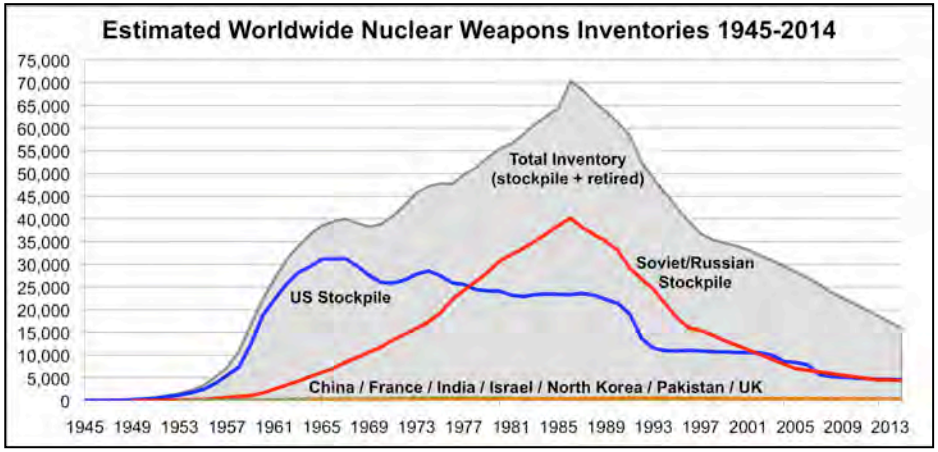
Nuclear Weapons Trends:
Numbers, Owners, Locations, Modernizations

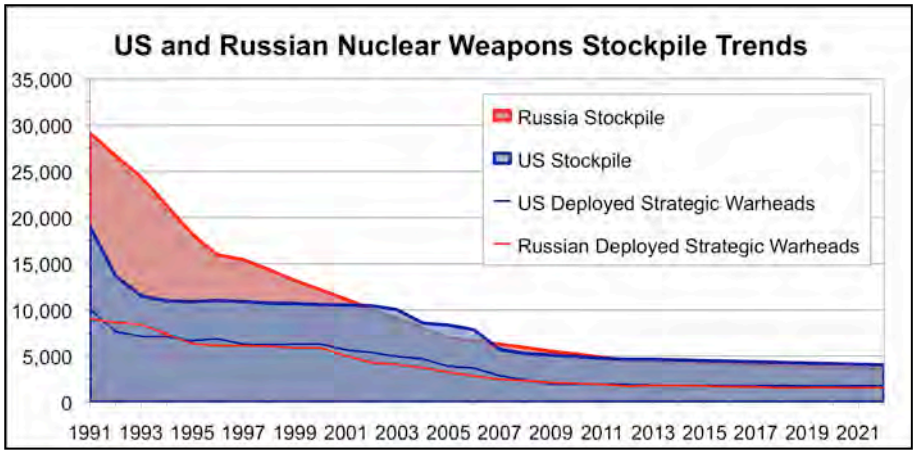
Hans M. Kristensen
Director, Nuclear Information Project
Federation of American Scientists
Phone: 202-454-4695
Email: hkristensen@fas.org

Presentation to
Meeting for National Societies in States Associated with Nuclear Weapon-based Military Policies
on Implementation of Resolution 1 of the 2011 Council of Delegates and its Plan of Action 2013 – 2017
The Netherlands Red Cross / Norwegian Red Cross
The Hague, Netherlands, June 16, 2014

Research and publications with generous support from the Ploughshares Fund and New Land Foundation

How Many - History





More than 125,000 warheads produced since 1945

Peak of 64,500 stockpiled warheads in 1986 (70,300 if including retired warheads)

- US stockpile peaked early (1967)
- Russian stockpile peaked late (1986)

Enormous progress since 1986 peak:

