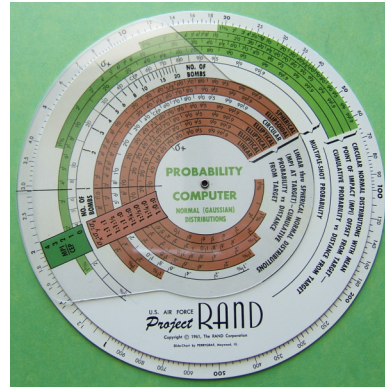


## Ethical issues and debates: arms control and disarmament

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<http://nautilus.org/network/associates/richard-tanter/talks/>



Source: "RAND bombing probability computer",  
Calculating, 10 July 2013, at  
<http://calculating.wordpress.com/2013/07/10/rand-bombing-probability-computer/>

## Effects of nuclear weapons

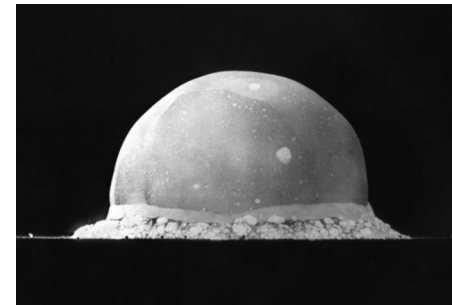
- **Blast**
  - direct
  - Indirect
- **Heat/light**
  - Burns, blindness
  - fires
- **Radiation**
  - Initial
    - Direct
    - Induction of radioactivity
  - Fallout
    - Local (mostly external)
    - Intermediate (mostly external)
    - Global (mostly internal)
- **Electromagnetic pulse**
- **Environmental effects**
  - Biota
  - Climate
- Complex synergistic effects
- 1 Mt airburst
  - blast lethal area 150 km<sup>2</sup>
  - Fire conflagration lethal area 350 km<sup>2</sup>
- Radiation LD50 normally 4.5 - 6 Gy; Hiroshima 2.5 Gy
- Persistent high mortality years later

## 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.



Source: Wikipedia, Trinity (nuclear test)  
[http://upload.wikimedia.org/wikipedia/commons/7/78/Trinity\\_Test\\_Fireball\\_16ms.jpg](http://upload.wikimedia.org/wikipedia/commons/7/78/Trinity_Test_Fireball_16ms.jpg)

## Hiroshima, 6 August 1945



Source: US Navy Public Affairs, shortly after 6 August 1945, at [http://en.wikipedia.org/wiki/File:Hiroshima\\_aftermath.jpg](http://en.wikipedia.org/wiki/File:Hiroshima_aftermath.jpg)

## 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)

Source: Hiroshima Peace Dome,  
Wikipedia  
[http://en.wikipedia.org/wiki/File:Hiroshima\\_Dome\\_1945.gif](http://en.wikipedia.org/wiki/File:Hiroshima_Dome_1945.gif)



## 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 push 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/menu/library/media-gallery/image/tredici/100.htm>

## 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 the finder for the second time, the object was blurred by tears."

## 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

	Hiroshima	Nagasaki
Population	320,000	260,000
Dead	78,000	35,000
Wounded	37,000	30,000
Total	115,000	65,000

- 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.
- Source: Paul Ham, *Hiroshima Nagasaki*, Harper Collins, Sydney, 2011, p. 408

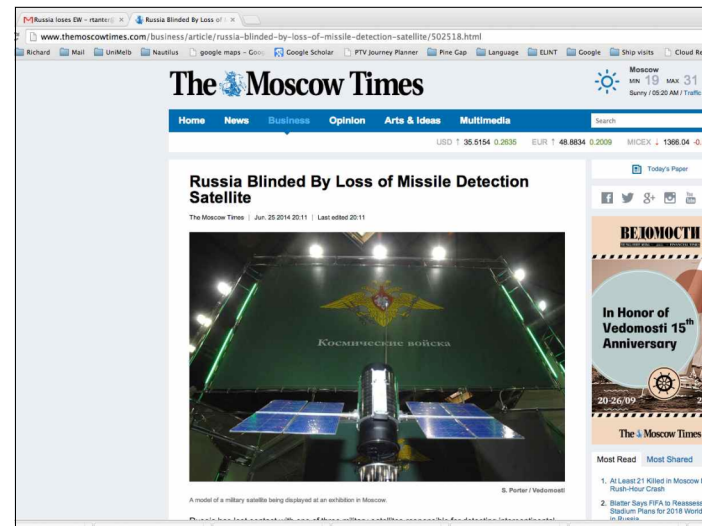
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The deterrence framework for nuclear weapon use

- 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

“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?”



