



**WEAPONS OF MASS DESTRUCTION AND  
OTHER STRATEGIC WEAPONS PROGRAMME**

**THE IMPLICATIONS OF HYPERSONIC  
WEAPONS FOR INTERNATIONAL  
STABILITY AND ARMS CONTROL:  
REPORT ON A UNIDIR-UNODA TURN-BASED  
EXERCISE**



**UNIDIR**  
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FOR DISARMAMENT RESEARCH



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## **About UNIDIR**

UNIDIR is a voluntarily funded, autonomous institute within the United Nations. One of the few policy institutes worldwide focusing on disarmament, UNIDIR generates knowledge and promotes dialogue and action on disarmament and security. Based in Geneva, UNIDIR assists the international community to develop the practical, innovative ideas needed to find solutions to critical security problems.

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## KEY FINDINGS

- A one-day turn-based (or table-top) scenario exercise involving representatives of governments including capital-based experts, Geneva diplomats, military counsellors and independent experts sought to explore the implications of hypersonic weapons for international stability and strategic arms control.
- The exercise further developed the findings of a study by UNODA and UNIDIR on *Hypersonic Weapons: A Challenge and Opportunity for Strategic Arms Control* (February 2019).
- Although exercises of this kind have limitations, the fictitious, hypothetical scenarios helped participants to explore findings of the study on the potential of risks related to *ambiguity, compressed decision-making times* and potential *entanglement* between conventional and nuclear conflict that could result from the deployment and use of hypersonic weapons.



## BACKGROUND

In launching his May 2018 Agenda for Disarmament, *Securing Our Common Future*, Secretary-General António Guterres made the case for the cooperative pursuit of collective security, noting that global insecurity is the paradoxical but inevitable result of each State pursuing security individually.<sup>1</sup> This paradox is evident in the race between a small (but growing) number of States to attain new long-range delivery systems, namely hypersonic boost-glide systems (commonly known as hypersonic weapons).

Prepared on the recommendation of the Secretary-General's Advisory Board on Disarmament Matters and informed by an expert meeting in November 2018, the Office for Disarmament Affairs (UNODA) and UNIDIR published a study in February 2019 entitled *Hypersonic Weapons: A Challenge and Opportunity for Strategic Arms Control*.<sup>2</sup> The study observed that the development of novel long-range strike options has received little attention in multilateral disarmament discussions despite their potentially negative consequences for security, arms control and disarmament. The study sought to raise awareness of the implications of hypersonic weapons, and recommended possible ways forward to address them in a multilateral context, while noting that “a significant amount of groundwork needs to take place before any such formal process could be initiated”.

Following the study's publication, UNIDIR convened a panel event in Geneva on 16 May 2019 on the implications of hypersonic weapons and the future of non-proliferation and arms control, which shared its findings. The event also included presentation and discussion of a 2017 study on hypersonic weapons by the RAND Corporation.<sup>3</sup>

Building on this research and dialogue, and the degree of interest expressed by diplomats and expert participants, UNIDIR and UNODA co-organized, on 19 September, a ‘table-top’ exercise. The purpose of this activity was to explore if and how hypersonic systems might impact fictitious, but plausible, crisis scenarios and interrelate with other strategic technologies. Exercises of this kind, which try to simulate the conditions and dynamics of crisis scenarios, have various advantages and disadvantages and do not capture or reflect real world conditions. However, such exercises can help practitioners to become familiar with the various dimensions of a particular technology, how it may or may not relate to existing systems and issues, and the range and types of arms control-related measures that may be of use in reducing their potential risks.

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<sup>1</sup> <https://s3.amazonaws.com/unoda-web/wp-content/uploads/2018/06/sg-disarmament-agenda-pubs-page.pdf>.

<sup>2</sup> <http://www.unidir.ch/files/publications/pdfs/hypersonic-weapons-a-challenge-and-opportunity-for-strategic-arms-control-en-744.pdf>.

<sup>3</sup> Speier, Richard H. et al., Hypersonic Missile Nonproliferation: Hindering the Spread of a New Class of Weapons, RAND Corporation, 2017, [https://www.rand.org/pubs/research\\_reports/RR2137.html](https://www.rand.org/pubs/research_reports/RR2137.html).