- ~54,000 warhead stockpile reduction
- ~47,000+ warheads dismantled

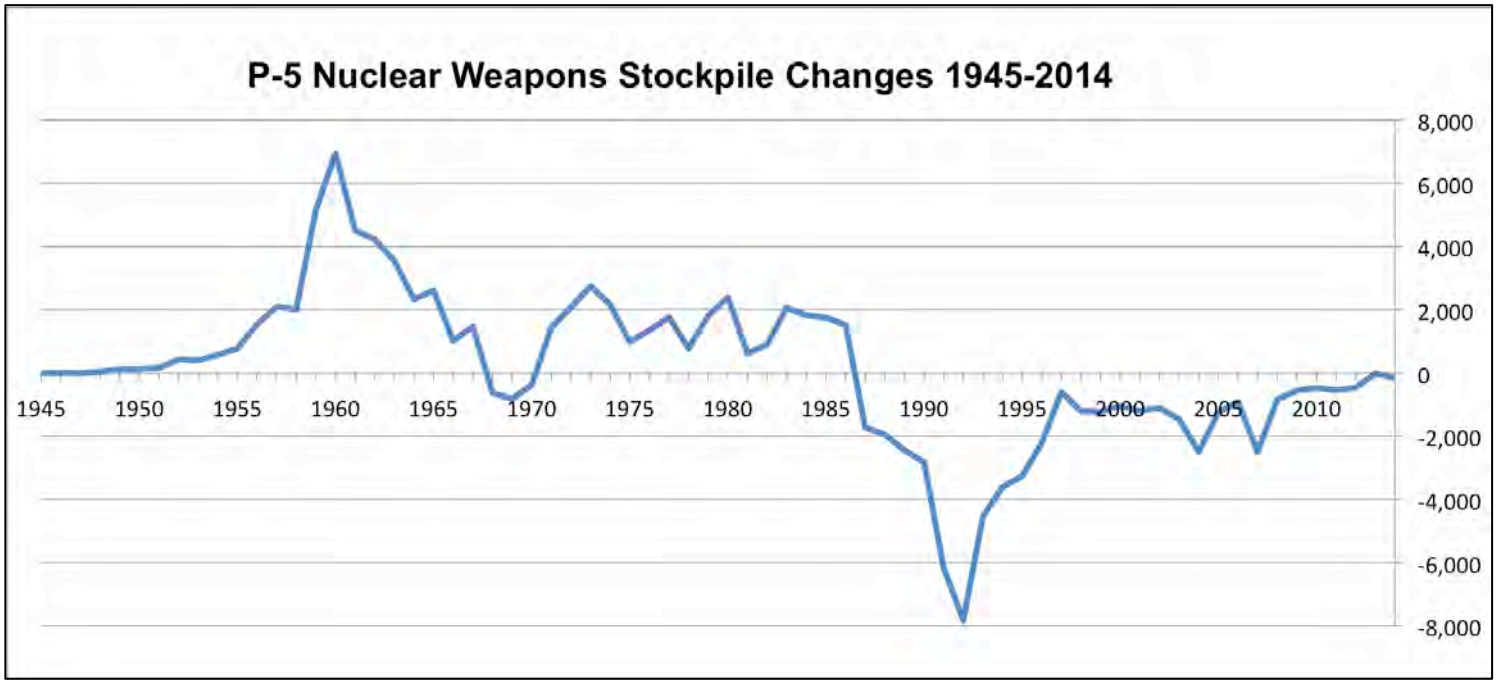
Trend: pace of reduction is slowing

US cut only 309 warheads in 2009-2013, compared with 3,287 warheads cut in 2004-2008

Russia cut an estimated 1,000 warheads in 2009-2013, compared with 2,500 in 2004-2008

Instead of continuing pace or increasing reductions, US and Russian stockpiles appear to be leveling out for the long haul

Changes Over Times



Fluctuation of P-5 nuclear weapons stockpiles (expressed in annual changes in stockpile sizes) shows increase during Cold War, significant reduction in 1986-1996, decreasing reduction since 2008.