## Russian early-warning satellites

Name	NORAD number	Orbit	Launch date	Position of GEO satellite (main functioning position)	Stopped functioning
Cosmos-2422	29260	HEO	<a href="#">21 Jul 2006</a>		"After Aug. 2009"
Cosmos-2430	32268	HEO	<a href="#">23 October 2007</a>		
Cosmos-2446	33447	HEO	<a href="#">2 December 2008</a>		
Cosmos-2379	26892	GEO	24 Aug 2001	24 W; later drifted to 12 E	"After Aug. 2009"
Cosmos-2440		GEO	<a href="#">27 Jun 2008</a>	80 E	February 2010
Cosmos-2479	38101		March 2012	90 E >> 80 E; drifted to 166°E.	April 2014

## 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  
<http://nautilus.org/projects/more-projects/a-j-disarm/public-forum/speeches-transcripts-and-audio/why-are-nuclear-weapons-so-persistent/>

Nuclear weapons today



Source: Piers Benatar, 2001

## 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

Country	Deployed warheads	Other warheads	Total
USA	2 150	6 350	8 500
Russia	2 427	8 570	11 000
UK	160	65	225
France	290	10	300
China	..	200	240
India	..	80–100	80–100
Pakistan	..	90–110	90–110
Israel	..	80	80
<b>Total</b>	<b>5 027</b>	<b>15 500</b>	<b>20 530</b>

All estimates are approximate and are as of January 2011.

Source: SIPRI Yearbook, 2012, Table 7.1

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

Weapon system	2011		2018	
	Delivery vehicles	Warheads	Delivery vehicles	Warheads
<i>Land-based ballistic missiles</i>				
Minuteman III	450	500	400	400
W78/Mk12A		250		150
W87/Mk21		250		250
<i>Sea-based ballistic missiles</i>				
Trident II D5	288	1,152	240	1,090
W76-0/Mk4, W76-1/Mk4A		768		706
W88/Mk5		384		384
<i>Heavy bombers<sup>a</sup></i>				
B-2	16	100	16	100
B-52 H	44	216	44	200
<b>Total</b>	<b>798</b>	<b>1,968<sup>b</sup></b>	<b>700</b>	<b>1,790<sup>c</sup></b>

<sup>a</sup> There are 113 B-2 and B-52 H bombers, of which 18 and 76, respectively, are nuclear-capable, but only 60 are thought to be nuclear tasked. Some of the B-1 bombers are also considered nuclear-capable under New START although the aircraft were removed from the nuclear mission in 1997. The reduction in ICBMs assumes the upload capability and flexibility of the bomber force will be prioritized. There are "considerably less" than 500 bomber weapons present at heavy bomber bases today, but since New START does not count actual bomber weapons, there is no requirement or incentive to further reduce or limit bomber weapons at the bases.

<sup>b</sup> In addition to these deployed strategic warheads, the stockpile includes another 2,850 strategic and tactical warheads. Plans for the stockpile by 2018 are not known but will likely decline further.

<sup>c</sup> Under New START, the 1,790 weapons would count only as 1,550 due to the attribution of only one weapon per aircraft. Even with a maximum load-out of 1,136 weapons on the 60 aircraft for a total force level of 2,626 weapons, the total warhead count under New START would still only be 1,550.

Source: Hans Kristensen and Robert S. Norris, "US nuclear forces 2011", Bulletin of the Atomic Scientists, 2011 67 (2), Table 1

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## The current U.S. nuclear strike triad:

2010 Nuclear Posture Review



- **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)

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## 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
- Robert S. Norris, Hans M. Kristensen and Joshua Handler, "The B61 Family of Bombs", *Bulletin of the Atomic Scientists*, 2003 59.
- B61, GlobalSecurity.org <http://www.globalsecurity.org/wmd/systems/b61.htm>
- Under New START each heavy bomber is counted as one warhead (although the maximum loading is 16-20).
- [See New START at a Glance, Arms Control Association, <http://www.armscontrol.org/factsheets/NewSTART>]

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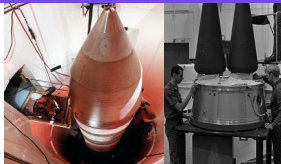
## B-2 long range bombers, Air Force Global Strike Command



