The impact of hypersonic missiles on strategic stability

Russia, China, and the US

Non-ballistic hypersonic missiles are highly manoeuvrable weapons that move with a speed of Mach 5 or more. Russia, China, and the US are the frontrunners in developing those weapons. The combination of speed, accuracy, manoeuvrability, and range makes hypersonic missiles effective both against time-sensitive targets and as an anti-A2/AD asset. Their effectiveness and lethality, with relatively low deployment costs, give hypersonic missiles a credible deterrence value, but also new possibilities for preventive action. Hypersonic missiles fulfil a need driven by a security dilemma, but at the same time they keep this dilemma in place. This has profound consequences for the concept of strategic stability. The velocity of these missiles reduces the reaction time for a proportional response to mere minutes, and thereby enhances the risk of unpredictable behaviour as a result of misinterpretation and miscommunication by both attacker and defender. This article argues that the impact of the new dynamics created by hypersonic missiles are detrimental to strategic stability.

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Power is always challenged by those who have it to a lesser degree. The skirmishes that we see in Asia, the Middle-East, Europe's East and Northern Africa are signs that the contemporary ordering structure of the international system is under stress. After more than a decade of US global hegemony, great power rivalry has re-emerged since the late 2000s with, among others, the rise of China and the rejuvenation of Russia. On the 70th birthday of the Communist Party, China paraded a new category of hypersonic weapons. A few weeks later, Russia announced that its Avangard hypersonic missile had entered service. The US, meanwhile, continues to develop a *conventional prompt global strike capability* (CPGS). These developments underscore both the rapid military modernisation that existing and emerging powers are going through, and the rivalry that is going on between the world's great powers to achieve dominance in the hypersonic realm. This raises questions about the impact of such new technology on strategic stability. This article seeks to find an answer to that question by looking into the motives of Russia, China and the US to develop hypersonic weaponry and how those weapons affect the impact on deterrence stability, escalation stability, and arms control stability.

On hypersonic weapons

Hypersonic weapons are highly manoeuvrable weapons that can travel at sustained speeds of more than Mach 5. They are divided into two categories: *hypersonic glide vehicles* (HGVs) and *hypersonic cruise missiles* (HCMs). HGVs (also

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A medium-range ballistic missile target is launched in an interception test. Missile defence systems aimed against existing delivery vehicles might be a trigger for the development of hypersonic weapons

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referred to as 'boost-glide vehicles') are non-propelled missiles that glide towards their target at hypersonic speeds after being launched by a rocket into the uppermost layers of the atmosphere. HCMs, too, use traditional booster rockets to bring the projectile up to supersonic speed but then switch to a scramjet propulsion system that enables the missile to sustain hypersonic speed.

Missiles flying at ultra-high speeds are not particularly new. Ballistic missiles, for example, may reach up to Mach 25 upon re-entry.[1] The difference, however, is that ballistic missiles follow a more or less predictable flight path. In the event of an enemy ballistic missile launch, missile defence systems can estimate where the missile will re-enter and adapt accordingly. The novelty of hypersonic missiles is in their manoeuvrability. This allows them to follow far more erratic flight paths, rendering the logic behind contemporary missile defence systems obsolete.

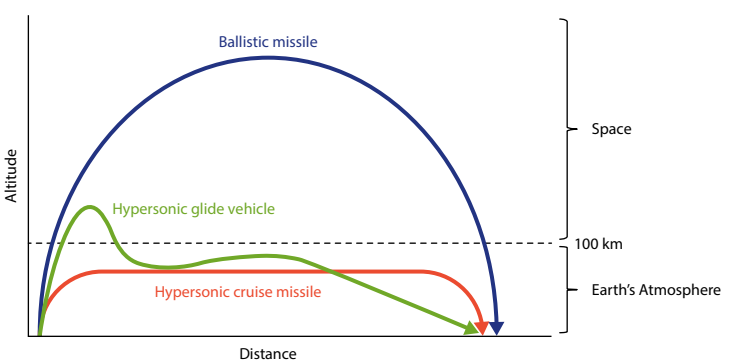


Figure 1 Difference in flight trajectories between ballistic missiles and hypersonic glide vehicles and cruise missiles (not to scale)

Hypersonic missiles 'overcome the tyranny of distance, time and defences that currently limits conventional power projection'.[2] The combination of speed, range, agility and precision provides tactical and strategic advantages that states keenly seek to acquire. These weapons are known to be under development in Australia, France, Japan and India, but the race is led by Russia, China, and the US. On the tactical level, the speed of these missiles makes them useful against time-sensitive targets. The ability to pierce through enemy air defences makes it an effective anti-A2/AD capability. With reference to John Warden's much-famed five-ring model, this also provides new and comparatively cost-effective means to disrupt and incapacitate the adversary by conducting strategic strikes on multiple high-value targets at once. The ability to strike with a high probability of success at relatively low cost not only provides strategic value in the spheres of prevention and pre-emption, but also makes these weapons veritable tools of deterrence for punishment and decapitation.