How Many - Today

Excessive sizes of US and Russian arsenals indicate that they are more determined by each other than what is needed for national and international security

~10,000 warheads in stockpiles (16,000 if counting retired warheads awaiting dismantlement)

US and Russia possess 90% of global inventory (94% if counting retired warheads); each has more than 4 times more warheads than rest of world combined; 15 times more than third-largest stockpile (France)

Decreasing: US, Russia, Britain, France

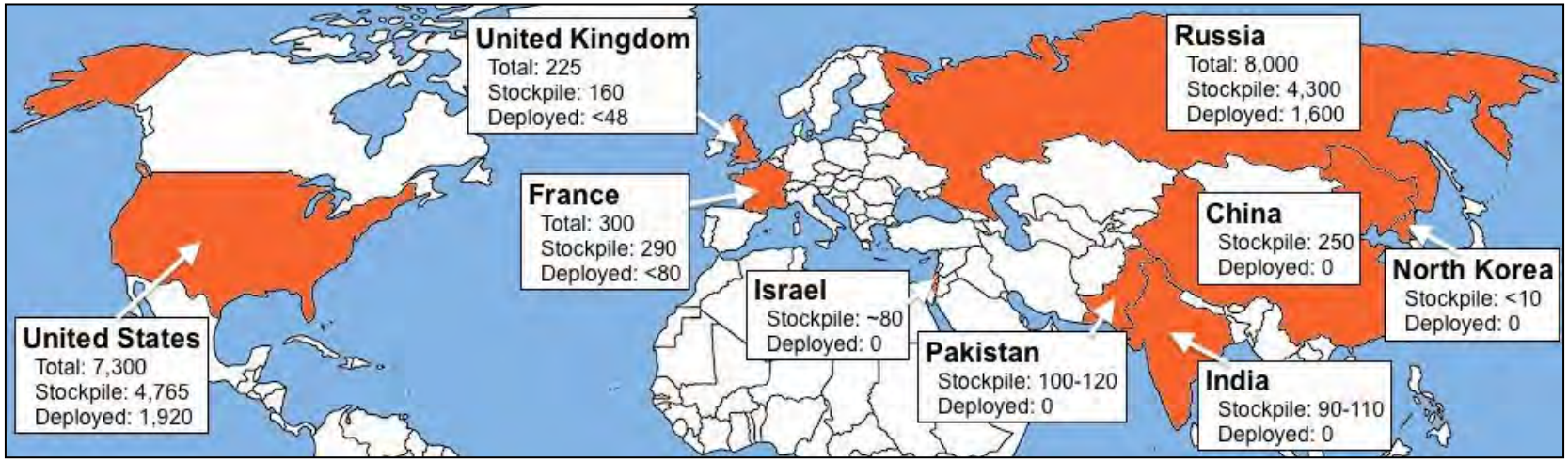
Increasing: China, Pakistan, India

Israel relatively steady; North Korea trying

Despite challenge of non-proliferation, reducing nuclear arsenals is predominantly and overwhelmingly the responsibility of the P5s

FAS

Where Are They?



States with operationally deployed nuclear warheads: France, Russia, United Kingdom, United States

States with Triad: Russia, United States, (China, India, Israel)

States with Dyad: China, France, India, Israel, Pakistan

States with Monad: United Kingdom, (North Korea)

States with surrogate nuclear status: Belgium, Germany, Italy, Netherlands, Turkey

States that have given up nuclear stockpile: Belarus, Kazakhstan, South Africa, Ukraine

Potential threshold states: Iran, (Japan, South Korea, Brazil, Egypt, Saudi Arabia, others?)

Why Modernize Them?

Sustainment: life-extension of existing weapons

- US life-extension of Minuteman ICBM, Ohio SSBN, Trident II SLBM, B-52 bombers, warheads
- Russian life-extension of ICBMs, Delta IV SSBNs, SS-N-23/Sineva SLBM, Tu-22/Tu-95/Tu-160 bombers, Su-24 fighter-bombers

Improvement: improving military capabilities to existing posture

- Russian Borei SSBN, Bulava SLBM, SS-27 ICBMs, Sarmat ICBM, PAK-DA bomber, Kh-102 ALCM, Su-34 fighter-bomber, Iskander SRBM, Yasen SSN, Kalibr SLCM
- Chinese road-mobile DF-31/31A ICBMs, Jin SSBN, JL-2 SLBM
- US SSBNX, LRS-B bomber, LRSO cruise missile, B61-12 bomb, F-35A fighter-bomber,
- French Triomphant SSBN, M51 SLBM, ASMPA cruise missile, Rafale fighter-bomber
- Indian Abdali SRBM, Agni III, Agni IV, Agni V missiles
- Pakistani Shaheen II MRBM
- NATO B61-12 bomb, F-35A fighter-bomber

