Ethical issues and debates: arms control and disarmament

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Effects of nuclear weapons

- Blast
  - direct
  - Indirect
- Heat/light
  - Burns, blindness
  - fires
- Radiation
  - Initial
    - Direct
    - Induction of radioactivity
  - Fallout
    - Local (mostly external)
    - Intermediate (mostly external)
    - Global (mostly internal)

- Electromagnetic pulse
- Environmental effects
  - Biota
  - Climate

- Complex synergistic effects
- 1 Mt airburst
  - blast lethal area 150 km²
  - Fire conflagration lethal area 350 km²
- Radiation LD50 normally 4.5 - 6 Gy: Hiroshima 2.5 Gy

Nuclear first use: July-August 1945

- Test:
  - “Trinity”, Alamogordo, New Mexico, 16 July
- Attack:
  - Hiroshima, 6 August
  - Nagasaki, 9 August

The Trinity explosion, July 16, 1945

0.016 seconds after detonation.
The fireball is about 600 feet (200 m) wide.
The black specks silhouetted along the horizon are trees.

http://upload.wikimedia.org/wikipedia/commons/7/78/Trinity_Test_Fireball_16ms.jpg
Hiroshima, 6 August 1945

The only photographs known to have been taken in Hiroshima on the day of the bombing, by Matsushige Yoshito, *Before I became a professional cameraman I had been just an ordinary person. So when I was faced with a terrible scene like this, I found it difficult to press the shutter. I was standing on the Miyuki-bashi Bridge for about 20 minutes before I could do it. Finally I thought, I am a professional cameraman so I have to.*

Source: Robert Del Tredici, At Work in the Fields of the Bomb
http://www.nuclearfiles.org/library/media-gallerie/image/tredici/1110.htm

Hiroshima, 6 August 1945

Matsushige Yoshito:
*In front of the police box of Senda township located at the west end of Miyuki Bridge, a policeman took off the lid of an oil can and started to give first aid treatment to the people with burns, but the number of the injured increased rapidly. I thought this must be photographed and held the camera in position. The scene I saw through the finder was too cruel. Among the hundreds of injured persons of whom you cannot tell the difference between male and female, there were children screaming 'It's hot, it's hot!' and infants crying over the body of their mother who appeared to be already dead. I tried to pull myself together by telling myself that I'm a news cameraman, and it is my duty and privilege to take a photograph, even if it is just one, and even if people take me as a devil or a cold-hearted man. I finally managed to press the shutter, but when I looked through the finder for the second time, the object was blurred by tears.*

Source: Photographs of Hiroshima and Nagasaki, Gensuikin [Japan Congress Against A- and H-Bombs]
http://www.gensuikin.org/english/photo.html

Hiroshima, 6 August 1945

Source: US Navy Public Affairs, shortly after 6 August 1945, at

Hiroshima, 6 August 1945

Hiroshima Prefectural Industrial Promotion Hall, now known as the Hiroshima Peace Dome.
Photographed in October 1945 by Hayashi Shigeo (林重男)


Hiroshima, 6 August 1945

Source: Photographs of Hiroshima and Nagasaki, Gensuikin [Japan Congress Against A- and H-Bombs]
http://www.gensuikin.org/english/photo.html
First nuclear war - Immediate casualties: 
hibakusha: 被爆者

<table>
<thead>
<tr>
<th></th>
<th>Hiroshima</th>
<th>Nagasaki</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>320,000</td>
<td>260,000</td>
</tr>
<tr>
<td>Dead</td>
<td>78,000</td>
<td>35,000</td>
</tr>
<tr>
<td>Wounded</td>
<td>37,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Total</td>
<td>115,000</td>
<td>65,000</td>
</tr>
</tbody>
</table>

- Note: These are the generally accepted figures for casualties on the days of the explosions. Radiation sickness doubled the casualty figures by the end of 1945, and people are still dying from radiation-related illnesses today.

“Golden Age of Stable Deterrence” and its post-Cold War regrets

- Deterrence as a psychological relationship induced between two parties
- Mutual assured destruction and variants
- Mutually understood “rules of the road”
  - Dependent on comparable technologies
  - Roughly symmetrical stakes
  - Technical capacity to communicate
  - Cultural capacity for mutual understanding
- Number of players = 2, or at times, = 3.
- The Gang of Four reverse course: George Schultz, William Perry, Henry Kissinger and Sam Nunn
  - CW was “high-risk stability” (in fact not stable at all)
  - NWs did not stop Soviet or US wars and invasions
  - NWs no longer productive of security for US
  - “Can we devise cooperative concepts to dismount the nuclear tiger?”

