

# SURVEY OF WEAPONS DEVELOPMENT AND TECHNOLOGY

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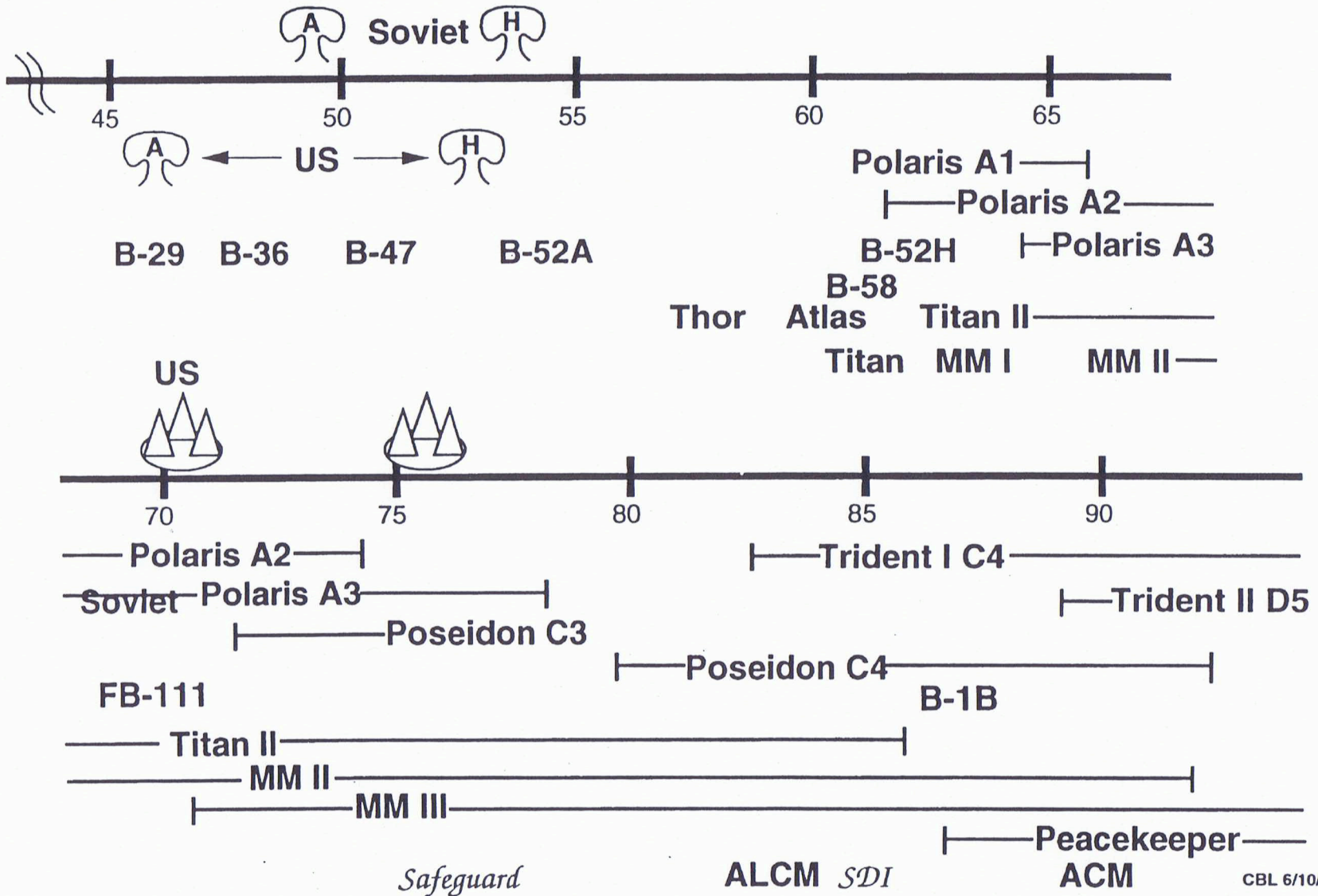
SESSION XV

•ARMS CONTROL ISSUES

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# Strategic Delivery Systems



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# The Evolution of Response Time

