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Hypersonic Weapons: Tactical Uses and Strategic Goals

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War on the Rocks

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Hypersonic Weapons: Tactical Uses and Strategic Goals

[Hypersonic flight](#) is not new. The V2 rocket and the vast majority of the ballistic missiles that it inspired achieved hypersonic speeds (Mach 5+) as they fell from the sky, as did crewed aircraft like the rocket-powered X-15. Rather than speed, today's renewed attention on [hypersonic weapons](#) owes to developments that enable controlled flight. These new systems have two sub-varieties: hypersonic glide vehicles and hypersonic cruise missiles. Glide vehicles are the cousins of ballistic warheads: they are lofted on high velocity boosters, separate, then use momentum and control surfaces to skip and glide through the upper atmosphere before crashing onto their targets. The cruise missiles use an advanced propulsion system (a [SCRAMJET](#)) for powered flight. While the descriptions are straightforward, the [engineering needed](#) to accomplish the guidance and maneuvering (not to mention survivability) of these weapons is far from clear.

Are these weapons and their employment simply an [evolution of existing missiles](#)? Or a [revolution that threatens](#) to upset the balance of power? The answer still depends on decisions yet to be made. Russia appears closest to fielding hypersonic missiles, as it aspires [to deploy the Avangard](#) glide vehicle before the year is out. The United States has ambitious goals for accuracy and precision, but operational capability of its [most viable programs](#) are not expected until 2022. Meanwhile, China has been characteristically vague on their hypersonic weapons while still letting it be known that they are [firmly committed to their development](#).

For now, it seems hypersonic weapons' predominant value is to give user countries a Clausewitzian capability (i.e., reaching a limited culminating point of victory quickly and decisively) in support of a Sun Tzu-inspired strategy (i.e., to win without fighting).

A trio of questions needs to be considered: what audience can hypersonic weapons be leveraged against, what tactical utility do they provide, and what strategic objectives can be advanced by using them or threatening to use them? Framing the discussion in this way is useful for delving deeper into why nations are pursuing hypersonic weapons as well as making initial assessments on how they may be operationalized. The propositions below are not exhaustive; they are meant to provoke discussion. They pair a particular application for a particular country, but there is nothing stopping Russia, China, or United States from taking advantage of any application discussed below.

Russia: Imposing Costs to Discredit NATO

Russian hypersonic weapon capabilities are addressed principally to two audiences: the West (especially NATO) and Russia's peripheral nations like Finland, the Baltics, Ukraine, or Georgia. Living under the hypersonic gun makes locations in western Europe as vulnerable to strikes initiated from within Russian territory as the Baltics, Ukraine, and Georgia have been in the sub-sonic age. Consider that Russia's [sub-sonic Kalibr cruise missile](#) launched from the Gulf of Finland could range any country on Russia's western border and would take about two hours to hit Sophia, Bulgaria, 1,200 miles to the south. An [air-launched Kinzhal hypersonic glide vehicle](#) traveling Mach 10 could hit Sophia in 11 minutes from the same location. Re-orienting the firing line to Russia's western borders, a *Kinzhal* could reach London, Paris, or Rome equally fast. To put it another way, hypersonic weapons mean that a hypothetical target 1,200 miles away has the same opportunity for warning as those within roughly 100 miles of a subsonic cruise missile. [The Mach 20 Avangard](#) expands the threat umbrella to cover ranges reportedly in excess of 3,700 miles with a flight time around 20 minutes.

Up until now, the West has been fairly confident that their collective intelligence capabilities would alert them to limited Russian aggression. Even if insufficient to fully interdict a Russian move, it was understood that distance equates to time and thus warning. Russian hypersonic weapons offer a novel way to overcome the tactical depth — the idea of where one's vulnerabilities lie; where those vulnerabilities can be exploited from; and, how quickly effects can be inflicted — implicit in European defense thinking. Countries in the Russian periphery feel the loss of depth in a different way: they are now quickly reachable from a vastly increased number of firing locations. For example, sub-sonic munitions would take about 15 minutes to hit Donetsk from the Russian border. Hypersonic weapons with the same flight time could now reach Donetsk from as far away as central (*Kinjal*) or eastern (*Avangard*) Russia.