The deterrence framework for nuclear weapon use

- Strategic policies using military force to ...
  - Deterrence
    - … to coerce another state to not act in a way it would otherwise do
  - Compellence
    - … to coerce another state to stop doing what it is doing
  - Reassurance
    - … re-assure an ally or an enemy of intention
- “Deterrence” as the key enabling framework for using nuclear weapons today
- “Humanitarian consequences” as emerging counter-framework
Russian early-warning satellites

<table>
<thead>
<tr>
<th>Name</th>
<th>NORAD number</th>
<th>Orbit</th>
<th>Launch date</th>
<th>Position of GEO satellite (main functioning position)</th>
<th>Stopped functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosmos-2422</td>
<td>29240</td>
<td>HEO</td>
<td>31 July 2006</td>
<td></td>
<td>After Aug. 2009</td>
</tr>
<tr>
<td>Cosmos-2430</td>
<td>32268</td>
<td>HEO</td>
<td>23 October 2002</td>
<td></td>
<td></td>
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<tr>
<td>Cosmos-2446</td>
<td>33447</td>
<td>HEO</td>
<td>2 December 2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cosmos-2440</td>
<td>38101</td>
<td>GEO</td>
<td>27 Jun 2009</td>
<td>80 E, after 160 E drifted to 0 E</td>
<td>February 2010</td>
</tr>
</tbody>
</table>

Enduring issues with nuclear deterrence

- Credibility of intention
  - to antagonist
  - to allies
  - to domestic audience
- Reliability of capacity for expressed intention
  - Force structure and disposition
  - Political resolve
- Risks and consequences of deterrence failure or error
- Moral and political standing of planning “a smoking ruin at the end of two hours” (David Rosenberg)

Patrick Morgan: Why are nuclear weapons so persistent?

- Security approaches and the international system
- Psychological utility of nuclear weapons as status definers
- Political value: no domestic consensus nuclear weapons have to be removed
- No progress on key conflicts driving nuclear proliferation
- The belief nuclear deterrence has kept the peace
- Foreign policy preferences: something else is always “more important”

Public forum: Who will stop nuclear next use? Nautilus Institute, Melbourne, September 2009
Contemporary instances of nuclear deterrence

(a) Bilateral direct deterrence
- US-Russia
- US-China
- US-North Korea
- North Korea - South Korea, Japan, China
- US-Iran
- China-Russia
- India-Pakistan
- Israel-Iran...

(b) Extended nuclear deterrence
- US-Russia
  - protégés: NATO countries (historically China re SU?)
- US-China
  - protégés: Japan, Korea, Taiwan, Australia
- US-North Korea
  - protégés: Japan, Korea, Taiwan,
- US-Iran (implied)
  - Middle Eastern allies - Israel; selected others?

World nuclear forces, 2011

<table>
<thead>
<tr>
<th>Country</th>
<th>Deployed warheads</th>
<th>Other warheads</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>2,150</td>
<td>6,350</td>
<td>8,500</td>
</tr>
<tr>
<td>Russia</td>
<td>2,427</td>
<td>8,570</td>
<td>11,000</td>
</tr>
<tr>
<td>UK</td>
<td>160</td>
<td>65</td>
<td>225</td>
</tr>
<tr>
<td>France</td>
<td>290</td>
<td>10</td>
<td>300</td>
</tr>
<tr>
<td>China</td>
<td>..</td>
<td>200</td>
<td>240</td>
</tr>
<tr>
<td>India</td>
<td>..</td>
<td>80-100</td>
<td>80-100</td>
</tr>
<tr>
<td>Pakistan</td>
<td>..</td>
<td>90-110</td>
<td>90-110</td>
</tr>
<tr>
<td>Israel</td>
<td>..</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>5,027</td>
<td>15,580</td>
<td>20,500</td>
</tr>
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</table>

All estimates are approximate and are as of January 2011.

