

FAS

FEDERATION OF AMERICAN SCIENTISTS

www.fas.org

The Status of Nuclear Weapons: Arsenals, Modernizations, and Operations

Hans M. Kristensen

Director, Nuclear Information Project

Federation of American Scientists

Phone: 202-454-4695

Email: hkristensen@fas.org

Presentation to

17th Castiglioncello International Conference

International Security in the Trump Era

Pugwash-USPID Joint meeting

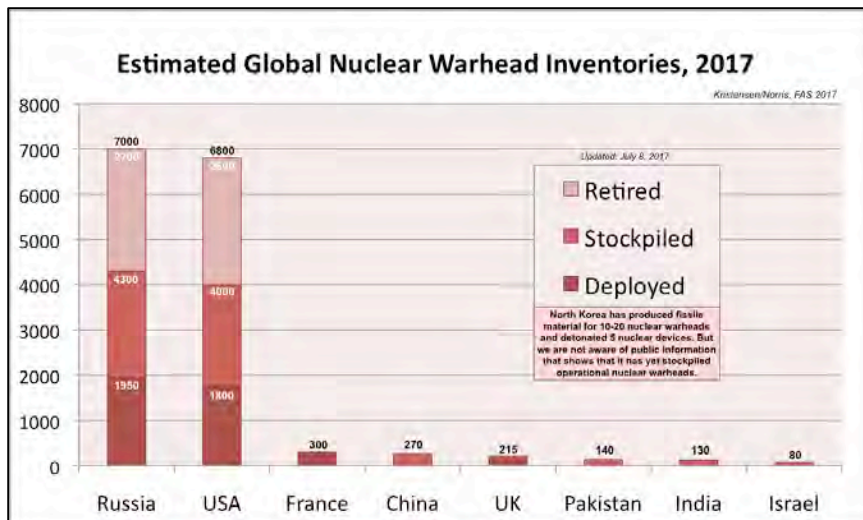
Castiglioncello, Italy

September 22, 2017



It's scary stuff!

Nuclear Arsenals and Trends



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 reductions since 1986 peak:

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

~10,000 warheads in stockpiles (~15,000 if counting retired warheads awaiting dismantlement)

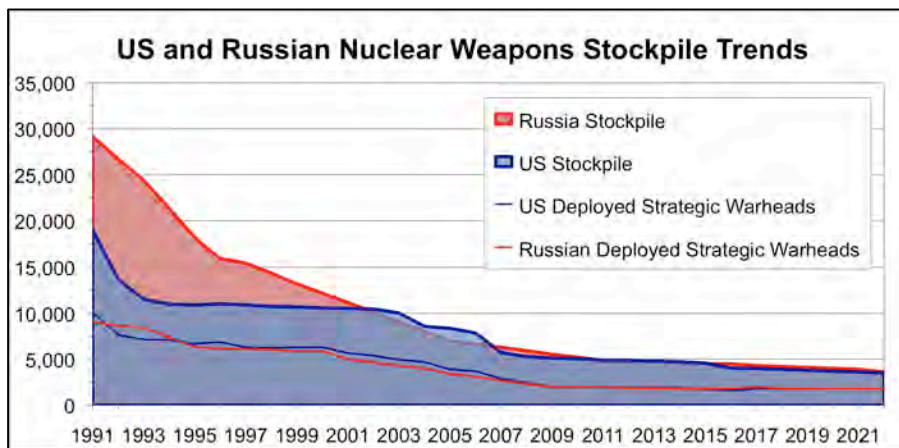
US and Russia possess 90% of global inventory (94% if counting retired warheads); **each has more than 4 times more warheads than rest of world combined**; 15 times more than third-largest stockpile (France)

Decreasing: US, Russia, Britain

Increasing: China, Pakistan, India, North Korea

Steady: France, Israel

Nuclear Arsenal and Trends



With more than 90% of world inventory, US and Russia have special responsibility to reduce

Reduction of deployed strategic warheads from some 23,000 in 1989 to 3,600 in 2017 (New START counts 3,176)

Readiness level of remaining strategic forces is high: some 1,800+ warheads on prompt alert

No official de-alerting, but significant reduction of overall alert numbers: heavy bombers de-alerted, US ICBMs and SLBMs downloaded, non-strategic forces de-alerted

Trend: pace of reductions is slowing

US cut only 1,273 warheads in 2008-2017, compared with 5,023 warheads cut in 1998-2007

Russia cut an estimated 1,629 warheads in 2008-2017, compared with 8,082 in 1998-2007

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

New initiatives needed to prevent stalling of arms control

Nuclear Arsenals and Trends

Large disparity in deployed strategic launchers (150 in Mar 2017) fuels asymmetric postures: Russia MIRV focus; US launcher focus