Expansion: adding new legs to posture

- Indian Arihant SSBN, K-15/K-4 SLBMs
- Pakistani NASR missile and Ra'ad/Babur cruise missiles
- Israeli Dolphin submarine with (possible) cruise missile

Modernizations: United States

ICBM
- Minuteman III life-extension fielding
- GBSD replacement ICBM planning
- W78 warhead life-extension/upgrade planning

SSBN / SLBM
- Ohio SSBN life-extension fielding
- Trident II SLBM life-extension planning
- SSBN(X) planning (12)
- W76-1 warhead life-extension fielding
- W88-1 warhead life-extension planning

Bombers
- B-2 upgrade planning
- B-52 upgrade planning
- LRS-B next-generation bomber planning
- B61 bomb life-extension/upgrade planning
- LRSO (ALCM) replacement planning

Tactical
- F-35 nuclear capability planning
- B61 life-extension/upgrade planning

Infrastructure
- Uranium Processing Facility (secondaries) planning
- Plutonium production facility (primaries) planning
- National Ignition Facility planning

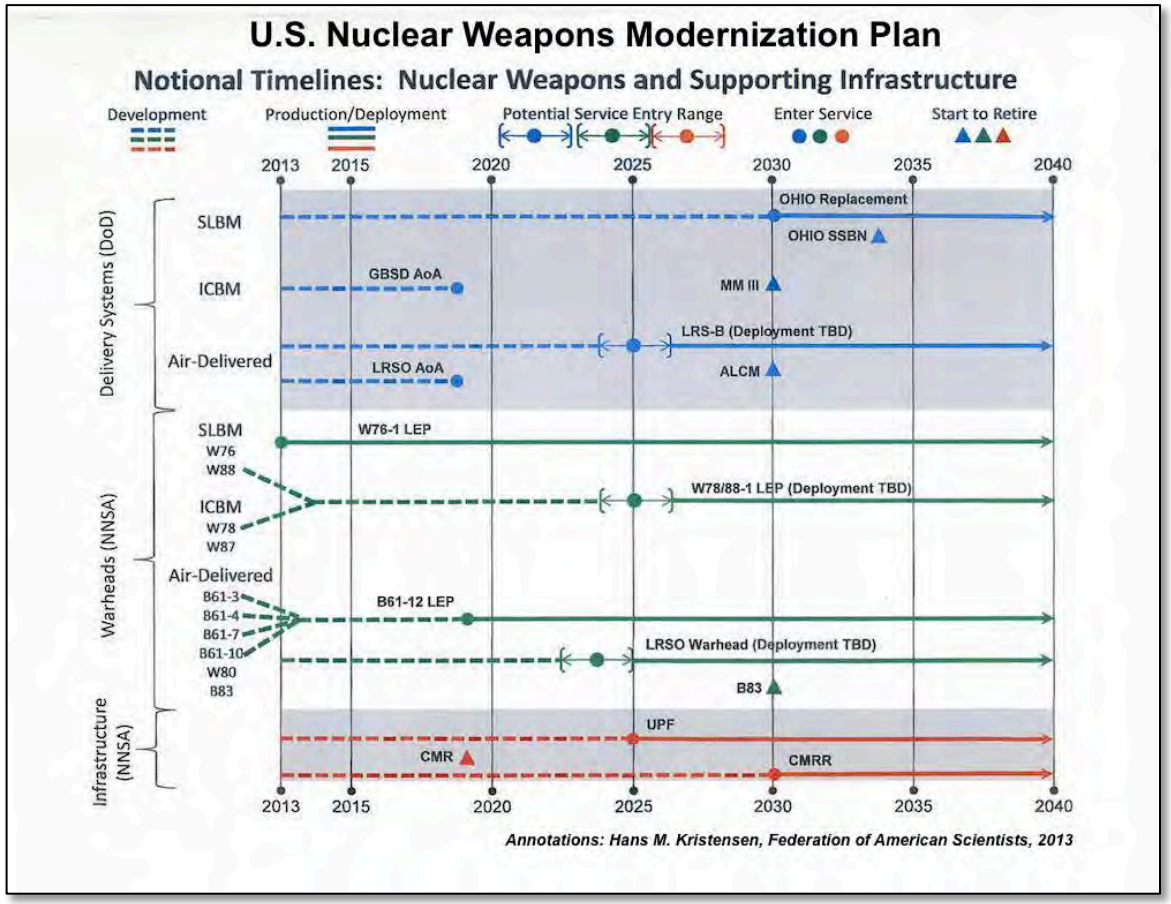
What is the focus of US nuclear policy: arms control or modernization or both?