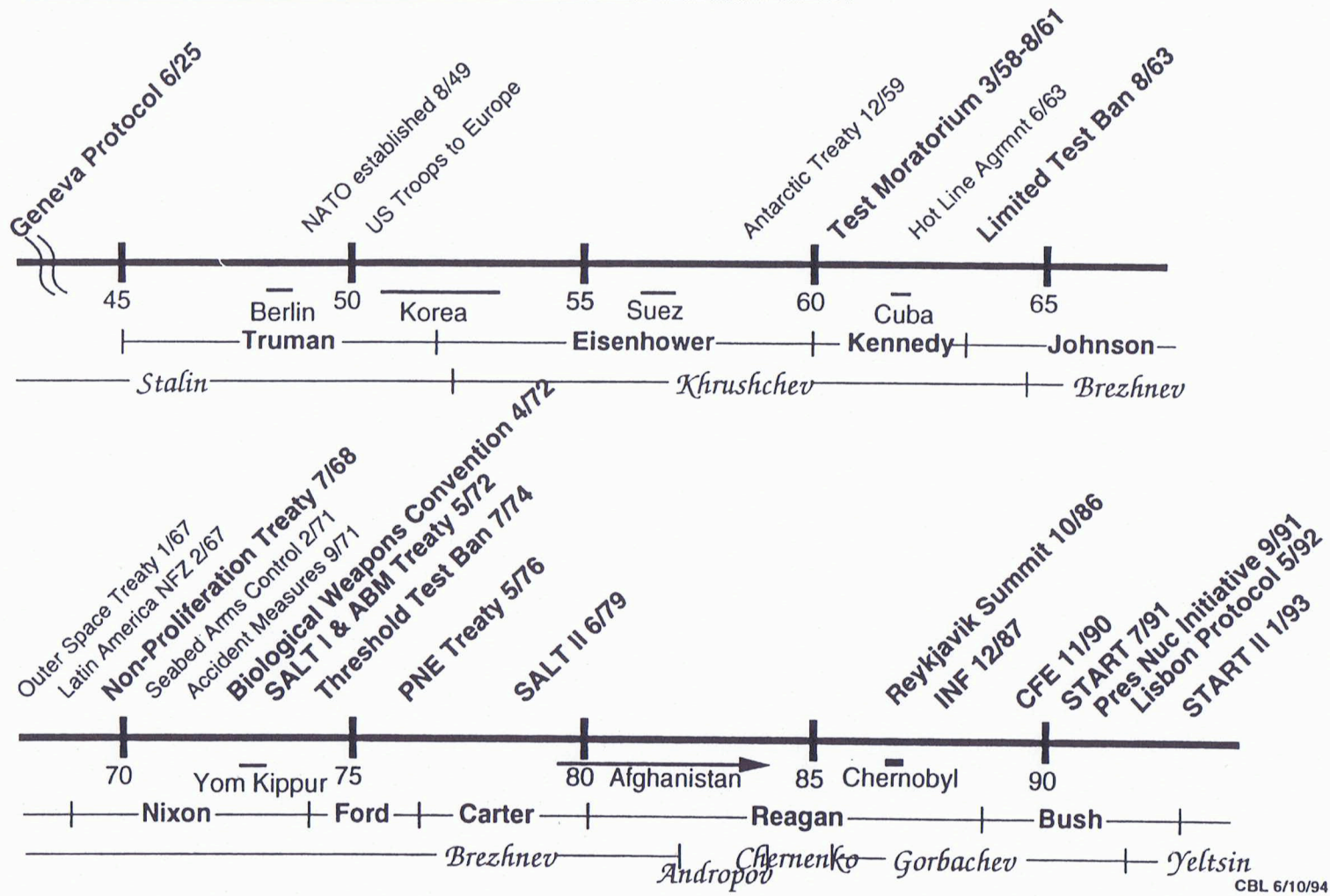
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1948	Berlin blockade	2 days to assemble
1957	Suez	few hours to launch
1959	DEFCON established	
1960	JSTPS & SIOP	1/3 of bombers ready for immediate take-off
1962	Cuban missile crisis	1/8 on airborne alert

