

## Hypersonic Weapons: Why the Need for Speed?

The roots of hypersonic weapons can be traced back to the 1930s, with the development of the world's first ballistic missile, Germany's V2 Rocket, during World War II. Technically speaking, the V2, or "Vengeance Weapon 2," was capable of reaching terminal velocities exceeding Mach 5, classifying the missile as a vehicle traveling at hypersonic speeds. However, what truly characterizes a modern hypersonic weapon lies not in its speed alone, but in its low flight profile and maneuverability. While traditional intercontinental ballistic missiles have a predictable trajectory that renders them an easy target for interception by air defenses, hypersonic weapons present a more formidable challenge to those same defenses. Due to the imminent threat posed by these weapons to national security, it is crucial for the U.S to develop hypersonic weapons. This advancement will ensure that the nation is equipped with a versatile and responsive capability against time-sensitive threats, especially when other options are limited or unavailable.

Currently, both Russia and China are ahead of the United States in hypersonic weapon development. This threatening gap requires that the U.S heighten its focus on the hypersonic arms race. According to Congressional Research Service, the Pentagon's budget request for hypersonic research rose from \$3.8 billion in the fiscal year 2022 to \$4.7 billion in the fiscal year 2023 request. Additionally, the Missile Defense Agency requested \$225.5 million for hypersonic defense. As Russia and China continue to advance their hypersonic weapons, it is critical for the U.S to adapt to the ever-increasing demands of technological innovation in the face of global security challenges.

In response to the U.S withdrawal from the Anti-Ballistic Missile Treaty in 2001 and its missile defense employments in the U.S and Europe, Russia began to accelerate its efforts in hypersonic weapons development. Subsequently, the country developed Avangard, a hypersonic

glide vehicle designed to deliver nuclear warheads. Russia has reportedly launched the cruise missile, Tsirkon, from a frigate and a Yasen-class submarine, as well as the guided ballistic missile, Kinzhal, in Ukraine. These weapons could also be fitted with a nuclear warhead, increasing their threat.

Similarly, China's hypersonic arsenal includes the missiles DF-17 and DF-41. China has reportedly fielded the DF-ZF in 2020, a vehicle "capable of performing extreme maneuvers during flight," and successfully tested Starry Sky-2, a nuclear-capable hypersonic vehicle prototype.

Against threats posed by adversaries, the U.S is vulnerable to attacks. However, it has yet to deploy any hypersonic missiles. Previous efforts to develop hypersonic weapons have either resulted in failure or been terminated before they could achieve success. According to *The Wall Street Journal*, these development problems may be in part due to inadequate testing infrastructure and the lack of an overarching plan for fielding the weapons. Notably, most U.S hypersonic weapons, unlike those in Russia and China, are not being designed for use with a nuclear warhead. Because conventional warheads have a lower energy density and thus require a larger payload to achieve similar effectiveness as a nuclear warhead, they can be more technically challenging to develop.

The challenges of hypersonic development, compounded with major cost concerns, prompt questions on whether the pursuit of hypersonic weapons is feasible. While monetary costs may be significant, the potential cost of human lives urges the development of hypersonic weapons. Because of the threat posed by Russia and China, the United States should embrace hypersonic weapon capabilities to maintain deterrence and establish dominance on the global stage as it enters a new era of great-power competition.