This makes hypersonic weapons a helpful tool for a *fait accompli*, a move so decisive (perhaps unexpected) that it instantly achieves the Clausewitzian “culminating point of victory” against opposition that is either unable or unwilling to fight back. A robust hypersonic weapons capability would help Russia quickly seize the initiative in escalating from rhetoric to kinetic action, quickly inflicting damage using units that are well-dispersed and may appear unrelated to each other or the conflict. Alternatively, the same capabilities can be used to strike targets meant to deter Western leaders from a forceful intervention. A single hypersonic weapon targeting an outlying military airfield may be enough of a “pressure point” to warn without provoking, or without cornering political leaders to respond in kind.

However, combat is not the Kremlin’s immediate usage for hypersonic weapons in Europe. It is to reinforce the most salient message that Russia hopes to send: NATO cannot protect you. This message preys on the fears of countries who rely on NATO as the guarantor of sovereignty and security norms within the Russian shadow. By showcasing capabilities — as it did in Syria with the use of a [*Kalibr* cruise missile in 2015](#) — Moscow seeks to simultaneously discredit NATO’s security guarantees and coerce deference from its periphery. By emphasizing NATO’s physical and psychological vulnerability, Moscow hopes to deter the alliance from confronting Russian aggression. These threats are magnified by the added prospect of [nuclear capability](#), supported by [Russian doctrine for the use of low-yield weapons in a regional conflict](#), which further emboldens Russian aggression. It’s worth noting that there is real debate on the credibility of Russia’s so-called “escalate to de-escalate” strategy — [a misnomer that should be corrected to “escalate to win” or “escalation control”](#). It does, however, illustrate Moscow’s willingness to wager a great deal while leaving its adversaries call the bluff. Real or imagined, Russian hypersonic weapons increase the cost to NATO in organizing a combat response to Russian grey zone aggression.

China: Ambiguous Capabilities, Clear Objectives

The state of China’s hypersonic missile program is unclear. What’s obvious is that the audience for China’s hypersonic weapons is first and foremost the United States, whom Beijing seeks to deter from interfering in portions of the Western Pacific that it sees as a privileged sphere of influence. Second are nearby nations and targets of periodic Chinese intimidation — specifically Japan, the Philippines, and Vietnam. Given the vastly maritime nature of China’s near abroad, synchronizing kinetic strikes becomes especially relevant and obviates a key reason that militaries historically seized terrain- to ensure that firepower could be leveraged en masse against priority targets.

A hypersonic capability affords Beijing more options for simultaneously striking ships at sea, forces ashore, and command functions using a force posture that appears deceptively routine. Distance-wise, Chinese weapons can already reach the ranges in question. However, to achieve simultaneous effects with existing, subsonic capabilities, China must either forward deploy its missile systems or stagger launches. Either approach would complicate achievement of a *fait accompli* by increasing Chinese forces’

vulnerability to counterbattery strikes or affording unstruck targets greater opportunity to defend or disperse.

If launched concurrently, a [Chinese YJ-83](#) cruise missile traveling 0.9 Mach would hit its target 100 miles away at the same time a [DF-17 hypersonic glide vehicle](#) going Mach 15 hit its target at 1,500 miles. That flight time is just under 9 minutes. This means that Chinese forces can position its launchers to impose near-instantaneous strikes anywhere within [the first island chain](#) that stretches from Japan through the South China Sea before hooking into Vietnam, as well as much of the second island chain reaching out toward Guam and the Marianas. Weapons launched from Chinese warships and shore batteries could be synchronized to simultaneously cripple U.S. naval assets in the South China Sea, air and amphibious forces on Okinawa, and 7th Fleet Headquarters in Sasebo. While the threat of hypersonic weapons to high value targets like aircraft carriers is concerning, the deeper problem is an improved Chinese ability to hit those high value targets as well as other units simultaneously and with very little warning.