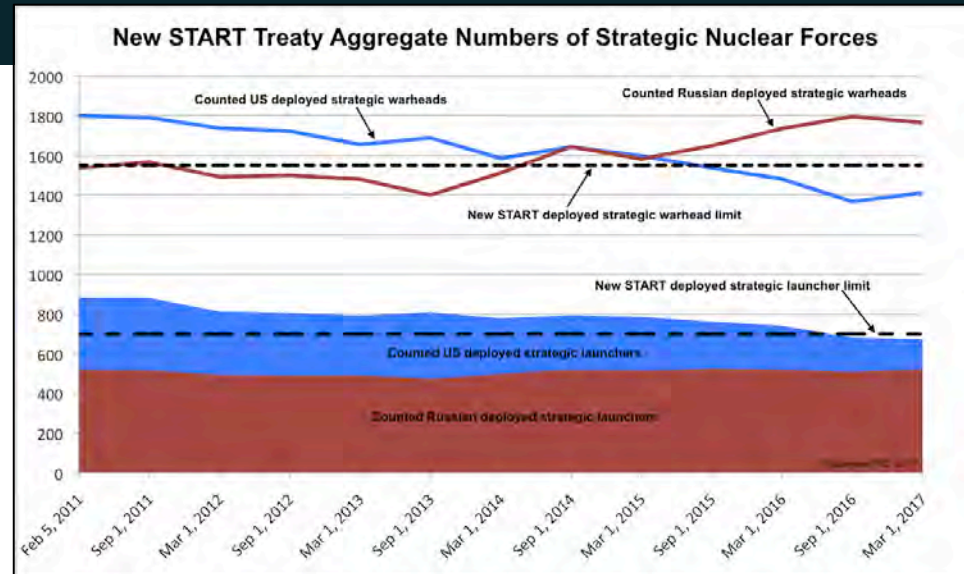
Russian increase of deployed warheads 2013-2016 fueled speculations that Russia would not implement New START

US retention of large warhead upload capacity and “warm” ICBM silos, especially when seen together with advanced conventional weapons and growing missile defense, seen as destabilizing

Overall modernizations deepen East-West crisis by fueling suspicion and worst-case scenario planning on both sides

Russian INF violation puts treaty future in doubt and poisons atmosphere for other treaties

Efforts to increase transparency and reduce non-strategic weapons have stalled



Russian increase of deployed strategic warheads looks bad and sends the wrong signal, but is not militarily significant:

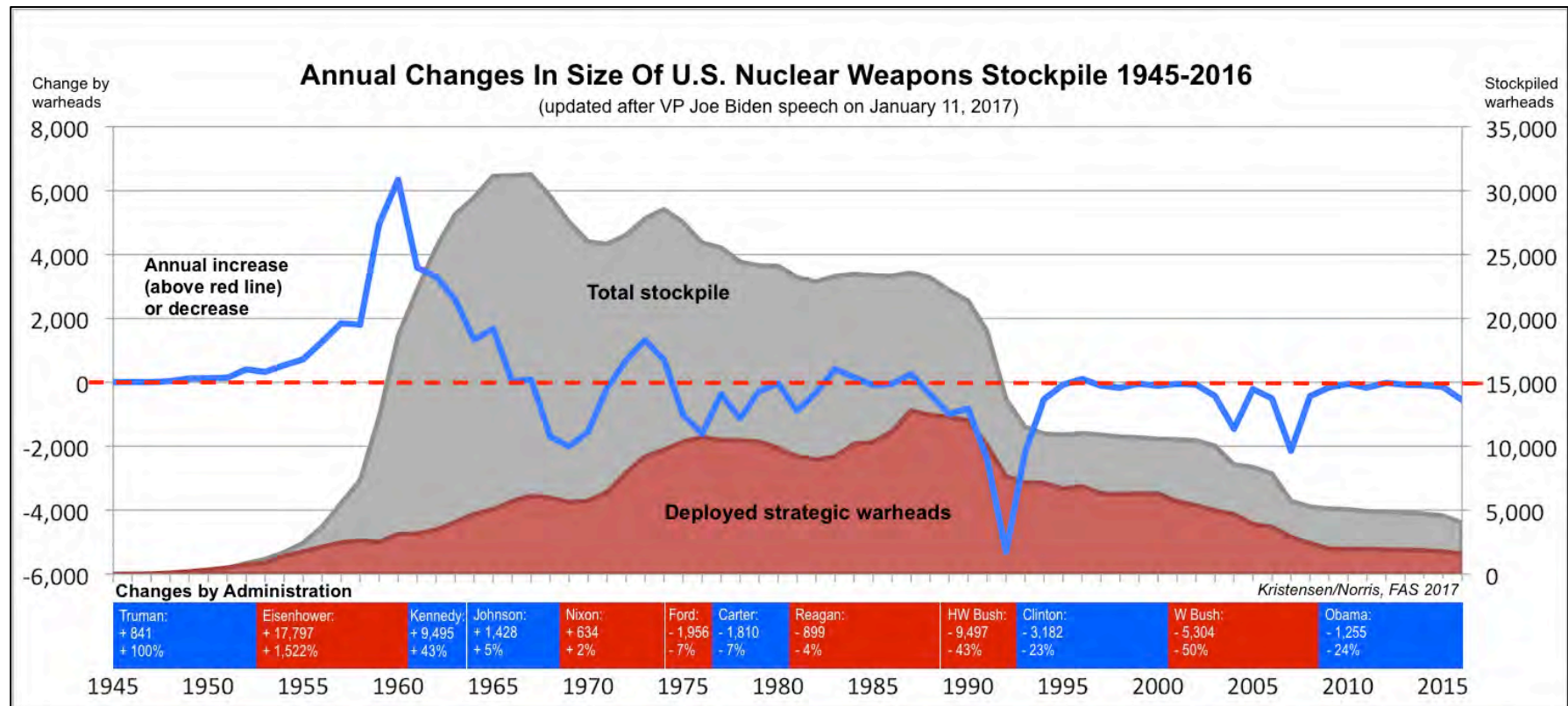
Even if Russia deployed additional strategic warheads to conduct a disarming first strike, *even significantly above the New START Treaty limits*, it “would have little to no effects on the U.S. assured second-strike capabilities that underwrite our strategic deterrence posture.”

