The Road Back to the Nuclear Brink

Hans M. Kristensen, Federation of American Scientists

Matthew McKinzie, Natural Resources Defense Council

United Nations, New York, NY

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Briefing Overview

This briefing is given in two parts:

1. Kristensen gives an overview of the the status and trends of nuclear forces and how the mission of nuclear weapons is evolving.

2. McKinzie gives an overview of the effects of nuclear weapons use and summarizes the findings and conclusions of their recent study (with Theodore Postol) of warhead fuze modernizations in the US arsenal.

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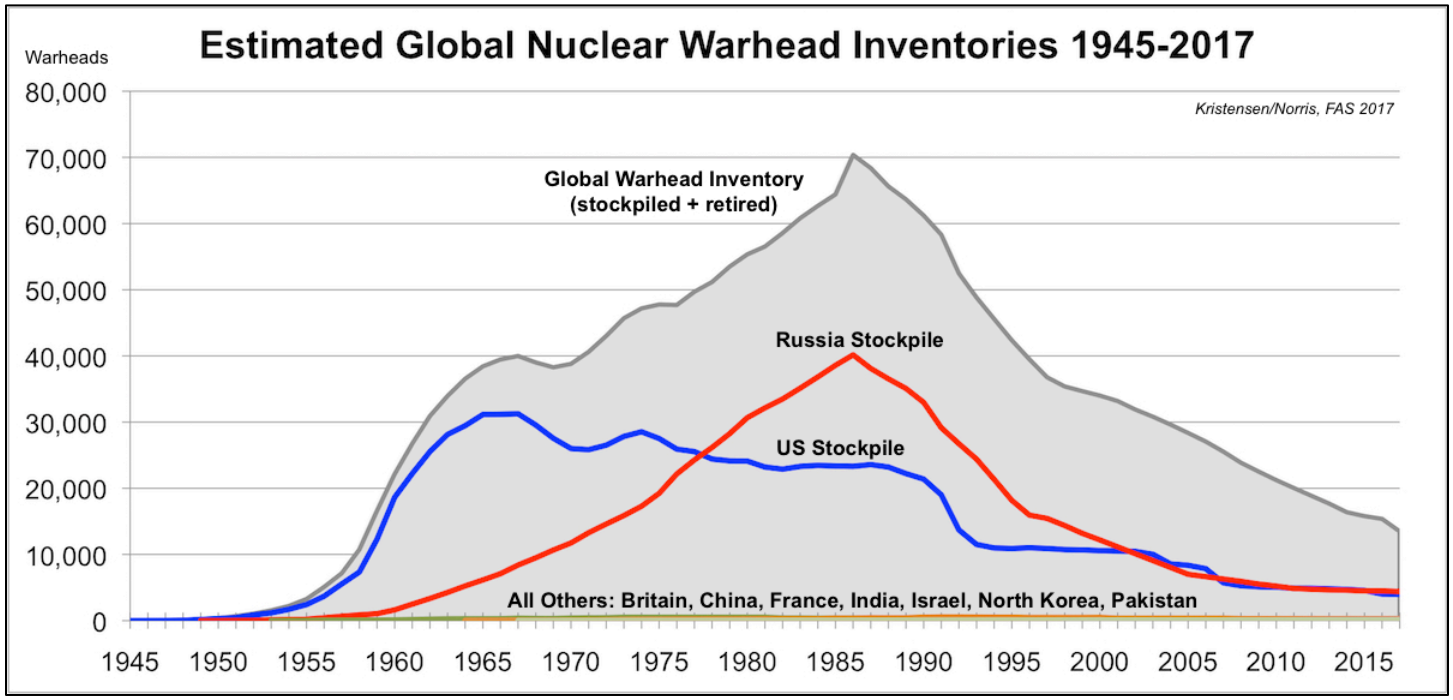
Arsenals: Status



Enormous reductions since peak of 64,500 stockpiled warheads in 1986 (70,300 if including retired warheads):

~55,000 warhead stockpile reduction; ~48,000+ warheads dismantled; ~5,500+ retired warheads awaiting dismantlement

Trend: pace of reductions is slowing

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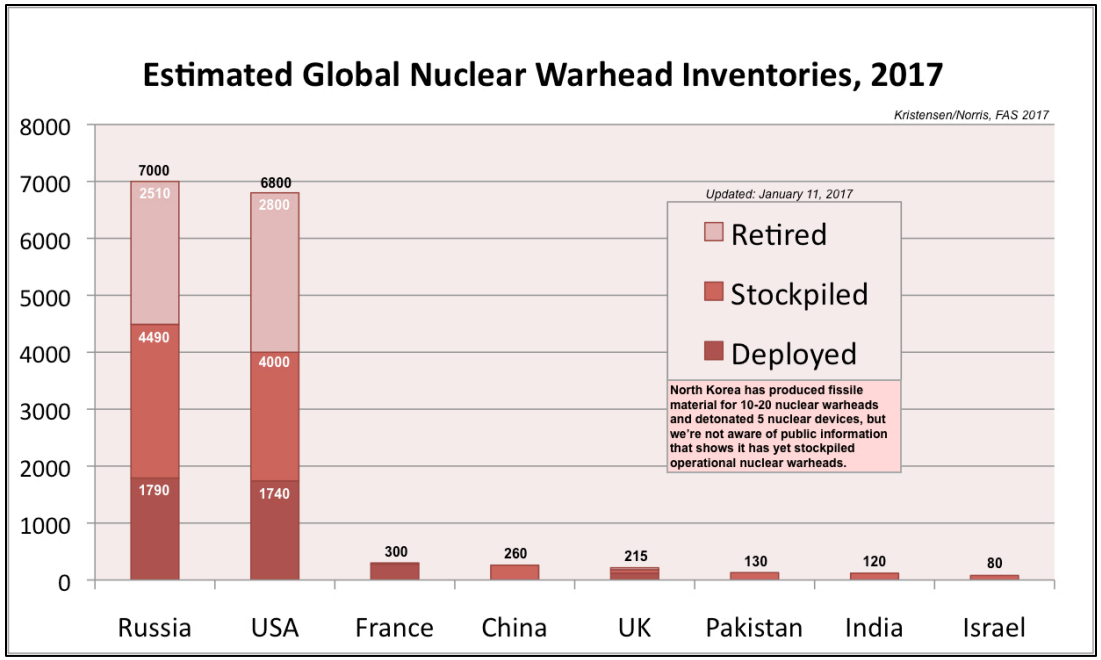
Arsenals: Status



Today: ~9,600 warheads in stockpiles (~14,900 if counting retired warheads awaiting dismantlement)

US and Russia possess 93% of global inventory; **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

Steady: France, Israel

Emerging: North Korea

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Modernizations: Global Situation

United States: After extensive weapons life-extensions, embarked upon complete replacement of arsenal and industry infrastructure. Producing life-extended warheads, planning new warheads. Increasing weapons capabilities. Reducing overall size of arsenal.

