The common HGV was initially planned to be used also in the Air Force's Hypersonic Conventional Strike Weapon (HCSW) programme, which was cancelled due to budgetary constraints in favour of a parallel project – the **AGM-183 Air-Launched Rapid Response Weapon (ARRW)**, a missile to be fired by B-52 bombers. The choice was motivated by the more advanced stage of ARRW and by the smaller size of the vector, which allows each B-52 to carry twice as many weapons and possibly enables F-15 fighters to employ them as well. The US is also funding research on **anti-hypersonic solutions**, but such initiatives are still at an early stage.<sup>4</sup>

The efforts by **Russia** and **China** to deploy hypersonic missiles respond to the reverse side of this logic. They plan to use them as Anti-access / Area Denial assets conceived to keep the US military – especially its aircraft carrier battle groups – away from their territory. Moscow and Beijing also regard hypersonic systems as a response to American anti-ballistic missile defences that in their perception break the longstanding nuclear equilibrium based on **Mutual Assured Destruction (MAD)**. According to its principles, a nuclear-armed power would never attack another, as the subsequent nuclear retaliation would annihilate the aggressor and ensure its defeat. But in theory,

missile defence systems could end this balance by shielding who deploys them from reprisal. Thanks to their ability to bypass such defensive assets, hypersonic weapons would solve the problem and restore the ancient equilibrium. However, the logical consistency of this argument is debatable for reasons that will be examined below. Still, while on the basis of available information the US is focusing on exclusively conventional systems, Russia is also developing nuclear-capable vectors while China has not clarified what kind of warheads will be carried by its hypersonic weapons.

More specifically, **Russia** is developing three hypersonic systems. The first is the **Avangard** (Project 4202 / Yu-74), an HGV which can be launched from ground-based intercontinental ballistic missiles, notably the RS-18 / SS-19 Stiletto currently in use and the RS-28 Sarmat / SS-X-30 Satan II that will soon substitute it. Featuring onboard countermeasures and with a range of at least 6,000 kilometres, it can allegedly reach a speed of Mach 20 and perform evasive manoeuvres. It carries a nuclear payload and has entered combat duty in late 2019. The second system is the **3M22 Tsirkon** (Zircon) cruise missile, which has an estimated range between 400 and 1,000 kilometres and a speed between Mach 6 and 8. The missile is mainly meant as an anti-ship weapon for striking US carriers and will be carried by various units including Kirov-class battlecruisers, frigates of the Admiral Gorshkov class and attack submarines of the Yasen class. An airborne version is also scheduled to equip strategic bombers like the Tu-160M2 and the next-generation, stealth-capable PAK-DA. Finally, there is the **Kh-47M2 Kinzhal** ('Dagger'), which is neither an HGV

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<sup>3</sup> Chin, Jeremy. "US Army, Navy, Air Force, and MDA Jointly Developing Hypersonic Weapon"; Missile Threat, Center for Strategic and International Studies; October 29, 2018; last modified October 29, 2018; last access April 8, 2020. <https://missilethreat.csis.org/us-army-navy-air-force-and-mda-jointly-developing-hypersonic-weapons/>

<sup>4</sup> Saylor, Kelley M. "Hypersonic Weapons: Background and Issues for Congress"; Congressional Research Service; R45811; Updated March 17, 2020; last access April 8, 2020. <https://fas.org/sgp/crs/weapons/R45811.pdf>



nor an HCM but rather a manoeuvrable air-launched ballistic missile reportedly capable of travelling at Mach 10 and having a maximum range of 2,000 kilometres. It is likely capable of attacking ground targets as well as ships, and it can be loaded with either a conventional or a nuclear warhead. The Kinzhal will be carried by MiG-31 and Su-34 fighters, and possibly by Tu-22M3 bombers. It was tested (allegedly with success) in 2018 and will be combat-ready in 2020.<sup>5</sup>

As far as **China** is concerned, it has reportedly tested with success an HGV called **DF-ZF**, previously known as WU-14. With a range close to 2,000 kilometres, its speed is estimated between Mach 5 and Mach 10. It is believed to be capable of performing evasive manoeuvres and of carrying either conventional or nuclear warheads. It could be mounted atop anti-ship ballistic missiles, notably the DF-21D, and used as a "carrier killer". Some believe it could be deployed in 2020. China also tested the DF-17 (a medium-range ballistic missile specifically designed to carry HGVs) and the DF-41 intercontinental ballistic missile (ICBM) which may be modified to launch HGVs. American defence sources also stated that China tested a hypersonic vehicle called Xing Kong 2 ('Starry King 2') in 2018, but little is known about this system.<sup>6</sup>