## WHAT ARE HYPERSONIC WEAPONS & WHY ARE THEY OF INTEREST?

There are two main classes of hypersonic weapons at this time: hypersonic glide vehicles and hypersonic cruise missiles. Hypersonic glide vehicles are systems boosted to altitude and speed by ballistic missiles. Hypersonic cruise missiles can be fired from aircraft, much like other cruise missiles, before accelerating to hypersonic speeds.

Hypersonic glide vehicles were the focus of the UNODA–UNIDIR study. Once they have reached their target velocity, these vehicles can manoeuvre towards their target on non-ballistic flight paths at speeds in excess of five times the speed of sound (Mach 5). While traditional ICBM re-entry vehicles still have a higher terminal velocity, hypersonic weapons fly at much lower altitudes than traditional ballistic missiles, which helps them to evade radar detection until they are relatively close to their targets and travelling very fast. These capabilities make it difficult for current defence systems to assess the trajectory of hypersonic weapons and defeat their strikes.

The combination of a more tense geopolitical environment and improvements in relevant strategic technologies, including missiles and missile defences, appears to be a driver for some States to acquire hypersonic weapons as additional components of their military forces. China, the Russian Federation and the United States are believed to have invested the most heavily to date in developing hypersonic weapons, although other States such as France, India and Japan are also researching hypersonic boost–glide capabilities and several more States are developing hypersonic cruise missile technologies. While there are serious technical challenges to overcome in developing reliable hypersonic weapons, it is plausible that China, the Russian Federation and the United States will deploy them within the next decade.

Historically, the development of hypersonic capabilities fits a continually evolving offence–defence response pattern in strategic systems. However, there is some reason to anticipate that hypersonic weapons will be qualitatively different from previous long-range delivery vehicles such as ICBMs. As the UNODA–UNIDIR report indicates,

*A central point in this regard is that manoeuvrable missiles travelling at hypersonic speeds appear to offer new military capabilities and might be able to hold at risk assets deemed crucial to a targeted State's ability to use its nuclear forces. This potential could change the deterrence calculus for nuclear-armed States, increase ambiguity in terms of crisis thresholds, and dramatically escalate a crisis or conflict if used.<sup>4</sup>*

The long range of hypersonic weapons, combined with their manoeuvrability and intended greater precision than traditional long-range delivery vehicles, might permit conventional strikes where the use of nuclear weapons would have previously been required in order to have a high level of confidence that a target would be destroyed. Given the taboo associated with the use of nuclear

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<sup>4</sup> <http://www.unidir.ch/files/publications/pdfs/hypersonic-weapons-a-challenge-and-opportunity-for-strategic-arms-control-en-744.pdf>, p. 1.

**HYPERSONIC  
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arms, this could make hypersonic weapons more ‘usable’ than traditional, nuclear-armed strategic systems.

Such hypersonic strikes would create acute issues for bystanders, let alone those targeted by such weapons. The decision–response time would be very short. And, it may be unclear whether the hypersonic strike is with weapons that are conventional or nuclear. Although this is an issue not unique to hypersonic weapons, their characteristics mean that it could be unclear what the intended target is (both in terms of country and nature of the target inside a country) until very late. These factors could exacerbate nuclear ‘use it or lose it’ dilemmas for decision makers responding to such weapons. It is also unclear what the deployment, let alone use, of hypersonic weapons would signal to adversaries in a crisis scenario. In sum, hypersonic weapon capabilities, even if primarily intended to strengthen deterrence in peacetime, could be highly destabilizing in a crisis. The points in this section are discussed in greater detail in the UNODA–UNIDIR study mentioned above.

## THE EXERCISE

UNIDIR and UNODA convened the hypersonic weapon exercise on 19 September 2019 at the Palais des Nations in Geneva. Representatives from 16 governments participated, as well as seven independent experts on technical and policy aspects of hypersonic and other strategic weapons chosen to assist the exercise. A team from UNIDIR and UNODA supported the event. UNIDIR engaged one of the experts, Mr. Dmitry Stefanovich of the Institute for Peace Research and Security Policy at the University of Hamburg, to design the scenarios and function as lead facilitator.<sup>5</sup>

The organizers divided government representatives and experts into four or five teams of six to seven people for each of two scenarios. Apart from the introductory session, the day's proceedings were held under the Chatham House Rule.<sup>6</sup>

The first scenario involved four teams, comprised of two fictional global military powers (each nuclear-armed) involved in backing rival non-State proxy forces in a remote 'Area of Conflict'. A third team represented a regional power geographically nearby (but not adjacent to) the Area of Conflict and reliant on it for natural resources. The fourth team represented a neighbouring State with considerable conventional military forces. The four teams found themselves in a crisis when a conventional strike in the Area of Conflict by one of the two global powers was only partially successful and raised the prospect of it striking a second time using hypersonic weapons. This scenario was intended to explore how the use of hypersonic weapons to destroy or evade air and missile defences would impact strategic decision-making and escalation/de-escalation more broadly.

