

# Latest Trends in Hypersonic Weapons

Research Fellow, Government and Law Division, Security Studies Department **ARIE Koichi**

---

## Introduction

---

Weapons known as “hypersonic weapons” or “hypersonic missiles” have long attracted attention as a security threat. As is already well known, these weapons travel within the atmosphere at speeds exceeding Mach 5 and are capable of significant maneuvering during high-speed flight, making them difficult to intercept with current defense systems.

As of 2025, in addition to the United States, China, and Russia, countries developing hypersonic weapons include European nations, Japan, Australia, and India. It has also been reported that North Korea has successfully conducted tests.<sup>1</sup> This paper explores the latest trends of hypersonic weapons, centered on their development status.

---

## Why Are Hypersonic Weapons Difficult to Intercept?

---

Hypersonic weapons can be broadly divided into two categories. The first is hypersonic glide vehicles (HGVs), which are launched by rocket, separate in the upper atmosphere, and then glide at speeds exceeding Mach 5. The second is powered hypersonic cruise missiles (HCMs), which use a specialized engine called a scramjet to accelerate beyond Mach 5 and strike their targets. HGVs fly at lower altitudes than ballistic missiles and glide within the atmosphere, meaning their flight paths do not follow a parabolic ballistic trajectory. These characteristics delay detection by ground-based radar and, together with their maneuverability, make their flight paths difficult to predict. This reduces available interception time, making them difficult to counter using conventional ballistic missile defense systems.<sup>2</sup> In addition, HCMs travel at speeds exceeding Mach 5 under powered flight and exhibit high maneuverability, making detection and interception by conventional defense systems extremely difficult.<sup>3</sup>

For this reason, in place of conventional defense systems, various means of interception are being considered. These include detection and tracking from space using satellite-mounted sensors, cyberattacks targeting the software that controls hypersonic weapons, neutralization using high-energy lasers, and improvements in detection and interception capabilities through artificial intelligence (AI).<sup>4</sup> These

approaches fall within so-called “new domains,” including space, cyber, and the electromagnetic spectrum, or involve the application of emerging technologies.

---

## Current Status of Countries that Develop and Possess Hypersonic Weapons

---

### United States

In December 2024, the U.S. Army successfully conducted the final flight test of the Long-Range Hypersonic Weapon (LRHW), commonly known as “Dark Eagle.”<sup>5</sup> Developed jointly with the U.S. Navy, Dark Eagle is a ground-launched HGV with a range of 2,775 kilometers and is expected to be operationally deployed following further operational testing.<sup>6</sup> In addition, the U.S. Air Force is currently developing an air-launched HGV and HCM, respectively known as the Air-launched Rapid Response Weapon (ARRW) and the Hypersonic Air-launched Cruise Missile (HACM).<sup>7</sup>

### China

At a military parade held in Tiananmen Square in September 2025, China unveiled several hypersonic weapons, including the ground-launched HGV “DF-17,” the surface-launched HGV “YJ-17,” the air-/surface-/sub-surface-launched HCM “YJ-19,” and the latest air-launched HCM “CJ-1000.”<sup>8</sup> In addition, earlier that same year in January, it was reported that China had conducted tests aimed at developing a hypersonic air-to-air missile.<sup>9</sup>

China is advancing a variety of initiatives applying hypersonic weapon technologies. In 2021, it was reported that China conducted a test involving the release of an HGV from a system resembling the former Soviet Fractional Orbital Bombardment (FOB) system.<sup>10</sup> More recently, China has been testing a hypersonic missile capable of adjusting drag and lift by folding and extending its retractable wings during high-speed flight.<sup>11</sup> In addition to missile weapons such as HGVs and HCMs, China is also developing a hypersonic drone, the “MD-19,” which is said to be capable of flying at Mach 7.<sup>12</sup>

### Russia

As part of its latest strategic nuclear capabilities designed to penetrate U.S. missile defense systems, Russia has deployed the ground-launched HGV “Avangard,” with a range of 6,000 kilometers, to strategic missile units in Orenburg Oblast near the border with Kazakhstan.<sup>13</sup> Russia has also deployed the surface-launched anti-ship HCM “Zircon” to its naval forces. According to Russian announcements, launch training for this system was conducted during the joint military exercise Zapad 2025, held with Belarus in September 2025. In addition, the exercise included launch training for the air-launched ballistic missile “Kinzhal,” carried by MiG-31K fighter aircraft.<sup>14</sup>

## Europe

France is advancing the V-MAX program to develop an HGV and successfully conducted its first flight test in June 2023. It has also launched the ASN4G program to develop an HCM as the successor to the current air-launched tactical nuclear missile "ASMP-A."<sup>15</sup> The German Bundeswehr has begun development of a hypersonic research aircraft capable of horizontal takeoff and fully reusable, with the first test targeted for 2028.<sup>16</sup> The United Kingdom is working in cooperation with the United States on the development of an HCM. In 2025, it conducted intensive hypersonic propulsion tests of engines for HCM development at NASA's Langley Research Center in Virginia.<sup>17</sup>