Modernizations: United States



Next 10 years:

$355 billion for maintaining and modernizing nuclear forces and infrastructure

Comprehensive modernization:

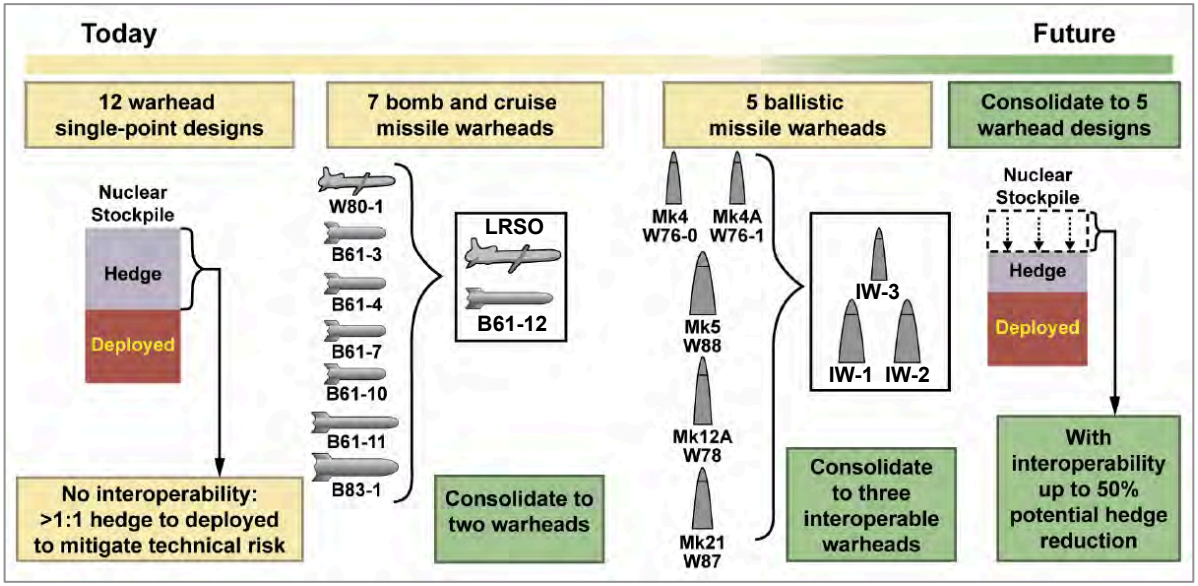
- All three legs of strategic triad
- Tactical dual-capable aircraft
- Warhead production complex

Consolidation and modification of warhead types

Some delays happening; more expected

Extending nuclear deterrent through 2080

Modernizations: United States



3+2 strategy: reduction from 12 warhead versions (8 basic designs) to 5 types:

3 "Interoperable" or "adaptable" warheads on ICBM and SLBM

IW-1 (W78/W88-1), IW-2 (W87/W88-1), IW-3 (W76-1)

2 non-interoperable warheads on bombers and fighters

ALCM (LRSO) with W80-1 or W84

B61-12 guided standoff bomb

Alleged advantages:

- Fewer warhead types permit reduction of hedge
- Modified warheads with increased safety, use control, and performance margin
- Fewer warheads will be cheaper to maintain and deploy

Possible risks:

- Modified warheads further from tested designs; reliability issues?
- Reduced stockpile diversity
- Complex and expensive programs prone to delays and cost overruns
- Modified warheads "new"?
- Costs highly uncertain and estimates probably underrated

Fundamental questions:

- Why is hedging necessary for missile warheads but not bomber weapons?
- Why must US hedge when Britain and France do not?
- Why is "deployed" warheads the same in the future?

