Inherent and Use Politics: An Analysis of Hypersonic Technology and Its Development

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Hypersonics is a fairly new field in science. Only within the last century have humans been able to develop vehicles able to travel at ridiculously high speeds. Hypersonics itself deals with speeds above five times the speed of sound, or Mach 5. To put this into perspective, the United States Navy's most widely used missile, the Tomahawk, travels at the astounding velocity of 568 miles per hour, or Mach 0.74. Hypersonics missiles travel at least seven times that speed (Banerjee, 2021). It's no shock that nations that crave superiority want access to the technology that can get them there, and for a majority of countries that includes weaponry. Hypersonic missiles not only sound frightening, but they travel at such a high speed that they are virtually untraceable. According to Military.com, the U.S. Aegis missile interceptor system, an advanced command and control system using radar to track/intercept enemy targets, "requires 8-10 seconds of reaction time to intercept incoming attacks." In those 8-10 seconds, the missile would have traveled more than ten miles. On top of that, air pressure in front of the missile transforms into a plasma cloud that absorbs all radio waves emitted by the missile, making it effectively invisible to any radar system.

The United States is on the precipice of gaining ground with hypersonics technology, but our competition, more specifically Russia and China, have advanced much quicker. The emphasis from our competitors on hypersonic missiles is likely due to their desire to match us in sheer global superiority, specifically our naval force. At any given time, the U.S. has 12 nuclear-powered aircraft carriers deployed around the world while Russia has one. This will mean nothing if just 15 of Russia's Buyan-class corvette ships can carry up to 25 Zircon missiles, Russia's newest and fastest hypersonic missile (Stilwell, 2020). This creates a new level of fear for the United States, and their response to said fear has created a new political agenda. This

paper will separate the United States' response into two categories, government propaganda and global political power, and connect them to Winner's idea of use versus inherent politics.

History of Hypersonics Weapons

War has been a characteristic of humans as long as humans have formed civilizations. For centuries, hand-to-hand combat and rudimentary weapons were the most common way fighting played out in battle. Catapults and ballistas enabled boulders and giant javelins to be launched into buildings and people, becoming the first long range weaponry after bows. Guns were the next step, entering the battlefield in the early 16th century (van Creveld, n.d.). It wasn't until 1911 that the first planes were used during battle, when Italian monoplanes bombed Turkish camps during the Italo-Turkish War (Wikimedia Foundation, 2023b). During WWI, tanks launched projectiles across the battlefield while in WWII planes bombed civilian cities and military bases. Since the beginning of war, those with the most advanced weaponry typically won, and as time progressed it seemed that weapons only became more and more long-ranged.

It wasn't until 1944 that the first missile was used. The V-2 was the world's first long-range guided ballistic missile, used as retaliation for the Allied-bombings of German cities. During ascent, the V-2 would reach Mach 4.3, reaching hypersonic speeds and clearing Mach 5 while descending onto English targets (Wikimedia Foundation, 2023a). Following WWII, the U.S. attached a sounding rocket, a rocket designed to carry instruments for atmospheric data collection, to the top of a V-2. During ascent, the sounding rocket was able to reach a speed of Mach 6.7 and maximum altitude of 250 miles. A decade later, the United States set the standard for many hypersonic missiles to come with their Atlas intercontinental ballistic missile (ICBM). Atlas was only used for a few years, but with a range of up to 9000 miles and a decent velocity of Mach 21, it proved the validity of hypersonics weaponry for the entire world (Atherton, 2022).

The United States began to lag behind rivaling nations when in the 1960s and 70s, much focus was spent on vehicles that carried people. While the United States may have beat the Soviets to the moon, the Soviets put a lot of effort and funding into hypersonics research. According to Congress, Russia has accelerated its hypersonics research efforts over the last few decades to ensure their nuclear potential is not devalued (Sayler, 2023). Because of the increased missile defense deployment in the U.S. and Europe as well as the United States' withdrawal from the Anti-Ballistic Missile Treaty in 2001, Russia claims that they must seek a means of "penetrating U.S. missile defenses [to restore their] sense of strategic stability." One such way is through the Avangard program, which is focused on developing an unlimited-ranged hypersonics glide vehicle deployed by an ICBM. With this heightened focus on hypersonics research, the United States must respond promptly.

