# 2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons

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## The Quad Nuclear Verification Partnership

### Working paper submitted by Norway, Sweden, the United Kingdom of Great Britain and Northern Ireland and the United States of America

*Summary*

The Quad Nuclear Verification Partnership was formed out of our four countries' shared belief in the necessity of effective verification for achieving nuclear disarmament. Norway, Sweden, the United Kingdom and the United States all recognize that a credible verification regime in which all States have confidence will be essential for reaching and maintaining a world without nuclear weapons. In October 2017, the Quad held the first-ever multilateral nuclear verification exercise, called LETTERPRESS, at the former nuclear weapons storage base RAF Honington in the United Kingdom. The lessons learned from the exercise have led the Quad to organize its continuing work towards 2025 in two separate workstreams, one focusing on verification strategies, the other focusing on verification technologies. The results will be integrated into a common, substantive deliverable, possibly including an exercise, within the time frame of the 2025 review cycle of the Treaty on the Non-Proliferation of Nuclear Weapons. The Quad seeks to demonstrate how multilateral nuclear disarmament verification may be implemented in the real world. Our partnership illustrates that non-nuclear-weapon States and nuclear-weapon States can work together to advance nuclear disarmament verification without breaking their non-proliferation obligations. We will continue to inform the international community about our activities and results. In this way, the Quad Nuclear Verification Partnership makes a meaningful contribution to the fulfilment of article VI of the Non-Proliferation Treaty.

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# I. Introduction

1. Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons sets out, among other elements, that "each of the Parties to the Treaty", both non-nuclear-weapon States and nuclear-weapon States, undertakes to pursue effective measures relating to nuclear arms control and disarmament "under strict and effective international control". The Group of Governmental Experts to consider the role of verification in advancing nuclear disarmament concluded that verification is essential in the process of nuclear disarmament and to achieving a world without nuclear weapons, and that a credible verification regime in which all States have confidence will be essential for maintaining a world without nuclear weapons (see A/74/90, para. 39). The establishment of effective verification measures will thus be instrumental for fulfilling article VI. Such verification measures must satisfy safety and security requirements and, crucially, uphold non-proliferation obligations under the Non-Proliferation Treaty.

2. The Quad Nuclear Verification Partnership seeks to contribute solutions to the challenges associated with verifying that nuclear disarmament has occurred. This partnership between two non-nuclear-weapon States and two nuclear-weapon States was established in 2015 between Norway, Sweden, the United Kingdom and the United States. The work of the Quad builds on experiences from the United Kingdom-Norway Initiative, as well as previous United Kingdom-United States verification and arms control exercises.

3. This step towards multilateralism is valuable for understanding the impact of multiple nuclear-weapon States and non-nuclear-weapon States taking part in future verification activities. The Quad has demonstrated that such collaboration is both possible and beneficial without being proliferative.

4. Key characteristics of the Quad are its small format and its bottom-up approach. This allows the participating States to explore specific issues in greater depth through collaborative work and exercises. The collaboration is to a large degree driven by the technical challenges. Within a framework set by our four Governments, the technical experts engage directly with one another, allowing for an atmosphere of informal, yet professional, creativity and trust.

# II. LETTERPRESS exercise

5. In October 2017, the Quad held a live-play simulation exercise at the former nuclear weapons storage base RAF Honington in the United Kingdom. The exercise, called LETTERPRESS, was the first multilateral nuclear verification exercise and the culmination of two years of extensive work in round-table discussions and working group meetings to develop the exercise's verification activities.

6. The exercise focused on nuclear warhead activities that take place between the removal of warheads from in-field deployment and the delivery of the same warheads for dismantlement. Verification activities related to the remaining active warheads were also simulated.

7. In the exercise, the Quad tested managed access procedures, as well as techniques and technologies that could verify the correctness and completeness of a declaration throughout storage at a nuclear weapon site and transportation.

8. LETTERPRESS was an excellent first step in multilateral cooperation on the complex problem of nuclear-weapons-related verification. The roles, leadership and responsibilities were distributed equally across the four participating countries.

9. The exercise enabled the Quad partners to identify concepts, techniques and technologies that might be applied in future verification regimes, and it provided the partners with experience in developing a system of verification procedures.

10. In the end, exercise participants determined that verification objectives were met despite various technical challenges. The inspecting party was, based upon the approach implemented for the technologies, able to verify the correctness and completeness of the declaration and that the chain of custody was always maintained.

11. The exercise provided valuable insight into the challenges associated with developing verification technologies. Valuable lessons were learned from the use of equipment at lower technology readiness levels, which had not yet been tested under a robust range of environmental and operational conditions.

12. The use of a genuine former nuclear weapon storage area at RAF Honington, coupled with authentic ballistic casings and transport containers, added significantly to the realism and success of the exercise. Any future exercise could benefit from this level of realism.