Russia: In middle of modernization of Soviet-era weapons to newer systems. Re-producing warheads and planning new ones. Increasing weapons capabilities. Reducing overall size of arsenal.

China: In final phase of modernization from early weapons to more efficient types. Producing warheads. Adding MIRV. Increasing weapons capabilities. Increasing size of arsenal.

France: In final phase of modernization of weapons and infrastructure. Researching next-generational weapons. Producing warheads. Increasing weapons capabilities. Arsenal size steady.

Britain: In early phase of modernization of weapons. Researching next-generational weapons. Producing warheads. Increasing weapons capabilities. Reducing size of arsenal.

Pakistan: In middle of modernization to newer and more diverse arsenal (Triad) and industry, including longer-range missiles and short-range tactical nuclear weapons. Producing warheads. Increasing size of arsenal.

India: In middle of modernization to newer and more diverse arsenal (Triad) and industry, including longer-range missiles. Producing warheads. Exploring MIRV. Increasing size of arsenal.

Israel: Possible upgrade of weapons. Arsenal size is steady.

North Korea: Rapid development of several types of missiles and platforms. Conducting nuclear testing and producing warheads. Increasing size of arsenal but operational status is unclear.

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Mission: War Planning and Trends

All nuclear-armed states are producing and refining nuclear strike plans.

- US, Russia, France, Britain various degree of counter-force strategy with weapons on alert.
- China, India have no-first-use strategy but possibly increasing readiness.
- Pakistan lowering threshold with tactical weapons.

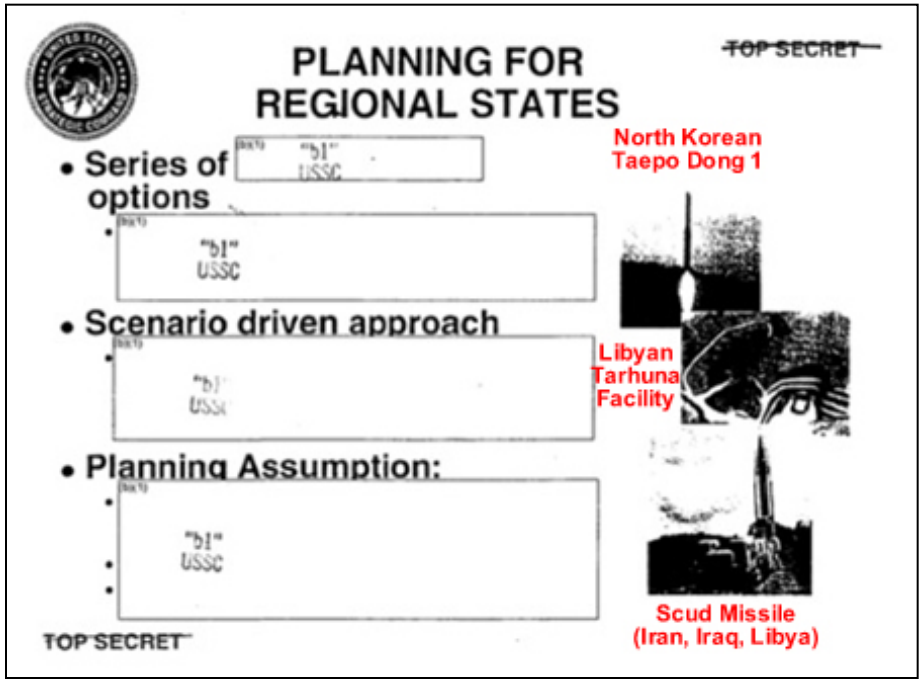
Prominence of nuclear weapons in limited, regional scenarios is increasing.

- US emphasizing regional in modernization programs and operations.
- Russia using explicit threats of use, modernizing short/medium-range weapons.
- Pakistan fielding tactical nuclear weapons.

Refinement of weapons to increase accuracy and reduce radioactive fallout.

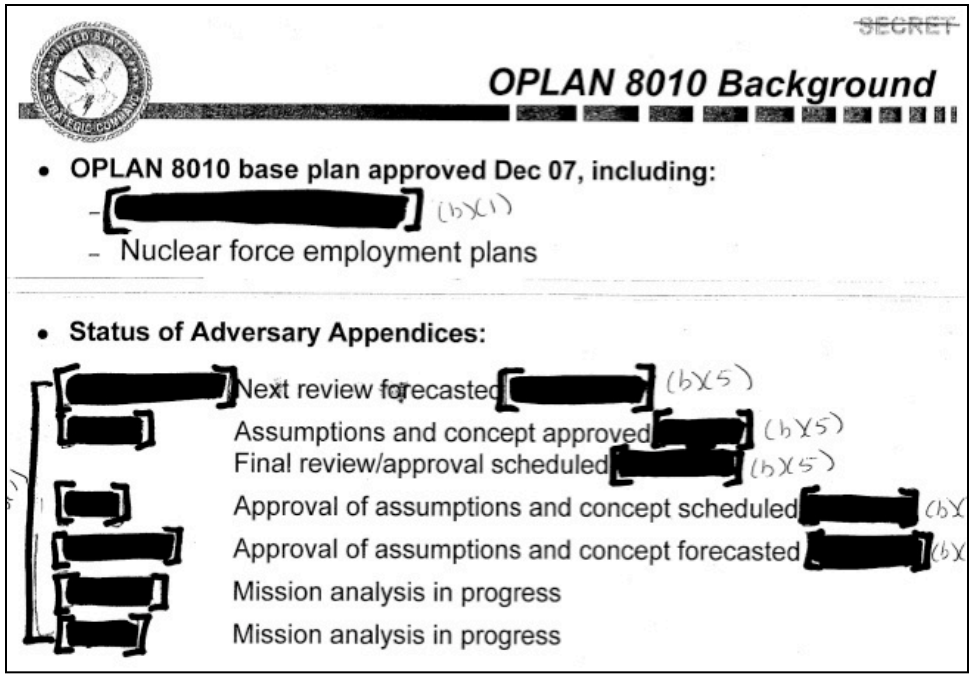
- Most modernization programs seek to increase attack accuracy and efficiency.
- US has strategy to build lower-yield weapons to reduce fallout of attacks.
- Russia replacing some Soviet-era warheads with lower yields.