United States

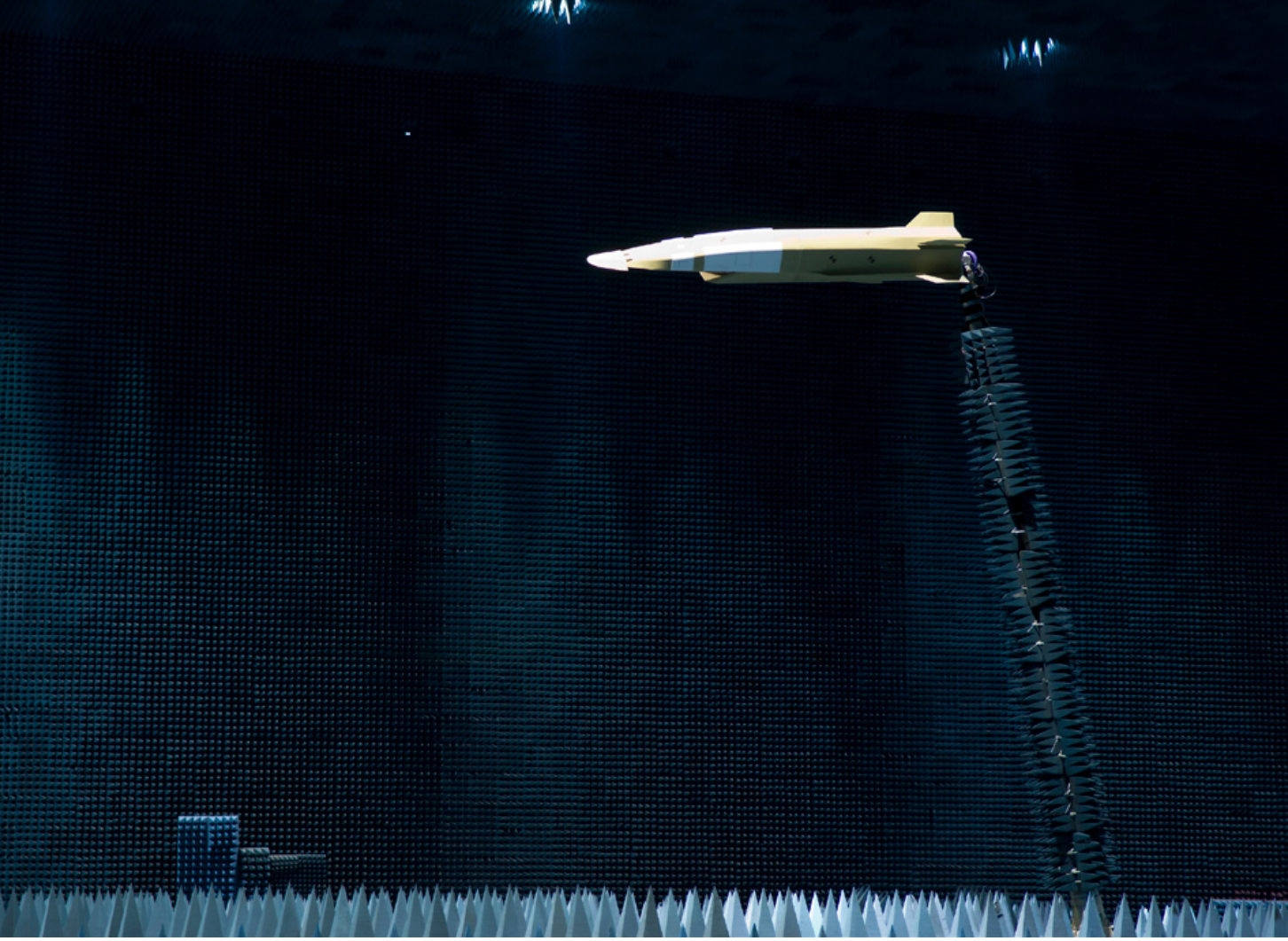
The genesis of the Pentagon's hypersonic weapons programme dates back to 2003 when the Bush administration sought a CPGS capability to strike targets anywhere in the world within an hour.[3] The major threat at the time was terrorism, which often presented itself with small windows of opportunity for attack. Back then, nuclear-tipped ballistic missiles were the only weapons that could be used in a prompt manner but the asymmetric destructibility would render such weapons far too disproportionate for counter-terrorist purposes. Hence the demand for a long-range high-precision conventional missile capability emerged. In addition to counter-terrorism, this new capability was envisioned to provide the US with a unique 'counter-nuclear' capability enabling it to target nuclear facilities and infrastructure at any place where nuclear proliferation appeared to occur. Furthermore, China's successful anti-satellite missiles test in 2007 laid bare the US's vulnerability of low-orbiting satellites which form the backbone of the American C4ISR capabilities.[4] A CPGS capability would provide a

1 'Ballistic Missile Basics', *Federation of American Scientists* (2000). See: https://fas.org/nuke/intro/missile/basics.htm.

