

FAS

FEDERATION OF AMERICAN SCIENTISTS

www.fas.org

World Nuclear Arsenals, Naval Nuclear Weapons, and Challenges for Nuclear Arms Control

Hans M. Kristensen
Nuclear Information Project
Federation of American Scientists
hkristensen@fas.org

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

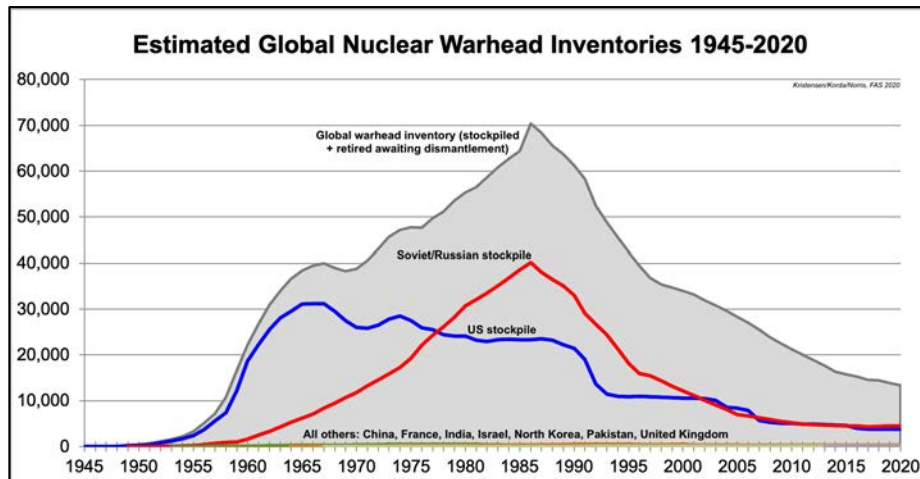
Briefing to the Illinois University Symposium:
75 Years After Hiroshima: A New Nuclear Arms Race?

November 4, 2020

Overview

1. Status of world nuclear forces
2. Focus on naval nuclear forces: Is there a resurgent role of sea-based nuclear capabilities in national security strategies and could it undermine the generally-recognized strategic stabilizing effect of submarine-launched ballistic missiles?
3. Strategy and stability
4. Arms control challenges

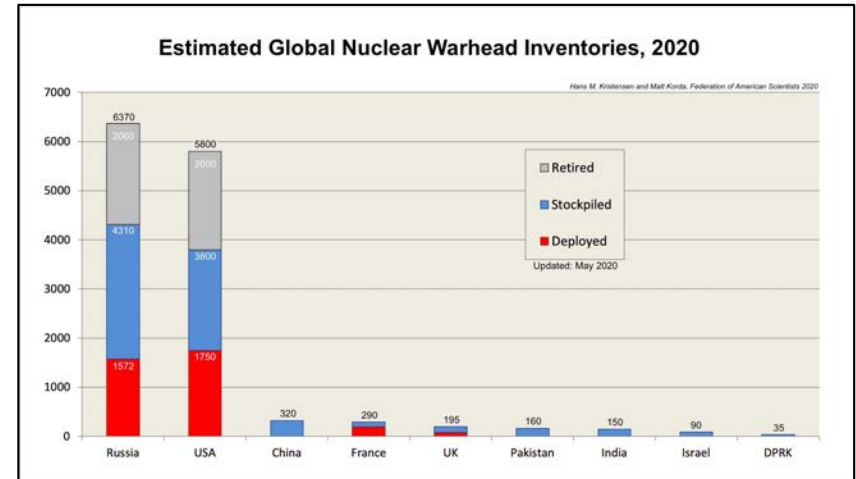
1. Status of world nuclear forces



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

- 55,000 warhead stockpile reduction
- 56,900 warheads dismantled
- 3,900 retired warheads currently awaiting dismantlement

