



The Potential for a Hypersonic Arms Race between the U.S., China, and Russia

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Progress in hypersonic technology will change the battlefield and risks regional arms races. The likelihood of new arms control regimes in this field are small and this has led to a growing problem in relations between the U.S., China, and Russia, the countries most advanced in developing such weapons. The development and deployment of American hypersonic systems might be a new element of deterrence against China and Russia and could influence U.S. allies' security in Asia and Europe.

Hypersonic Technology and Applications. Work in previous decades on controlled flight at hypersonic speeds (Mach 5 and above) was focused on ballistic missile re-entry vehicles with protection for warheads as well as re-entry shields for de-orbiting space vehicles. Progress in the development of ballistic missile defence after the Cold War raised interest in new military applications of hypersonic systems. Apart from achievements in crossing huge technological barriers (materials, control systems, and in-flight manoeuvring), another impulse for China's and Russia's efforts was the U.S. Conventional Prompt Global Strike concept, which assumed a decrease in non-strategic nuclear weapons in favour of hypersonic weapons.

Two types of these weapons are in development. The first is a category called hypersonic glide vehicles (HGV), which are vehicles boosted by rocket engines adapted from ballistic missiles. After the boost phase, HGVs "glide" at altitudes of 40–100 km and manoeuvre toward a target at Mach 20–25. The trajectory of the HGV means it is not susceptible to detection, observation, and interception by ballistic missile-defence systems. A specific modification of the HGV is an air-launched ballistic missile (ALBM), carried by airplanes. A second type of these weapons is the hypersonic cruise missile (HCM), which, thanks to scramjet engines, can fly at a very low altitude at a speed of Mach 5–8. The advantages of this variant over subsonic cruise missiles is that with speeds a few times higher, combined with manoeuvrability, it is hard to detect and predict the flight path. Current experience with HCMs using a scramjet opens also the possibility to develop hypersonic airplanes or drones.

The U.S. concept from 2003 foresaw hypersonic weapons as ideal against hard to destroy and limited availability targets—leaders of terrorist groups, weapons of mass destruction in transit, command-and-control centres, and air-defence and anti-satellite weapon systems. In China and Russia, the approaches to hypersonic weapons are to use them to destroy enemy naval surface vessels, command centres, and ballistic missile-defence systems. With China and Russia still lacking precision guidance, they might be more inclined to put nuclear warheads on their hypersonic systems.

Advancements by the Three Powers. Among the more than two dozen countries working on hypersonic technology, the most advanced are the U.S., China, and Russia. The introduction of these new weapons into their arsenals might have serious implications. The American efforts in this field were initiated in the 1950s

but it was only in the last decade that many projects and prototypes were revealed. Among them, few are likely to be introduced and put into service before 2025. Among them are HGV models on sea-launched ballistic missiles (a modified Trident missile) and an AHV ground-launched intermediate range missile. The U.S. Air Force has already contracted the small ALBM Arrow and HCM Hacksaw weapons, and initiated research on the SR-72 hypersonic reconnaissance plane. In 2018, the U.S. Army began research on OpFires, a tactical missile system, and [the Missile Defense Agency is studying different systems to counter hypersonic threats](#) (the most advanced seems to be the THAAD-ER project). The Pentagon has been criticised by Congress for having a scattered approach to the development of hypersonic weapons so far, but at the same time, its budget for the research, development and deployment of such weapons has been growing constantly (\$17 billion in 2003 to \$201 billion in 2018). It is highly likely that the U.S. will introduce a few HGV and HCM models and will increase the scale of investments in counter-hypersonic weapons systems.

A [National Defense Strategy Commission report in 2018 stressed Russia's and China's progress in the development of their hypersonic weapons](#). In Russia's case, these are mainly renewed projects initiated during the Soviet era, such as the sea-launched conventional-armed 3M22 Zirkon HCM and another – Avangard HGV, which can be carried by the heavy intercontinental-range R-36 Voevoda missile but is intended for future RS-28 Sarmat missiles. The Avangard vehicle also could be [adapted to fit an intermediate range missile if Russia decides to renew the missile's development](#). Russia also claims that it has already introduced into service the Kh-47 Kinzhal ALBM (modification of the Iskander-M missile) on the MiG-31 platform (in the near future, also on Tu-160 and Su-57 airplanes).

The Chinese efforts are focused mainly on a single HGV model called DF-ZF, which might be introduced after 2020 on intermediate and medium-range missiles. Its ALBM variant was also tested on H-6N bombers. Moreover, China in 2018 tested its first HCM called Xingkong-2 and plans for 2030 assume even a hypersonic space shuttle. Nevertheless, opinions that China and Russia are more advanced in the hypersonic field are much exaggerated because both countries are successful in developing the relatively less costly and less complicated ALBM systems.

Critique of Hypersonic Weapons. Experts on the development of these weapons by the US, China, and Russia point out that the main advantages of hypersonics—speed and manoeuvrability—might result in the unprecedented shortening of reaction time in comparison with “classical” missiles. This means that current decision processes are not adequate to deal with the new weapons and the identification of an attack and appropriate response could be ceded to the operational military level and be dependent on command systems augmented by artificial intelligence. This risks an uncontrolled escalation of a military crisis or regional conflicts caused by a mistake in detecting a conventional HGV or HCM attack as a nuclear first-strike and increases the probability of a retaliatory strike. A conventional hypersonic strike could result in disproportional nuclear retaliation. In this context, hypersonic weapons could also increase the preference of its owners to conduct pre-emptive strikes to neutralise the command systems and strategic forces of an enemy. Other debated issues include the influence of these new weapons on the regional military balance or even at the global level. The risks of further proliferation have been pointed out, citing the continued cooperation in this field between the U.S. and Australia and previous efforts between Russia and France and India (halted in 2014).

Prospects. It is realistic that in the next few years hypersonic weapons will be introduced into the arsenals of the U.S., China, and Russia. In the context of the huge investments and progress in the research and development of these weapons, the likelihood of an agreement between the three powers on hypersonic arms control, especially at the tactical and regional level, is low. However, it cannot be excluded that hypersonic strategic systems will be subject to U.S.–Russian negotiations on an agreement succeeding New START, which will end in 2021. From the U.S. point of view, hypersonic weapons are operationally useful given the long distances in Asia and the threats from Chinese air-defence and anti-satellite systems. The potential applications of the new weapons could be stronger than arguments against their use by critics and could be decisive in deploying them to U.S. forces in Asia. Considering the shorter distances in Europe, the subject will be much more controversial and some NATO countries might be reluctant to support the introduction of U.S. hypersonic weapons near Russia. On the other hand, the expected effectiveness of the U.S. hypersonic weapons might be an important factor in [ongoing allied discussions of military options to balance Russia's missile arsenal advantage after its violation of the INF Treaty](#). Backers of the new weapons suggest they can be a new element of conventional deterrence for NATO, especially the possibility of overwhelming air-defences and intermediate- and medium-range missile systems.