2 R. Hallion, C.M. Bedke, M.V. Schanz, (2016) *Hypersonic Weapons and US National Security* (Arlington, The Mitchell Institute for Aerospace Studies, 2016) 8.

3 E. Ekmektsioglou, 'Hypersonic weapons and escalation control in East Asia', in: *Strategic Studies Quarterly* 9 (2015) (2) 45; R. Haffa, A. Datla, 'Hypersonic Weapons: Appraising the "Third Offset"', The American Enterprise Institute (2017) 7.

4 H. Vasani, 'How China is Weaponizing Outer Space', in: *The Diplomat* (2017). See: https://thediplomat.com/2017/01/how-china-is-weaponizing-outer-space/.



An X-51 Scramjet-Waverider mock-up is being tested. The X-51 is an American experimental hypersonic aircraft. The US is one of the frontrunners in hypersonic developments

PHOTO U.S. AIR FORCE

plausible option to pre-empt any such unfolding decapitation strike against the US.[5] The urgency for the programme became even more poignant after China tested the DF-21D 'carrier killer' anti-ship ballistic missile in 2010 for the first time – a development which caught US strategists and policymakers off-guard.[6] The Obama administration inherited the CPGS programme and saw its use chiefly in the light of a counter-A2/AD capability that befitted the US's pivot to Asia.

'The US deals with great powers through *offset strategies* which aim to minimise adversary advantages and maximise the US's advantages.'[7] The US's pursuit of conventional hypersonic weapons is part of a quest for a *third offset strategy*[8] which is spurred by the rise of great power competition. It follows the second offset strategy of the late 1980s,[9] which rested upon precision-guided munitions (PGMs), sensors and network centric warfare to maintain an edge over competitors. The potential of the second offset strategy, which boosted discussions about a *revolution in military affairs*, was first demonstrated during Operation Desert Storm. Now, thirty years later, PGM's have become a commodity in most modern armed forces. The proliferation of PGMs have made A2/AD defences increasingly capable – and they pose an increasing challenge to US global power projection.

5 Ekmektsioglou, 'Hypersonic weapons',47.
6 Ibidem 48.
7 Deputy Defense Secretary Robert Work, *Speech at Air Command and Staff College at Maxwell Air Force Base* (27 May 2016). See: https://www.youtube.com/watch?v=wA0epN0L1fc.
8 Haffa, Datla, 'Hypersonic Weapons: Appraising the "Third Offset"'.
9 The first offset strategy was President Eisenhower's *New Look* strategy which spurred the development of a nuclear triad and a doctrine of massive retaliation. The triadic component of the strategy remained intact but the doctrine was replaced by flexible response under the Kennedy Administration.

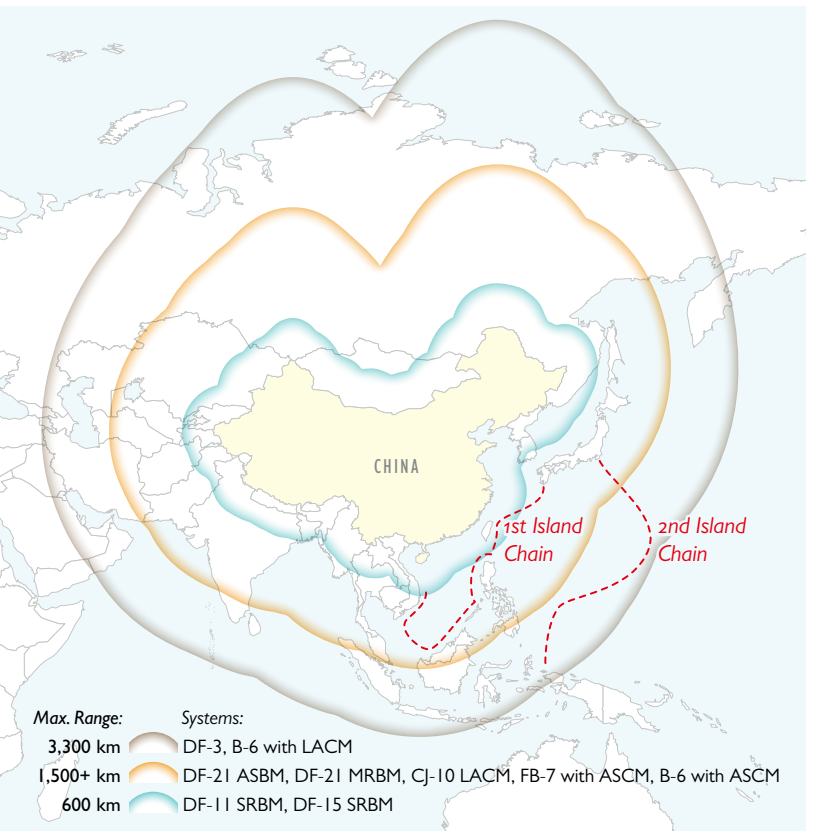


Figure 2 The DF-21D easily covers the first island chain and large parts of the second island chain, enhancing its A2/AD capability in that region