Overall trend: pace of reductions slowing, everyone is modernizing, increasing role, and reaffirming importance of nuclear weapons



Today: 9,500 warheads in stockpiles (13,400 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, North Korea

Steady: France, Israel

2. Naval nuclear weapons

Significant reduction since Cold War both in overall numbers and types

Yet, today's naval arsenal constitutes approximately 30% of global stockpiles, up from 24% at end of Cold War

6 (possibly 7) of world's 9 nuclear-armed states possess naval nuclear weapons. Others are developing

Significant differences in countries' arsenals

Estimated Naval Nuclear Weapons, 1990 and 2020*

Country	1990	2019
United States	7,524	1,920
Soviet/Russia	6,410	1,540 ^a
France	440	250
Britain	125	200
China	12 ^b	48 ^b
India	0	12
Pakistan	0	0 ^c
Israel	0	(5-10) ^d
North Korea	0	0
Total	14,511	3,980

* Estimates based on Nuclear Notebooks, SIPRI Yearbooks, and authors' estimates.

^a Russia's 1,540 naval nuclear weapons include 720 strategic and 820 tactical.

^b Two more SSBNs are fitting out.

^c Pakistan is developing the Babur-3 cruise missile for its submarines.

^d Israel might have a small inventory of submarine-launched cruise missiles.

2. Naval nuclear weapons (Russia)

Arsenal almost evenly split between strategic and non-strategic weapons

Mainly Soviet-era SSBNs with upgraded missiles

New SSBN class (Borei) is fielding with Bulava missile; will replace all Soviet-era SSBNs

Non-strategic arsenal large and diverse: cruise missiles (anti-ship, land-attack), air-defense, anti-submarine rockets, torpedoes, mines, coastal defense

New types in development: long-range torpedo, hypersonic (possibly nuclear)

Strategy focused on mix of battlefield and deterrence



2. Naval nuclear weapons (USA)

Entirely SSBN-based missiles and warheads

All SSBNs carry Trident II D5LE missile

Life-extended W76-1/Mk4A has improved target kill capability

New low-yield W76-2 warhead deployed in late-2019; would entail tactical use of strategic fast-flying missile

All non-strategic naval nuclear weapons were scrapped between 1988 and 2010

Plan to develop new sea-launched cruise missile

FAS Federation of American Scientists

ABOUT FAS ISSUES EXPERTS PUBLICATIONS BLOGS PRESS CENTER CONTACT US

FAS Strategic Security Nuclear Weapons US Deploys New Low-Yield Nuclear...

US Deploys New Low-Yield Nuclear Submarine Warhead

Posted on Jan.29, 2020 in [Nuclear Weapons](#), [Russia](#), [United States](#) by [Hans M. Kristensen](#)

By William M. Arkin* and Hans M. Kristensen



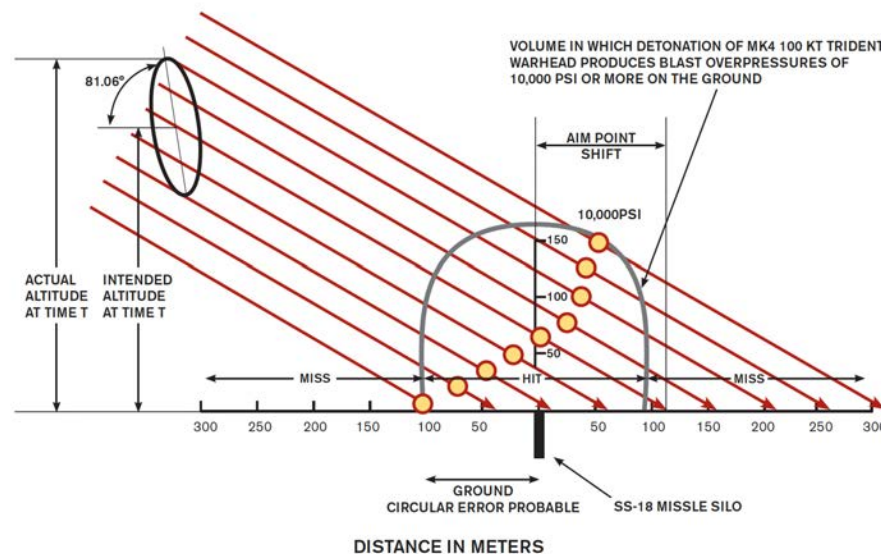
The USS Tennessee (SSBN-734) at sea. The Tennessee is believed to have deployed on an operational patrol in late 2019, the first SSBN to deploy with new low-yield W76-2 warhead. (Picture: U.S. Navy)