The “Russian Federation...would not be able to achieve a militarily significant advantage *by any plausible expansion of its strategic nuclear forces, even in a cheating or breakout scenario under the New START Treaty...*”

DOD, Report on the Strategic Nuclear Forces of the Russian Federation, 2012

Nuclear Arsenal and Trends

Until last-minute cut in 2016, the Obama administration had reduced stockpile the least of any post-Cold War US administration. Even with last cut it only barely outperformed Clinton. Republications have cut twice as much

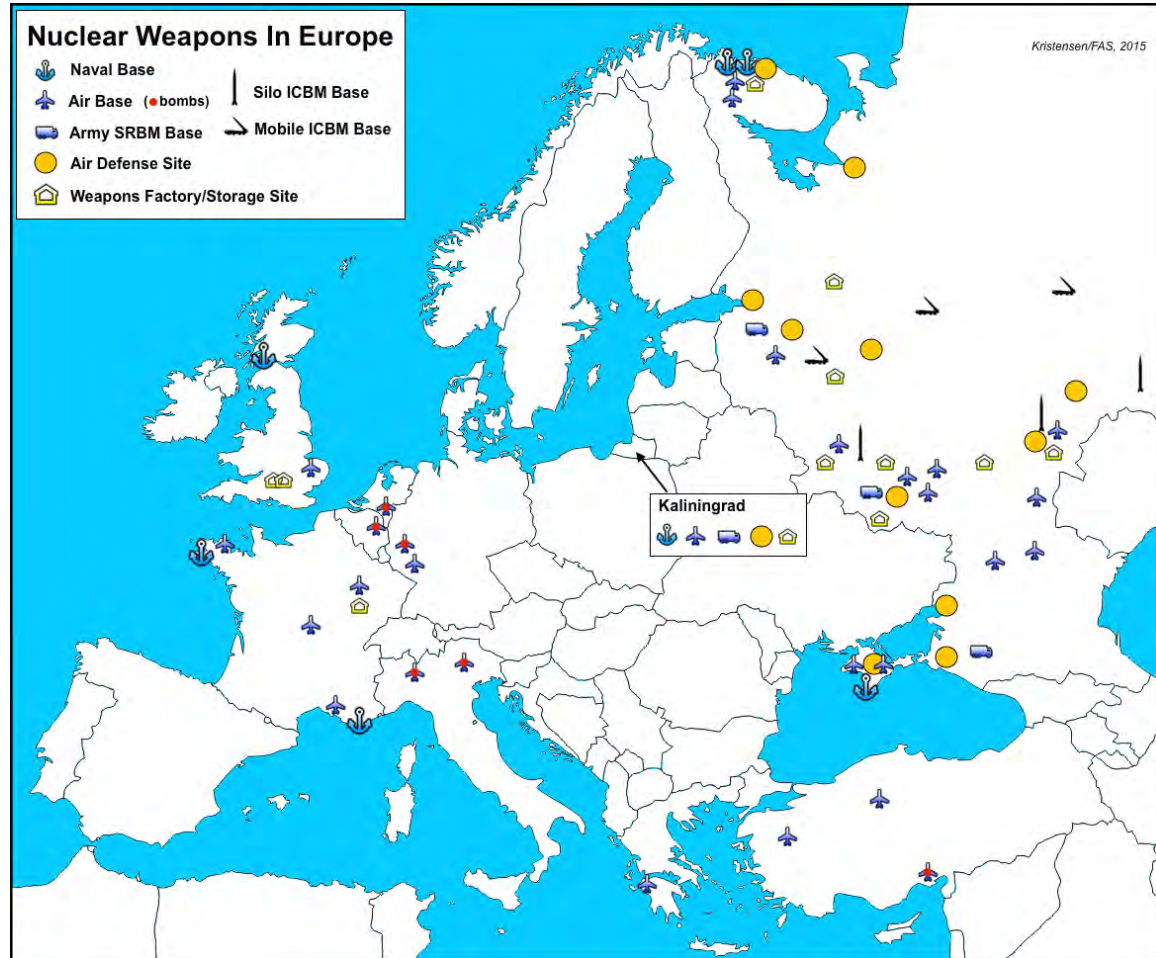


Nuclear Arsenals and Trends

In Europe: significant reductions since Cold War and most forces pulled back

Yet significant forces remain:

- 3 European nuclear weapon states
- 5 non-nuclear weapons states have semi-nuclear status
- Russia has ~1,850 non-strategic nuclear warheads for air-, naval-, army-, and defense-forces
- NATO non-strategic weapons include ~150 US bombs in Europe (red dots) and 54 French air-launched cruise missiles (considered strategic by France)



Modernization: Russia

ICBM

- SS-27 Mod 2 (mobile): replacing SS-25s at Novosibirsk, Tagil, Yoshkar-Ola
- SS-27 Mod 2 (silo): replacing SS-19s at Kozelsk
- SS-27 Mod 2 (rail): envisioned but uncertain
- RS-26 (compact SS-27): to replace SS-25s at Irkutsk and Vypolzovo
- RS-28 (Sarmat): to replace SS-18s at Dombarovsky and Uzhur



SSBN / SLBM

- SS-N-23 SLBM life-extension (Sineva/Layner) in Delta IV SSBN
- Borei SSBN: 8 planned (possibly 10-12)
- SS-N-32 (Bulava): fielding