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# Arms Control Treaties



CBL 6/10/94

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# **The Geneva Protocol - 1925**

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**Banned the use in war of asphyxiating, poisonous, or other gases and of bacteriological methods of warfare**

**US ratified in 1975**

**All major states now parties**

**UN Conference on Disarmament is working toward a ban on production and stockpiling**

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## **Test Moratorium - 1958 to 1961**

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**In March 1958, Soviets declared moratorium**

**In October, negotiations on CTBT began &  
Eisenhower announced 1-yr U. S. moratorium**

**May 1960 U-2 incident scrubbed planned summit**

**Kennedy Administration resumed talks**

**August 1961, citing French test, Soviets resumed  
testing**

**Soviets conducted over 50 tests in the last 3 months of  
1961**

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# **The Limited Test Ban Treaty - 1963**

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**Limited nuclear tests to underground**

**Original signatories were US, Soviet Union, and UK**

**US ratified 10/63**

**More than 100 parties now**

**France ceased above ground tests in 1974,  
China in 1980**

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# The Nonproliferation Treaty - 1968

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- Eisenhower proposed "Atoms for Peace" in 1953
- IAEA established in 1957 to promote and monitor
- Nuclear Nonproliferation Treaty was negotiated from 1965 and signed in 1968
- NPT Review Conferences every 5 years
- After 25 years (April 1995) the Review and Extension Conference (Chaired by Amb. Dhanapala) decided on indefinite extension - without a vote
- In exchange for peaceful use of atomic energy, signatories agree to safeguards

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## States not party to the NPT (as of 1/23/97)

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- Brazil
- Cuba
- India
- Israel
- Macedonia
- Pakistan
- Serbia/Montenegro

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# Biological and Toxin Weapons Convention

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Outlaws development, production, stockpiling of all biological or toxin weapons and requires destruction of existing stocks

No specific verification provisions

Signed in 1972 and ratified by the US in 1975

Nixon ended US program in 1969 and destroyed stocks

Soviet incident at Sverdlovsk in 1979

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# **SALT I - 1972**

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**Interim Agreement on Strategic Offensive Arms**

**Limited launchers (silos and sub tubes) to the then current number**

**US - 1710**

**SU - 2347**

**Limit on heavy launchers (SS-9 and later SS-18)**

**Five year duration**

**US ratified in Oct 1972**

**Reagan repudiated SALT I and II in May 1986**

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## Joint Statement on the ABM Treaty - March 21, 1997

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- Preserve the ABM Treaty, prevent circumvention, and enhance viability
- TBM systems may be deployed, but must not threaten strategic nuclear forces
- TBM systems will not be deployed against each other (?)
- SCC to complete demarcation between TBM and ABM
  - target missile velocity < 5 km/s, range < 3500 km
  - no space based TBM interceptors based on OPP

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# ABM Treaty - 1972

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Johnson and McNamara tried to convince Kosygin at Glassboro to limit ABM systems - June 1967

US announced Sentinel program in September 1967

ABM talks were postponed by Soviet invasion of Czechoslovakia in 1968

Nixon changed concept to Safeguard, protecting ICBMs and Washington, DC

Treaty prevents defense of territory, limits to 2 sites with 100 interceptors, limits LPARS

Forbids mobile ABMS or sea, air, or space systems

OPP, Krasnoyarsk, SCC, capabilities questions

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# Threshold Test Ban Treaty - 1974

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Signatories are the US, Soviet Union, and UK

Limits nuclear tests to 150kT

Verification by NTM (seismic)

A two page treaty

Joint Verification Experiment in 1988

US ratified in 1989

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# Peaceful Nuclear Explosives Treaty - 1976

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Limited peaceful nuclear explosives to 150kT

Permitted maximum aggregate yield of 1.5 MT,  
with on site monitoring for yields above 150kT

Plugged a loophole in the TTBT

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# SALT II - 1979

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## Limited and reduced SNDVs

All SNDVs	2250	(2504 actual)
MIRVed ICSs, SLs, bombers	1320	
MIRVed ICs, SLs	1200	
MIRVed ICs	820	