Great powers are states that have the power to influence the international order. They can take on other great powers with conventional means and generally possess a nuclear deterrent force that can credibly survive a first strike. The confines of the international structure causes existing and aspiring great powers to clash occasionally. In the event of such a conflict, a nuclear collision is the least desirable scenario – simply because it is too dangerous. To avoid that, the US seeks to pursue a superior conventional deterrent.[10] Successive Quadrennial Defense Reviews (QDRs) refer to CPGS as a form of deterrence that reduces the US's reliance on nuclear weapons to cope with the volatility of the post-Cold War security environment.[11] The 2010 QDR, for example, reads: 'U.S. forces must be able to deter, defend against, and defeat aggression by potentially hostile nation-states. This capability is fundamental to the nation's ability to protect its interests and to provide security in key regions. Anti-access strategies seek to deny outside countries the ability to project power into a region, thereby allowing aggression or other destabilizing actions to be conducted by the anti-access power. Without dominant U.S. capabilities to project power, the integrity of U.S. alliances and security partnerships could be called into question, reducing U.S. security and influence and increasing the possibility of conflict.'[12]

In order to maintain an edge over its competitors, the US is seeking a third offset strategy which rests partly on precision-guided hypersonic weapons systems.[13] The goal of these weapons is to have a sufficiently offsetting character to deter and overcome the A2/AD threats that are applied by existing and aspiring great powers, including Russia and China.

Russia

Soviet research on highly manoeuvrable supersonic technology began in the 1980s, spurred by Reagan's Strategic Defence Initiative (SDI) which sought to take out enemy ballistic missiles with a system of space-based lasers. However, just as SDI, the Soviet quest for a hypersonic counter-capability never saw the light of day due to technical challenges relating to flight control and thermal management at sustained hypersonic speeds. After a lull in the 1990s, the research programme was revamped in the early 2000s after the Bush administration announced to withdraw from the anti-ballistic missile (ABM) treaty and decided to construct a missile shield in Eastern Europe. While the shield was said to be a security measure against Iran, it created a sense of vulnerability in Moscow which legitimised its conviction to pursue counterbalancing capabilities.

10 Robert Work, *Speech at Air Command and Staff College*. See: https://www.youtube.com/watch?v=wA0epN0L1fc.

11 Ekmektsioglou, 'Hypersonic weapons', 46.

12 *Quadrennial Defense Review 2010* (Washington D.C., U.S. Department of Defense) 31. See: https://dod.defense.gov/Portals/1/features/defenseReviews/QDR/QDR_as_of_29JAN10_1600.pdf.

13 *Quadrennial Defense Review 2010*, 9. The other types of *third offset weapons systems* that are talked about are railguns and direct-energy weapons.

On 27 December 2019 Russia announced that the *Avangard* HGV entered service with the First Missile Regiment.[14] Based behind the Ural mountains, close to the Kazakh border, this missile is said to reach speeds up to Mach 20, enabling it to reach any Western European capital within fifteen minutes. While Western analysts are unsure about the real operational status of Avangard,[15] Russia already put into operation another hypersonic missile in the capacity of the *Kinzhal* missile which can cover a distance of 2,000 kilometres at Mach 10.[16] Apart from Kinzhal and Avangard, Russia is working on at least two HCMs: the Zircon anti-ship cruise missile and the short-range BrahMos-II in collaboration with India.[17]

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American and European military leaders start the construction of a missile defence system in Poland. While the shield was said to be a security measure against Iran, it created a sense of vulnerability in Moscow

There are several reasons why Moscow invests heavily in a hypersonic capability. The first one is a direct reminder of President Putin's address to the Federal Assembly in 2018, where he reclaimed Russia's status as a great power after having unveiled a series of 'invincible' flagship weapons, including Avangard and Kinzhal. Driven by an urge to undo the 'gravest geo-political error of the 20th century' and to counter the US/NATO missile shield, these new weapons, which can be equipped with both nuclear and conventional warheads, add to Russia's strategic deterrent posture. The Kremlin had often filed protests against these defence systems, but, as Putin stated, 'nobody listened to us. So listen to us now.'[18] Russia may now comfort itself in having regained a counter-deterrent vis-à-vis a defence system that left it perceptively vulnerable. Even though analysts note that the current US missile defence systems are of mediocre quality, Russia may be anti-cipating on increasingly effective missile defence systems in the foreseeable future.[19] Moscow seeks to discredit NATO and with these weapons it may feel reassured that it can exploit a vulnerability gap for several years to come. Hypersonic missiles allow Moscow to signal that

14 'First regiment of Avangard hypersonic missile systems goes on combat duty in Russia', *TASS* (27 December 2019). See: https://tass.com/defense/1104297.