Mission: War Planning and Trends (US example)



- Proliferation concern and 9/11 attacks triggered broadening of not only conventional but also nuclear planning to "regional states" armed with WMD
- Terminology changed from deterring "nuclear" adversaries to deterring "WMD" adversaries
- OPLAN 8044 Revision 03 included executable strike options against regional proliferators
- Based on NSPD-14 (2002)
- Effect: mission proliferation (do more with less); plan more complex

Mission: War Planning and Trends (US example)



Source: STRATCOM OPLAN 8010 briefing slide obtained by FAS under FOIA

- OPLAN 8010-12 (July 2012): Strategic Deterrence and Force Employment.
- Includes four types of nuclear attack options:
  - Basic Attack Options (BAOs).
  - Selective Attack Options (SAOs).
  - Emergency Response Options (EROs).
  - Directed/Adaptive Planning Capability Options.
- There are no longer Major Attack Options (MAOs) in the strategic war plan.
- Directed against six adversaries: Russia, China, North Korea, Iran, Syria and 9/11-type WMD scenario (Iran has probably been dropped).
- Broader plan than SIOP; includes conventional, cyber, missile defense.
- Geographic commands (EUCOM/PACOM) also have regional nuclear plans.

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Mission: War Planning and Trends (Others)

Russia: Has weapons on alert but more basic strategic war plan than US. Greater reliance on non-strategic nuclear weapons to compensate for less effective conventional forces. Occasional direct nuclear threats. Rumored increased role of limited use ("escalate-to-deescalate") but other says rumors exaggerated.

China: No-first-use, counter-attack strategy. Increasing weapons accuracy and responsiveness. Discussing scenarios for when weapons should be used and how soon. No official change.

France: Has weapons on alert. Has adjusted warhead loading on submarines to allow potential use of more limited use against regional adversaries. Increasing range and accuracy of weapons.

Britain: Has weapons on alert. Has reduced warhead loading but is upgrading with more efficient US weapons technologies (warhead fuze).

Pakistan: Fielding tactical nuclear weapons intended for use in scenarios short of strategic weapons.

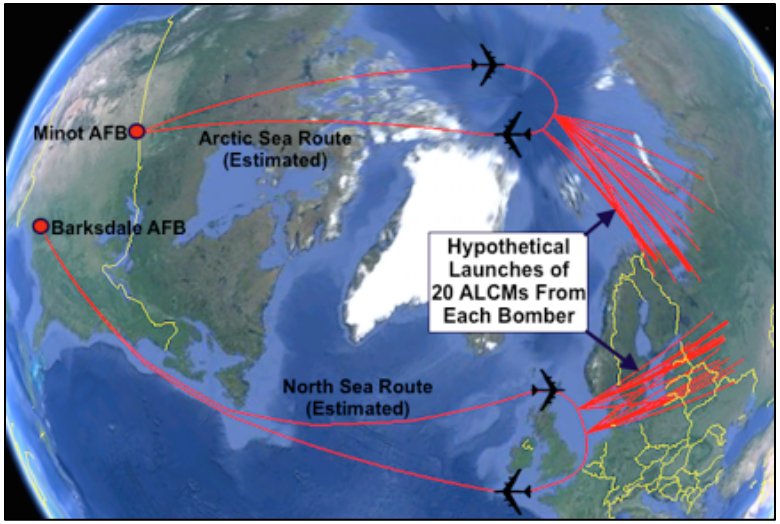
India: Developing missiles that are capable of launching quicker.

Israel: Possible fielding sea-based cruise missiles (unclear).

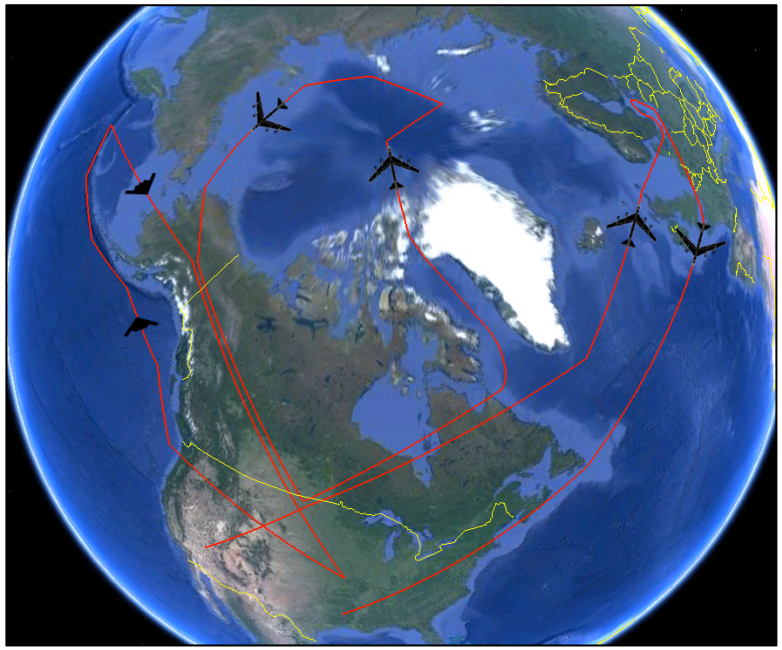
North Korea: Strategy unclear but frequently issues threats. Developing mobile weapons and missile that can be launched more quickly.

Mission: War Planning and Trends

US and Russia have increased prominence of nuclear-capable bomber operations in recent years. Russia with flights around Europe and Asia and off United States. US has reinstated polar exercises, increased Northern Europe and Pacific operations, activated OPLAN for EUCOM



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.

New and Resurgent Dangers from Nuclear Weapons

Management of the US Nuclear Arsenal and US Government Capacity on Arms Control and Nonproliferation

- Risk of nuclear weapons use somewhere in the next four years: How will the Trump administration manage a crisis involving nuclear weapons?
- Shift from zero nuclear weapons as a US policy goal
- Expansion of US nuclear weapons modernization - new nuclear weapons and new nuclear missions
- US funding for arms control and nonproliferation programs at risk, including for the CTBTO; potential for a return to explosive nuclear testing
- Missile defense issues and NATO nuclear weapons policy