One new type, no new heavies, MIRV limits

CM counting rules, FRODs, Backfire statement

Verification by NTM, no encryption

12/79 Afghanistan, withdrawn from ratification

"Fatally flawed," no undercut, then terminated 5/86

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# Conventional Forces in Europe - 1990

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**MBFR talks ended after 15 years in February 1989**

**CFE talks formally opened March 1989, with the 23 members of NATO and the Warsaw Pact**

**Treaty signed November 1990**

**Treaty limits equipment in the Atlantic to the Urals (ATTU) region**

**Limits on tanks, artillery, ACVs, combat aircraft, attack helicopters**

**Wide-ranging and intrusive verification regime**

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# START Treaty - 1991

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Signed July 31, 1991, 5 months before the end of SU

Lisbon Protocol, signed May 1992, committed Russia, Ukraine, Belarus, and Kazakhstan to START (and NPT)

START limits SNDVs and deployed warheads:

	START	US forces*	Soviet forces*
SNDVs	1600	2246	2500
ICBM & SLBM Warheads	4900	8210	9416
Total Warheads	6000	10563	10271
Heavy ICBM Warheads	1540	-----	3080
Mobile ICBM Warheads	1100	-----	618
Throw-wt ICs & SLs	3600	2631	6626
(metric tons)			

\*as of 9/90

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## Nuclear Posture Review - 9/94

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- **Strategic Forces**
  - No more than 20 B-2 bombers
  - Reduce B-52 force from 94 to 66
  - Reduce Trident fleet from 18 to 14
  - Maintain single RV MM III
- **Non-Strategic Nuclear Forces**
  - Maintain European NSNF at current level  
( $<10\%$  of Cold War levels)
  - Eliminate nuclear weapons capability from surface Navy
  - Retain cruise missile capability on subs
  - Retain land-based DCA

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## Comprehensive Test Ban Treaty - 200?

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- **Adopted by the UNGA 9/10/96**
  - **CD could not reach consensus (India)**
- **EIF requires 44 states with reactors**
  - **includes India, Iran, Egypt, Israel, North Korea, Pakistan**
- **Activities not prohibited - finessed**
  - **US “true zero” yield**
- **Zero not verifiable, less than 1kT too expensive**
- **International Monitoring System**
  - **Seismic, Radionuclide, Hydroacoustic, Infrasound**
  - **OSI requires 30 of 51 Executive Council votes**

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## START III - 200?

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- Clinton and Yeltsin at Helsinki Summit, March 21, 1997
  - Immediate START III negotiations upon START II EIF
  - 2,000 - 2,500 strategic warheads by end of 2007
  - Transparency of strategic warhead inventories
  - Measures to promote irreversibility of warhead reductions
  - Deactivation of SNDVs under START II by end of 2003
  - Elimination deadline for SNDVs extended to end of 2007

*Joint Statement on Parameters on  
Future Reductions in Nuclear Forces*

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# The President's Nuclear Initiative-1991

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## Sept 1991

Eliminate ground launched tactical nuclear weapons

Lance and AFAPs

Withdraw tactical nuclear weapons from surface ships, subs and P-3 bases

B-57, SLCM, B-61

Stand down strategic bombers from alert

Stand down MMII

Cancel mobility for PK and SICBM

Cancel SRAM II

Propose joint elimination of MIRVed ICBMs

## Jan 1992

Build only 20 B-2s

Cancel SICBM

Halt production of ACM

Halt production of W88 for Trident II

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# START II - 1993

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Treaty between the Russian Federation and US, signed by Bush and Yeltsin January 3, 1993, codified agreements of the Washington summit of June 17, 1992.

