Current Status of Nuclear Weapons

8.S271
Class 12
Nuclear Weapons – History and Future Prospects

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Reminder – 4th and Last Writing Assignment

Related to Classes 10, 11, and 12

Posted on the Canvas site under “Files” and under “Assignments”

Due end of day Friday, May 6
Outline

Nuclear Weapons in Each Stockpile
Types of Deployed Weapons
Defense Systems Issues
Status and Effectiveness of Treaties
Other Relevant Issues
The world's nuclear arsenals:

- **United States**: 5,428
- **Russia**: 5,977
- **United Kingdom**: 225
- **France**: 290
- **Israel**: 90
- **Pakistan**: 165
- **India**: 160

The United States and Russia together possess 11,395 nuclear warheads, or about 90% of the world's total about 13,000 warheads. Only the United States and Russia possess multiple warhead delivery systems, while France and Israel have single-warhead systems, and the United States and Russia have multiple-warhead systems. Reassuming warhead stockpiles: North Korea, Pakistan, Russia, UK. Stable warhead stockpiles: France, Israel. Resuming warhead stockpiles: US.
Estimated nuclear warhead stockpiles, 1945 to 2022

Stockpiles include warheads assigned to military forces, but exclude warheads queued for dismantlement.

Source: Federation of American Scientists (2022)
OurWorldInData.org/nuclear-weapons/ - CC BY

Note: The exact number of countries' warheads is secret, and the estimates are based on publicly available information, historical records, and occasional leaks. Warheads also vary substantially in their power.
<table>
<thead>
<tr>
<th>Country</th>
<th>Strategic</th>
<th>Nonstrategic</th>
<th>Nondeployed</th>
<th>Stockpile</th>
<th>Inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>1,588</td>
<td>0</td>
<td>2,889</td>
<td>4,477</td>
<td>5,977</td>
</tr>
<tr>
<td>United States</td>
<td>1,644</td>
<td>100</td>
<td>1,964</td>
<td>3,708</td>
<td>5,428</td>
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<tr>
<td>France</td>
<td>280</td>
<td>n.a.</td>
<td>101</td>
<td>290</td>
<td>290</td>
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<tr>
<td>China</td>
<td>0</td>
<td>?</td>
<td>350</td>
<td>350</td>
<td>350</td>
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<tr>
<td>United Kingdom</td>
<td>120</td>
<td>n.a.</td>
<td>60</td>
<td>180</td>
<td>225</td>
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<tr>
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<tr>
<td>Pakistan</td>
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<td>165</td>
<td>165</td>
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<tr>
<td>India</td>
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<td>n.a.</td>
<td>160</td>
<td>160</td>
<td>160</td>
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<tr>
<td>North Korea</td>
<td>0</td>
<td>n.a.</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Total: ~3,632 ~100 ~5,708 ~9,440 ~
Category Definitions

Deployed Strategic: ICBMs, Heavy Bomber Bases, Submarine based

Deployed Nonstrategic: at bases with short-range delivery systems

Reserve/Nondeployed: in storage

Military Stockpile: sum of first three categories

Total Inventory: Military stockpile plus retired warheads in the queue for dismantlement
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US Nuclear Warheads

W78 – Intermediate Yield Strategic ICBM MIRV Warhead
Yield: 335 – 350 kT, Number in service about 200

W87 – Intermediate Yield Strategic ICBM MIRV Warhead
Yield: 300 kT, Number in service about 240

W76 – Intermediate Yield Strategic ICBM MIRV Warhead
Yield: 100 kT, Number in service about 760

W88 – Intermediate Yield Strategic SLBM MIRV Warhead
Yield: 475 kT, Number in service about 380
W80 – Intermediate Yield Strategic Cruise Missile Warhead
   Yield:  5, 150 kT,   Number in service about 200

B61 – Intermediate Yield Strategic and Tactical Thermonuclear Bomb
   Yield:  0.3, 1.5, 60, 170 kT,   Number in service about 50

B83 – High Yield Strategic Thermonuclear Bomb
   Yield:  Low kT to 1200 kT,   Number in service about 50
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Missile Defense Issues

In class 9, Prof. Barletta discussed a number of aspects of defense systems against nuclear weapons.

Most of the missile defense systems that are deployed are directed toward ICBMs. This is because at least much of their trajectory can be predicted and interception is at least plausible.

Even so, the technical aspects of missile defense are very challenging.
One relevant issue that has long been considered is whether effective missile defense systems would make the world safer or less safe.
Questions for Discussion

Why do you think nuclear defense systems are apparently so ineffective?

Should nuclear defense systems be abandoned?
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**Nuclear Weapons Testing Treaties**

**Limited Test Ban Treaty** –
- August 5, 1963
- United States, the United Kingdom, and the Soviet Union
- Prohibits all nuclear tests except those underground

**Threshold Test Ban Treaty** –
- July 1974
- United States, the United Kingdom, and the Soviet Union
- Prohibits all nuclear tests exceeding 150 kT
New START Treaty

A treaty between the USA and Russia to place verifiable limits on deployed intercontinental-range nuclear weapons.

The treaty entered into force in 2011.

Both the USA and Russia met the limits imposed by the treaty by the deadline of 2018.

The USA and Russia agreed in 2021 to extend the treaty until 2026.
Treaty on the Prohibition of Nuclear Weapons

A legally binding instrument to prohibit nuclear weapons, leading to their total elimination.


Signed by 86 nations, the main exceptions being the 9 nations that possess nuclear weapons.
Question for Discussion

How should the world try to really implement the Treaty on the Prohibition of Nuclear Weapons?
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Nuclear Weapons do require regular upkeep to remain effective. In particular, tritium has a half-life of about 12 years and must be replaced regularly. Tritium is produced in nuclear reactors built for that purpose.

The USA recently launched a program to upgrade and replace much of its nuclear arsenal. The cost is estimated to be more than $600B over the next decade. The Biden administration has this under review.
Some Thoughts on Nuclear Reactors

Nuclear Reactors pose challenges with regard to safety and their possible use to facilitate nuclear weapons production, but they certainly do not represent the existential threat that nuclear weapons do.

Besides carbon-based fuels, the only system the world currently has to produce electricity that can be turned on or off at will is based on nuclear reactors.

Therefore if we do not want to continue to use nuclear reactors, we must either implement another system that can be turned on or off at will (hydrogen fuel?) or greatly improve electricity storage systems.
The Ukraine Situation

Obviously, it is a terrible situation independent of the danger of nuclear war.

The possibility of the use of nuclear weapons and escalation to WWII is truly frightening to the world.

It is a very complicated set of issues for the US and NATO to handle.
Questions for Discussion

President Biden has declined to enforce a no-fly zone over Ukraine. Do you agree with this decision?

What other decisions are likely influenced by the danger of the use of nuclear weapons?
Suggested Takeaways

The existence and deployment of huge numbers of nuclear weapons poses by far the most serious existential threat to humanity and to the Earth.

We must work hard and consistently to convince the public and world leaders that all nuclear weapons must be eliminated.