

# Demonstrating the Elimination of Nuclear Weapon Programmes

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Second Meeting of States Parties to the  
Treaty on the Prohibition of Nuclear Weapons

New York, November 28, 2023

~~SECRET~~  
Metallurgical Laboratory  
P.O. BOX 5207  
CHICAGO 90, ILLINOIS

June 12, 1945

To: Secretary of War - Attention: Mr. George Harrison  
From: Arthur H. Compton

In re: Memorandum on "Political and Social Problems" from Members of the  
"Metallurgical Laboratory" of the University of Chicago.

Dear Mr. Secretary:

I have submitted to you a memorandum which has been prepared on short notice by certain key members of the scientific staff of the Metallurgical Laboratory of the University of Chicago. It deals with the long-term consequences of use of the new weapons with which we are concerned. I am submitting this at the request of the Laboratory, for the attention of your Interim Advisory Committee. The memorandum has not yet been considered by other members of the "Scientific Panel." This will be done within a few days, and a report by the panel dealing with the matter in question will be submitted. In the meantime, however, because time is short for making the necessary decisions, I have personally taken the liberty of transmitting this memorandum to you for the consideration of your committee.

The main point of this memorandum is the predominating importance of considering the use of nuclear bombs as a problem of long-range policy rather than for its military advantage in this war. Their use should thus be directed primarily toward bringing about some international control of the means of nuclear warfare.

The proposal is to make a technical but not military demonstration, preparing the way for a recommendation by the United States that the military use of atomic explosives be outlawed by firm international agreement. It is contended that its military use by us now will prejudice the world against accepting any future recommendation by us that its use be not permitted.

I note that two important considerations have not been mentioned:

- (1) that failure to make a military demonstration of the new bombs may make the war longer and more expensive of human lives, and
- (2) that without a military demonstration it may be impossible to impress the world with the need for national sacrifices in order to gain lasting security.

This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, U.S.C. 50, 72 and 73. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

~~SECRET~~  
Order Sec Army 7-2030

"We now consider the question of how an **effective international control** of nuclear armaments can be achieved.

This is a **difficult problem**, but we think it to be **soluble**."

Franck Report, June 1945

Written prior to the first nuclear weapon explosion by group of Manhattan Project scientists.

Franck, J., D. Hughes, L. Szilard, T. Hogness, E. Rabinowitch, G. Seaborg, and C.J. Nickson. "The 'Franck Report' - a Report to the Secretary of War, June 1945," 1945. <http://www.fas.org/sgp/eprint/franck.html>.

**What is the purpose of effective international control?**

# Elimination





# Civilian Use and Conversion “Safeguards”





# Strategic Stability

“Arms Control” / “Warhead Authentication”



Image: [https://www.reddit.com/r/submarines/comments/9gnfbe/hatches\\_open/](https://www.reddit.com/r/submarines/comments/9gnfbe/hatches_open/)

# Verification within a TPNW context



## Strategic Stability Verification

Verification of warhead numbers and warhead dismantlement is only relevant in a deterrence context.

Mian / Philippe (2022),  
Paradigm shift in verification:

“The traditional nuclear weapon-centred model of nuclear arms control verification is shaped by active suspicion and distrust.”

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## Demonstrating Civilian Use and Conversion

Civilian facilities not used for weapon purposes, including converted elements of weapon programmes.



## Demonstrating Elimination

Facilities and other infrastructure is demolished and dismantled, their absence is shown.

**What needs to be verified?**

Mining

Fuel  
Fabrication

Enrichment

Reactors

Reprocessing

U/Pu  
Storage

Nuclear Fuel Cycle



Mining

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Reactors

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Storage

Nuclear Fuel Cycle

Reflector

Conventional  
Explosives

Tritium

Detonator

Pit

Lithium  
Deuteride

Weapon  
Electronics

Neutron  
Initiator

Component Manufacturing

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Component Manufacturing

Scientific  
Training

Research &  
Development

Testing

Simulation

Assembly

Maintenance

Weaponization

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Weaponization

Special  
Military Units

Command &  
Control

Nuclear  
Strategies

Weapon  
Storage Sites

Transport  
Capabilities

Early Warn.  
Systems

“Use” Infrastructure



Mining

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Enrichment

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## Nuclear Fuel Cycle

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## "Use" Infrastructure

Missile  
Technology

Reentry  
Vehicles

Dual Capable  
Aircraft

Nuclear  
Submarines

Long Range  
Bombers

## Delivery Systems

Mining

Fuel  
Fabrication

Enrichment

Reactors

Reprocessing

U/Pu  
Storage

## Nuclear Fuel Cycle

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## Delivery Systems



**Demonstrating  
Civilian Use and  
Conversion**



**Demonstrating  
Elimination**

**Where are areas of opportunity  
for new research?**



# Further Define Nuclear Weapon Programme Elements

GLOBAL CHANGE, PEACE & SECURITY  
2018, VOL. 30, NO. 3, 187-207  
<https://doi.org/10.1080/14781158.2018.1467392>