START II builds on START - and requires START

	<u>START</u>	<u>START II Ph1</u>	<u>START II Ph Ph2</u>
Start Warheads	6000	3800-4250	3000-3500
ICBM & SLBM Warheads	4900	no sublimit	no sublimit
MIRVed ICBM Warheads	N/A	1200	0
SLBM Warheads	N/A	2160	1700-1750
Heavy ICBM Warheads	1540	650	0
Mobile ICBM Warheads	1100	1100	1100

Phase one to be complete 7 years after entry-into-force,  
Phase two by 2003

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# Comprehensive Test Ban

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- Negotiations ongoing at the UN CD
- China testing through '96
- France resumed (8 tests) 9/95 - 5/96
- Activities not prohibited
  - US - "true zero"      UK - soon, US codes
  - France - OK                      Russia - eventually
  - China - waffling, still wants PNEs
- Zero not verifiable, less than 1kT too expensive
- International Monitoring System
  - Seismic - 50 stations, 50 - 150 auxiliaries
  - Radionuclide - Ba140, 75 - 100 stations, US wants Xe
  - Hydroacoustic
  - Infrasound - 50 - 60 stations
- Implementing agency - IAEA or ?

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## Books of interest

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**The Making of the Atomic Bomb**, Richard Rhodes, 1986.

Pulitzer prize winner, follows the scientific discoveries that led to the bomb, particularly good at the personalities involved, finishes with vivid descriptions of Hiroshima and Nagasaki. Excellent and entertaining.

**At the Highest Levels**, Michael R. Beschloss and Strobe Talbott, 1993.

Intimate details of the end of the Cold War, as seen at the top.

**Lenin's Tomb**, David Remnick, 1993.

Details the end of the Soviet Union from the viewpoint of the Russian people and their legacy. Choppy, but a very human picture of the great event.

**The Wizards of Armageddon**, Fred Kaplan, 1983.

Follows the policy and strategy decision regarding nuclear weapons, much emphasis on the early RAND personalities. Very good and readable.

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Nonproliferation Initiative

# Nonproliferation

A New Challenge to the US Nuclear Weapon Program

SESSIONS XVI

John Taylor

National Security Policy Research Department

Sandia National Laboratories

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## Some Definitions

Proliferation is the spread of weapons of mass destruction (WMD)-- typically nuclear, biological, and chemical weapons--and the systems which deliver them.

Nonproliferation is the use of the full range of political, economic and military tools to prevent proliferation, reverse it diplomatically, or protect our interest against an opponent armed with WMD or missiles.

Counterproliferation measures are the activities of the DoD across the full range of U.S. efforts to combat proliferation.

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# The Changing Context

Old

New

**Bipolar Rigidity**  
**Predictable**  
**Communism**  
**U.S. Dominant Western Power**  
**Fixed Alliances**  
**"Good Guys and Bad Guys"**  
**U.N. Paralyzed**

**Multipolar Complexity**  
**Uncertain**  
**Nationalism/Religious Extremists**  
**U.S. Militarily No.1 - Not Economical**  
**Ad Hoc Coalitions**  
**"Grey Guys"**  
**U.N. Viable**

*Ref.: National Security in the 1990s: Defining a New Basis for U.S. Military Forces, Rep. Les Aspin, Chrmn House Armed Services Committee, January 6, 1992*

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**Nonproliferation Initiative**

# The Changing Threat

**Old**

**New**

**Single (Soviet)**  
**Survival at Stake**  
**Known**  
**Deterrable**  
**Strategic Use of Nukes**  
**Overt**  
**Europe-Centered**  
**High Risk of Escalation**

**Diverse**  
**American Interests at Stake**  
**Unknown**  
**Non-Deterrable**  
**Terroristic Use of Nukes**  
**Covert**  
**Regional, Ill-Defined**  
**Little Risk of Escalation**

*Ref.: National Security in the 1990s: Defining a New Basis for U.S. Military Forces, Rep. Les Aspin, Chrmn House Armed Services Committee, January 6, 1992*

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# A Snapshot of the World

- 253 Sovereign nations, dependent areas, etc.
- 189 (+) Countries
- 177 Members in the United Nations
- (171 Members in FIFA!)
  
- 60 conflicts in progress involving more than 130 states or subnational entities

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## All the World's Conflicts - May 1996

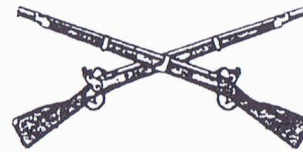
Area	Countries	Intensity	Nature of Conflict
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### Summary and Analysis

#### Intensity by type and percent of total

High	1	(0)	1%	(0%)
Medium	17	(18)	28%	(30%)
Low	42	(40)	71%	(70%)
Totals	60	(58)		

Numbers in () from  
last reporting period (2/96).