## The Offensive Potential of Hypersonic Missiles

Even though the specific characteristics of hypersonic missiles vary according to the different strategic needs of the powers that are developing them, they all have some prominent features in common. Their **extremely high speed and ability to change course during flight** means that they are almost impossible to intercept and leave little reaction time to respond to an incumbent attack. Moreover, their **range and destructive**

**power** enables hypersonic missiles to neutralize important assets located at great distance even when armed with a conventional payload, and to cause massive damage in case they carry nuclear warheads. As a result, such systems have **strategic-level effects**.

As with virtually every weapons system, hypersonic missiles can be employed both offensively and defensively. In the case of Russia and China, their operational use is to act (along with other systems) as A2/AD assets to create "bubbles" within which the US forces cannot operate. But on the strategic plan their role can be twofold: they could be employed defensively to protect Russian and Chinese territory by deterring or blocking a foreign intervention, but they could also support offensive operations against countries like the Baltic states or Taiwan by preventing America to come in defence of an ally under attack. The same is true for US hypersonic missiles. Operationally, they should provide the US with rapid strike capabilities. On the strategic level they may be used in a defensive logic to deter an enemy attack, but they also enable America to act offensively by delivering a rapid blow to undermine the adversary's warfighting capabilities.

Considering the above, ***it is not possible to determine whether such systems are deployed for offensive or defensive purposes.*** However, it is important to note is that ***hypersonic missiles do have a notable offensive potential*** due to their range and ability to avoid interception. It is also necessary to emphasise since now that this does not imply that hypersonic missiles are game-changing weapons. As stated in an article on this topic, even though there are no effective defences against them, hypersonic systems "will not change the fundamentals of strategy" for the simple reason that it is not

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<sup>5</sup> *Ibidem.*

<sup>6</sup> *Ibidem.*

possible to achieve total invulnerability from all existing threats.<sup>7</sup> In fact, a complete and invincible defence cannot be granted even against ordinary ballistic missiles. Yet, due to their offensive power, the deployment and the possible use of hypersonic weapons have strategic-level consequences.

## The Debate over the Strategic Impact of Hypersonic Missiles & the Limits of MAD

The most recurrent argument in the debate over the strategic effects of hypersonic missiles is that they allegedly threaten the existing nuclear equilibrium.<sup>8</sup> This raises a central point, namely **ambiguity**. As a matter of fact, it is impossible to discern whether a hypersonic missile is carrying a conventional or nuclear warhead until it reaches the target.<sup>9</sup> In theory, this problem affects only Russian and possibly Chinese system, since on the basis of official declarations American hypersonic missiles have never been conceived as nuclear-capable vectors. In any case, ambiguity is problematic and dangerous because it **raises the risk that a conventional missile strike may be misinterpreted for a**

**nuclear one**, thus accidentally sparking a nuclear response (this is also the main limit of hypersonic missiles as means for satisfying the objectives of the CPGS: While supposedly conventionally-armed, they may be considered – correctly or not – as nuclear weapons, with all the consequences that this could have). Because of ambiguity and since they are nearly impossible to intercept, some argue that hypersonic missiles threaten the longstanding strategic balance based on MAD.

However, **this problem is not unique to hypersonic missiles**. First, a large-scale strike with ordinary missiles would be equally impossible to block. Second, there are other systems that are also affected by the ambiguity problem – for instance, all the non-hypersonic cruise missiles that are capable of carrying nuclear warheads – and yet they have not undermined the nuclear equilibrium. As such, it has been stated that hypersonic systems are no different from normal ballistic missiles, and that MAD is still fully applicable.<sup>10</sup> Continuing along this logic one could argue that, in the impossibility to ascertain the conventional or nuclear nature of an attack carried out with hypersonic missiles, the target state will always consider it as a nuclear strike and respond accordingly.

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<sup>7</sup> Raitasalo, Jyri. “Hypersonic Weapons are No Game-Changer”; The National Interest; January 5, 2019; last access January 9, 2019.