Bombers

- Upgrades of some Tu-160 (Blackjack) and Tu-95 (Bear)
- New bomber (PAK PA) in development
- Nuclear ALCM (Kh-102) in development



Tactical

- Tu-22M (Backfire) upgrade underway
- Su-34 (Fullback) fielding (replacing Su-24)
- Yasen (Sverodvinsk) SSGN fielding
- SLCM (SS-N-30A, Kalibr) fielding
- GLCM (SSC-8) fielding
- SSM (SS-26, Iskander-M) fielding (replacing SS-21)
- SAM (S-400/SA-21) fielding (replacing S-300); nuclear?
- ABM (A-135) upgrade planned

Russia is **reducing** its arsenal

Modernization: Russia

Upgrade of 10 short-range ballistic missile brigades since 2007

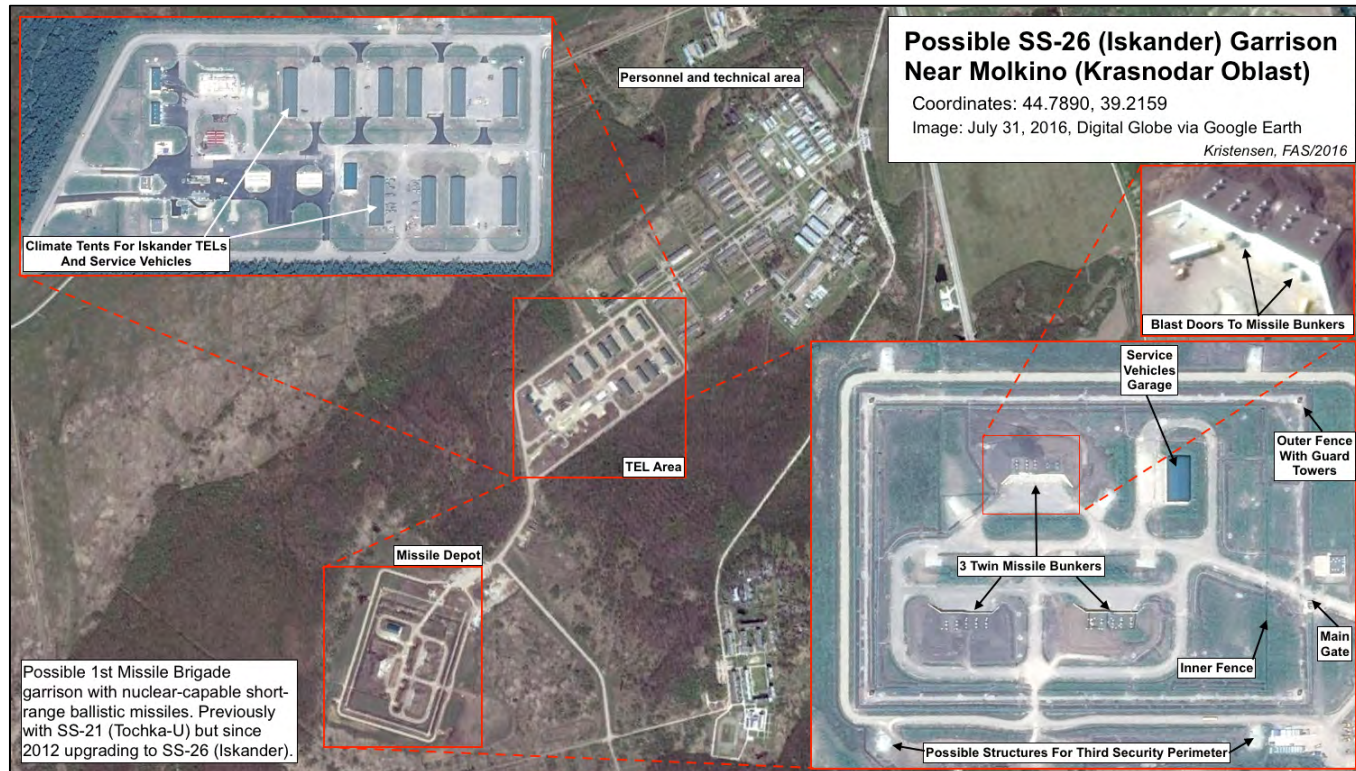
From SS-21 (Tochka-U) to SS-26 (Iskander-M)

First brigade operational in 2014 at Luga South of St. Petersburg

Second SS-26 brigade possibly near Molkino in Krasnodar Krai east of Crimea (right)