15 See for example: Missile Defense Project, 'Avangard', in *Missile Threat*, Center for Strategic and International Studies (3 January 2019), https://missilethreat.csis.org/missile/avangard/ and J.E. Barnes, D.E. Sanger, 'Russia Deploys Hypersonic Weapon, Potentially Renewing Arms Race', in: *The New York Times* 27 December 2019), https://www.nytimes.com/2019/12/27/us/politics/russia-hypersonic-weapon.html.

16 M. Episkopos, 'Russia is going hypersonic: as in hypersonic missiles on Su-57 stealth fighters?', *The National Interest* (13 August 2019). See: https://nationalinterest.org/blog/buzz/russia-going-hypersonic-hypersonic-missiles-su-57-stealth-fighters-73266. https://nationalinterest.org/blog/buzz/russia-going-hypersonic-hypersonic-missiles-su-57-stealth-fighters-73266

17 '3M22 Zircon', Missile Defense Advocacy Alliance (2019). See: https://missiledefenseadvocacy.org/missile-threat-and-proliferation/missile-proliferation/russia/3m22-zircon/.

18 Vladimir Putin, *Presidential Address to the Federal Assembly* (2018). See: http://en.kremlin.ru/events/president/news/56957.

19 A. Panda, 'The Absurd Strategy Behind Russia's Nuclear Explosion', *The New Republic* (21 August 2019). See: https://newrepublic.com/article/154815/absurd-strategy-behind-russias-nuclear-explosion.

Figure 3 Flight time of Avangard and Kinzhal missiles (not to scale, compiled by author). Source (on range and speed): CSIS missile threat project

it can bypass missile protection systems and that any European capital can be reached within an instant. In doing so, it underscores the question of solidarity and unity within an alliance that appears internally weakened.[20] Furthermore, Cummings emphasises that these weapons strengthen Russia's hybrid capabilities. If Moscow wishes to conduct another Crimea-like operation, these weapons further raise the cost of retaliation.[21] This renews the Gaullian question: would Washington trade Hamburg for New York, or, more poignantly, would The Hague trade Riga for Rotterdam?[22]

China

The US's CPGS programme was met with concern by Chinese analysts. They place it in the same context as the Pentagon's ballistic missile defence programme, which Beijing regards as an effort by the US to achieve 'absolute security' vis-à-vis other countries. Chinese analysts raised questions about the future stability of the system as other states' efforts to try to keep up with the US may incite weapons proliferation in both the conventional and nuclear domains.[23]

Beijing has adhered to a doctrine of minimal nuclear deterrence combined with a no-first-use policy since 1964. This means that it will not be the first to initiate a nuclear strike and that it holds to the idea that the ability to inflict unacceptable damage through a small number of nuclear weapons is sufficiently credible as an effective strategic deterrent.[24] China has therefore maintained a modestly-sized nuclear arsenal of around 300 warheads. Liquid-fuelled missiles, which require longer preparation time than solid-fuelled missiles, have been the main vector for these warheads for decades. A veritable CPGS capability would jeopardize the survivability of China's nuclear forces and undermine the effectiveness of China's nuclear deterrent. It would leave China vulnerable to US coercion – which it can ill-afford due to its rising power ambitions and territorial claims.

The recent modernisation of its nuclear force structure may partly be a reaction to these developments. China seeks freedom of action in the South and East China Seas. It therefore aims to deter the US from interfering in that region and seeks to weaken Washington's security guarantees to regional states. Beijing has sought to increase the survivability of its nuclear arsenal through a network of tunnels, transporter-erector launchers, solid-fuelled missiles such as the DF-31(A) and a fleet of ballistic missile submarines. Furthermore, it has pursued the development of a hypersonic missile capability of its own. On 1 October 2019, at the Communist Party's 70th birthday military parade, it publicly displayed the DF-17 HGV for the first time.[25] With a range of approximately 1,500 kilometres, this missile easily covers China's first island chain which adds to Beijing's ability to deny foreign navies access to the South and East China Seas.[26] China is expected to transition hypersonic capabilities to longer-range missiles too, such as the DF-31 which has a range of 8,000 kilometres,[27] allowing it to reach the continental US.

Impact on stability

Analysts often overemphasise the nefarious effects of emerging technology on stability before their actual use. History counsels against

20 'Time to Reform NATO?', *Sputnik News* (4 December 2019). See: https://sputniknews.com/analysis/201912041077479251-time-to-reform-nato-alliance-became-irrelevant-nearly-30-years-ago-after-ussrs-collapse--analyst/.

21 A. Cummings, 'Hypersonic weapons: Tactical uses and strategic goals', *War on the Rocks* (12 November 2019). See: https://warontherocks.com/2019/11/hypersonic-weapons-tactical-uses-and-strategic-goals/.

22 A 2015 Pew Research poll among the publics of five key NATO nations showed that 58 per cent of the German population thinks that Germany should not use military force if Russia attacked a neighbouring country that is a NATO-memberstate. See https://www.pewresearch.org/global/2015/06/10/nato-publics-blame-russia-for-ukrainian-crisis-but-reluctant-to-provide-military-aid/.