<https://nationalinterest.org/blog/buzz/hypersonic-weapons-are-no-game-changer-40632>

<sup>8</sup> This has been noted by various analysts; for example: - Majumdar, Dave. “Nuclear War: Could China’s Mach 10 Hypersonic Weapons Unleash the Unthinkable?”; The National Interest; November 16, 2017; last access December 30, 2018.

<https://nationalinterest.org/blog/the-buzz/nuclear-war-could-chinas-mach-10-hypersonic-weapons-unleash-23228>

- Woolf, Amy F. “Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues”; Congressional Research Service; April 6, 2018; last access December 30, 2018.

<https://fas.org/sgp/crs/nuke/R41464.pdf>

- Muspratt, Adam. “Hypersonic missiles: What are they and can they be stopped?”; Defence IQ; August 28, 2018; last access January 3, 2019.

<https://www.defenceiq.com/defence-technology/news/hypersonic-missiles-what-are-they-and-can-they-be-stopped>

<sup>9</sup> Woolf, Amy F. “Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues”; Congressional Research Service; April 6, 2018; accessed December 30, 2018.

<https://fas.org/sgp/crs/nuke/R41464.pdf>

<sup>10</sup> Bercuson, David J. “The global arms race no one’s talking about”; National Post, January 22, 2019; last access February 25, 2019.

<https://nationalpost.com/opinion/david-j-bercuson-the-global-arms-race-no-ones-talking-about>

But this kind of reasoning also raises doubts. In an academic rational-based model the logic described above seems perfectly solid. However, it implies that **decision-makers who automatically launch their nuclear weapons in response to an ambiguous hypersonic attack would face the risk of inadvertently starting a nuclear war out of what was in reality a conventional strike.** Much depends on the scale of the strike, but arguing that they would actually take this enormous risk is questionable: After all, MAD lies on rationality; but immediately launching nuclear weapons in response to any attack with hypersonic missiles (or with other vectors characterized by ambiguity) is hardly rational, considering that it could lead to a nuclear war.

At the same time, **it is an equally risky assumption to dismiss the potential dangers deriving from the deployment of hypersonic missiles (as well as other systems) on the basis that MAD is so solid that a war is simply impossible.** Of course, MAD has been the basis of the strategic equilibrium between nuclear powers for decades, and it remains a formidable conflict-preventing factor. But it is hazardous to believe that MAD is a total guarantee against the possibility of great power war. If it was actually the case, then there would be no reason to worry about growing tensions between the US and its competitors like Russia and China, about the development of new weapon systems, about the potential destabilizing consequences of the end of the Intermediate-Range Nuclear Forces Treaty (INF) or about the future of the Strategic Arms Reduction Treaty (START); since war would simply never happen because of MAD. For powerful that this concept is as a paradigm to understand the strategic equilibrium between nuclear-armed powers, it is important to remind that **MAD is a model, not an irrefutable dogma.** Moreover, directly **excluding the worst-case scenario (nuclear war) means ignoring the risks** that could lead to it; and a passive approach is exactly what leaves room for the worst to happen. Finally,

all while being an effective interpretative model, **MAD cannot fully depict reality.** The reason is double fold.

First, **MAD is a model based on rationality and predictability, but reality is neither fully rational nor predictable.** Technical errors, misinterpretations, miscalculations, external factors or casual events may interfere and lead to an unexpected crisis; and even though the likelihood is low, they cannot be completely excluded and consequently ignored. The crisis scenario is an important one to consider, and it will be examined later more in detail. Here, the main point is that **while MAD is a very solid guarantee against a deliberate and pre-planned attack, it cannot fully ensure against an unforeseen event such as a crisis sparked by an external factor.**

Second, **if deterrence fails and war breaks out in spite of MAD due to the factors outlined above, then its logic might no longer be applicable.** MAD is a very powerful model to explain deterrence during peacetime, but it is not equally suitable to examine an armed conflict scenario between nuclear powers. This is an important distinction that is often overlooked. It is frequently stated that in case war actually erupted it would immediately escalate to the nuclear level. But if we apply the very logic of MAD, then we would conclude that nuclear weapons will never be used (unless the vital interest and/or the existence of the state are threatened); as it would result in the immediate defeat of both parties. The fact is that **in such an unpredictable context it is impossible to determine in advance how things would actually evolve.**