## Japan

The Air Systems Research Center of the Acquisition, Technology and Logistics Agency (ATLA) began research in FY2023 on a hypersonic guided missile system equipped with a scramjet engine. Ground tests have already demonstrated successful engine operation at hypersonic speeds, and it is reported that there are also prospects for long-duration engine operation.<sup>18</sup> In addition, in 2024 the Ministry of Defense initiated joint Japan-U.S. development of the Glide Phase Interceptor (GPI).<sup>19</sup>

## Other Countries

Australia launched the Southern Cross Integrated Flight Research Experiment (SCIFiRE) program jointly with the United States in 2020 and is advancing the development of an air-launched HCM.<sup>20</sup> In 2024, under the AUKUS trilateral security framework with the United States and the United Kingdom, the three countries also agreed to promote the development of hypersonic weapons as part of the AUKUS "Pillar II."<sup>21</sup>

India is pursuing a range of programs under the Defence Research and Development Organisation (DRDO) of its Ministry of Defence to develop HGVs, HCMs, and their interception systems. In 2025, it was reported that India conducted a test of an HCM reaching speeds of Mach 8 off its eastern coast. India is also jointly developing the HCM "BrahMos-II" with Russia.<sup>22</sup>

Iran claims to have already developed and possess the HGVs "Fattah-1" and "Fattah-2."<sup>23</sup> During Israeli strikes against Iran in 2025, it was reported that the Islamic Revolutionary Guard Corps used the "Fattah-1" against Israel.<sup>24</sup>

North Korea reportedly succeeded in the launch test of the HGV "Hwasong-8" in 2021.<sup>25</sup> At a military parade held in Pyongyang in 2025, the "Hwasong-11Ma," believed to be a new HGV, was unveiled.<sup>26</sup> The Republic of Korea is also reportedly developing an air-launched HCM capable of being mounted on fighter aircraft.<sup>27</sup>

---

## Discussions Surrounding Hypersonic Weapons

---

Due to the difficulty of intercepting them with conventional defense systems, hypersonic weapons are often discussed as a potential “game changer.”<sup>28</sup> Since the United States is developing hypersonic weapons equipped only with conventional warheads rather than nuclear warheads, it has been pointed out that, once deployed, they could potentially strike an adversary’s nuclear forces without escalation into nuclear exchanges.<sup>29</sup> There is also a view that hypersonic weapons enable rapid power projection without reliance on forward-deployed bases or rear-area support.<sup>30</sup>

At the same time, there are also arguments highlighting the technical challenges associated with the development of hypersonic weapons.<sup>31</sup> For example, when traveling through the atmosphere at speeds exceeding Mach 5, aerodynamic heating on the vehicle surface can exceed 2,000°C, meaning that numerous technical issues remain, including the development of vehicle shapes and materials capable of withstanding such conditions.<sup>32</sup> In addition, there is a view that maneuvering during hypersonic flight increases drag and reduces speed, potentially causing the vehicle’s velocity to drop below Mach 5 at the point of target impact and thereby diminishing its destructive power.<sup>33</sup>

There is also debate regarding methods and means of intercepting hypersonic weapons, including a hard-kill approach involving directly striking the target with a kinetic interceptor,<sup>34</sup> and soft-kill approaches such as those employing electronic warfare.<sup>35</sup> As an example of the latter, during the Russia–Ukraine war, Russia utilized the aforementioned air-launched ballistic missile “Kinzhal,” describing it as a hypersonic missile. However, it is said that Ukraine reduced the missile’s accuracy by combining cyber measures such as jamming and spoofing (signal deception) targeting the missile’s satellite navigation receiver.<sup>36</sup> Furthermore, a more unique idea has been proposed in which large quantities of fine particles are dispersed along the flight path of incoming hypersonic weapons to damage the vehicle and achieve interception.<sup>37</sup>

---

## Future Outlook

---

The number of countries initiating the development of hypersonic weapons has been gradually increasing, and this trend is expected to remain unchanged going forward. One factor likely to promote the proliferation of hypersonic weapons is their declining cost.

Recently, it has been reported that a Chinese private aerospace company has developed a low-cost, mass-producible hypersonic missile, the “YJK-1000,” using materials such as foamed cement for the heat-

resistant coating.<sup>38</sup> While details remain unclear, if this is true, it could increase the likelihood that even smaller states may acquire hypersonic weapons at relatively low cost, and could potentially lead to their proliferation to non-state actors. In 2024, there were also reports that the Houthi armed group in Yemen had developed a hypersonic missile.<sup>39</sup> Although the facts remain unconfirmed, this trend is expected to accelerate in the future.