## An international monitoring system for verification to support both the treaty on the prohibition of nuclear weapons and the nonproliferation treaty

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Princeton University, Princeton, NJ, USA

**ABSTRACT**  
The Treaty on the Prohibition of Nuclear Weapons calls for states to meet regularly to consider measures for the verified, time-bound and irreversible elimination of nuclear weapon programs. Key to this effort is mapping a comprehensive set of nuclear weapon program indicators and further developing international capacity to monitor them. Distinct from the deadlocked Conference on Disarmament, this new forum will have an opportunity to program indicators and further developing international capacity to monitor them. Distinct from the deadlocked Conference on Disarmament, this new forum will have an opportunity to program indicators and further developing international capacity to monitor them. Distinct from the deadlocked Conference on Disarmament, this new forum will have an opportunity to program indicators and further developing international capacity to monitor them.

**ARTICLE HISTORY**  
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Accepted 14 April 2018

**KEYWORDS**  
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security; governance;  
environment; verification

### Introduction

The 2017 Treaty on the Prohibition of Nuclear Weapons, commonly known as the Treaty of Ban, establishes an obligation for verifying the irreversible elimination of nuclear weapons. The treaty, which enters into force upon ratification by 11 states, includes both disarmament process-oriented and long-term verification elements. The treaty also reinforces the requirement for international Atomic Energy Agency (IAEA) safeguards. As such, the broad scope of the treaty combines both disarmament and nonproliferation obligations and verification into its structure. The Treaty requires in particular that:

- States that elect to disarm before joining the treaty must 'cooperate with the competent international authority ... for the purpose of verifying the elimination of its nuclear-weapon programme'. The 'competent international authority' is defined as the IAEA.

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Federal Foreign Office



## Toward Nuclear Disarmament

Building up Transparency and Verification

MALTE GÖTTSCHE AND ALEXANDER GLASER (EDITORS)

Limited research exists outlining elements of nuclear weapon programmes.

**Future research:**  
Comprehensively define nuclear weapon programmes;  
find potential indicators for effective control.

Patton, Tamara. "An International Monitoring System for Verification to Support Both the Treaty on the Prohibition of Nuclear Weapons and the Nonproliferation Treaty." *Global Change, Peace & Security* 30, no. 2 (2018): 187-207. <https://doi.org/10.1080/14781158.2018.1467392>.

Kütt, Moritz. "Weapons Production and Research." In *Toward Nuclear Disarmament: Building up Transparency and Verification*, edited by Malte Götttsche and Alexander Glaser, 116-39. Berlin: German Federal Foreign Office, 2021. <https://www.auswaertiges-amt.de/blob/2462108/6dc81f5932e6b96b48b8bc222f4b2e58/towards-nuclear-disarmament-data.pdf>.

# Expand Absence Approaches



Recent research  
has focused on demonstrating the  
absence of nuclear weapons.

**Future research:**  
Expand to demonstrate  
absence of nuclear weapon  
programme elements.

Podvig, Pavel, Ryan Snyder, and Wilfred Wan. "Evidence of Absence: Verifying the Removal of Nuclear Weapons." United Nations Institute for Disarmament Research, 2018.  
Podvig, Pavel, Eleanor Krabill, Vivienne Zhang, Eric Lepowsky, Christoph Wirz, Alexander Glaser, Jaewoo Shin, Veronika Bedenko, and Pavel Podvig. "Menzingen Verification Experiment - Verifying the Absence of Nuclear Weapons in the Field." The United Nations Institute for Disarmament Research, July 28, 2023. <https://doi.org/10.37559/WMD/23/MVE>.

# Engage with Safeguards Research

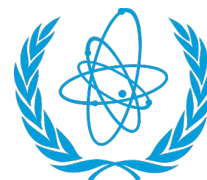
Research efforts on the demonstration of civilian use exist in support of IAEA safeguards activities.

## **Future research:**

Expand to converted weapon programme facilities

## Symposium on International Safeguards

Reflecting on the Past  
and Anticipating the Future



**IAEA**

and Anticipating the Future  
Reflecting on the Past

## Conclusion / Take aways

- 1) Do not focus verification efforts on strategic stability/deterrence.
- 2) Demonstration of conversion and elimination must cover many elements: Nuclear fuel cycles, weapon component production, weaponization, “use” infrastructure (as well as delivery systems).
- 3) Research opportunities exist to establish the relevant set of elements for nuclear weapon programmes, to allow for the expansion of safeguards, and to develop new absence approaches.