- B-2 nuclear deployment at [Whiteman AFB, Missouri](#)
- Non-nuclear deployment also at Andersen AFB, Guam; UK; and Diego Garcia

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## LGM-30 Minuteman III ICBM and W78 thermonuclear warhead



Operational USAF units (150 missiles each):

- 90th Missile Wing
- 91st Missile Wing
- 341st Missile Wing

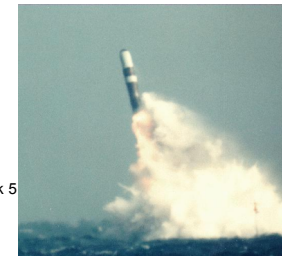
Source: LGM-30 Minuteman, Wikipedia [http://en.wikipedia.org/wiki/File:LGM-30G\\_Minuteman\\_III\\_MIRV.jpg](http://en.wikipedia.org/wiki/File:LGM-30G_Minuteman_III_MIRV.jpg)  
[http://en.wikipedia.org/wiki/File:Minuteman\\_III\\_in\\_silo\\_1989.jpg](http://en.wikipedia.org/wiki/File:Minuteman_III_in_silo_1989.jpg)



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## 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" <http://www.globalsecurity.org/wmd/systems/d-5-spec3.htm>

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## Arms control agreements in place or being pursued

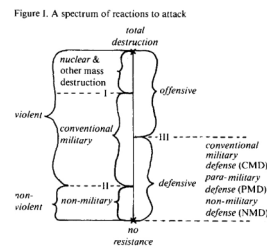
- small arms [almost nothing]
- conventional (non-nuclear) explosive devices [almost nothing]
- landmines
- cluster munitions
- chemical weapons
- biological weapons
- conventional (non-nuclear) explosive devices [almost nothing]
- nuclear weapons
  - strategic/long-range
  - tactical/short-range [almost nothing]
  - delivery systems
  - missile defence systems [US withdrew from 1972 US-SU Anti-Ballistic Missile Treaty in 2002]

## 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



Source: Johan Galtung, "Transarmament: from Offensive to Defensive Defense", Journal of Peace Research 1984 21: 127

## 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”?

## 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

## Flaws and failings in the NPT regime

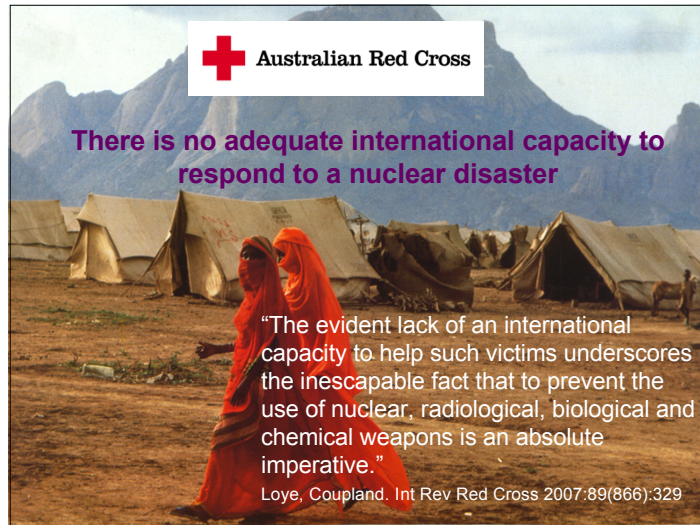
- NPT has not prevented proliferation by non-members
- Inherently flawed regime structure:
  - Legally unclear, inconsistent and politicised ad hoc enforcement processes via the IAEA and UNSC
  - “Nuclear apartheid”: the P-5 NWS vs. the rest
- Weak IAEA safeguards and inspections
  - lack of budget and 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
  - legitimizes nuclear weapons possession, encourages imitation, and abolition with distract from abolition potential via arms control.

## 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**





**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=Wx-7THEZ6xk>

“Political Science”, Randy Newman (1972) / 2

We'll save Australia  
 Don't wanna hurt no kangaroo  
 We'll build an All American amusement park there  
 They got surfin', too

Boom goes London and boom Paree  
 More room for you and more room for me  
 And every city the whole world round  
 Will just be another American town  
 Oh, how peaceful it will be  
 We'll set everybody free  
 You'll wear a Japanese kimono  
 And there'll be Italian shoes for me

They all hate us anyhow  
 So let's drop the big one now  
 Let's drop the big one now

<http://www.youtube.com/watch?v=Wx-7THEZ6xk>