That said, the purpose of this paper is not to assess the validity of MAD, to determine what are the most convincing theoretical interpretations about the effects of hypersonic missiles on the strategic equilibrium, or to demonstrate what would

happen in case they were actually used. There are various possible scenarios each having different degrees of probability, but none of which can be excluded with certainty. As a matter of fact, it is impossible to prove what would happen in such an eventuality, and discarding any given scenario is hazardous. In particular, as noted above, it is a disputable assumption to consider that a hypersonic attack would be immediately treated as a nuclear one on the basis of MAD and as a consequence that it would never occur in the first place. At the same time, this reasoning should not aliment scaremongering and paranoia. It is just a necessary measure to maintain the critical spirit that is due when examining such complex and delicate issues.

In short, *while the deployment of hypersonic missiles hardly modifies the existing nuclear balance, it is practically impossible to ascertain in advance how they would be treated in case of a real contingency, and consequently what the response will be.* Differently said, *uncertainty is the only certain thing.* Having clarified this, it is possible to proceed and examine under which conditions hypersonic weapons might actually be used.

## The Conventional Use of Hypersonic Missiles

An important point that is often neglected when discussing the strategic implications of hypersonic missiles is that they are also conventional weapons. Even though most analyses focus primarily on their impact on the nuclear balance, an attentive examination leads to the reasonable conclusion that such systems are primarily conceived for conventional strikes.

First of all, if hypersonic missiles were actually meant to carry out nuclear attacks, it would be unclear why it was necessary to develop a new class of weapons if they do not affect the

existing strategic balance. Nuclear deterrence is already ensured by normal ballistic missiles; and redundancy – a central element of deterrence because it ensures second-strike capabilities – is already granted by the sheer number of land-based ICBMs and the existence of submarine-launched ballistic missiles (SLBMs). Neither the ability of hypersonic missiles to bypass existing defences is a justifying factor, because a large-scale attack carried out with normal ballistic missiles would be equally unstoppable. As such, developing a new category of weapons is not necessary.

Considering all this, it may seem unclear why the world's three leading military powers are investing considerable resources in developing hypersonic missiles. A reasonable explication is that, even when possibly nuclear-capable, they are not primarily meant for nuclear strikes. The US has always excluded their nuclear use, the PRC has never clarified this point, and only Russia is declaredly developing systems capable of carrying nuclear warheads. However, apart from the Avangard, Russian and Chinese systems seem to be essentially designed as anti-ship conventional missiles. In any case, this double conventional-nuclear profile is nothing new, since non-hypersonic cruise missiles capable of transporting either conventional or nuclear payloads have been in service in various countries for decades, and yet their main purpose is not to perform nuclear strikes.

Therefore, it can be reasonably argued that hypersonic vectors are mainly conceived as substitutes and upgrades to existing cruise and theatre ballistic missiles; especially those designed for anti-ship roles. So, *hypersonic systems seem mainly conceived for non-nuclear operations on a relatively limited scale; and they should not be automatically examined as nuclear assets, but rather as conventional weapons with nuclear capabilities.* On this basis, there is a particular

scenario where hypersonic assets might actually be employed, an eventuality that should not be excluded and that raises indeed the risk of unintended (nuclear) escalation: a major crisis involving the US and Russia/China.

## Hypersonic Missiles During a Crisis

The logic of MAD makes a deliberate and premeditated attack by a nuclear-armed state against another a virtually impossible eventuality. Yet, reality is complex and unpredictable, and **an unintended escalation sparked by an international crisis cannot and should not be ruled out completely.**

To understand the implications of this scenario on the possible use of hypersonic missiles, it is first necessary to define the concept. ***A crisis is a situation where decision-makers perceive the combination of an external threat to basic values, a high probability of involvement in military hostilities, and finite time for response; resulting into elevate levels of stress.***<sup>11</sup> This kind of scenario could be sparked by various factors, including an unpredicted event or the initiative of a third-party actor (for example, if Taiwan declared its formal independence China would probably react militarily, thus obliging the US to intervene in defence of its ally). Now, **similar circumstances reduce the rationality of the decision-making process** as the lack of time and information distorts perceptions and leaders unconsciously employ mental shortcuts to interpret and simplify a complex and fast-changing reality in order to hasten their decisions. Therefore, ***in a crisis situation we cannot and should not assume that decision-makers will behave in a completely rational way.***

<sup>11</sup> Brecher, Michael. "Decision in crisis: Israel, 1967 and 1973"; University of California press, 1980, page 1.