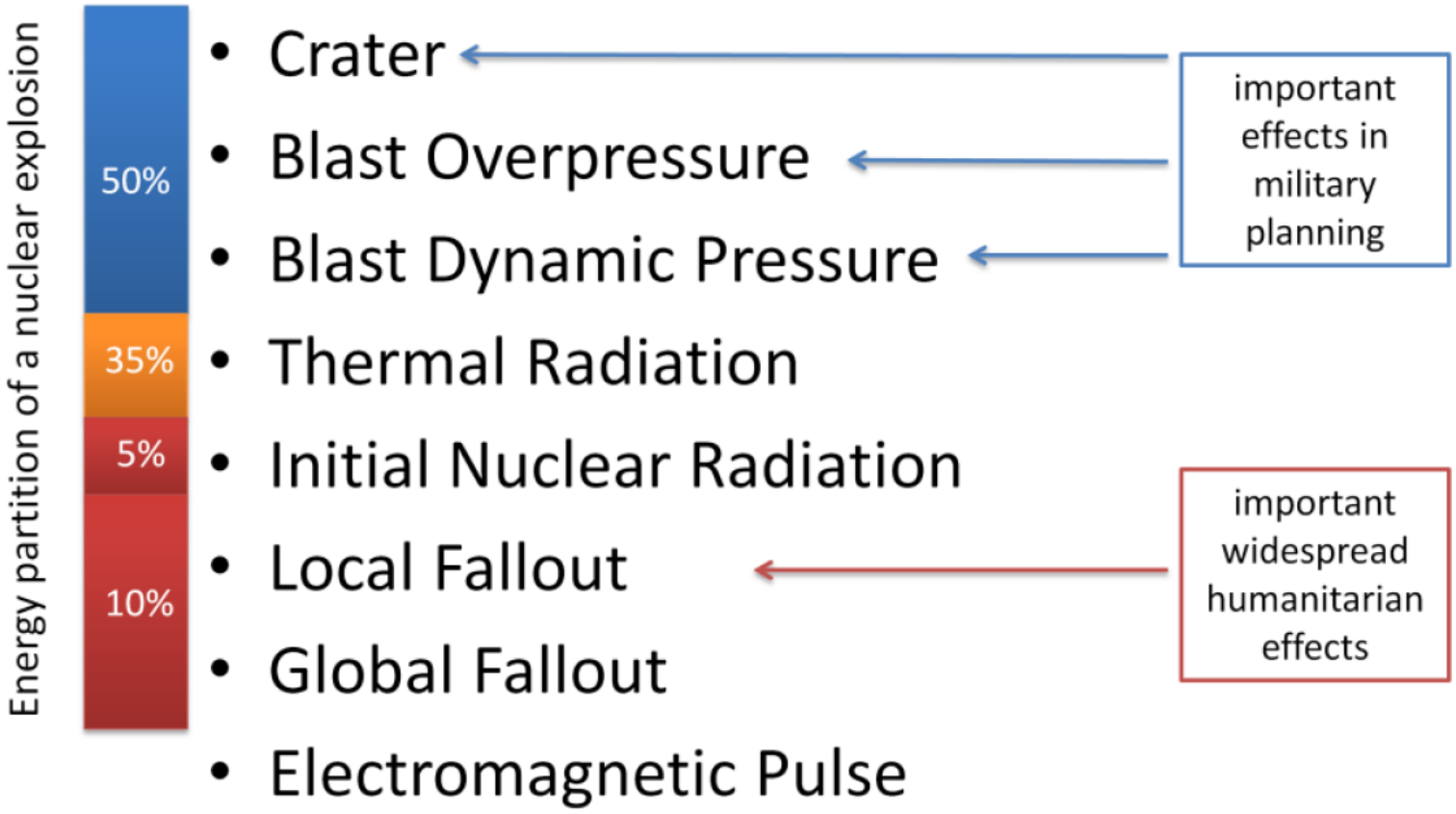
Arms Control Work by the United States and Russia

- Withdrawal from New START/withdrawal from INF
- Strategic stability talks - extending the START process

Regional Nuclear Threats: Asia and the Middle East

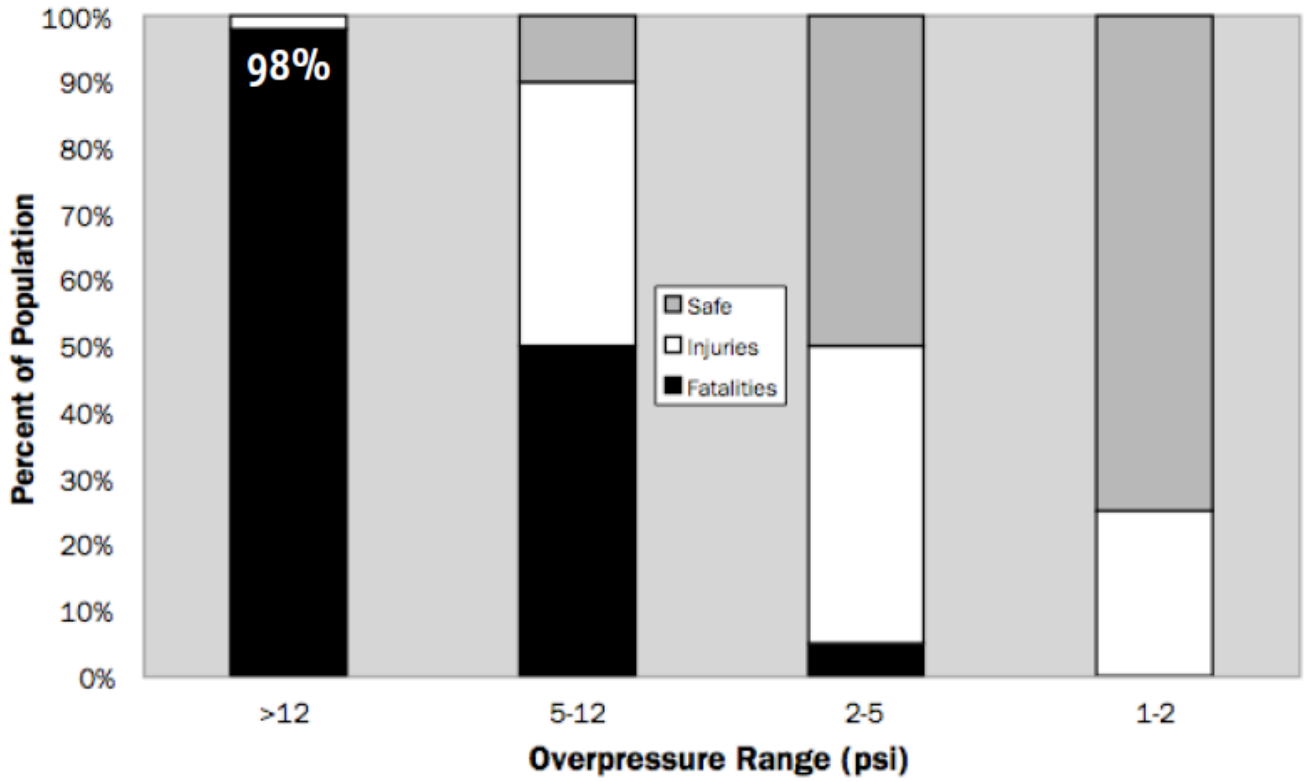
- Iran and the future of the JCPOA
- Threat of nuclear conflict on the Korean peninsula
- Danger of nuclear war between Indian and Pakistan