23 L. Saalman, 'China and the US nuclear posture review', in: *The Carnegie Papers* (Washington D.C., Carnegie-Tsinghua, 2011) 22-23.

24 R.M. Basrur, *Minimum Deterrence and India's Nuclear Security* (Singapore, NUS Press, 2009) 39.

25 J. McDonald, 'China shows off new hypersonic nuclear missile at military parade', in: *The Washington Times* (30 September 2019). See: https://www.washingtontimes.com/news/2019/sep/30/china-displays-df-17-hypersonic-nuclear-missile-pa/.

26 B. Gill, 'First salvo: missile test mark intensified US-China competition', *The Interpreter by The Lowy Institute* (5 July 2019). See: https://www.lowyinstitute.org/the-interpreter/first-salvo-missile-tests-mark-intensified-us-china-competition.

27 H. Williams, 'Asymmetric arms control and strategic stability: Scenarios for limiting hypersonic glide vehicles', in: *Journal of Strategic Studies* 42 (2019) (6) 789-813.

such alarmism.[28] One such example was the introduction of strategic bombers in the 1920s which was believed to make land warfare obsolete because 'the bomber would always get through.'[29] Another were chemical weapons which were thought to change warfare forever, but proved less effective in practice than conventional ordnance.[30] Still, many analysts follow the development of contemporary technology with concern. How may hypersonic missiles affect strategic stability? Strategic stability refers to the stability of interstate relations between two or more states. It is the result of a dynamic balancing act by adversaries between superiority and inferiority vis-à-vis each other. Under conditions of strategic stability, incentives for conflict are reduced.[31] Conversely, interstate relations are *unstable* when either the costs of conflict initiation are lower than the expected benefits, or when the risk of escalation is considerable. This section will look into three sub-components of strategic stability: deterrence stability, crisis stability, and arms race stability.

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The Russian and Chinese presidents. To counter US missile defence, Russia and China invested heavily in A2/AD-capabilities. Hypersonic weapons buttress this capability

Deterrence stability

Deterrence is an influencing strategy whereby threats of the use of force are applied to manipulate the opponent's behaviour in such a way that it refrains from taking action that is against your interest. Deterrence stability, then, is often understood as a classic balance-of-terror, which is reached when two or more powers are equally capable of inflicting such levels of damage upon each other that it becomes unappealing to initiate an attack.[32] This balance can be tilted through the introduction of offsetting capabilities, such as new technologies and doctrines. The US/NATO missile shield in Poland and Romania as well as the introduction of the THAAD missile defence system in South Korea briefly tilted the balance of terror in favour of the US. To counter this move, Russia and China invested heavily in A2/AD-capabilities. Hypersonic weapons buttress this capability. In both regions, the US and its allies do not have the means to counter this capability.[33] This affects US power projection abilities, making it more difficult to reassure its allies in the region which rely on its extended deterrent. In the Pacific region, for example, the deployment of aircraft carriers and troops becomes more costly (in terms of vulnerability). With hypersonic weapons, Russia and China reinforce their ability to manipulate US behaviour because it raises the costs of retaliation.[34]

According to existing theory, stability restores as soon as actors in a contesting relationship possess equivalent capabilities. This logic, however, stems from the bipolar context of the Cold War that fits uneasily in a system where multiple great powers are competing for their own share of (regional) hegemony. The continuous action-reaction cycle between multiple actors makes the management of stability more

28 T.S. Sechser, N. Narang, C. Talmadge, 'Emerging technologies and strategic stability in peacetime, crisis, and war', in: *Journal of Strategic Studies* 42 (2019) (6) 727-735.

29 Cf. Giulio Douhet's theory on air power and Stanley Baldwin's speech in UK parliament in which he warned that 'the bomber will always get through'. T. Hippler, *Bombing the people: Giulio Douhet and the Foundations of Air-Power Strategy 1884-1939* (Cambridge, Cambridge University Press, 2013) 14.

30 Sechser et al, 'Emerging technologies', 729.

31 H. Williams, 'Asymmetric arms control and strategic stability', 789-813.

32 T.C. Schelling, *Arms and Influence* (New Haven, Yale University Press, 2008) 19.

33 'As currently posed, NATO cannot successfully defend the territory of its most exposed members.' D.A. Shlapak, M. Johnson,*Reinforcing Deterrence on NATO's Eastern Flank* (Washington, D.C., RAND Corporation, 2016).

34 For an interesting take on this, see discussion on China's hypersonic missile advances and US responses at Hudson Institute, 11 March 2019: https://www.youtube.com/watch?v=trCTKvAqXz0&t=1825s.