<sup>12</sup> Speier, Richard H.; Nacouzi, George; Lee, Carrie; Moore, Richard M. "Hypersonic Missile Nonproliferation: Hindering the Spread of a New Class

This brings to the central point about the risks of actually using hypersonic missiles in a similar contingency. Given the considerable challenge of intercepting them and most importantly the short reaction notice they leave, **such weapons are suitable for delivering a rapid blow to hamper the enemy's ability to fight.** However, this logic has potentially destabilizing implications in a crisis context. A report by the RAND Corporation notes that, due to their extremely high speed and manoeuvring capabilities, hypersonic missiles "further compress the timelines for response by a nation under attack".<sup>12</sup> ***Faced with the threat of a rapid, powerful and virtually unstoppable hypersonic attack, decision-makers may well conclude that the only solution is to launch a pre-emptive strike in order to gain an immediate decisive advantage and/or to prevent the enemy from obtaining it by attacking first.*** Compared to other solutions such as submarines and stealth aircraft, hypersonic missiles themselves would be the ideal assets to achieve this goal due to their ability to bypass enemy defences and deliver a rapid blow combined with their lower cost and the fact that they do not entail the risk of losing human operators. Consequently, ***the perceived threat generated by the crisis would appear even more urgent if both powers had hypersonic vectors, and this logic may realistically lead to an escalation and then to a full-fledged war between great powers.***

In addition, the incertitude over the conventional or nuclear nature of the hypersonic attack raises the actual risk that the crisis would degenerate into a nuclear exchange. As noted above, it is impossible to determine in advance how events would unfold under such conditions, and we cannot

of Weapons" (Key Findings); RAND Corporation, 2017; last access December 30, 2018.

[https://www.rand.org/pubs/research\\_reports/RR2137.html](https://www.rand.org/pubs/research_reports/RR2137.html)



and should not exclude any scenario. A large-scale hypersonic strike would almost certainly be considered as a nuclear aggression and spark a nuclear retaliation, but a relatively limited attack against a specific objective (for instance, a US carrier battle group) to obtain a decisive advantage on the enemy would reasonably be carried out with conventional warheads and treated as such – even though ambiguity surely persists, notably in the case of Russian and Chinese systems. As for the US, the fact that it is declaredly developing only conventional vectors theoretically eliminates the problem. But for this very reason, **American hypersonic assets may be perceived as even more prone to be used for preemptive strikes, thus triggering the escalatory logic described above.**

It should be underlined that *hypersonic missiles could have destabilizing effects not much because they increase the likelihood of a crisis, but because they would make it more acute and favour an escalatory logic in case a crisis occurs in the first place.* An article published on the *Strategic Studies Quarterly* of the US Air Force supports this thesis.<sup>13</sup> Examining the case of a US-China confrontation, the author notes that thanks to their precision, high survivability and low cost, hypersonic assets are useful for both China's A2/AD doctrine and for America's strategy to counter it by targeting enemy C3 infrastructure from outside the A2/AD "bubble". The main objective of both powers is to deter the adversary, while defeating it in battle only comes if dissuasion fails. However, both sides have "embraced an equally offensive operational thinking" to ensure deterrence; considering a possible escalation

as a limited event capable of granting victory by hampering the adversary's ability and willingness to fight.<sup>14</sup> But this is a risky assumption, because the escalation may easily get out of control and result into a large-scale war. As the author states, such operational use of hypersonic weapons "might have deleterious consequences, forcing both parties into a highly escalatory conflict."<sup>15</sup> For this reason, the article argues that **the use of hypersonic missiles should be assessed in and governed by a crisis management logic rather than in a warfighting one.** Mentioning another RAND report, which notes that conventionally-armed ballistic missiles can lead to an escalation by raising fears of an imminent surprise attack, the author also concludes that due to the higher speed of hypersonic vectors "the RAND findings apply in their case to an even greater degree."<sup>16</sup>

That said, the actual employment in a real crisis scenario depends on various factors, many of which are non-rational or casual and virtually impossible to foresee. But exactly because of this, *it is necessary to acknowledge that there are risks associated with hypersonic systems in a crisis context, which should be taken into account by strategist and decision-makers alike.*

## Conclusion: Key Findings

The world's three leading military powers (the United States, Russia and China) and others are developing hypersonic systems in the form of glide vehicles (HGVs) or cruise missiles (HCMs). These vectors can perform in-flight manoeuvres and travel at speeds equal or

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<sup>13</sup> Ekmektsioglou, Eleni. "Hypersonic Weapons and Escalation Control in East Asia"; *Strategic Studies Quarterly*; Summer 2015; last access December 30, 2018.