The US Navy has now deployed the new W76-2 low-yield Trident submarine warhead. The first ballistic missile submarine scheduled to deploy with the new warhead was the USS Tennessee (SSBN-734), which deployed from Kings Bay Submarine Base in Georgia during the final weeks of 2019 for a deterrent patrol in the Atlantic Ocean.

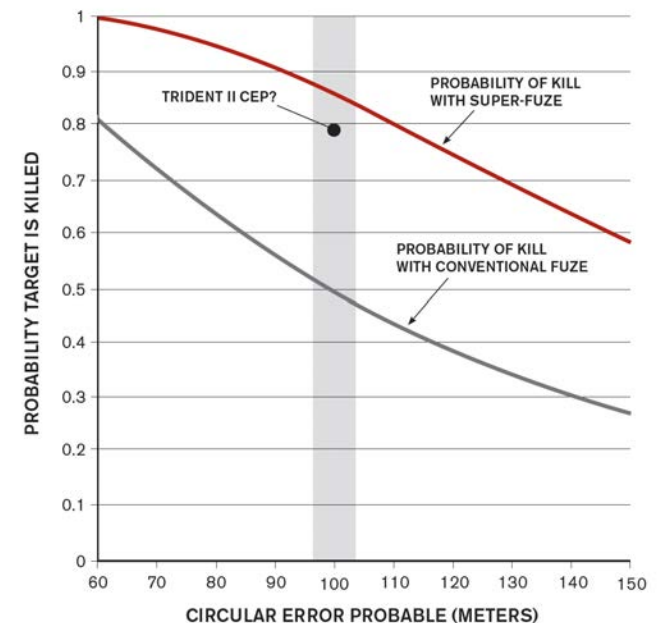
2. Naval nuclear weapons (USA)

Fuze upgrade of W76-1/Mk4A has improved target kill capability and provided hard-target kill capability to entire SSBN force

DETONATION SPREAD: SUPER-FUZE



100 KT LOW AIR-BURSTS, 10,000 PSI TARGET (MK4 OR MK 4A WARHEAD FUZE)



Source: Theodore A. Postol, Matthew McKinzie, Hans M. Kristensen, "How Nuclear Force Modernization is Undermining Strategic Stability: The Burst Height Compensation Fuze," Bulletin of the Atomic Scientists, March 2017, <https://thebulletin.org/2017/03/how-us-nuclear-force-modernization-is-undermining-strategic-stability-the-burst-height-compensating-super-fuze/>

2. Naval nuclear weapons (Others)

China: Has fielded SSBN fleet with regional capability. Developing new SSBN with longer-range missile

France: Nearly entire arsenal is sea-based. Has fielded new SSBN and is upgrading missile. Is developing follow-on SSBN

Britain: Entire arsenal is sea-based. Is developing new SSBN that will carry US missile

India: Developing SSBN force

Pakistan: Developing sea-launched cruise missile

Israel: Subs might have sea-launched cruise missile

North Korea: Developing SSBN with missile



3. Strategy and challenges

SSBNs have traditionally been seen as stabilizing if they can't be detected: an invulnerable ultimate security

US is very confident it's SSBN is secure and adversaries would not be able to avoid a devastating retaliatory response to an attack