China is probably not preparing this kind of surprise attack — for now. Similar to Russia, China would rather use these weapons to demonstrate backyard dominance without resorting to war. They want the United States to conclude that the benefits to maintaining its regional interests are not worth the costs of armed confrontation. Regional Asian countries are unlikely to conclude that their individual cost-benefit calculations are any better. Indeed, they are much worse given China's added economic leverage.

The possibility of China developing intercontinental hypersonic weapons with nuclear warheads hints at a further strategic use: to impose [mutual vulnerability](#) on the United States. Chinese defense planners may see their relatively small nuclear stockpile as vulnerable to a catastrophic first strike. In their nightmares, whatever does survive a first strike could plausibly be intercepted by U.S. ballistic missile defenses, if not now then in the future as defense systems mature. A Chinese nuclear-capable hypersonic weapon thus guarantees mutual vulnerability as a *de facto* [state of affairs between Washington and Beijing](#). They accept that the United States could deliver overwhelming nuclear force through its strategic triad, and Washington would have no choice but to concede a practical inability to defend against nuclear-armed hypersonic weapons. Beijing may see this as a stabilizing to United States-Chinese relations, and certainly would view it as enhancing the credibility of their nuclear deterrent. In doing so, China may perceive further freedom of action versus a United States unwilling to jeopardize nuclear stability over Chinese sovereignty assertions.

United States: Deter Adversaries and Reassure Allies

The majority of defense messaging from Washington can be put in one of two categories: deterring adversaries (especially China and Russia), or reassuring allies (especially the ones confronted by China or Russia). The discussion of hypersonic weapons is no different as the US seeks to navigate competitive great power ties and safeguard the regional allies and partners who provide a key competitive advantage.

To begin with, hypersonic combat capabilities like those already mentioned would also accrue to the United States. A Mach 8 weapon fired from the North Sea could strike military bases 700 miles away in the Kaliningrad oblast within 9 minutes. Likewise, hypersonic weapons can enable synchronized fires *against Chinese forces* [from allied platforms deployed in the first and second island chains](#). The characteristics that make these weapons useful to U.S. adversaries for seizing the initiative in an offensive action are also useful to the United States and allies for stalling their momentum with equally rapid and injurious counterattacks.

But the United States has an added opportunity: deploying hypersonic missiles overseas to signal interest and resolve. The U.S. systems that media reports portray as closest to being operational — like the [Air](#)

[Force's ARRW](#) or the [Army's AHW](#) — have theater-level ranges, meaning they will have to be sent to the region beforehand. Since the number of weapons initially available will likely be limited, it makes them all the more potent in illustrating U.S. priorities on interests and redlines. That also makes them useful for diplomatic leverage; a stick for our adversaries and a carrot for our allies. There is of course concern that allies may be unwilling to host these weapons for fear of inviting unwanted attention domestically and from Russia or China. It stands to reason then that low-visibility deployments to existing bases may be beneficial, as well as developing systems that are easily surged and recovered such as [HIMARS or ship-based weapons](#). If developed wisely, these weapons offer a new coin to be used for conventional deterrence and assurance.

Second, a hypersonic weapons program can be used as leverage in pursuing arms control agreements beneficial to the security of the United States and its allies. This would be broadly analogous to the *Pershing II* missiles which played a central role in the negotiations that led to the Intermediate Range Nuclear Forces Treaty. Hypersonic weapons could serve a similar purpose today in tamping the threats posed by Russian and Chinese weapons, or in trade for other strategic interests. It is important to note that to negotiate from a position of strength, the United States would be best served by successfully developing and deploying the same capabilities that it would like to limit; only then will adversaries be forced to consider the negotiations seriously.