Effects of a Nuclear Explosion

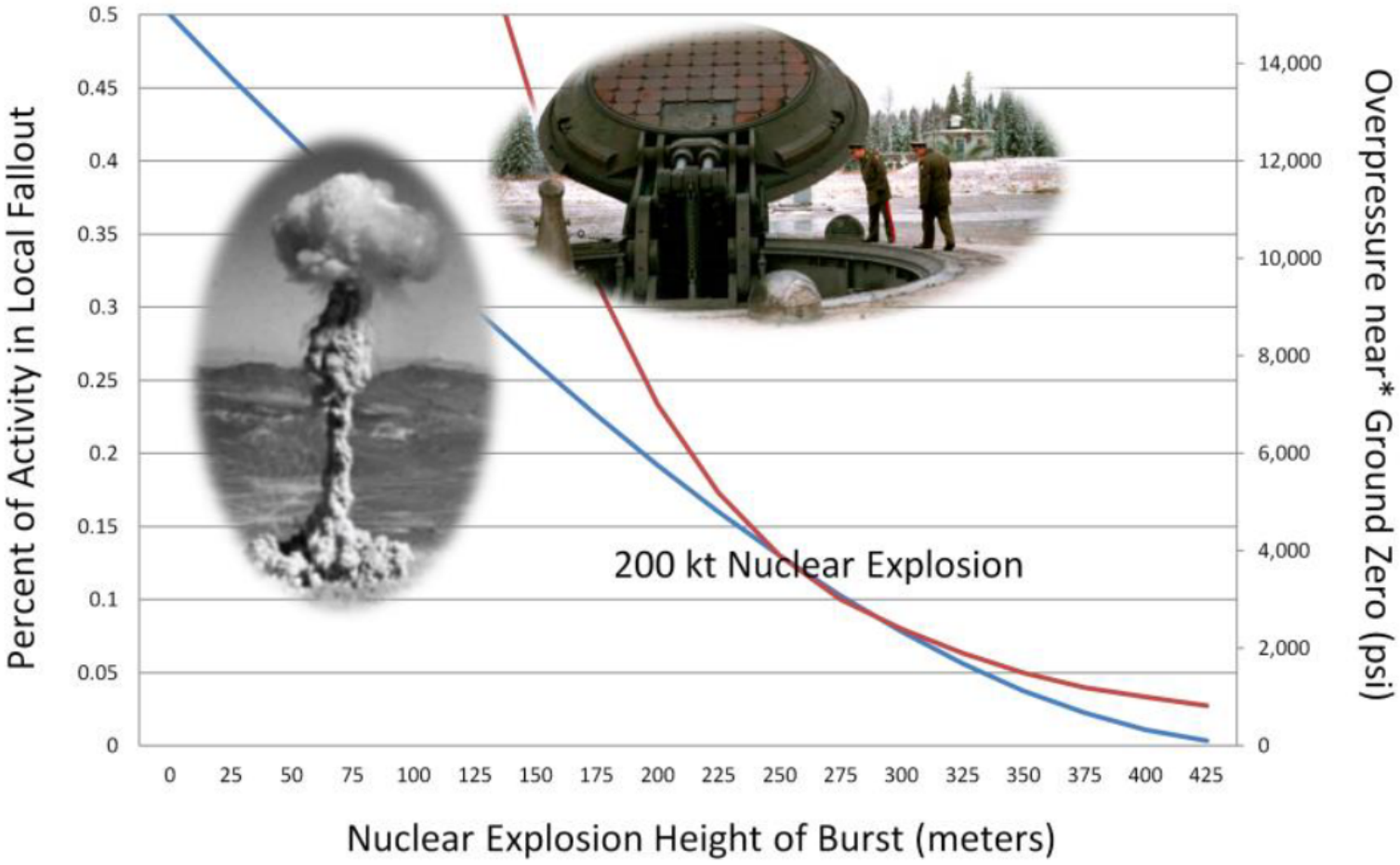


Nuclear Targeting: Cities

Percentage of Population Killed and Injured as a Function of Peak Overpressure



Correlation Between Height of Burst and Nuclear Effects



Three Basic Levels of Nuclear Targeting and Nuclear Conflict:

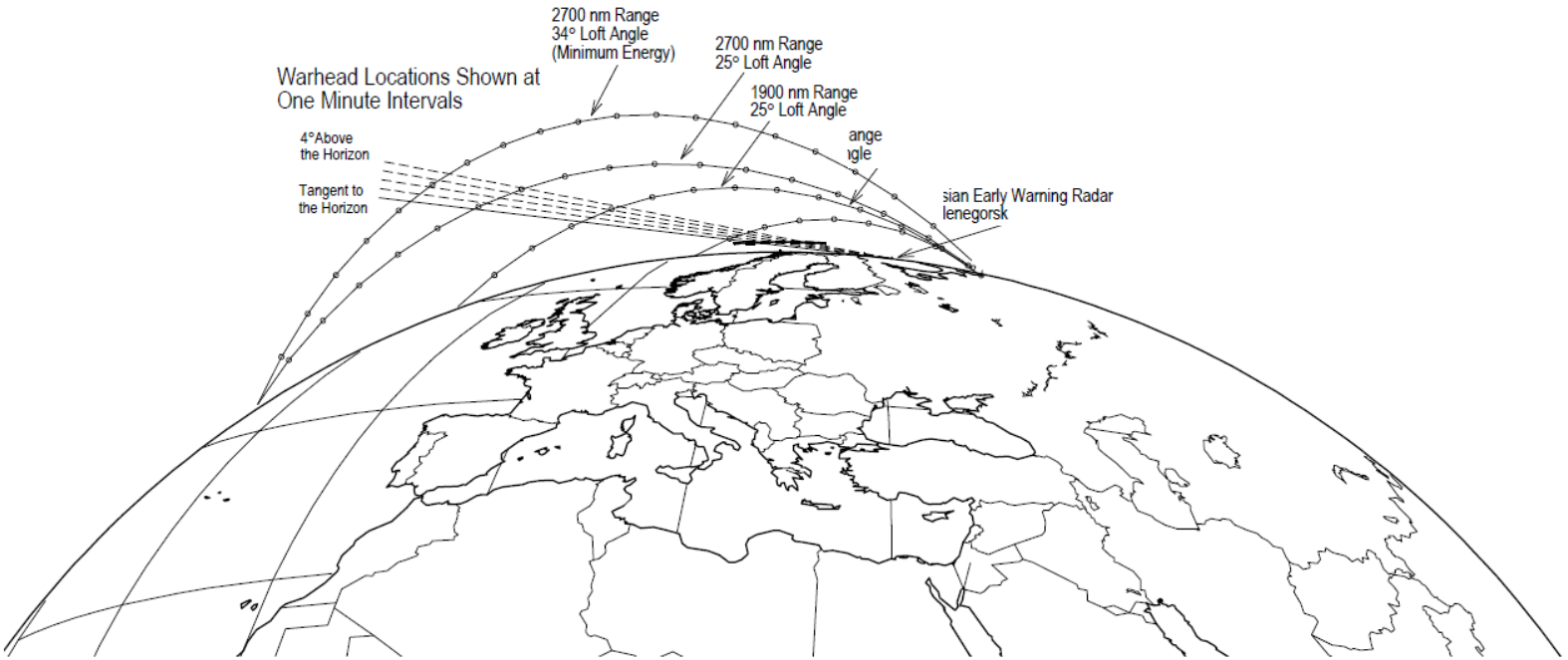
Level 1. Countries target each other's non-strategic targets with nuclear weapons – for example: troop formations, military garrisons, conventional missile and air bases, conventional naval bases, missile defense systems, nuclear weapons production facilities or *tactical nuclear weapons sites:* escalation; potential for fallout on population centers.