Source: SIPRI Yearbook, 2012, Table 7.1

Estimated US deployed strategic nuclear weapons, 2011, 2018 (with notes)

<table>
<thead>
<tr>
<th>Weapon system</th>
<th>2011</th>
<th>2018</th>
<th>2018</th>
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<tbody>
<tr>
<td>ICBM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minuteman III</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>W/BN/BN/BN</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>W/BN/BN/BN/BN</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>ICBM</td>
<td>1,060</td>
<td>1,060</td>
<td>1,060</td>
</tr>
<tr>
<td>Trident D-5</td>
<td>1,153</td>
<td>240</td>
<td>1,393</td>
</tr>
<tr>
<td>W/BN/BN/BN/BN/BN/BN/BN</td>
<td>700</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>ICBM</td>
<td>1,060</td>
<td>1,060</td>
<td>1,060</td>
</tr>
<tr>
<td>SLBM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trident D-5</td>
<td>90-110</td>
<td>90-110</td>
<td>90-110</td>
</tr>
<tr>
<td>ICBM</td>
<td>90-110</td>
<td>90-110</td>
<td>90-110</td>
</tr>
</tbody>
</table>
| Nuclear capable heavy bombers: 76 B-52H bombers and 18 B-2 bombers that can be equipped with nuclear weapons
| Inter-continental ballistic missiles (ICBMs): 450 deployed silo-based Minuteman III ICBMs
| Submarine-launched ballistic missiles (SLBMs): Trident D-5 SLBMs aboard 20 Ohio-class strategic nuclear submarines (SSBNs)

The current U.S. nuclear strike triad: 2010 Nuclear Posture Review

- Nuclear capable heavy bombers
- Inter-continental ballistic missiles (ICBMs)
- Submarine-launched ballistic missiles (SLBMs): Trident D-5 SLBMs aboard 20 Ohio-class strategic nuclear submarines (SSBNs)
B61 group ("family") of nuclear bombs

- Variable yield thermonuclear bomb
  - B61-7 Gravity bomb, variable yield 0.3 Kt - 350 Kt.
  - B61-11 earth penetrating weapon, single yield.
- About 150 tactical versions (gravity bombs) deployed under nuclear-sharing arrangements in six NATO countries.
- B61, GlobalSecurity.org
  - Under New START each heavy bomber is counted as one warhead (although the maximum loading is 16-20).

B-2 long range bombers, Air Force Global Strike Command

- B-2 nuclear deployment at Whiteman AFB, Missouri.
- Non-nuclear deployment also at Andersen AFB, Guam; UK; and Diego Garcia.

LGM-30 Minuteman III ICBM and W78 thermonuclear warhead

Operational USAF units (150 missiles each):
  - 90th Missile Wing
  - 91st Missile Wing
  - 341st Missile Wing

Source: LGM-30 Minuteman, Wikipedia

Trident II D-5 Fleet Ballistic Missile

- Primary contractor: Lockheed Missiles and Space Co., Inc.
- Unit Cost: $29.1 million (current production)
- Length: 13.41 meters, Diameter: 1.85 meters
- Weight: 58,500 kg
- Range: 11,000km
- Greater than 7,360 km
- Thermonuclear MIRV (Multiple Independently Targetable re-entry Vehicle) warhead
  - 8 W88 300-475 kiloton MIRVs in a solid-fuel Mk 5 post boost vehicle
  - download to 5 re-entry vehicle planned under START 2
- Circular Error Probable (CEP) reportedly as low as 120 meters

Source: GlobalSecurity.org, "Trident II D-5 Fleet Ballistic Missile"
Arms control agreements in place or being pursued

- small arms (almost nothing)
- conventional (non-nuclear) explosive devices (almost nothing)
- landmines
- cluster munitions
- chemical weapons
- biological weapons
- conventional (non-nuclear) explosive devices (almost nothing)
- nuclear weapons
  - strategic/long-range
  - tactical/short-range (almost nothing)
  - delivery systems

Some examples of minor but important arms control agreements

- hotlines
- Incidents at Sea (INCEA) Agreement
- Joint Data Exchange Center agreement 1998
  - not implemented, but back again (2011)

Primary task about nuclear weapons - what is it, and how do we do it?

- Candidates:
  - avoiding nuclear next-use
  - disarmament
  - non-proliferation
  - counter-proliferation
  - nuclear security
  - arms control
  - abolition
  - transarmament
- How do they relate to each other, positively, and negatively
- Hierarchy of goals?
- Who says? Who says what?
- Systems approaches as a solution?
  - e.g Carnegie Endowment’s Universal Compliance as an approximation