Both Luga and Molkino have new unique weapons depot

Introduction might begin in Kaliningrad around 2018



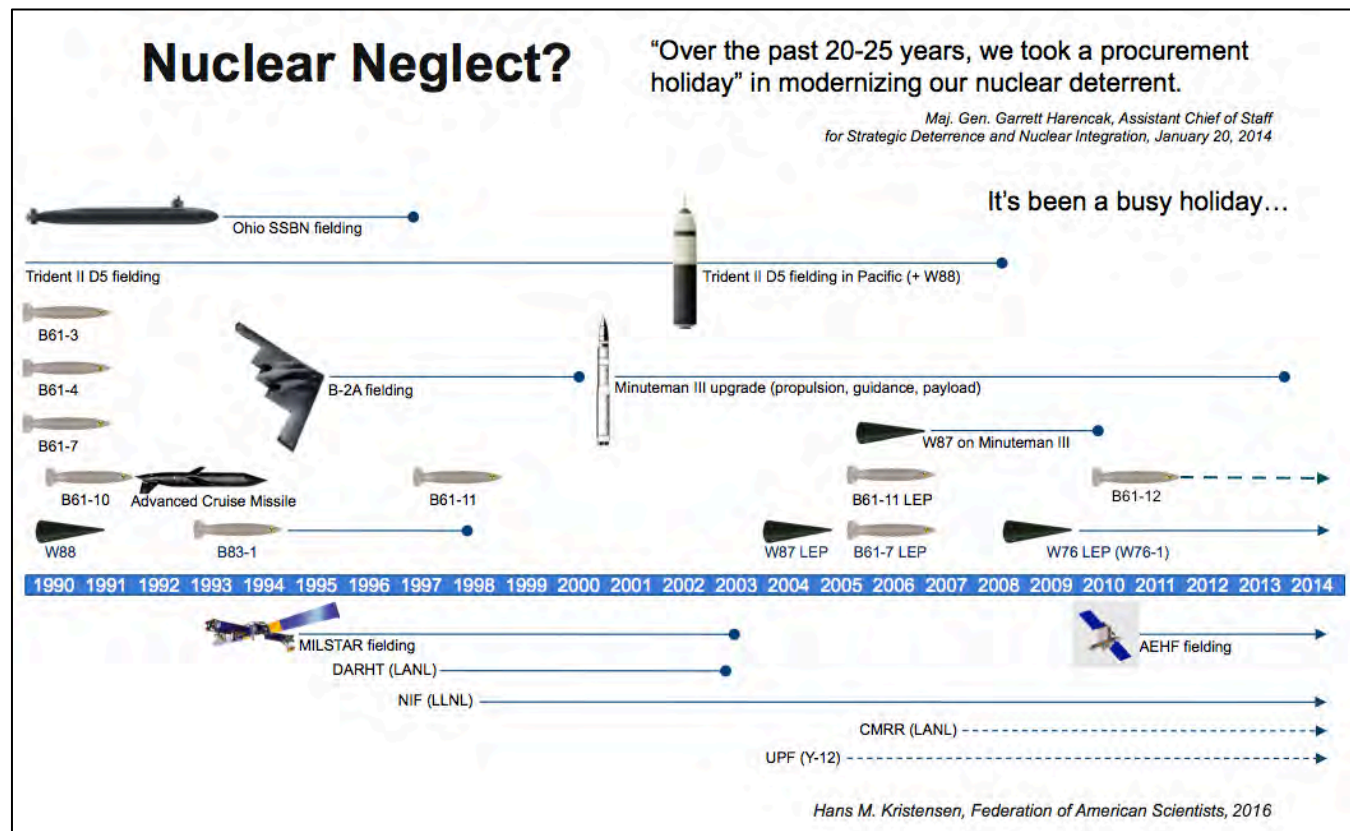
Modernization: United States

It is often said that the United States has had a “procurement holiday” on nuclear forces since the Cold War

And that “everyone is modernizing but the United States”

And that “Russia is building warheads while the United States can’t”

Well...



Modernization: United States

ICBM

- Minuteman III life-extension completing
- Warhead fuzes/interoperable warhead planned
- GBSD (ICBM replacement) in development

SSBN / SLBM

- Trident II D5 SLBM life-extension fielding
- SSBN replacement development (12 planned)
- Enhanced W76-1 warhead life-extension deploying
- W88-1 warhead life-extension development

Bombers

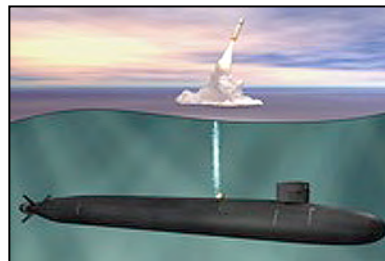
- Upgrade of B-2 and B-52 underway
- B-21 next-generation bomber in development
- B61-12 guided standoff bomb in development
- LRSO (ALCM replacement) in development

Tactical

- F-35A nuclear capability in development
- B61-12 guided standoff bomb in development

Infrastructure

- Uranium Processing Facility (secondaries) construction
- Plutonium production facilities (primaries) construction
- Warhead surveillance/simulation facilities upgrades



The United States is **reducing** its arsenal

Modernization: United States + NATO

- Modification of B61 bomb from “dumb” bomb to guided, standoff B61-12 with guided tail kit assembly that increases targeting accuracy and efficiency: one type can cover all bomb missions (tactical as well as strategic)*
- B61-12 integration on B-2, B-21, F-15E, F-16, F-35A, Tornado
- B61-12 First Production Unit in 2020; stockpiling from 2024
- B61-12 cost \$8-\$10 billion: more than a decade worth of European Reassurance Initiatives
- The B61-12 will replace B61-3, (B61-4), B61-7, B61-10, B-83

* Note: Digital aircraft (B-2, B-21, F-15E, F-35A) will be able to use tail kit for guided employment; older analog aircraft (Tornado, F-16) will use ballistic employment

“The Air Force tail kit will provide the B61-12 with a measure of improved accuracy **to give the same military capability as the higher yield bombs it replaces.**”

Brian McKeon, OSD, July 28, 2016 (emphasis added)

B61-12: Also a nuclear bunker buster?

Going...

Going...

Gone!

An F-15E drops one of two B61-12 guided nuclear bomb shapes at Tonopah Test Range in Nevada on October 20, 2015. Official images from the test indicate that the B61-12 demonstrated an accuracy of less than 30 meters (98 feet) and that the guided bomb has earth-penetrating capability against underground targets.