#### Number and Percentage by Conflict Type

Territory	15	28%
Ethnic	31	53%
Oil	4	7%
Civil War	30	52%
Religious	9	16%

#### Percent of Total by Region

Europe	12%
Latin America	19%
Africa	31%
Middle/Near East	12%
South Asia	8%
Southeast Asia	7%
Far East	10%

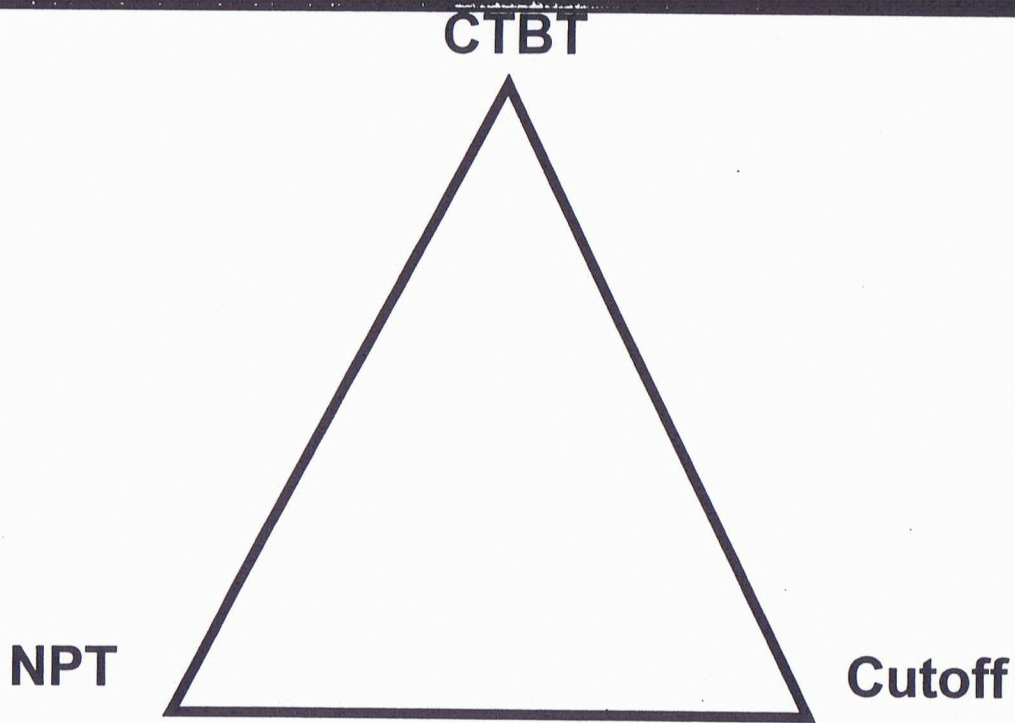


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# Alva Myrdahl's Historical View of Nuclear Weapon Controls



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# What Constitutes a Weapon of Mass Destruction

- Indiscriminate nature of use
- Effect not confined to belligerents
- Excessive injury -- "cruel and unusual"
- Inability to defend against effectively
- Use would overwhelm medical and evacuation resources
- Notion of "terror"

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## Motivation to Acquire Weapons of Mass Destruction

Great Powers have always countered the weapons of other great powers (e.g., USSR in the late 1940s)

Fear that a great power ally will not follow through (e.g., UK, France)

Fear over nuclear capabilities of potential adversaries (e.g., PRC, India, Pakistan, Iran, perhaps US in 1940s)

Fear of adversaries conventional strength (e.g., Israel, perhaps US in 1940s)

Cheaper than conventional defense (e.g., US in 1950s)

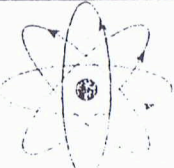

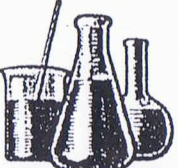

Desire for offensive capability (e.g., US in 1940s?)