China holds a similar mentality. Like many competing nations, they without the belief that hypersonics weaponry is necessary to counter advanced U.S. military threats. More specifically, China, like Russia, is developing hypersonics weapons to counter any preemptive strike by the U.S. on their nuclear arsenal, destroying their entire defense system and, inherently, their infrastructure. Because of this mentality, all of the global superpowers are trying to build the best hypersonics weapon as a precaution that the enemy has one even better. This results in a constant need for advances in the technology. But what specifically is pushing this need for the most effective missile? If Russia and China state they are building hypersonics missiles as a defense from American missiles, and yet the U.S. would never impulsively launch an attack, then there shouldn't be an issue. However, with distrust comes the biggest human emotion, one of the driving factors for survival: fear. If only humans trusted each other, then there wouldn't be any fear in the first place.

Introduction to Frameworks

Langdon Winner set forth a framework that technological artifacts have politics associated with them, inherently and through their use. Use politics translates to what a technology might represent and what it symbolizes. Inherent politics describes what a technology actually is or does (Winner, 1980). With the emergence of hypersonic missiles and the fear created by such weaponry, this framework is a perfect example of how to analyze this fear. This framework is particularly effective when speaking about technologies with underlying ethical issues. An example of this is the low-hanging overpasses on Long Island, New York, where the ceiling is as low as nine feet, a measurement overlooked by most. As it turns out, it was constructed intentionally low as to "discourage the presence of buses [on parkways]" (Winner, 1980), the main form of transportation for the lower-class. This framework perfectly represents how a simple bridge design, for example, can have an inherent use of transportation for vehicles all while having the underlying purpose of preventing minorities and lower-class residents from finding work in the city. Winner's idea has its basis in the fact that every technological artifact has more than one purpose, and so this is crucial when trying to determine why a technology might flourish and why a government, for example, might put so much backing and funding in its success.

Use Versus Inherent Analysis

Inherently, the United States fears losing its global superiority, and so it's putting billions of dollars into hypersonics research. Russia and China have already developed missile technology more advanced than any current American design, and so the U.S. must respond promptly for fear of the destruction caused by enemy attacks. The victor is, always has been, and always will be those with the most strategic offensive strategy. This could mean having the strongest and most destructive weapon, but it could also include having the strongest defensive strategy. Even if our

enemy had the newest, most groundbreaking missile, one with virtually unlimited range and a speed of up to Mach 20, the United States having a defense system capable of tracking and intercepting such a missile long before it came close to its target renders that offense useless. But tracking hypersonic objects is a science not yet understood to its full potential. This is why the U.S. government has begun a new initiative with STEM. The government uses the representation of hypersonic weapons as a form of propaganda to get students into the STEM field and, therefore, into the defense industry.

The first of Winner's artifact-characterization is inherent politics, which can be described in this fear. Fear drives almost every decision in regards to the defense industry. With Russia and China on the forefront of advanced hypersonics technology, they will quite literally be leaving the United States in their wake. To put it simply, the United States is once again locked into an arms race (Ross, 2022). By landing on the moon before the Soviet Union, America's dominance globally was solidified. Gaining a level of "insurmountable pride", American citizens felt like they belonged to the "superior" nation (Stone, 2020). But time has caught up with the U.S., and our enemies are once again able to rival us in terms of sheer ability. The United States government feels this shift and has begun to fear loss of their superiority once again. Hypersonic weapons are the main contribution to such an anxiety. By their very nature, they create a political climate that rivals nations and instills fear into millions. As quoted by Winner, "the adoption of a given technical system unavoidably brings with it conditions for human relationships that have a distinctive political cast" . The adoption of hypersonics weapons into the modern world set the precedent for any future weaponry: fast is best. The nation with the fastest weapon is the most superior. The United States losing their position as the superpower of the world could have drastic repercussions globally. We could lose territories and trade connections, and most

importantly we wouldn't be able to protect those unable to do so themselves. Russia and China could take over neighboring countries and oppress millions of once-liberated citizens, and they could enforce their rule all over the world with nobody to stop them. Of course, this is a little bit drastic as the United States still retains control over the most powerful naval force in the world, currently able to match any weapon in use. But as time continues, so does the enemy's knowledge of hypersonic weapons.