Third, hypersonic weapons may provide new response options in the face of adversary counterspace actions. It is near-common knowledge that the United States is disproportionately reliant on space-based assets to enable functions like surveillance, communication, and precision navigation. Accordingly, the United States is especially wary of adversary capabilities that jeopardize those assets. First, a rapid strike capability may allow U.S. forces to disable command uplinks to the anti-satellite weapon before it achieves its effect, especially those targeting higher orbits or designed for co-orbital rendezvous/collision. Second, given the prospect of losing some space-based capability, the short flight times of hypersonic weapons give the United States an option to inflict damage before its own space-based enabler is lost. Both options support a plausible response to anti-space attacks which, if signaled to the adversary, can deter anti-satellite launches in the first place.

An alternative contribution may be ascent-phase ballistic missile defense. The need to put an interceptor in close proximity to the launch site is a recurring challenge with ascent-phase targeting. However, because hypersonic weapons compress the time/speed/distance relationships while also flying at high altitudes, they may be well-suited to this role. Hypersonic cruise missiles would be particularly useful since their powered flight would facilitate maneuvering and are easier to deploy on high mobility platforms like ships and aircraft. Hypersonic weapons may still not be responsive enough for completely unexpected launches; but, launch cueing and robust detection capabilities could provide enough of an edge.

Broader Implications

Evolution or revolution, and whether used to make or deter war, hypersonic weapons will bring change. One could reasonably cite [the advent of military aviation in 1909](#) or [subsonic missiles in the 1950s](#) bringing similar reductions in tactical depth that were eventually overcome. The difference is that they still traveled for hours to reach distant targets. The vulnerability they imposed was contingent on poor detection capabilities that eventually improved and restored a sense of depth. There is nothing that makes hypersonic weapons inherently undetectable or un-interceptable; yet, even when that becomes technologically possible, the speed of hypersonic weapons increases the distances for which detection is largely moot. Consider a response that requires at least five minutes to implement or launch. For a subsonic weapon to beat that reaction time, it has to be fired from roughly 60 miles away. For a

hypersonic weapon flying at Mach 10 to beat that same reaction, it can be fired from around 570 miles. What hope such systems offer would rely on a perfect sequence of instantaneous detection, flawless communication, and immediate response.

Advancements in hypersonic weapons will also motivate developments in other technologies. Space-based defenses may take better advantage of limited flight time, but the formal weaponization of space (despite decades of avoidance) may invite a proliferation of counter-space weapons that jeopardize other interests. The short warning times may eventually incentivize automated interceptor systems to a degree not previously acceptable, up to and including firing without human approval. Confronted with exceptionally challenging post-launch problems, these weapons may increase the attractiveness of pre-emptive attacks to make sure they are neutralized prior to larger hostilities. Finally, Russia or China could line their own pockets by selling export versions of these systems to current customers like India, Iran, Syria, or Turkey and gain the added benefit of complicating the United States' strategic landscape. Perhaps most concerning would be the sale (real or apparent) of a limited quantity of hypersonic weapons to a Western Hemisphere nation like Venezuela or Cuba. While it may not seem economically feasible at first, Russia or China may one day find strategic value in making whatever arrangements necessary to put their weapons on America's doorstep.

Hypersonic Weapons Alone Are Not the Challenge

Hypersonic weapons may lead to a revolution in warfighting if countries produce them at scale. Mass production and deployment of reliable designs would mean that these weapons are no longer a niche capability targeted against a limited number of valuable targets. Rather, inflicting near-instantaneous effects over a multitude of primary and secondary targets could bring realization to current fears of increased crisis pressures and faster escalation dynamics. In fewer numbers, there may be evolutionary changes at the tactical and operational levels of war without drastically threatening the strategic balance of peer adversaries. In this case, they may herald another iteration of stability-instability dynamics where states take advantage of high-end warfighting capabilities to enable grey zone aggression. Whether revolution or evolution, hypersonic weapons alone are not the challenge. They will contribute to a 21st century combined arms dilemma that includes other new technology like cyber activities, advanced anti-submarine warfare, and space operations as well as traditional, but indispensable, maneuver forces like infantry battalions, warships, and air superiority fighters.

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