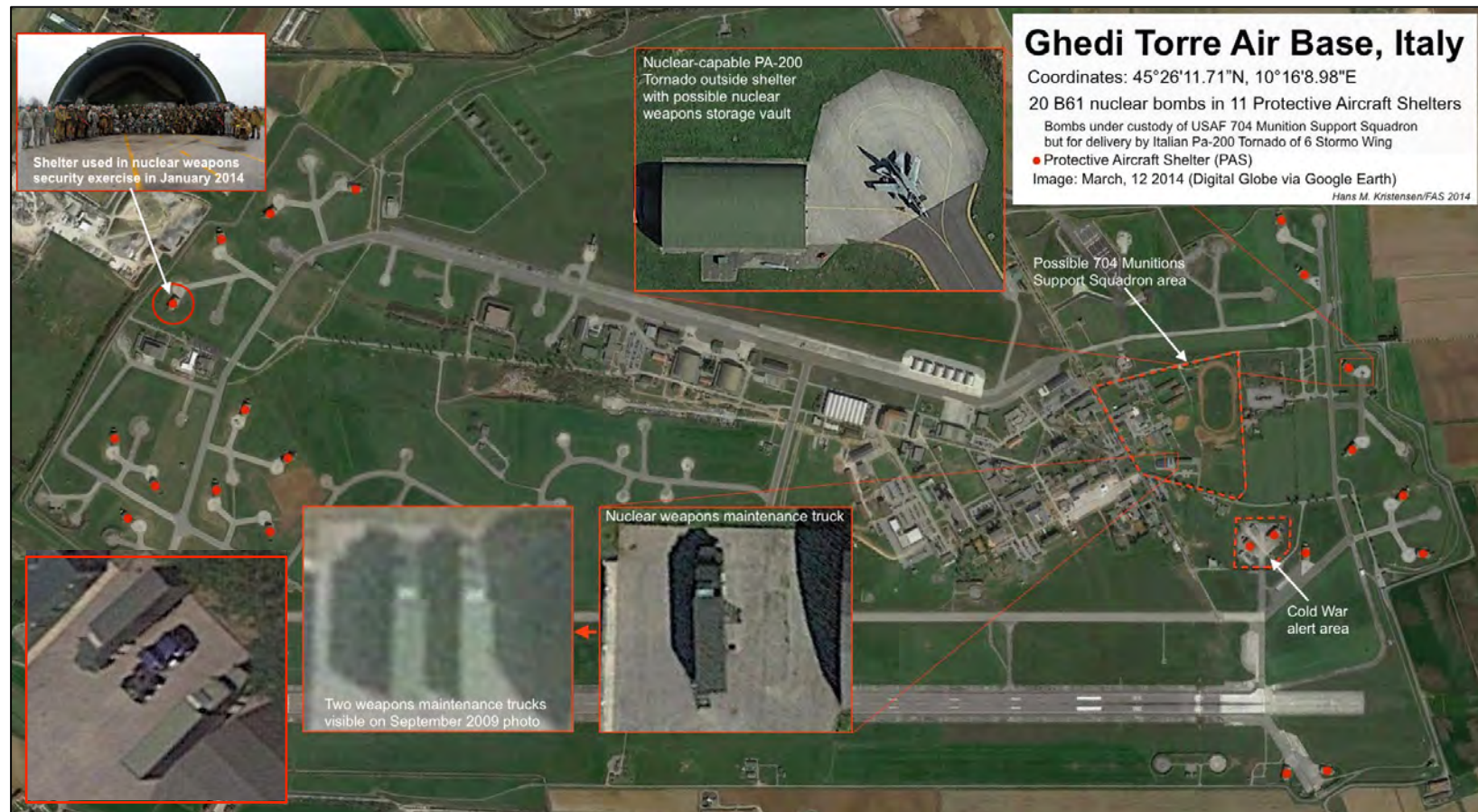
Kristensen/FAS, 2016

Modernization: United States + NATO

Active vault weapon storage system at six bases in five countries: Belgium (Kleine Brogel), Germany (Buchel), Italy (Aviano, Ghedi), Netherlands (Volkel), Turkey (Incirlik). Security at US bases has been upgraded at Aviano (below) and Incirlik



Modernization: United States + NATO



Modernization: China

ICBM / IRBM

- DF-31AG ICBM in development
- DF-31A (CSS-10 Mod 2) ICBM fielding
- DF-5B (CSS-4 Mod 2) ICBM with MIRV
- DF-41 ICBM in development (possibly MIRV)
- DF-26 IRBM fielding



SSBN / SLBM

- Jin (Type-094) SSBN fielding (4-5 expected)
- JL-2 (CSS-N-14) SLBM in development
- Type-096 SSBN possibly in development



Cruise Missiles:

- ALCM (CJ-20 on H-6 bomber) in development*
- New ALCM in development, possibly nuclear option**



* Listed in 2013 AFGSC briefing as nuclear

** Listed in DIA 2017 briefing

China is **increasing** its arsenal

Modernization: France

SSBN / SLBM

- TNO warhead fielding on M51.2 SLBM
- M51.3 SLBM in development

Bombers

- Rafale K3 to replace Mirage 2000N at Istres Air Base
- Next-generation ALCM in development

Infrastructure

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



France is **neither increasing nor reducing** its arsenal



Modernization: Britain

SSBN / SLBM

- SSBN Dreadnought in development (4 planned)
- SLBM (Trident II D5LE) SLBM fielding
- Mk4A/W76-1 type warhead fielding

