Nuclear Weapons and Arms Control: Modernizing Nuclear Arsenals

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More than 125,000 warheads produced since 1945

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

Today: ~ 10,200 warheads in stockpiles (17,200 if counting retired intact warheads awaiting dismantlement)

US and Russia possess 90% of global inventory (94% if counting retired intact warheads): each has 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
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 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
Modernizations: United States

$200 billion-plus modernization
- All three legs of strategic triad
- Tactical dual-capable aircraft
- Warhead production complex

Consolidation and modification of warhead types
Extending nuclear deterrent through 2080
Modernizations: United States

3+2 warhead strategy: reduction from 7 warhead types to 5 types:
- 3 ballistic missile warheads
- 2 bomber warheads

W78/W88 interoperable warhead on ICBM and SLBM

B61-12: guided bomb with enhanced military capabilities

W80-1 and ALCM (LRSO)

Alleged advantages:
- Fewer warhead types allow reduction of hedge
- Modified warheads with increased safety, use control, and performance margin

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”?

* As proposed by NNSA.

Annotations: Hans M. Kristensen, Federation of American Scientist, 2013
Modernizations: United States

NNSA warhead schedule envisions 3 interoperable warheads
- IW1: W78/W88-1
- IW2: W61/W80-1
- IW3: W87/W76-1

Expensive and complex programs
Unrealistic budget estimates
Technology risks
Interoperable warheads essentially Reliable Replacement Warheads
Contradicts pledge not to produce “new” nuclear warheads
Modernizations: NATO

Belgium
- F-35 replacement of F-16 planning?
- B61 bomb life-extension/upgrade planning

Germany
- Tornado bomber life-extension planning?
- B61 bomb life-extension/upgrade planning

The Netherlands
- F-35 replacement of F-16 planning
- B61 bomb life-extension/upgrade planning

Italy
- F-35 replacement of Tornado planning
- B61 bomb life-extension/upgrade planning

Turkey
- F-35 replacement of F-16 planning
- B61 bomb life-extension/upgrade planning
Modernizations: France

SSBN / SLBM
- M51.1 SLBM (TN75) fielded
- M51.2 SLBM (TNO) planning
- M51.3 SLBM (TNO) planning

Bombers
- Mirage 2000NK3 fielded
- Rafale K3 fielded
- Rafale MK3 fielded
- 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; Dombarovsky) planning
- New ICBM (“heavy”; modified SS-27 (RS-26); or new) 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
- ALCM (Kh-102) fielding?
- New bomber (PAK PA) planning

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

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Modernizations: Russia

Russian SS-27 Deployments 2013, 2023
(Note: All SS-18, SS-19, SS-25 will be retired)

- Road-mobile versions
- Silo-based versions
- Future deployment
- ICBM base scheduled to close

Hans M. Kristensen, Federation of American Scientists, 2013
Modernizations: Russia


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Modernizations: China

ICBM / MRBM
- DF-31 (CSS-10 Mod 1) ICBM fielding
- DF-31A (CSS-10 Mod 2) ICBM fielding
- DF-21 (CSS-5 Mod 1/2) MRBM fielding
- DF-41 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.
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+)
- Sagarika/K-15 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.
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.
# Modernizations: Outlook

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**Key:**
- ALCM = Air-Launched Cruise Missile
- GLCM = Ground-Launched Cruise Missile
- ICBM = Intercontinental Ballistic Missile
- IRBM = Intermediate Range Ballistic Missile
- SLBM = Sea-Launched Ballistic Missile
- SLCM = Sea-Launched Cruise Missile
- SRBM = Short Range Ballistic Missile
- SSBN = Nuclear-Powered Ballistic Missile Submarine
- WH = warhead

*Hans M. Kristensen, Federation of American Scientists, 2013 | Slide 18*
Conclusions

- All nuclear weapon states have extensive and expensive nuclear weapons modernization programs underway spanning next two decades
- Programs underway include at least: 27 ballistic missiles, 8 warships, 5 bombers, 9 cruise missiles, 8 warheads, 8 factories
- Warhead inventories are decreasing in US, Russia, France and Britain but increasing in China, Pakistan, India and North Korea
- Modernizations drive suspicion, worst-case planning, and nuclear competition
- Modernizations slow or hinder nuclear disarmament efforts
- Continued modernizations contradict NPT Article VI
- Numerical warhead reductions have served primary role until now, but constraints on modernizations are needed to avoid undercutting arms control process