The second scenario featured five teams engaged in a maritime territorial dispute. The scenario featured three major naval powers, each nuclear-armed, seeking to exert their influence in a region. One of these powers was located within the region and had strong territorial and maritime border interests, while the other two were located nearby with their own strategic interests including maintaining open access and supporting certain other States. Two other teams represented additional States of the region with varying economic and military capabilities also seeking to pursue their own strategic interests. These States were especially interested in enforcing claims over newly discovered natural resources in the region. A crisis emerged after the sinking of one team's submarine—it is not established whether deliberately or inadvertently—while it had been clandestinely observing the manoeuvres of a rival's naval battlegroup. As a randomized element part way through the exercise, a cyber operation mounted against the military forces of one team by an unknown entity contributed to the escalation dynamic. This scenario was intended to create the conditions for exploring the implications of

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<sup>5</sup> The experts were Laura Grego, Ankit Panda, Dmitry Stefanovich, Manpreet Sethi, Beyza Unal, Amy Woolf and Tong Zhao. The UNIDIR-UNODA team consisted of John Borrie, Amy Dowler, Pavel Podvig and Daniel Porras with assistance from Alisha Anand, James Revill, Jennifer Lyne Hart and Yue Yuan.

<sup>6</sup> When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.

tactical/theatre-level hypersonic weapons in crisis escalation/de-escalation, and how this might interact with other strategic technologies to create unforeseen impacts.

A one-hour discussion session for participants followed the conclusion of the scenarios.

## KEY OBSERVATIONS

### DIFFERING PERCEPTIONS AND UNCLEAR DOCTRINE COULD LEAD TO ESCALATION REGARDLESS OF THE INTENTION OF A STATE THAT USES HYPERSONIC WEAPONS.



The primary purpose of these exercises was to generate insights about hypersonic weapons and, specifically, their potential dynamics in crises. Thus the outcomes of the scenarios are less important than the understanding and discussions that they facilitate. Moreover, outcomes are contingent on a range of factors additional to the initial conditions set out in each scenario. Intra-team dynamics, imperfect information and certain kinds of bias prevalent in these types of exercise (for instance, ‘priming’ to use/not use hypersonic weapons due to knowledge that the exercise is about hypersonic weapons) can all have an impact. In this regard, some participants made the point following the exercise that it was difficult to consider the impact of likely ‘real world’ factors like military alliances and multilateral institutions, for instance on de-escalation efforts.

Several observations, drawing on inputs from participants during the discussion can be made:

#### *Unclear signals*

- In both scenarios, different teams viewed hypersonic weapons as serving different purposes in the same situation. For instance, merely having a militarily useful hypersonic weapon capability was viewed by some as a form of strategic signaling, whether this capability was used or not. Likewise, in the type of intent it communicated, the use of hypersonic weapons sometimes had consequences the user did not foresee.
- During the scenarios, the teams appeared to take hypersonic capabilities as conveying a certain national military competence deemed to be of political importance more broadly. To similar end, in those instances where teams demonstrated hypersonic weapon capabilities, they would also issue public statements lauding their technical prowess and sending warnings to rivals. Other teams sometimes questioned the technical reliability of those weapons in order to undercut the claims of rivals.
- Some (the users) considered conventional/nuclear ambiguity about a given hypersonic weapon to be useful while they felt they had a first-mover advantage. Others (those targeted, or those looking on) viewed this ambiguity as problematic. Later, when more than one team had used hypersonic weapons, this same issue confronted the initial user of hypersonic weapons. This suggests that clarification of doctrines for use of hypersonic weapon capabilities might have an impact in such situations.
- The scenarios suggested that differing perceptions and unclear doctrine could lead to escalation regardless of the intention of a State that uses hypersonic weapons. There was a mismatch between teams’ views of the strategic nature of hypersonic weapons. At one point, a team used what it described as a ‘conventional’ hypersonic weapon, leading another team to make a statement at the Security Council that in its view no use of hypersonic weapons in this context could be considered to be ‘conventional’.