Infrastructure

- Joint UK-French warhead surveillance testing technology center development



Britain is **reducing** its arsenal

Modernization: Pakistan

MRBM / SRBM

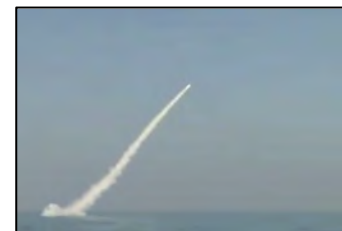
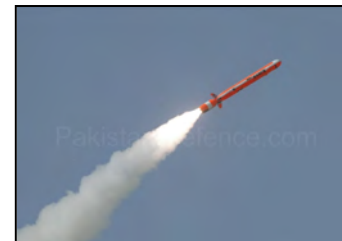
- Shaheen III MRBM (Hatf-6) in development (MIRV?)
- Shaheen II MRBM (Hatf-6) fielding
- NASR SRBM (Hatf-9) fielding
- Abdali SRBM (Hatf-2) fielding

Cruise Missiles

- GLCM (Babur/Hatf-7) in development
- ALCM (Ra'ad/Hatf-8 on Mirage) in development
- SLCM (Babur 3) in development

Infrastructure

- Khushab-IV reactor #4 construction
- Uranium enrichment facility upgrade



Pakistan is **increasing** its arsenal

Modernization: India

ICBM / IRBM / MRBM

- Agni VI ICBM in development (MIRV?)
- Agni V ICBM in development
- Agni IV IRBM in development
- Agni III IRBM fielding

SSBN / SLBM

- Arihant SSBN development (3+ expected)
- K-15/K-4 SLBM in development
- Dhanush SLBM fielding

Cruise Missiles

- GLCM (Nirbhay) in development*

Infrastructure

- One plutonium production reactor developing
- Breeder reactors?

* Reported by news media but not listed in 2017 NASIC report.

India is **increasing** its arsenal



Modernization: Israel

IRBM

- Jericho III IRBM in development?

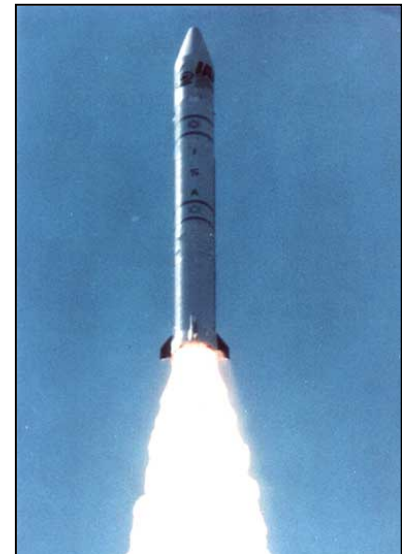
SSG / SLBM

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

Bomber

- F-35A fielding

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



Israel is **neither increasing nor reducing** its arsenal

Modernization: North Korea*

ICBM / IRBM / MRBM

- No Dong MRBM fielding
- Scud ER MRBM in development
- Bukkeukseong-2 MRBM in early development
- Hwasong-10 (Musudan) IRBM in development
- Hwasong-12 IRBM in early development
- Hwasong-13 (KN-08) ICBM in development
- Hwasong-14 ICBM in development
- Taepo Dong 2 SLV (ICBM?) in development

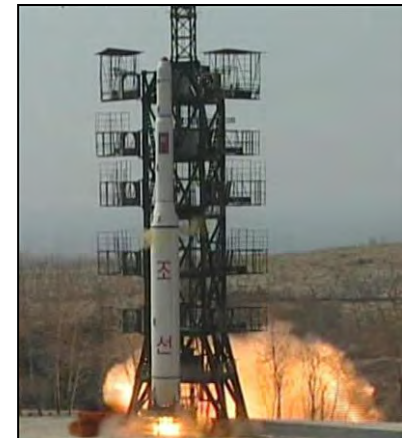
SSBN/SLBM

- SSBN in development
- Bukkeukseong-1 SLBM in development

Infrastructure

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

* After six underground nuclear tests and increasingly advanced missile tests, North Korea might be capable of miniaturizing its test devices. It is unclear to what extent it has operationalized its nuclear capability. Sufficient fissile material for 30-60 warheads but assembled number unknown.



North Korea is increasing its arsenal

Nuclear Operations: Russia

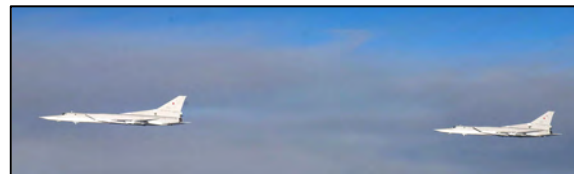
Long-range bomber flights resumed in 2004; non-strategic nuclear-capable fighter-bombers closer to NATO countries increased sharply since 2012; “snap” exercises increasing in frequency, size, visibility; occasional explicit nuclear threats issued by officials

Nuclear strategy similar to US but more emphasis on non-strategic weapons and early/first use

May not always be explicit nuclear signal, but often seen as such



Baltic Sea: Su-24 fighter-bomber intercept



Baltic Sea: Tu-22M bombers reportedly simulated nuclear strike against Sweden in 2013