13. Based upon the experiences of the players and planners in the LETTERPRESS exercise, continued engagement between non-nuclear-weapon States and nuclear-weapon States is necessary to foster trust and ownership of technical and procedural solutions. Exercising verification activities also increases understanding of the demands and limitations of protecting sensitive information.

# III. Future of the Quad Nuclear Verification Partnership

14. The Quad organizes its work towards 2025 in two separate workstreams, one focusing on verification strategies and the other focusing on verification technologies.

15. The two workstreams have developed programmes of work that reflect the lessons learned from LETTERPRESS and the overall purpose of the Quad. The workstreams complement each other in developing nuclear disarmament verification methodologies for the future.

## A. Verification strategies workstream

16. The LETTERPRESS exercise integrated several previously developed verification concepts and technology prototypes in an inspection setting. One of the lessons learned from the exercise is that there is a need to further develop higher-level verification concepts and approaches. This would allow us to better understand and to demonstrate how information from individual verification activities fulfils verification objectives and ultimately supports compliance assessments of treaty goals.

17. The Quad verification strategies workstream is investigating this issue by studying different strategies and approaches to verifying nuclear-weapons-related arms control and disarmament treaties.

18. Work within the verification strategies workstream draws on previous experiences from the development and execution of the LETTERPRESS exercise to develop a clearer understanding of how different verification strategies could be applied within the context of nuclear disarmament verification. Research and analysis in this workstream primarily include:

- Studying verification system architectures

- Identifying and assessing potential impacts, conflicts and solutions with respect to the information exchanged between treaty partners in order to make verification strategies feasible

19. A systems approach has been taken to encourage a broad analytical perspective. This approach involves treating the nuclear weapons enterprise of a hypothetical State as a dynamic system, about which a nuclear-weapon State can make claims that are to be verified. It evaluates the information known at any given time, and how sufficient this knowledge is for a given purpose.

20. This approach builds upon the progress made during LETTERPRESS, where many elements of a systems perspective were employed during the development of the exercise. Following that exercise, the Quad partners acknowledged the benefits of the approach, but noted that resulting verification activities need to be investigated and further assessed to understand how they may be implemented under conditions different from those stipulated for LETTERPRESS.

## B. Verification technologies workstream

21. While the LETTERPRESS exercise used several types of verification technologies, the establishment of the parties' initial confidence in the correct, safe and secure operation of the technical equipment was not trialled. Subsequently, the Quad partners have identified a need to examine and develop methodologies related to the authentication and certification of equipment and how these processes affect the confidence in data generated by the equipment. These issues are present over the full nuclear disarmament process and relevant for a large number of Treaty monitoring activities.

22. The verification technologies workstream programme of work encompasses equipment procedures, data handling, encryption and the interplay between them, in order to meet safety and security requirements and to maintain confidence in the data generated. The workstream will test the outcomes of its work with technology demonstrations to examine specific circumstances.

23. Given the above-mentioned approach, five specific tasks have been identified:

- Initial examination of digital data cryptography and authentication
- Methodology for tracing dependencies in authentication and confidence in data
- Examination of different authentication and certification approaches
- Demonstrations
- Development of an authentication and certification requirements framework

## C. Quad Nuclear Verification Partnership

24. The Quad partners believe that work on multilateral nuclear disarmament verification can play positively into the Non-Proliferation Treaty review process also beyond the tenth Review Conference. As highlighted in the present paper, the Quad will therefore continue to assess and explore in depth methodology, procedures and technologies relevant for nuclear disarmament verification.

25. The two workstreams will mainly focus on their respective programmes of work in the period up to 2022. In the following two years, the partnership will then build on their results and integrate them into a common, substantive deliverable, possibly including an exercise, within the time frame of the 2025 Non-Proliferation Treaty

review cycle. This deliverable will represent an evolution from LETTERPRESS in the way that individual verification technologies and approaches will form part of further developed verification strategies and a more consistent approach to establishing confidence in information from verification technologies.

26. The Quad partnership will continue to share its work at future Non-Proliferation Treaty Preparatory Committee meetings and review conferences, as well as other appropriate venues.[1]

# IV. Conclusion

27. While not a goal in itself, knowledge of disarmament verification will prove indispensable when future disarmament and arms control agreements are negotiated. Verification may never provide complete confidence, and there will be trade-offs owing to the relationship between resources, effectiveness and the protection of sensitive information. However, effective verification provides a high level of confidence and trust, both between the parties to an agreement and among the broader community of States.

28. Multilateral disarmament verification is a vital component of an incremental and pragmatic approach towards our goal of a world without nuclear weapons. By including non-nuclear-weapon States as important players in this process, as well as by providing a realistic testbed for evaluating verification technologies and strategies, the Quad demonstrates how multilateral nuclear disarmament verification may be implemented in the real world. In this way, the Quad Nuclear Verification Partnership makes a meaningful contribution to the fulfilment of article VI of the Non-Proliferation Treaty.

[1] The Quad Nuclear Verification Partnership website, available at https://quad-nvp.info/.