Modernizations: NATO

Belgium
- F-16 replacement not yet decided
- B61-12 deployment after 2020

Germany
- Tornado bomber life-extension planning
- B61-12 deployment after 2020

The Netherlands
- F-35 replacement of F-16 planning
- B61-12 deployment after 2020

Italy
- F-35 replacement of Tornado planning
- B61-12 deployment after 2020

Turkey
- F-35 replacement of F-16 planning
- B61-12 deployment after 2020

Increased military capability of B61-12 and F-35A raise questions about role in Europe and arms control policy

How has deployment in Europe helped reassure Eastern European allies after Ukraine?

Modernizations: France

SSBN / SLBM

- M51.1 SLBM (TN75) fielded
- M51.2 SLBM (TNO) deployed from 2015
- M51.3 SLBM planning

Bombers

- Mirage 2000NK3 fielded at Istres Air Base
- Rafale K3 fielded at Saint-Dizier Air Base
- Rafale MK3 fielded on Charles de Gaulle
- ALCM (ASMPA/TNA) fielded

Infrastructure

- Megajoule at CESTA planning
- Airix/Epure hydrodynamic test center at Valduc planning (partly Joint French-UK warhead surveillance testing center)

Modernizations: Britain

SSBN / SLBM

- SSBN (Vanguard replacement) planning (3+)
- SLBM (Trident II D5LE) planning
- Mk4A/W76-1 type warhead fielding

Infrastructure

- Joint UK-French warhead surveillance testing technology center planning

Modernizations: Russia

ICBM

- SS-27 Mod 1 (silo) completed (Tatishchevo: 60) fielded
- SS-27 Mod 1 (mobile) completed (Teykovo: 18) fielded
- SS-27 Mod 2 (mobile: Teykovo (18); Novosibirsk; Irkutsk; Tagil) planning
- SS-27 Mod 2 (silo: Kozelsk) planning
- New ICBMs (Sarmat “heavy”; modified SS-27 (RS-26)) planning

SSBN / SLBM

- Delta IV SSBN fielded
- SS-N-23 SLBM life-extension (Sineva/Layner) fielding
- Borei SSBN fielding (8)
- SS-N-32 (Bulava) fielding

Bombers

- Tu-160 (Blackjack) upgrade planning
- Tu-95 (Bear) upgrade planning
- New bomber (PAK PA) planning
- ALCM (Kh-102) fielding?

Tactical

- Tu-22M (Backfire) life-extension
- Su-34 (Fullback) fielding
- Yasen (Sverodvinsk) SSGN planning
- SLCM (SS-N-30, Kaliber) planning
- SSM (SS-26, Iskander) fielding
- SAM (S-400/SA-21) fielding (nuclear ?)
- ABM (A-135) planning


Russian ICBM Developments, 2014-2024
(Note: All SS-18, SS-19, SS-25 will be retired)
Road-mobile versions
Silo-based versions
Future deployment
X ICBM base expected to close
Hans M. Kristensen, Federation of American Scientists, 2014
X Vypolzovo
SS-25 (Topol)
Teykovo
SS-27 Mod 1 (Topol-M)
SS-27 Mod 2 (RS-24)
Kozelsk
SS-19 (RS-18)
SS-27 Mod 2 (RS-24)
X Yoshkar-Ola
SS-25 (Topol)
Tatishchevo
SS-19 (RS-18)
SS-27 Mod 1 (Topol-M)
Tagil
SS-25 (Topol)
SS-27 Mod 2 (RS-24)
Dombarovsky
SS-18 (RS-20V)
SS-27 Mod 2 (RS-24)
or Sarmat "heavy"
Novosibirsk
SS-25 (Topol)
SS-27 Mod 2 (RS-24)
? Uzhur
SS-18 (RS-20V) (Sarmat "heavy" ICBM)?
X Barnaul
SS-25 (Topol)
Irkutsk
SS-25 (Topol)
SS-27 Mod 2 (RS-24)

