Nuclear Weapons and Arms Control: Modernizing Nuclear Arsenals

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Presentation to
Short Course on Nuclear Weapons issues in the 21st Century
Elliott School of International Affairs
George Washington University
Washington, D.C.
November 3, 2013

Research and publications with generous support from the New-Land Foundation and Ploughshares Fund
Status of nuclear forces

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 (Sverodvinisk) SSGN planning
- SLCM (SS-N-30, Kaliber) planning
- SSM (SS-26, Iskander) fielding
- SAM (S-400/SA-21) fielding
- ABM (A-135) planning
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: 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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<th>USA</th>
<th>ICBM WH</th>
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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
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