Televised ICBM/SLBM launches



North Sea: Tu-95 bomber intercept



Baltic Sea: SS-N-9 SLCM loading



Luga: SS-26 return from Kaliningrad deployment

Nuclear Operations: United States

Long-range bombers integrated more prominently into EUCOM strike planning; Cold War-like bomber strike exercises over North Pole and North Sea into Baltic Sea; exercises in Eastern Europe increasing in frequency, size, visibility; fighter-bomber rotational deployments and exercises in Baltic States, Poland, Sweden; occasional SSBN port visits to Scotland

2013 nuclear strategy reaffirmed counterforce, rejected minimum deterrence



F-16 deployments to Estonia, Poland, Sweden



B-52, B-2 deployment to United Kingdom



B-52 over Latvia



B-52s over BALTOPS exercise



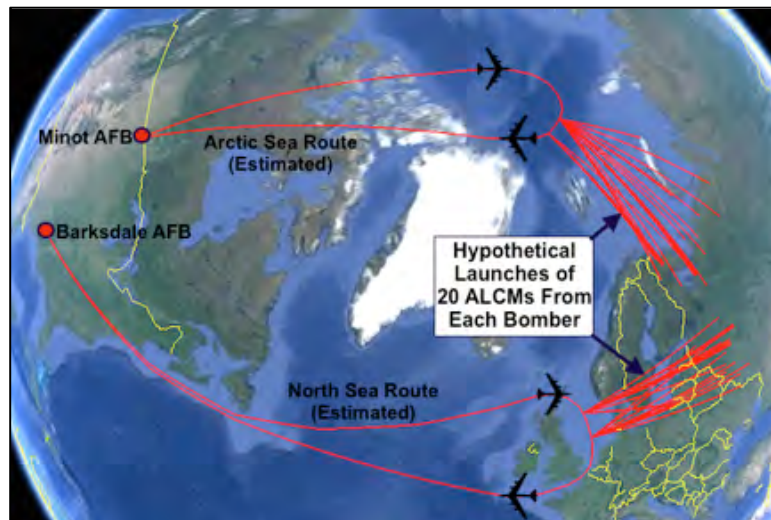
SSBN visit to Scotland

Nuclear Operations: United States

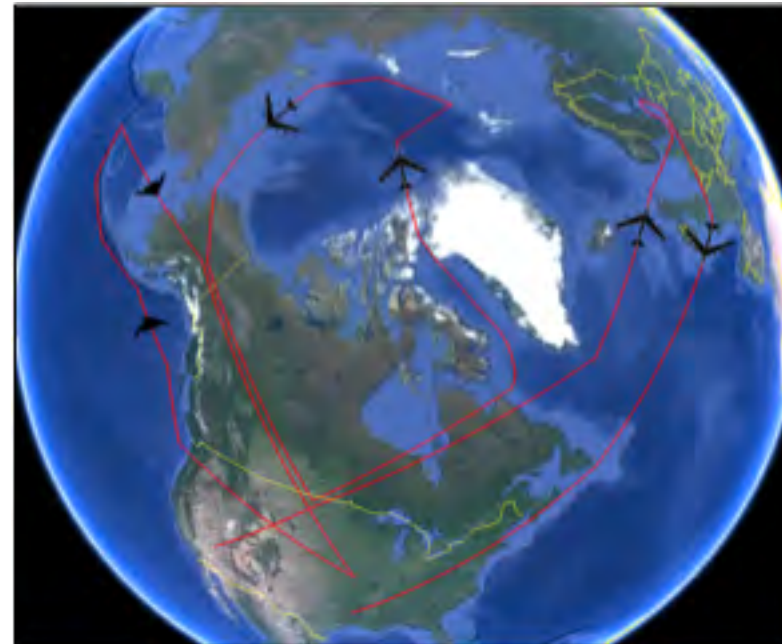
Perhaps the most significant change in US operations has been the resumption of bomber strike exercises over the Northern Hemisphere

As part of “maintaining the U.S. nuclear deterrent with NATO” to provide the “supreme guarantee of the security of the Allies,” US European Command “has forged a link between STRATCOM Bomber Assurance and Deterrence missions to NATO regional exercises.”

General Philip Breedlove, SACEUR, February 2015



Exercise Polar Growl on April 1, 2015 saw deployment of four B-52s over the North Pole and North Sea. The bombers went all the way to their launch points for air-launched cruise missiles.



Exercise Polar Roar on August 1, 2016 saw deployment of six bombers (4 B-52 and 2 B-2) over the North Pacific, North Pole, North Sea, and Baltic Sea. The deterrence exercise required 24 tankers.

Conclusions

Global nuclear forces have been reduced significantly since Cold War, but...

The pace of reductions is decreasing

Four nuclear-armed states are increasing the size of arsenals

All nuclear-armed states are modernizing their forces

Nuclear-armed states are reaffirming the importance and role of nuclear weapons

Nuclear planning (signaling, readiness, plans) is being revitalized

Many non-nuclear weapon states continue to rely on nuclear weapons states for national security

None of the nuclear-armed have plans to eliminate nuclear arsenals but seem intent on keeping them

There are currently no negotiations about adopting new arms control treaties

QUESTIONS?

Additional information and resources from FAS Nuclear Information Project:

FAS Status of World Nuclear Forces Overview

<https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/>

FAS Nuclear Notebook Series (Column in Bulletin of the Atomic Scientists):

<http://thebulletin.org/search/feature-type/nuclear-notebook>

FAS Strategic Security Blog:

<https://fas.org/blogs/security/>

This Briefing and Other Nuclear Related FAS Publications:

<https://fas.org/issues/nuclear-weapons/nuclear-information-project-publications/>