Modernizations: Russia

Novosibirsk: Replacement of SS-25 with SS-27 Mod 2 (RS-24). 2008 image (left) shows old garrison layout with SS-25 TEL garages. 2013 image (right) shows TEL garages removed, upgrade of service buildings, and expansion of fence perimeter. Third of 7 missile divisions to receive SS-27 by mid-2020s.

Modernizations: China

ICBM / MRBM

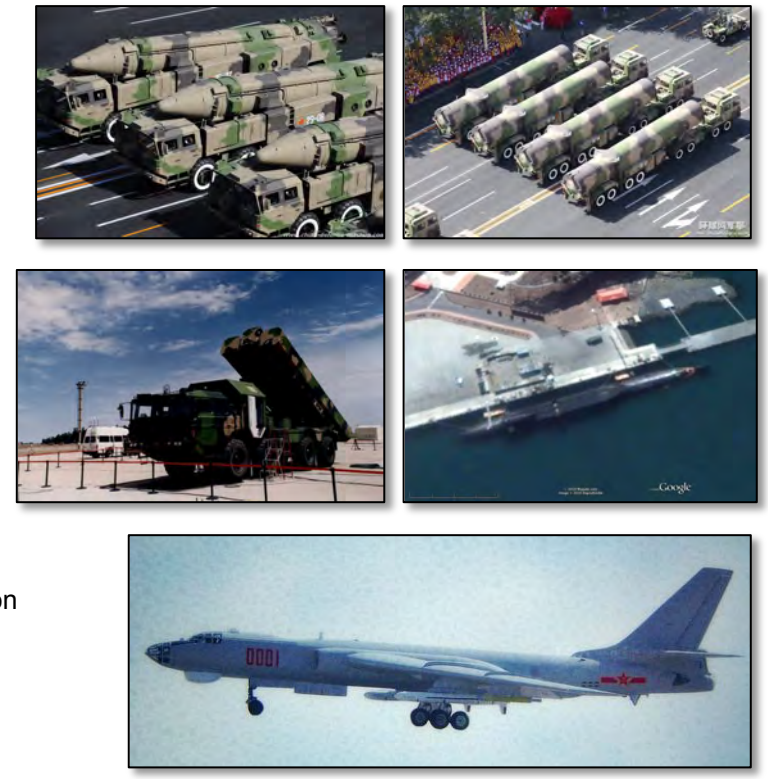
- DF-31 (CSS-10 Mod 1) mobile ICBM
- DF-31A (CSS-10 Mod 2) mobile ICBM fielding
- DF-21 (CSS-5 Mod 1/2) mobile MRBM fielding
- DF-41 mobile ICBM planning (MIRV)?

SSBN / SLBM

- Jin (Type-094) SSBN fielding (3+)
- Type-096 SSBN planning
- JL-2 (CSS-N-14) SLBM fielding

Cruise Missiles:

- ALCM (CJ-20 on H-6 bomber) planning*
- GLCM (DH-10/CJ-10) fielding**



* Listed in 2013 AFGSC briefing but not in 2013 NASIC report.
** Listed by NASIC as "conventional or nuclear," the same designation as the Russian nuclear-capable AS-4 Kitchen ALCM.

Modernizations: Pakistan

MRBM / SRBM

- Shaheen II MRBM (Hatf-6) planning
- NASR SRBM (Hatf-9) planning
- Abdali SRBM (Hatf-2) planning*

Cruise Missiles

- GLCM (Babur/Hatf-7) planning
- ALCM (Ra'ad/Hatf-8 on Mirage) planning
- SLCM (naval version of Babur) planning?

Infrastructure

- Khushab-IV reactor planning

* Listed by Pakistani ISPR but not by 2013 NASIC report.