### ***Escalation/De-escalation***

- Many participants felt that hypersonic weapons, as used in the scenarios, were not decisive capabilities, but certainly affected how the crises played out. Another view expressed was that there is nothing distinctive about hypersonic weapons and their use in the scenarios made no difference.
- Several participants said that, through the exercise, they had obtained a greater appreciation for, and concern about, the effects of ‘entanglement’, leading them to wonder where hypersonic weapons would sit in the escalation ladder between nuclear-armed powers.
- With hypersonic weapons present in a region, conflicting parties tried to avoid active hostilities involving ground troops and surface ships.
- The nature and importance of crisis communication mechanisms such as, but not limited to, ‘hotline’ agreements and other emergency contacts, as well as notifications of launch, were the subject of much discussion. During the discussion, several participants suggested that such mechanisms would be useful avenues to explore, not only in the context of hypersonic weapons, but in general as tools in managing strategic crises and for reducing the risk of accidental or inadvertent nuclear war.
- Some participants thought pursuing crisis communication and risk reduction were especially salient in the second scenario because of the confusion introduced by the interactive effects of other factors and capabilities in the escalating crisis (in that case, a cyber operation that affected the military readiness of one of the powers involved).

### ***Proliferation***

- One dynamic displayed in the scenarios was that in situations in which one or more teams used hypersonic weapons, others without the technology sought to obtain it through technology transfer or complete systems obtained from other teams. This proliferation dynamic suggests that as a few States deploy these systems, others will feel pressure to follow. Proposals by one or more teams in each scenario for moratoriums on use or tests of hypersonic weapons were only seriously considered by others after the opportunity to test and prove the technology themselves. One reason put forward to support a moratorium was the alleged absence of a decisive combat role for hypersonic weapons, especially if similar missions could be successfully accomplished with more ‘traditional’ weapons (e.g. subsonic land-attack cruise missiles).

## CONCLUDING OBSERVATIONS

**HYPERSONIC WEAPONS PRESENT A CHALLENGE AT A TIME WHEN THE ARMS CONTROL AND DISARMAMENT ARCHITECTURE IS ALREADY STRAINED.**



These broad observations resonate with the main findings of the UNODA-UNIDIR study on hypersonic weapons. In particular:

- Hypersonic weapons have the potential to contribute to an arms race dynamic. Already, an arms race dynamic in hypersonic technology itself has unfolded, motivated at least partly by strategic rivalry and some States' pursuit of capabilities with the potential to overcome others' missile and air defences. In turn it appears to be contributing to broader arms racing in other strategic technologies, including the pursuit of defences designed to counter hypersonic weapons.
- The military utility of hypersonic weapons remains unproven and therefore uncertain. Nevertheless, hypersonic weapons may offer some useful new capabilities to users. A broader point is that it is not well understood how these technologies will interact in a crisis or conflict.
- Hypersonic weapons have the potential to contribute to strategic miscalculation or unintended escalation due to ambiguity about their payload (i.e. conventional versus nuclear), and their high speed and manoeuvrability, which could result in shorter decision-making times in crisis compared to other weapons. More broadly, the advent of these systems could lead to changes in nuclear doctrine that broaden the range of circumstances in which nuclear weapon use is envisaged and higher nuclear alert levels.
- Hypersonic weapons present a challenge at a time when the arms control and disarmament architecture is already strained. It is difficult to assess the prospects for regulation after the demise of the Intermediate Nuclear Forces Treaty in August 2019 and due to current uncertainty about the future of New START (which could apply to nuclear-armed hypersonic weapons, as well as some conventional ones).
- There are a range of means to tackle aspects of the issues that hypersonic weapons may pose, for instance launch notification regimes, strategic export control arrangements and the folding of hypersonic weapons into existing strategic arms control processes, whether in current bilateral or expanded plurilateral form. However, given the variety of purposes and capabilities of individual hypersonic weapon systems, it is difficult to divorce these from broader considerations of strategic balance and international stability, which is an important point to bear in mind in considering the potential role of arms control.