Although Russia and China claim plans for weapons able to "fly around the world at blinding speed, then snake around hills and dales to a target" (Ross, 2022), common use of these weapons is still far off. Even still, these missiles, if implemented properly, have the ability to carry conventional warheads and evade any naval defense, depriving the U.S. of its preeminence at sea, yet another reason for Russia and China to fund hypersonics. One of the most successful ways to garner attention from the government is to threaten its safety, and that is exactly what hypersonics is doing. Although in the past funding has been relatively restricted, Congress has seen a recent flourishment in successful hypersonics tests around the world. Both Russia and China have demonstrated successful hypersonic glide vehicle tests, posing a strategic threat for the first time in decades and pushing the U.S. to start putting more funding into the field. As of now, the Pentagon has requested $4.7 billion for hypersonics research for 2023, almost a billion dollar increase from 2022 (Sayler, 2023). This money can then be used to fund contracts with defense companies like Lockheed Martin and Raytheon and research at universities and independent labs.

The second of Winner's technology characterizations, use politics, can be represented by the newly-flourishing STEM field. New contracts have resulted in the defense companies scouring university campuses in search of newly-graduated engineers to fill their programs

(Olivier, 2022). STEM majors are essentially a pipeline for the defense industry, with the promise of jobs with high-paying salaries directly after graduation persuading students to join the field. This is yet another tactic by the government that has developed from the fear of enemy hypersonics weapons. Winner's idea of a technology being characterized as a use politic can describe how the representation of hypersonics leads to propaganda by the government. By funding defense contracts and, in turn, pushing companies to scour campuses for new-grads, the government is persuading students to join the STEM field. The idea of hypersonic weapons provided by the government pushes students to study what they think will lead to the most high-paying jobs. In this way, companies like Lockheed Martin are advertising themselves as the company with the most successful employees and highest room to grow, therefore enticing people to join them as they graduate school. Lockheed Martin sets up recruitment events, cash-prize competitions, scholarships, and even internship opportunities (Olivier, 2022) with the hopes of incentivizing students to join them in their mission of "defending the nation," an idea set up from the get-go by the U.S. government. Just like the Long Island overpasses, there is an underlying reason for these recent events. Winner almost perfectly describes this idea, explaining that no technology can get away with having just one use. Every technological artifact, whether starting because a direct reason or an underlying one, will have multiple effects on its users. In this case, hypersonic weapons had a direct use, to help the user gain a superior offensive strategy, but further gained a secondary use that had numerous other effects. By getting students to fill companies' roles, defense contracts can be fulfilled and the government can proceed knowing they have the best minds at work to help retain their role as a global superpower, all while the students think they're just getting a high-paying job at a well-known contractor.

Conclusion

To summarize, hypersonic weapons can be characterized into two political realms. Through their inherent use, they can cause governments to fear for global superiority, pushing nations to clash further and governments to intensely fund defense contracts. Hypersonic weapons are capable of evading the most advanced of defenses, and so through their direct use they are a technological artifact. On the other hand, these missiles represent a threat to U.S. global superiority, and therefore have forced governments like the United States to incentivize their young citizens to join the STEM field. With competitions, scholarships, and promises of stability and high-paying jobs, the U.S. uses propaganda to persuade people to join in the fight against the nation's enemies.

The United States has had numerous ways to respond to threats over the decades of reigning as one of the world's superpowers. With hypersonics technology becoming more of a threat, and with responses becoming limited, characterizing these threats properly is crucial to then understanding the best way to counter. Philosophers like Langdon Winner have created frameworks that have led people to further study why forces like the United States government respond the way they do. Overall, understanding these frameworks can help people to connect technology to ethical dilemmas and, in turn, have the hindsight to engage in the best course of action when dealing with these technologies.

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