To deal with the problem of speed, entanglement, and human agency with regard to hypersonic weapons, some analysts make the case for pairing artificial intelligence technology with air defence systems

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difficult than in bipolar systems. Additionally, even under conditions of parity, the speed and precision of hypersonic weapons (and the lack of defences against them) continue to leave open the option of a decapitating first strike. Such developments are inherently destabilising because they invite pre-emptive strategies, launch-on-warning policies and stir a dynamic in which competitors continue to seek ways to offset each other's capabilities. Moreover, if deterrence were stable, contestants would not feel the need to react and counter-react on their pursuit of hypersonic weapons.

Crisis stability

If deterrence is unstable, crisis stability becomes all the more important. It refers to the extent to which crises may escalate into actual conflict. Escalation can be intentional or unintentional ('inadvertent'): conflict as a result of calculated decision-making vis-à-vis conflict as a result of accidental, undeliberate events.

Intentional escalation is the result of a contemplated decision which requires time to think through the scenarios and risks involved. Hypersonic weapons, however, compress the decision-making time to minutes[35] – assuming that a launch has been spotted from the earliest stage. This promptness and ability to penetrate through enemy air defences give hypersonic weapons an appealing first-mover advantage, for example, by taking out an enemy's C4ISR nodes. What results may be a classic 'use-or-lose scenario': when a state feels that it is under threat of a decapitating strike, it may seek to pre-empt or even prevent the threat by taking it out before it has materialised. What is more, Russian and Chinese hypersonic missiles can be fitted with both nuclear and conventional warheads. Thus, when a hypersonic weapon launch is detected, decision-makers cannot be certain about the type of warheads that has been fitted on these projectiles. Compounding the problem of this dual-use capability is the fact that both the Russian and Chinese armed forces have integrated nuclear and conventional missiles under the same command. Such 'entanglement' makes it difficult to discriminate between a nuclear or conventional threat – even with an effective early warning system.[36]

The risk of crossing the line of inadvertent escalation, then, is on the receiver's end of an impending attack. What do you do when a state is (a) only minutes away from a missile strike, (b) against which there is no effective defence, and (c) of which one cannot be sure whether it is fitted with a conventional or a nuclear warhead? It is a tricky question to answer because it is subject to human agency, which is erratic under normal circumstances and becomes even less predictable in situations of stress. To deal with the problem of speed, entanglement, and human agency, some analysts make the case for pairing artificial intelligence (AI) technology with air defence systems in the foreseeable future to determine the nature of the threat and appropriate response in the event of an enemy hypersonic missile launch. Introducing AI in the command-and-control of hypersonic weapons creates a dynamic of its own that goes beyond the scope of this article.[37] But, the advantage would be that well-programmed machines can have a dampening effect on the problem of human error. On the other hand, badly programmed machines create huge problems[38] and we don't know how AI technology will actually behave in crisis situations.[39] Paradoxically, this may, in fact, have a deterrent value in itself; Schelling referred to this dynamic

35 At Mach 5 a missile covers 2,000 kilometres in approximately 20 minutes.

36 C. Talmadge, 'Emerging technology and intra-war escalation risks: evidence from the Cold War, implications for today', in: *Journal of Strategic Studies* 42 (2019) (6) 864-887; H.M. Kristensen, R.S Norris, 'Chinese nuclear forces 2018', in: *Bulletin of the Atomic Scientists* 74 (2018) (4) 289-295.

37 For an interesting account on this, see M.C. Horowitz, 'When speed kills: Lethal autonomous weapon systems, deterrence and stability', in: *Journal of Strategic Studies* 42 (2019) (6) 764-788.

38 Robert Work, *Speech at Air Command and Staff College*. See: https://www.youtube.com/watch?v=wA0epN0L1fc.

39 K. Payne, 'Artificial Intelligence: A Revolution in Strategic Affairs?', in: *Survival* 60 (2018) (5) 7-32.

American personnel perform a simulated missile reduction in accordance with New START. With the end of the INF and ABM treaties, Moscow and Washington are down to this treaty, which only covers ballistic missiles

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as a 'threat that leaves something to chance.'[40] It does, however, increase the threat of unintended escalation through miscalculation or misinterpretation, the consequences of which may be grave enough in this context that they could result in a 'flash war.'[41]

Arms race stability

An arms race is a 'competitive, reciprocal, peacetime increase or improvement in armaments by two [or more] states perceiving themselves to be in an adversarial relationship.'[42] The objective of arms control arrangements is to strengthen stability by putting a cap on the action-reaction cycle that keep the actors involved in a race to the bottom. It is no stretch to argue that the states discussed in this article are involved in a triangular arms race. The US reacts to Russian and Chinese developments and seeks to reassure its allies in Europe and the Pacific, which causes Beijing and Moscow to respond to Washington, and so forth.