Level 2. Countries target each other's strategic nuclear weapons deterrent, including command, control and communications targets: severe escalation, targets in cities.

Level 3. Countries target each others cities directly.

Major themes: Nuclear War Planning; Nuclear Targeting; Command and Control of Nuclear Forces; Prompt Launch; Delegation

Line-of-Sight Constraints Associated with Early Warning Radars



(Graphics by Theodore Postol)

Time Needed to Carry Out Basic Nuclear Weapons Launch-Operations

Time for attacking missiles to rise over the horizon into the line-of-sight of early warning radars	1 minute
Time for radars to detect, track, and characterize detected targets, and to estimate the size and direction of motion of targets	1 minute
Military and civil command conference to determine response	1 to 3 minutes
Time for command and unit elements of silo-based forces to encode, transmit, receive, decode, and authenticate a launch order	2 to 4 minute
Time for missile crews to go through full launch procedures	1 to 3 minutes
Time for launched missile to reach a safe distance from its launch-silo	1 minute
Total time consumed in unavoidable and essential operations	7 to 13 minutes

Findings and conclusions of recent study of warhead fuze modernizations in the US arsenal:

How US nuclear force modernization is undermining strategic stability: The burst-height compensating super-fuze

Hans M. Kristensen
Matthew McKinzie
Theodore A. Postol

http://thebulletin.org/how-us-nuclear-force-modernization-undermining-strategic-stability-burst-height-compensating-super10578

Bulletin of the Atomic Scientists

Increased capability comes from modification of fuze rather than nuclear warhead itself

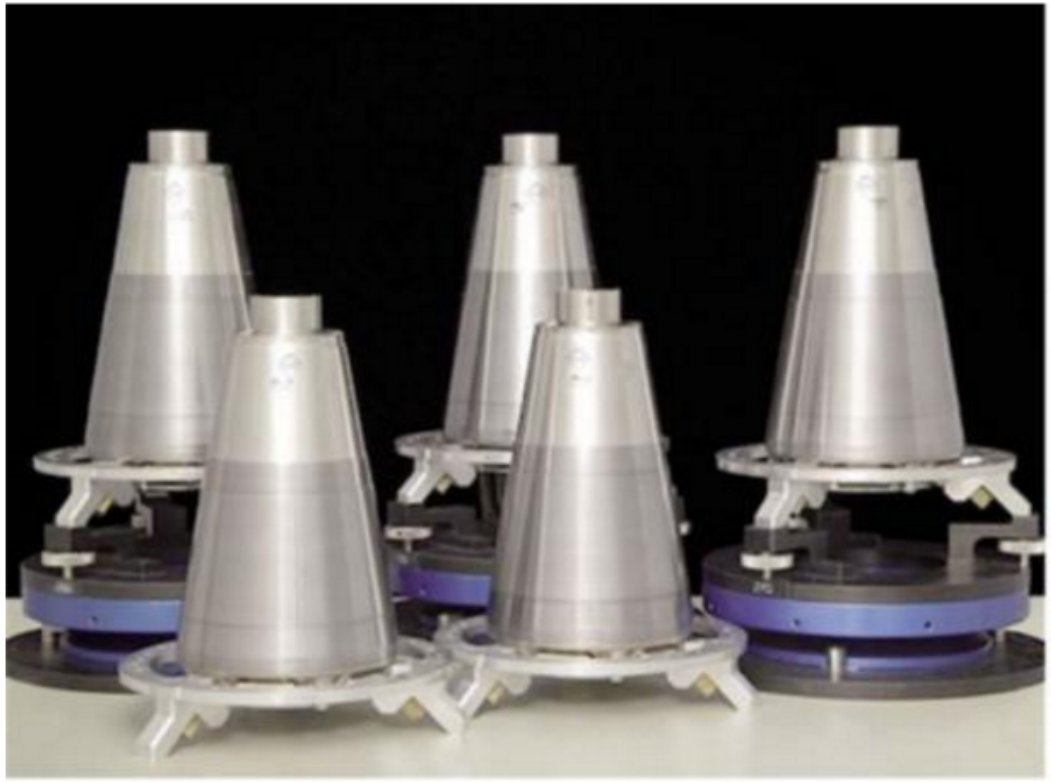


FIGURE 6. *The first of the new MC4700 AF&F super-fuzes for the W76-1 were completed at the Kansas City Plant in 2007. Delivery of the W76-1/Mk4A warhead to the Navy began in 2009.*

How the old warhead would perform:

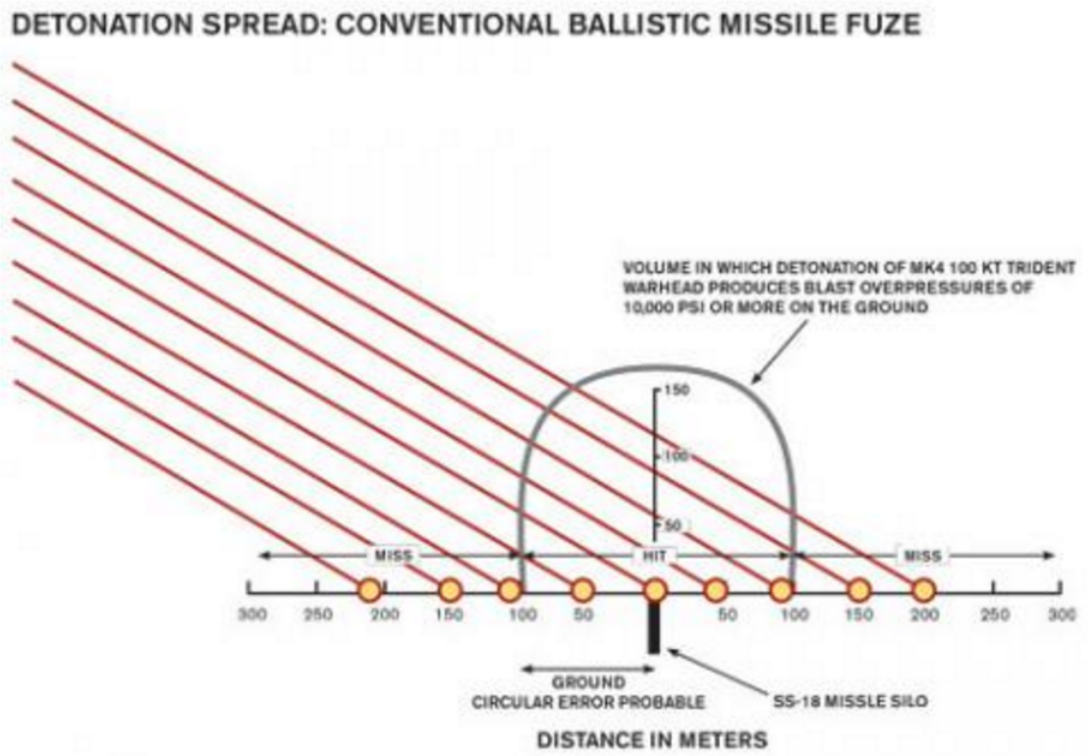
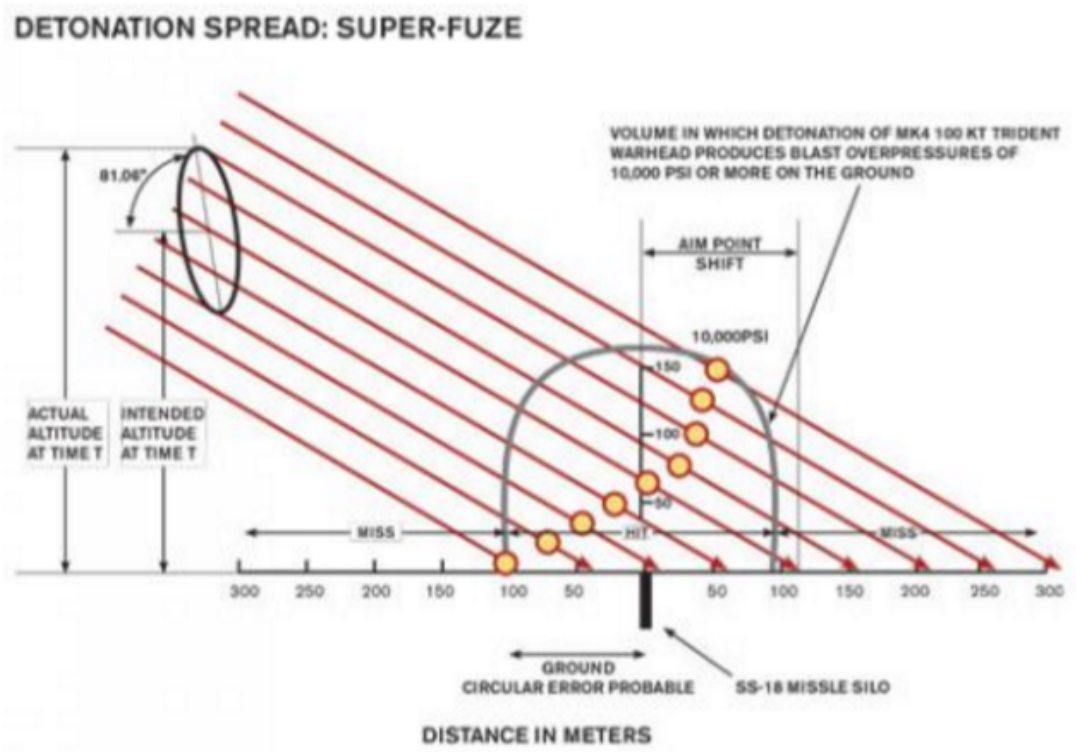


FIGURE 2. *Missiles with fixed height-of-burst fuzes can overshoot or undershoot the "lethal volume" (shown here by a gray, dome-shaped line), limiting their ability to destroy hardened targets.*



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How the new warhead performs:

FIGURE 3. *The tilted ellipse in the left upper corner of Figure 3 depicts the spatial distribution of incoming warheads at the time the super-fuze measures its altitude. In this particular case, the orientation of the ellipsoid indicates that the errors leading to a miss at the target are mostly due to a mix of small discrepancies in the velocity and direction of the warheads when they are deployed from the rocket upper stage outside the atmosphere. The orientation and dimensions of this ellipse are well known to a ballistic missile designer, so the altitude measurement can provide information that leads to an estimate of the distance from the lethal volume above the target.*

History and Status of Super-Fuze Development:

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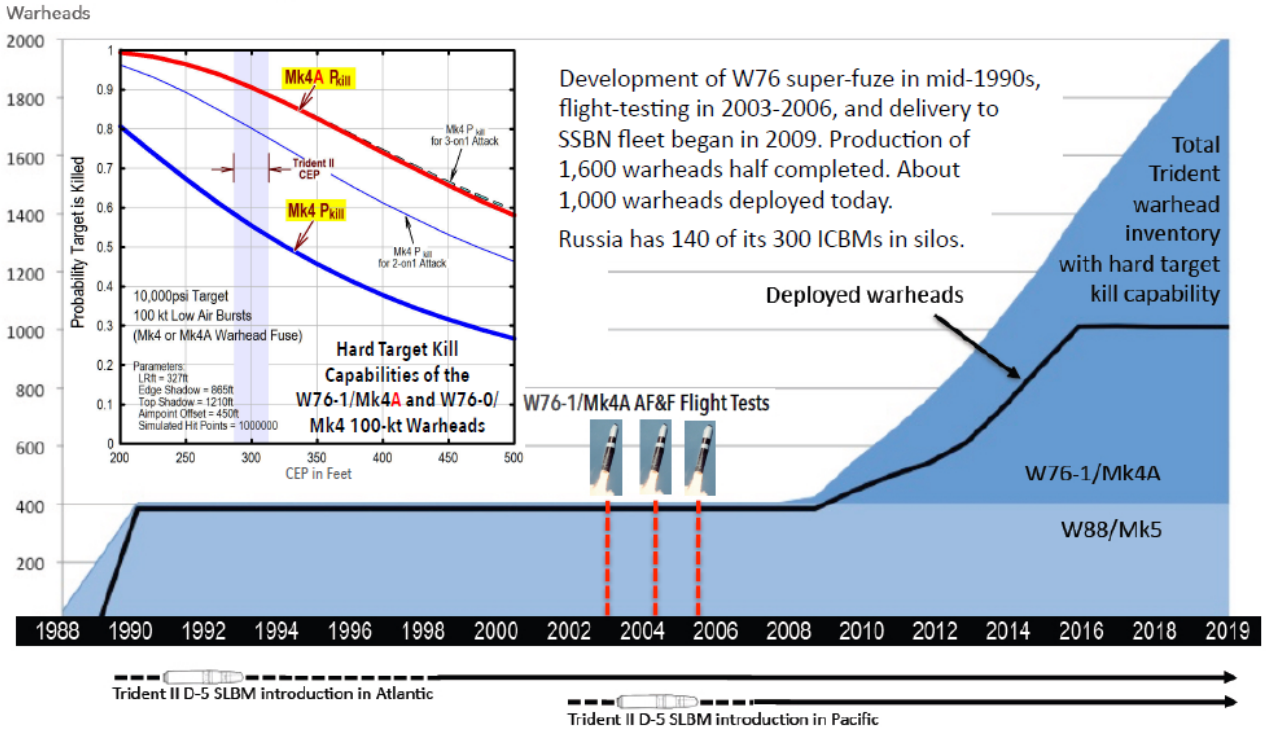
Hard Target Kill Warheads on Ohio-Class Missile Submarines