[https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-09\\_Issue-2/ekmektsioglou.pdf](https://www.airuniversity.af.edu/Portals/10/SSQ/documents/Volume-09_Issue-2/ekmektsioglou.pdf)

<sup>14</sup> *Ibidem*, page 57.

<sup>15</sup> *Ibidem*, page 58.

<sup>16</sup> *Ibidem*, page 59. The RAND report the author refers to is the following: Morgan, Forrest E. "Crisis Stability and Long-Range Strike: A Comparative Analysis of Fighters, Bombers, and Missiles"; RAND Corporation, 2013; last access December 30, 2018.

<https://www.rand.org/pubs/monographs/MG1258.html>

superior to five times the speed of sound (Mach 5), and are therefore almost impossible to intercept. They can be armed with either conventional or nuclear warheads, which raises the problem of ambiguity due to the impossibility to know which kind of payload they are carrying before they hit the target.

America has declared that its systems will exclusively be conventionally-armed, whereas Russia is explicitly developing nuclear-capable vectors. China has not made any official statement in this regard, but is suspected to be exploring weapons suited for carrying nuclear warheads. Yet, Russian and Chinese vectors are mainly designed as Anti-Access / Area Denial (A2/AD) assets to disrupt the operational capabilities of US carrier battle groups in order to deter American interventions in the case of a contingency. As such, even though the ambiguity problem persists, **it is reasonable to believe that hypersonic missiles are mainly conceived to be used with conventional payloads.**

Under normal circumstances, according to the principles of Mutual Assured Destruction (MAD), no nuclear state would attack another out of fear of a nuclear retaliation. Their extremely high speed notwithstanding, **hypersonic missiles do not alter the global strategic equilibrium based on MAD and their existence does not make war more likely.** A large-scale attack performed with ordinary intercontinental ballistic missiles (ICBMs) would be equally unstoppable, and there are other weapons (such as cruise missiles) that are also affected by the ambiguity problem but have not altered the strategic balance. So, the logic of MAD still applies and it represents a very strong deterrent against the eventuality of a conflict between nuclear-armed powers.

Yet, **war remains possible because unforeseen events might trigger a crisis that could eventually degenerate into a full-scale armed conflict in spite of MAD.** It is important to remind that **the decision-making process is**

**not fully rational in a crisis context marked by stress and distorted perceptions.** Under such conditions, one side might decide to strike first to immediately undermine the enemy's warfighting capabilities or to act preemptively out of fear of suffering such a sudden and debilitating attack. Due to their high speed, their capability to penetrate enemy defences and their relatively low cost (plus the fact that they minimize the risk of suffering human losses), hypersonic weapons are the best-suited assets for a similar strike. However, this would escalate the crisis and could result into an unintended and possibly nuclear war. As such, **hypersonic missiles may lead to an escalatory logic during a crisis, especially if both parties possess such systems.**

For what concerns the possible nuclear escalation, **MAD is not appropriate to predict whether nuclear weapons (ordinary or hypersonic) will be used or not.** MAD is meant to ensure deterrence; but if this fails and war breaks out, then the scenario becomes very unpredictable. According to the very principles of MAD, it is even more reasonable to state that nuclear weapons will not be used, unless the state's vital interests and/or its existence are threatened. Yet, **it is impossible to determine in advance what would happen in such a complex and rapidly-changing scenario.**

Finally, hypersonic missiles are not the only weapons alighting this escalatory dynamic, but due to their characteristics they are arguably the most important. Therefore, **the main destabilizing effect of hypersonic missiles is that they increase the likelihood that an escalation will occur in case of a crisis.** This could have devastating consequences, and in today's tense international scene decision-makers should be well aware of this; especially in the case a major crisis takes place.