

# Pugwash Briefing Paper

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## **Hypersonic Weapon Series**

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How to mitigate the risks  
associated with Hypersonic  
Weapons?

## **Background**

The Pugwash Foundation supported an international Pugwash workshop on hypersonic weapons, which took place in Geneva on 9 and 10 December 2019. The meeting brought together 30 international participants from various continents, including current and former government officials, scientists, engineers, academics and experts from think tanks and other non-governmental organisations.

The workshop aimed at fostering a constructive exchange of views on hypersonic weapons. Participants discussed factors driving the development, roles and purposes of hypersonic weapons, as well as the risks associated with their deployment and use.

Based on the workshop's discussions, the Pugwash Foundation produced a series of briefing papers on hypersonic weapons. The series covers the following themes:

- What is a hypersonic weapon?
- What technical challenges do hypersonic weapons raise?
- What are the current hypersonic weapon development programmes?
- Why do States develop hypersonic weapons?
- What are the roles and missions of hypersonic weapons?
- What are the risks associated with hypersonic weapons?
- How to mitigate the risks associated with hypersonic weapons?
- How to counter hypersonic weapons?

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## How to mitigate the risks associated with hypersonic weapons?

Workshop participants considered several measures in order to mitigate the risks associated with the introduction of HCMs and HGVs. These involved:

### Reducing proliferation risks

Technology used in the development, production and maintenance of HGVs and HCMs is to a certain extent covered by some multilateral export control regimes (MECRs):

#### Wassenaar Arrangement

The Wassenaar Arrangement (1996) is a voluntary export control regime. The forty-two participating states exchange information on transfers of conventional weapons and dual-use goods and technologies. Through such exchanges, Wassenaar aims to promote "greater responsibility" among its members in exports of weapons and dual-use goods and to prevent "destabilizing accumulations."

The Wassenaar Arrangement establishes two lists of items for which member countries are to apply export controls:

- The Munition List
- The Dual-Use List

#### *Munition List*

At least six provisions of the Munitions List may apply to HGVs and HCMs:

- ML4 – covers rockets and missiles
- ML8b. - covers propellants
- ML10 – covers Aircraft, Unmanned Aerial Vehicles and aero-engines
- ML11 – covers electronic equipment e.g. guidance and navigation equipment
- ML21 and ML22 – cover software and other technologies designed for development, production, operation, maintenance, repair, overhaul of items in the Munitions List

#### *Dual-Use List*

At least three provisions of the dual-use list may apply to HGVs and HCMs:

- Category One – covers special materials and related equipment including carbon matrix and equipment related to their development and production
- Category Two – covers electronics and equipment related to their development and production
- Category Nine – covers aerospace and propulsion, and equipment related to their development and production.

## Hague Code of Conduct (HCoC)

HCoC members voluntarily commit themselves politically to provide pre-launch notification on ballistic missiles and space launch vehicles, and test flights. Since HGVs are mounted on top of ballistic missiles, relevant provisions of HCoC could also apply to them. These include:

- Provision 4.a).i – make an annual declaration providing an outline of their HGV policies and provide annual information on the number and generic class of HGVs launched during the preceding year (HGV references added)
- Provision 4.a).iii – exchange pre-launch notifications on HGV launches and test flights (HGV reference added)

## Missile Technology Control Regime (MTCR)

The Missile Technology Control Regime (MTCR) (1987) is a voluntary export control regime formed by the G-7 industrialized countries. It is an informal political understanding among 35 member states that seek to limit the transfer of technology capable of being used for the delivery of weapons of mass destruction. There are two categories of items:

- Category I items (with capabilities exceeding a 300km/500kg range/payload threshold) are subject to an unconditional "strong presumption of denial" regardless of the purpose of the export and are licensed for export only on rare occasions.

- Category II items are systems capable of a maximum range equal to or greater than 300km (regardless of payload) and are not subject to a "strong presumption of denial".

While MTCR guidelines apply to HGVs and HCMs, it depends on the vehicle whether they fall under Category I or II, especially on their range and payload.

Whilst most technologies required for the development, production and maintenance of HGVs and HCMs are controlled by MECRs, some issues remain. These include:

- A more inclusive participation that involves all relevant stakeholders: China currently participates neither in the Wassenaar Arrangement nor the MTCR.
- HCMs are Unmanned Area Vehicles (cruise missiles) according to MTCR, and are missiles under the Wassenaar Munitions List.
- Under the MTCR, depending on national interpretation, HGVs might be considered either as re-entry vehicles or UAVs.
- The accounting for commercial/civilian use of hypersonic technology requires clarification.