Russian Reactions

http://russiancouncil.ru/en/analytics-and-comments/analytics/US-Nuclear-Warheads-Scary-Modernization/

Viktor Yesin

***Colonel General Viktor Yesin (ret.)**, candidate of military sciences and Russian International Affairs Council expert with*

The information published by U.S. experts that the Americans are carrying out profound modernization of their nuclear munitions in order to improving their effectiveness is **nothing new to the Russian military and political leadership**. This circumstance has been taken into account in forming and implementing the Russian defensive plan. Russia is taking effective measures to maintain missile and nuclear parity with the United States, both in terms of perfecting its strategic offensive weapons and in terms of developing the capability of its missile defence system, including the missile warning systems. In particular, in 2016 Russia completed the programme to establish complete radar coverage of the country's borders, with a detection range capability of up to 6,000 kilometres for ballistic targets. Russia has also started deploying a new uniform space-based detection and combat command system, which is expected to be fully deployed by 2020.

With all these factors taken into consideration, it can be argued that **Russia has the capability to promptly detect a nuclear missile attack and respond appropriately**. As has been repeatedly stated at the highest military and political level, the missiles currently deployed as part of Russia's strategic nuclear forces are capable of overcoming the missile defences of any enemy in the foreseeable future. To ensure continued confidence in the reliability of Russia's strategic nuclear forces and its missile defence systems, relevant funds are planned to be allocated for research and development as part of the state arms programme for 2018–2025, which is currently under development. These research and development efforts will allow Russia to have weapons systems on a par with the best foreign equivalents.

Russian Reactions

http://russiancouncil.ru/en/analytics-and-comments/analytics/US-Nuclear-Warheads-Scary-Modernization/

Vladimir Dvorkin

***Major General Vladimir Dvorkin**, chief researcher at the Centre for International Security at Primakov National Research Institute of World Economy and International Relations under the Russian Academy of Sciences and Russian International Affairs Council expert*

First. W76 warheads have been in service with Trident II missiles for over 30 years now, so, from the point of view of safety and reliability, it is not surprising that they are being upgraded. The fusing method that is being implemented has been known for around 20 years. In essence, based on the target miss estimate, at the end of the active trajectory leg the missile selects the warhead detonation method: if the missile is undershooting, the warhead is detonated by the contact fuse on impact with the surface; if it is overshooting, the warhead is detonated mid-air at the closest point to the target. The United States is retrofitting virtually all its ICBM and SLBM warheads this way as part of upgrade programmes, and Russia is most likely doing the same.

Second. The W76 has a yield of around 100 kilotons and is, therefore, classed as a light warhead. Such warheads are not intended to be used against hard targets such as missile silos, and will not be used for that purpose, despite the relatively insignificant improvement in their killing accuracy thanks to the upgraded fusing method. It would be much more efficient to engage hard targets, such as missile silos, with W88 warheads, which yield over 400 kilotons and are also used with Trident II SLBMs. The warheads of Minuteman III ICBMs also fit the bill. Therefore, the United States will not "free up" a significant portion of its arsenal for use against other targets of the potential enemy.

Third. There is no need for any measures to be taken in response to the W76 modernization programme. Russia follows its own schedule for replacing obsolete weapons systems within its strategic nuclear forces, and is introducing new strategic systems in line with the New START treaty, which ensures guaranteed nuclear deterrence.

Fourth. The temporary incomplete capability of the Russian space-based missile warning system component would in no way affect the retaliatory strike capability, seeing as the decision to launch such a strike may just as well be based on information from the second, radar-based missile warning tier, which Russia has no problems with.

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Conclusions and Implications For Strategic Stability

Despite US policy not to add new military capabilities to nuclear weapons during life-extension programs, all life-extension programs appear to do so anyway.

The new hard-target capability of the W76-1/Mk4A significantly increases the capability against Russian and Chinese hard and deeply buried targets.

Unlike during the Cold War, most US hard target kill capability is now on SSBNs that can put more warheads on target faster than ICBMs.

Pursuit of increased accuracy, enhanced hard target kill capability, stealthy cruise missiles and bombers, lower-yield options to reduce radioactive fallout, and more widely distribution of enhanced flexible strike options on aircraft, show a nuclear posture that appears to look beyond basic deterrence in pursuit of warfighting and supremacy.

This, combined with Russia's and China's lack of effective space-based early-warning systems, undermines strategic stability and contradicts US policy to maintain it.

"...are we doing the right things to encourage strategic stability?"
Admiral Cecil Haney, Commander, STRATCOM, July 29, 2015

"The United States seeks to maintain strategic stability with Russia. Consistent with the objective of maintaining an effective deterrent posture, the United States seeks to improve strategic stability by demonstrating that it is not our intent to negate Russia's strategic nuclear deterrent, or to destabilize the strategic military relationship with Russia."
DOD, Nuclear Employment Strategy Report, June 2013, p, 3.

"Stability in the nuclear relationship between the United States and the Russian Federation depends upon the assured capability of each side to deliver a sufficient number of nuclear warheads to inflict unacceptable damage on the other side, even with an opponent attempting a disarming first strike."
DOD/DNI. Report to Congress on Russian Strategic Forces, 2012, p. 5.

QUESTIONS?

For additional information:

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Natural Resources Defense Council (https://www.nrdc.org)