Status in world or region (e.g., Iraq)

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## Some Proliferants of Concern

Country				
China				
India				
Iran				
Iraq				
Israel				
Libya				
Pakistan				
North Korea				
Russia				
Belarus, Kaz., Uk.				

	Thought to possess capability
	May possess capability
	Thought not to possess capability

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## **“Cost Effectiveness” of Weapons of Mass Destruction**

**The cost of producing, storing and delivering weapons can be estimated as the amount of money to deliver one lethal dose.**

**For nuclear weapons = \$2000**

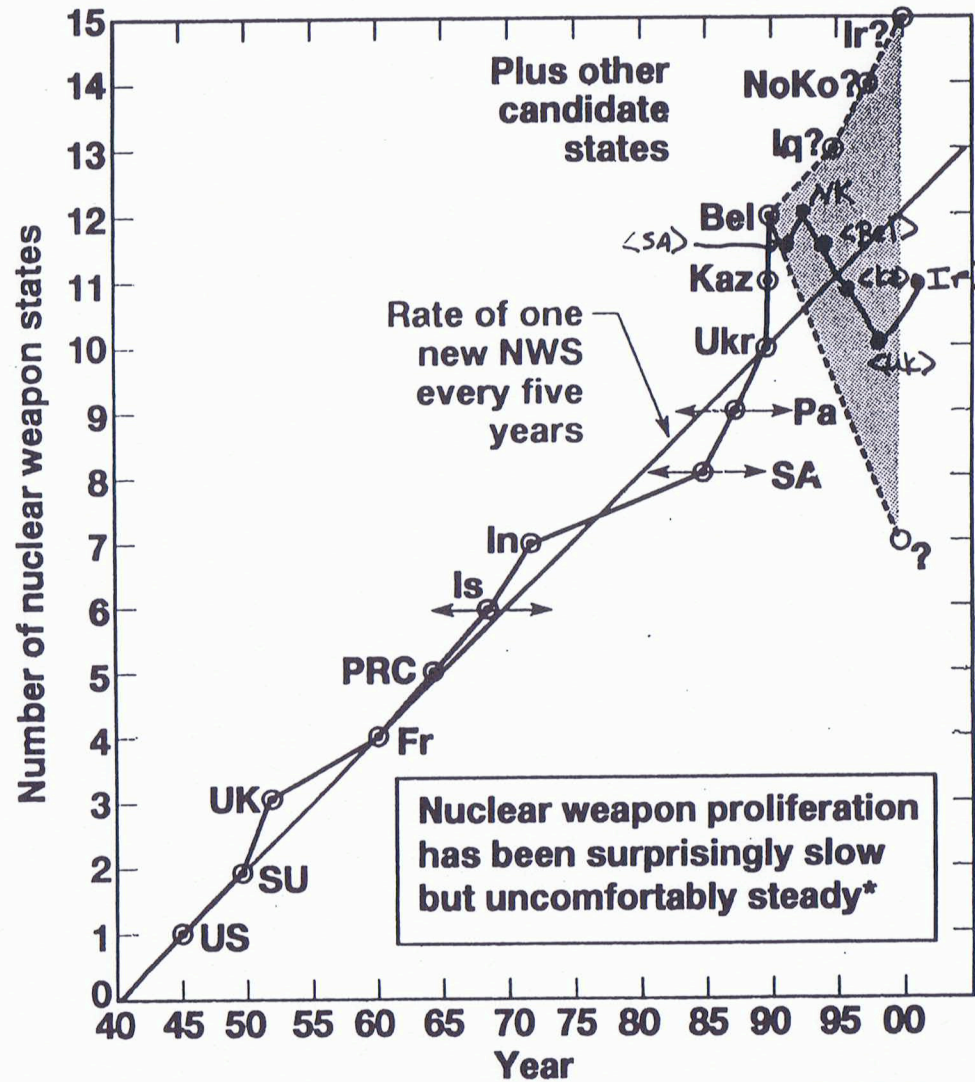
**For chemical weapons = \$100**

**For biological weapons = \$1**

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# How many nuclear weapons states will there be in the year 2000?