Modernizations: India

ICBM / IRBM / MRBM
- Agni VI ICBM planning (MIRV)?
- Agni V ICBM planning
- Agni IV IRBM planning
- Agni III IRBM planning
- Agni II MRBM fielding

SSBN / SLBM
- Arihant SSBN planning (3+)
- K-15/K-4 SLBM planning
- Dhanush SLBM planning

Cruise Missiles
- GLCM (Nirbhay) planning*

Infrastructure
- Two plutonium production reactors planning

* Reported by news media but not listed in 2013 NASIC report.







Modernizations: Israel

IRBM
- Jericho III IRBM planning?

SSG / SLBM
- Dolphin SSG fielding
- SLCM (Popeye Turbo/Harpoon) fielding?*

Bomber
- F-35 acquisition?

* Reported by news media but denied by officials. US public intelligence reports omit references to Israeli nuclear forces.

Modernizations: North Korea

ICBM / IRBM / MRBM

- No Dong MRBM planning?
- Musudan IRBM planning?
- Hwasong-13 (KN-08) ICBM planning?
- Taepo Dong 2 SLV/ICBM planning?

Cruise Missiles

- KN-09 coastal defense cruise missile?*

Infrastructure

- Yongbyon plutonium production reactor re-start
- Uranium enrichment production

* Listed by 2013 AFGSC briefing but not in 2013 NASIC report. 2014 update of AFGSC does not list KN-09.

Is nuclear role being reduced?

United States: Increased role after Cold War against China and regional WMD adversaries. Appears committed to reducing role (statements in Prague, NPR, Korea, and employment strategy), but little sign of reduction yet. Employment strategy explicitly rejects countervalue and minimal deterrence.

Russia: Appears to have increased the importance of nuclear weapons to compensate for declining conventional capability.

China: Public and professional debate about no-first-use conditions and new weapon systems could potentially served increased role, but no sign leadership has agreed to any change. New SSBNs and cruise missiles raise questions.

France: Increased role against regional WMD adversaries.

United Kingdom: "Sub-strategic" mission language has vanished but unclear if any effect on strategy.

India: No-first-use policy but prepared to use nuclear weapons in response to chemical and biological attack. New SSBN and long-range missiles raise questions.

Pakistan: No no-first-use pledge and new tactical missiles raise questions.

Israel: Rumors about sea-based leg raise questions.

What constitutes reduced role?

Different types of “reductions” mean different things: there is a difference between reducing role by *constraining* mission and reducing role by phasing out tasks or weapons that are no longer needed.

United Kingdom has completely eliminated naval and air-delivered bombs and anti-submarine nuclear weapons.

France has eliminated land-based missiles.

United States has completely eliminated non-strategic naval, army, and marine corps nuclear weapons: many roles simply fell away after the Cold War; others were replaced by more credible conventional weapons.

Obama administration’s 2013 nuclear employment strategy:

- directs the military to study improving the role of conventional weapons in contingency planning, **but** says conventional weapons are not a substitute for nuclear weapons;
- directs the military to study reducing reliance on Launch-Under-Attack, **but** rejects dealerting and retains the current alert posture;
- commits to future “sole purpose” role, **but** retains role against chemical, biological, and conventional weapons

Conclusions

- Significant reductions in numbers and types of nuclear weapons since Cold War, but pace of reduction is slowing
- Warhead inventories are decreasing in US, Russia, France and Britain but increasing in China, Pakistan, India and North Korea
- All nuclear weapon states have extensive and expensive nuclear weapons modernization programs underway spanning next two decades
- Cold War arms race is over but replaced by dynamic and global technological arms race
- Modernizations drive suspicion, worst-case planning, and nuclear competition
- Modernizations can undermine nuclear disarmament efforts
- Does modernizations in perpetuity contradict NPT Article VI?
- Some nuclear-armed states say they have reduced role of nuclear weapons and want to reduce further, but there is little evidence role has been reduced other than because Cold War missions fell away and improvements of conventional weapons
- Numerical arms control has served primary role until now, but constraints on modernizations are needed to limit nuclear competition and avoid undercutting arms control process