In light of these developments, the United States appears poised to further strengthen its response to hypersonic weapons. The National Security Strategy released in November 2025 refers to a “Golden Dome” concept as a next-generation missile defense system for the U.S. homeland,<sup>40</sup> which includes the development of a large-scale system for detecting and intercepting hypersonic weapons.<sup>41</sup> In addition, in December 2025, Lockheed Martin announced the establishment of a new research facility in Alabama dedicated to hypersonic weapons development.<sup>42</sup> As noted earlier, the U.S. Army’s HGV “Dark Eagle” is also planned to be deployed in the near future. Attention will therefore focus on how the United States will further strengthen its posture toward hypersonic weapons on both the offensive and defensive fronts.

<sup>1</sup> “Which Countries Have Hypersonic Missiles in 2025?” World Population Review website.

<sup>2</sup> Kelly M. Saylor, “Hypersonic Weapons: Background and Issues for Congress,” Congressional Research Services, Updated August 27, 2025, pp. 2-3.

<sup>3</sup> John Hursh, “Let’s Make a Deal: How to Mitigate the Risk of Hypersonic Weapons,” Just Security website, May 6, 2020; Antonio Graceffo, “Hypersonic Weapons: Paradigm Shift or Empty Hype?” Geopolitical Monitor website, April 6, 2025.

<sup>4</sup> “Countermeasures against Hypersonic Weapons,” Government of Canada website, June 6, 2024.

<sup>5</sup> “Army Announces Official Name for Its Long-Range Hypersonic Weapon,” U.S. Department of War website, April 24, 2025.

<sup>6</sup> Kaif Shaikh, “Dark Eagle Missile Explained: Range, Speed, Cost, and Global Hypersonic Rivals,” Interesting Engineering website, November 7, 2025.

<sup>7</sup> Stephen Losey, “Air Force May Revive Shelved AARW Hypersonic Program,” Defense News website, June 10, 2025; “AGM-183A Air-launched Rapid Response Weapon,” Airforce Technology website, September 2, 2020.

<sup>8</sup> “Inside China’s Largest Military Parade: Hypersonic Missiles, Drones, and Advanced Defense Systems,” International Relations Insight & Analysis website, September 8, 2025. It is also said that the CJ-1000 has a maximum range of up to 6,000 kilometers. Chloe Anderson, “China’s New CJ-1000 Hypersonic Cruise Missile Raises Alarms,” Defense Feeds website, September 4, 2025.

<sup>9</sup> Arun Bishnoi, “China Conducted Final Test of Secretive Hypersonic Air-to-Air Missile,” Overt Defense website, January 30, 2025.

<sup>10</sup> Emma Helfrich and Tyler Rogoway, “More Details on China’s Exotic Orbital Hypersonic Weapon Come to Light,” The War Zone website, November 30, 2022.

<sup>11</sup> Akhsan Erido Elezhar, “China Says It Built a Hypersonic Missile That Changes Shape at Mach 5,” NextGenDefense website, November 4, 2025.

<sup>12</sup> The MD-19 is believed to be equipped with AI. Brandon Weichert, “China’s New MD-19 Hypersonic Drone Is a Nightmare for U.S. Air Defense,” The National Interest, April 25, 2025.

<sup>13</sup> “Russia Expands Strategic Nuclear Arsenal with Avangard Hypersonic Missile Deployment,” Army Recognition website, August 27, 2025.

<sup>14</sup> Clement Charpentreau, “Russia Uses Zapad 2025 for ‘Hypersonic Posturing’ with Zircon, Kinzhal Drills,” AeroTime website, September 15, 2025.

<sup>15</sup> “Report: V-MAX2 Marks a New Phase in France’s Hypersonic Weapons Strategy,” Army Recognition website, August 19, 2025.

<sup>16</sup> “Bundeswehr Advances Its Reusable Hypersonic Aircraft Project: Tests Planned for 2028,” Defense Express website, March 2, 2025.

<sup>17</sup> Giulia Bernacchi, “UK, US Complete Major Hypersonic Propulsion Test for Future Missile,” The Defense Post website, April 11, 2025.

<sup>18</sup> Air Systems Research Center, “Gokuchoonsoku yudodan no kenkyu” [Research on hypersonic guided missiles], Acquisition, Technology and Logistics Agency of Japan website.