\*Data from news and journal articles in 1992

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# Nuclear Proliferation: A Current Status

- **Acknowledged/Declared Nuclear Weapon States**
  - US, UK, China, France, Russia
- **Undeclared but widely suspected Nuclear Weapon States**
  - India, Pakistan, Israel
- **"Inheritors" of Soviet weapons**
  - Ukraine, Kazakhstan, Belarus
- **Virtual Nuclear Weapon States (e.g., weapon capabilities but no weapons)**
  - Japan, Germany
- **Threshold Nuclear Weapon States**
  - North Korea
- **Aspiring Proliferators**
  - Iraq, Iran, Libya, Algeria, various terrorist organizations
- **Rollback cases**
  - Argentina, Brazil, Sweden, Switzerland, Egypt, Taiwan, South Africa(?)

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## There have been some Nonproliferation Successes

- Sweden abandoned its programs in the 1970s.
- South Africa stopped its programs in 1992 ( 6 weapons).
- Argentina and Brazil renounced their programs.
- Taiwan and South Korea abandoned their programs in the 1980s.
- Iraq's program "put on hold" by Desert Storm and UN Resolution 687 and 715.
- Belarus, Kazakhstan, and Ukraine (?) have agreed to return the FSU weapons to Russia.
- NPT indefinitely extended by "pseudo consensus"

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# WMD Technological Capabilities

**Nuclear:**

5 acknowledged possessors, 30 countries with "capability"

**Chemical:**

20-24 possessors, 80-90 countries and some subnational entities with "capability"

**Biological:**

10-12 possessors, virtually every state and several subnational entities are "capable"

**(Conventional weapons:**

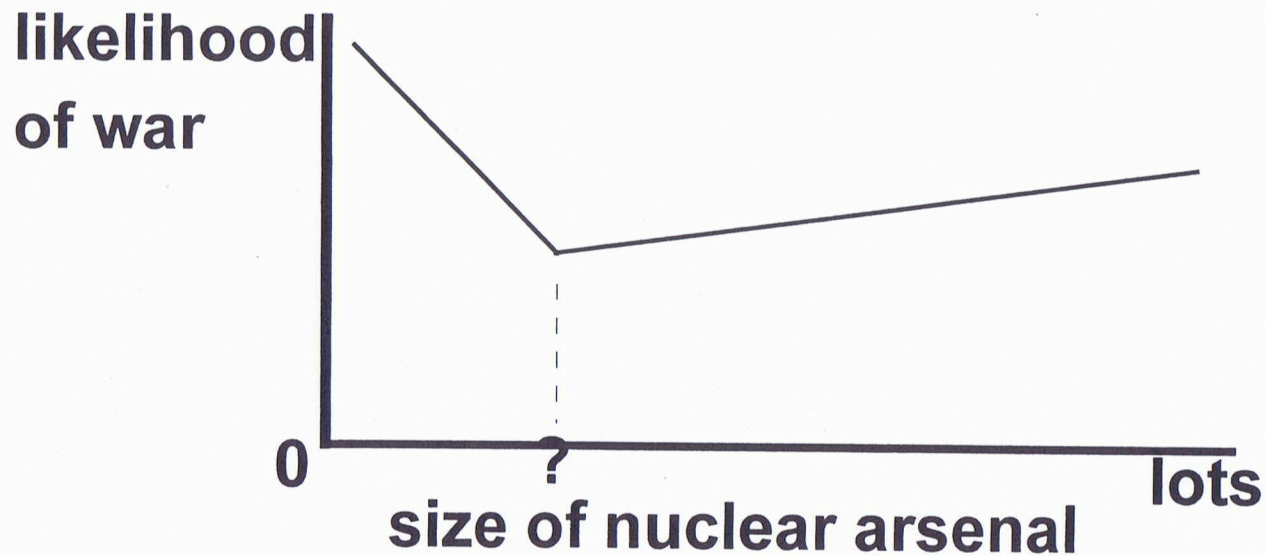
virtually every country possess, 10-40 are major suppliers)

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# Why Not Zero?

Many nations and individuals want us to completely eliminate weapons -- attractive philosophy but dubious policy:



There may be things worse than nuclear weapons (e.g. biologics)

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