## **Confidence building and arms control**

Confidence-building and arms control measures could contribute to reducing nuclear risks. Some measures may require a level of political will that is lacking at the moment. However, it is useful not to limit the field of possibilities and consider a wide-range of measures for policymakers to choose from:

### Enhancing transparency and predictability

#### *Communication*

Better communication on roles and missions of HGVs and HCMs would enable countries to gain a better understanding of their intended use.

Communication measures could include the adoption of a more explicit definition of their roles and missions in public documents such as Defence White Papers.

#### *Notification*

Better notification would allow for a more accurate assessment of another country's hypersonic arsenal and its operational level.

Notification measures could include:

- Applying HCoC's provisions on test-launches to HCM and HGV tests
- Adopting an open source-based hypersonic weapons register, reflecting numbers, range, platforms and areas of deployment, with a mechanism for interested countries to contribute on a voluntary basis

#### *Warhead clarification*

Clarifying the nature of the warhead carried by HCMs and HGVs would help mitigate the risk of warhead ambiguity, thus reducing threat perceptions and the likelihood of miscalculations.

Clarification measures could include communicating what type of payload can each hypersonic system carry and how many will be fitted respectively with nuclear and conventional payload.

While politically challenging, verification mechanisms would greatly improve confidence in the accuracy of the information communicated.

#### *Limitation*

Agreed limitations on HCMs and HGVs would contribute to reducing the incentive to embark on an arms race and reducing the perception of vulnerability that an otherwise uncontrolled deployment of HCMs and HGVs would generate.

Limitations could include numerical and geographical measures on the deployment of HGVs and HCMs.

#### *Non-targeting*

Non-targeting agreements would reduce the incentive for a first strike and enhance strategic stability.

Non-targeting measures could focus on certain vital assets such as command and control centres, radars, and satellites needed for early warning, thereby contributing to long-term sustainability in outer-space.

## Making use of and strengthening the bilateral and multilateral regulatory framework

### *New START*

While existing HCMs and non-strategic HGVs are clearly outside the framework of New START, mechanisms provided under the New START Treaty could be used to include strategic HGVs, as a variant of ICBMs, under its limits (provided the Treaty is extended).

### *Multilateral Export Control Regimes (MECRs)*

Abiding by and implementing relevant provisions applicable to hypersonic technology would contribute to reducing the risks of proliferation.

With their relatively limited politicisation and strong emphasis on technical aspects, MECRs may also provide conducive platforms to initiate dialogue on hypersonic weapons.

### *Test Ban*

Freezing current testing programmes and prohibiting future flight testing of HCMs and HGVs suitable as weapons (commercial HGVs would stay outside the remit of a test-ban) would contribute to slowing down an arms race.

A test-ban would not require scrapping existing HGVs and HCMs. However, confidence in the performance of those existing systems would decline in the medium to long term, if left untested.

HCMs and HGVs are also linked to other weapon systems which provide reasons for their development, support for their use, or response to their use. Therefore other relevant weapon systems should be taken into account when dealing with HCMs and HGVs.

In parallel to stand alone measures, HCMs and HGVs should be considered in a broader context of confidence building/arms control, strategic/regional stability and nuclear risks reduction.

## **Conclusion**

### **Reducing proliferation risks**

Technology used in the development, production and maintenance of HGVs and HCMs is to a certain extent covered by some multilateral export control regimes (MECRs):

- Wassenaar Arrangement
- Hague Code of Conduct
- Missile Technology Control Regime

Whilst most technologies required for the development, production and maintenance of HGVs and HCMs are controlled by MECRs, some issues remain. These include:

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## **Confidence building and arms control**

Confidence-building and arms control measures could contribute to reducing nuclear risks. Some measures may require a level of political will that is lacking at the moment. However, it is useful not to limit the field of possibilities and consider a wide-range of measures for policymakers to choose from:

- Enhancing transparency and predictability:
  - Communicating roles and missions
  - Notifying test-launches and deployment
  - Clarifying nature of warhead
  - Adopting numerical and geographical limitations
  - Non-targeting of vital assets
  
- Making use of and strengthening the bilateral and multilateral regulatory framework
  - Applying relevant provisions of New START
  - Applying relevant provisions of MECRs
  - Using MECRs as platforms to initiate dialogue
  - Considering feasibility of a Test Ban

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## **Acknowledgements**

The Pugwash Foundation and the Pugwash Conferences on Science and World Affairs would like to express their gratitude to the Ministry of Foreign Affairs of the Kingdom of the Netherlands for its generous financial support, which made this workshop possible. They are also grateful to the Federal Department of Foreign Affairs of Switzerland, the Permanent Mission of Canada to the United Nations in Geneva, and the British Pugwash Group for their assistance in the realisation of this workshop.