<sup>19</sup> Ministry of Defense of Japan, “GPI Nichibei kyodo kaihatsu ni kansuru purojekuto torikime no shomei ni tsuite” [Signing of the

- 
- Project Arrangement on Japan-U.S. Joint Development of the GPIJ, Ministry of Defense / Japan Self-Defense Forces website, May 15, 2024.
- <sup>20</sup> Department of Defence of Australia, "Australia Collaborates with the US to Develop and Test High Speed Long-range Hypersonic Weapons," December 1, 2020.
- <sup>21</sup> Department of Defence of Australia, "Accelerated Delivery of AUKUS Pillar II Hypersonic Systems," November 19, 2024.
- <sup>22</sup> "India's Hypersonic Missile Program: ET-LDHCM, Dhvani, and BrahMos-II Edge," The Defense Watch website, November 27, 2025.
- <sup>23</sup> "Iran Establishes Itself as a Missile Superpower through Advanced Precision and Hypersonic Technology," Iran Front Page website, October 28, 2025.
- <sup>24</sup> "Iran Says It Fired Hypersonic Missiles at Israel, after Israel Strikes Tehran," *Le Monde* website, June 18, 2025.
- <sup>25</sup> Sangmi Cha, "N. Korea Joins Race for New Hypersonic Missile with Latest Test," Reuters website, September 30, 2021.
- <sup>26</sup> Brad Lendon and Gawon Bae, "As Its Ruling Party Turns 80, an Emboldened Kim Jong Un Shows off North Korea's New Hypersonic Weapon, ICBM," CNN website, October 11, 2025.
- <sup>27</sup> Alain Servaes, "South Korea Reveals First Hypersonic Air-to-Ground Missile HAGM to Boost Regional Deterrence," Army Recognition website, October 22, 2025.
- <sup>28</sup> Aqeel Ahmad, "Hypersonic Weapons: The Game Changer Technology," WGI World website, November 25, 2021; Prateek Tripathi, "How Hypersonic Weapons Are Redefining Warfare," ORF website, May 2, 2024.
- <sup>29</sup> Shahzad Masood Roomi, "Hypersonic Missiles: A Game Changer in Warfare and the Global Strategic Scenario," PolicyEast website, September 12, 2024.
- <sup>30</sup> Joshua Thibert, "Hypersonic Horizons: The Next Generation of Air Superiority," Global Security Review website, November 7, 2024.
- <sup>31</sup> David Wright and Cameron Tracy, "Hypersonic Weapons Are Mediocre. It's Time to Stop Wasting Money on Them," Bulletin of the Atomic Scientists, March 12, 2024.
- <sup>32</sup> "The Science of Hypersonic Weapons and Aerodynamics," Genesis Defense website, June 27, 2025.
- <sup>33</sup> Dominica Kunertova, "Hypersonic Weapons: Fast, Furious...and Futile?" Royal United Services Institute (RUSI) website, October 15, 2021.
- <sup>34</sup> Rajesh Uppal, "DARPA's Glide Breaker: The Game-Changer in Countering Hypersonic Threats," International Defense, Security & Technology (IDST) website, March 14, 2024.
- <sup>35</sup> Jeff Schogol, "How Much of a Threat Are Chinese Hypersonic Missiles to US Navy Ships and Sailors?" Task & Purpose website, April 18, 2025.
- <sup>36</sup> David Hambling, "How Spoofing Is Delivering Russian Missiles into Empty Fields," *Forbes* website, November 20, 2025.
- <sup>37</sup> Tom Karako and Masao Dahlgren, "Complex Air Defense: Countering the Hypersonic Missile Threat," Center for Strategic and International Studies (CSIS), February 2022, pp. 35–38.
- <sup>38</sup> Alex Croft, "China's New 'Dirt Cheap' Missile Made of Concrete Is 40 Times Cheaper Than Average US Weapon," *The Independent* website, December 4, 2025.
- <sup>39</sup> Danielle Greyman-Kennard, "Yemen's Houthis Obtain Hypersonic Missile, Upgrade Weapons Arsenal - Report," *The Jerusalem Post* website, March 15, 2024.
- <sup>40</sup> The White House, "National Security Strategy of the United States of America," November 2025, p. 3.
- <sup>41</sup> Taylor Hathorn, "Golden Dome: America's Answer to the Hypersonic Threat," Real Clear Defense website, April 3, 2025.
- <sup>42</sup> "Lockheed Martin Opens 17,000-Square-Foot System Integration Lab for Hypersonic Capabilities," Lockheed Martin website, December 3, 2025.

## PROFILE

### ARIE Koichi

Research Fellow, Government and Law Division, Security Studies Department

Fields of expertise: Nuclear strategy, deterrence theory

The views expressed in this paper do not represent the official views of the National Institute for Defense Studies.

We do not permit any unauthorized reproduction or unauthorized copying

### Planning and Coordination Office

#### National Institute for Defense Studies

Telephone (direct) : 03-3260-3011

Telephone (general) : 03-3268-3111 (ext. 29177)

National Institute for Defense Studies website: [www.nids.mod.go.jp](http://www.nids.mod.go.jp)