The Kremlin may well be using its new line of hypersonic weapons to force the US to the arms-control negotiating table. With the end of the INF and ABM treaties, Moscow and Washington are down to New START, which only covers ballistic missiles and will expire in 2021. At the 2019 Munich Security Conference, Russian officials expressed their readiness to extend the treaty but the Trump administration initially signalled little interest in doing so. However, in April 2019 US Secretary of State Pompeo said that the US is willing to explore an extension of New START on the condition that China should join it.[43]

The chances of China joining any new arms control treaty are slim, however. First of all, China's nuclear force is an 'order of a magnitude' smaller than that of the US and Russia. It is therefore of the opinion that it is up to others to make strides in nuclear cuts first.[44] Moreover, if China were to join an extension of New START, it would legally allow Beijing to significantly increase the size of its nuclear arsenal because the new quota would be lower

40 T.C. Schelling, *The Strategy of Conflict* (Cambridge, Harvard University Press, 1980) 187.

41 P. Scharre, 'A million mistakes a second', *Foreign Policy* (12 September 2018). See: https://foreignpolicy.com/2018/09/12/a-million-mistakes-a-second-future-of-war/.

42 T. Dalton, J. Tandler, *Understanding the arms 'race' in South Asia* (Washington, D.C., Carnegie Endowment for International Peace, 2012) 4.

43 Japan Times (2019) 'Mike Pompeo wants China to join Russia in START nuclear treaty', *Japan Times* (11 April 2019). See: https://www.japantimes.co.jp/news/2019/04/11/asia-pacific/politics-diplomacy-asia-pacific/mike-pompeo-wants-china-join-russia-start-nuclear-treaty/#.XjbrEGhKgdU.

44 R. Wu, 'Trilateral arms control initiative: A Chinese perspective', *Bulletin of the Atomic Scientists* (4 September 2019). See: https://thebulletin.org/2019/09/trilateral-arms-control-initiative-a-chinese-perspective/.

than the US's and Russia's current stockpiles, but still be higher than China's because it traditionally maintained a small nuclear arsenal. Also, China has traditionally kept aloof from multilateral arrangements. Admittedly, it has been the forerunner of a multilateral no-first-use-treaty for years, although to little avail as its proposals have been repeatedly dismissed by the US and Russia, among others.[45]

Generally, New START is about reducing the aggregate number of strategic missile delivery vehicles and warheads – not about their ranges or speed. Should any new agreement aim to limit the ranges or speed of delivery vehicles with the aim of capping the hypersonic missile threat, then neither of the actors involved may show a keen interest in ratifying it. After all, limiting speed would rule out a large range of existing ballistic missiles too which still have strategic effect and are cheaper than hypersonic missiles. Limitations on missile range would be met with equally little interest, especially by China which is believed to be in the process of transitioning its hypersonic capabilities to longer-range missiles. Lastly, the proliferation of hypersonic missile technology is not only confined to Russia, China and the US. Several other states have indigenous hypersonic R&D programmes too.[46] Any meaningful arms control agreement would have to include these states, which makes the prospect of reaching an arms control agreement more difficult.

Conclusion

Hypersonic missiles are one realm in which contemporary great power competition manifests itself. Their development is driven partly by a security dilemma on the part of the three protagonists discussed in this essay, but also simply because the technology is there. Ultra-high-speed missiles have been around for years and now new strides are made in precision, range and manoeuvrability that make them 'the next new thing' that competing states seek to acquire to buttress their own power positions. Hypersonic missiles unlock new strategic options in the spheres of prevention, pre-emption and deterrence by punishment, decapitation and denial. More concretely, hypersonic weapons provide the means to both reinforce one's own A2/AD-capabilities and to counter another power's A2/AD-capabilities. How hypersonic weapons affect the stability of Europe and Asia – and the international system at large – depends on their envisioned use. Doctrine and theory about emerging technologies hardly ever make sound predictions of their actual use and impact on stability. Still, the problem that comes with small reaction times, first-mover advantages, and the lack of interest that key players will have to pursue arms control agreements, does not bode well for strategic stability.
On the other hand, the escalatory risk that is involved with entanglement makes the use of hypersonic weapons a risky endeavour for both the assailer and the assailed. Knowing this, none of the possessors of these weapons would be inclined to use these weapons just like that. Thus, as long as humans remain in control over the actual use of these weapons, they will probably affect risk behaviour in such a way that it deters actors from getting bogged down in situations where their use becomes a viable option. Nonetheless, the fact that hypersonic missiles will become part of the strategic inventory of several states in the upcoming years is a factor that will affect the strategic equation. The most likely implication is that it will deepen spheres of influence because they serve as an enhancer of already existing A2/AD capabilities. This poses a challenge for the US's need to reassure its allies in Europe and Asia as a part of its extended deterrent. When unchallenged, it could trigger assertiveness on the side of opposing states. This underscores the importance of smaller states (including the Netherlands) to counter such trajectories by showing more commitment to national and collective security. ■

45 Wu, 'Trilateral arms control initiative'.

46 R.H. Speier, G. Nacouzi, C.A. Lee, R.M. Moore, *Hypersonic missile nonproliferation: Hindering the spread of a new class of weapons* (Santa Monica, RAND Corporation, 2017) 25.