Negative Security Assurances and No First Use assurances

- China 1964 and consistently since:
  - will not use NW against NNWS (negative security assurance)
  - will never use nuclear weapons unless first attacked with nuclear weapons (No First Use)
- United States
  - “The United States is declaring that we will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the Nuclear Non-Proliferation Treaty and in compliance with their nuclear nonproliferation obligations,”
    President Obama, 6 April 2010, releasing the Nuclear Posture Review
  - The United States has consistently refused to make a No First Use declaration, arguing it would undermine deterrence
Treaty on the Non-Proliferation of Nuclear Weapons (NPT, 1968)

- entered into force 1970
- now 189 signatory states
- five “Nuclear Weapon States” (NWS) United States, Russia, China, France, UK
- 185 “Non Nuclear Weapon States” (NNWS)
- four nuclear-armed non-signatories
  - India, Israel, Pakistan, (North Korea withdrawn 2003)
- Three pillars:
  - non-proliferation (no transfer from NWS, no manufacture by NNWS)
  - NWS disarmament
  - peaceful use of nuclear energy
- “the most successful arms control arrangement of all time?”

Flaws and failings in the NPT regime

- NPT has not prevented proliferation by non-members
- Inherently flawed regime structure:
  - Legally unsecure, inconsistent and politicised ad hoc enforcement processes via the IAEA and UNSC
  - “Nuclear apartheid”: the P-5 NWs vs. the rest
- Weak IAEA safeguards and inspections
  - lack of budget and P-5 obstruction
  - introduction of voluntary Additional Protocol (intrusive inspections) after Iraq NW attempt
- “inalienable right” to peaceful nuclear power permits NNWS to go right to the edge of proliferation within the treaty. Solution:
  - limit NNWS access to uranium enrichment and spent fuel reprocessing (to extract plutonium)
  - establish multilateral nuclear fuel banks with guaranteed access for NPT-compliant NNWS
- P-5 NWs non-compliant through failure to disarm
- NWS commitment to deterrence undermines disarmament
  - legitimates nuclear weapons possession, encourages imitation, and abolition with distract from abolition potential via arms control.

Three pillars of the NPT

- Non-proliferation:
  - no transfer of NW from NWS,
  - no manufacture or acquisition of NW by NNWS
  - NNWS abide by IAEA safeguards on nuclear technology
- Disarmament:
  - “Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament.”
- Peaceful uses of nuclear energy:
  - “inalienable right” to use nuclear energy for peaceful purposes, “in conformity with” non-proliferation requirements

Disarmament and its discontents:

Fundamental issue of ethics and justice remain unaddressed

- The threat from NW use challenges the right to survival and human security for the world’s population
  - indiscriminate suffering
  - ecological catastrophe (nuclear winter plus climate change)
- The threat of nuclear use through deterrence is an act of terror and a crime in itself
- The exclusion of all populations even in stable democratic states from full knowledge of planned use by their governments, and consequent inability to make informed judgments about genuine security.
- Arms control and deterrence doctrines
  - legitimate nuclear possession,
  - render nuclear next use inevitable, and
  - distract from the task - and hope - of nuclear abolition.
- Alternative: humanitarian effects of nuclear weapons
  - The process of forming a an alternative norm on nuclear weapons
  - Non-nuclear weapons countries outflanking the nuclear weapons countries
There is no adequate international capacity to respond to a nuclear disaster

“The evident lack of an international capacity to help such victims underscores the inescapable fact that to prevent the use of nuclear, radiological, biological and chemical weapons is an absolute imperative.”

Loye, Coupland. Int Rev Red Cross 2007;89(868):329

Red Cross: ICRC 2013

• "the ICRC has over the past 6 years made an in-depth assessment of its own capacity, and that of other agencies, … We have concluded that an effective means of assisting a substantial portion of survivors of a nuclear detonation, while adequately protecting those delivering assistance, is not currently available at national level and not feasible at international level. It is highly unlikely that the immense investment required to develop such a capacity will ever be made. If made, it would likely remain insufficient."

– Peter Maurer, ICRC President, Oslo 4 March 2013

“Political Science”, Randy Newman (1972)

No one likes us – I don’t know why
We may not be perfect, but heaven knows we try
But all around, even our old friends put us down
Let’s drop the big one and see what happens

We give them money—but are they grateful?
No, they’re spiteful and they’re hateful
They don’t respect us—so let’s surprise them
We’ll drop the big one and pulverize them

Asia’s crowded and Europe’s too old
Africa is far too hot
And Canada’s too cold
And South America stole our name
Let’s drop the big one
There’ll be no one left to blame us

http://www.youtube.com/watch?v=Vx-7THEZ6ak

http://www.youtube.com/watch?v=thE/Z6ak