Stability depends on how secure SSBN is. US Maritime Strategy of 1980s tried to hold SSBNs at risk. Chinese SSBNs are noisy

Today US SSBNs are far more capable than in 1960s. Not just retaliatory but offensive role with full-range targeting capability

Tactical naval nuclear weapons have special escalation implications: because use at sea would have no civilian casualties, they might be seen as easier to use

Report on the Strategic Nuclear Forces of the Russian Federation Pursuant to Section 1240 of the National Defense Authorization Act for Fiscal Year 2012 (U)

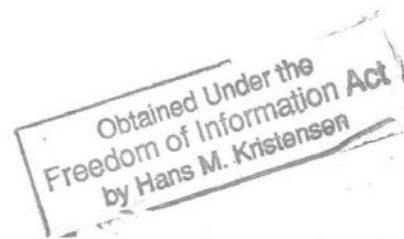
A. Introduction

B. Assessed Number of Russian Nuclear Forces

C. Options with Respect to the Size and Composition of Russian Nuclear Forces

D. Factors Likely to Influence the Number and Composition of Russian Nuclear Forces

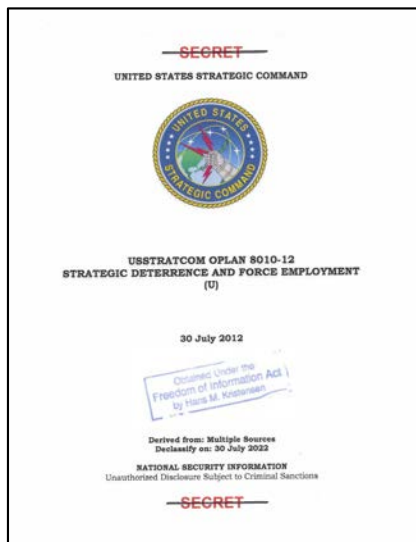
E. Effects on Strategic Stability



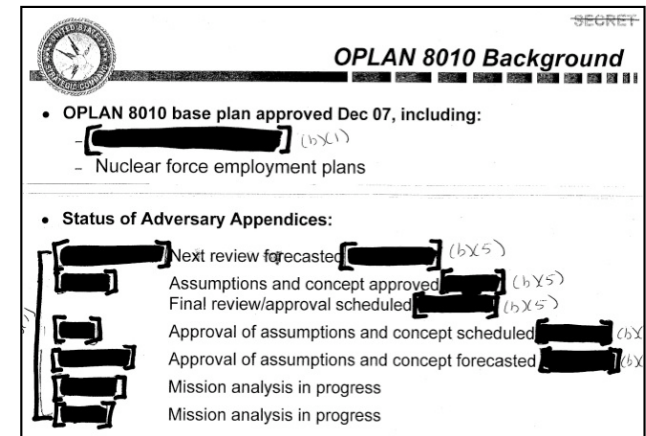
(U) The U.S. nuclear force structure, as articulated in the 2010 Nuclear Posture Review, has been designed to account for any possible adjustments in the Russian strategic force configurations that may be implemented in response to the New START Treaty. This includes Russian deployment of additional strategic warheads, which, even if significantly above the New START Treaty limits, would have little to no effect on the U.S. assured second-strike capabilities that underwrite our strategic deterrence posture. The Russian Federation, therefore, 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, primarily because of the inherent survivability of the planned U.S. strategic force structure, particularly the OHIO-class ballistic missile submarines, a number of which are at sea at any given time. The United States also would be capable of uploading additional warheads on all three legs of its strategic triad in response to a Russian breakout scenario.

~~SECRET//NOFORN~~

3. Strategy and challenges



- Strategic War Plan: Operations Plan (OPLAN) 8010-12
- Replaced SIOP (after OPLAN 8044 transition plan)
- STRATCOM “is changing the nation’s nuclear war plan from a single, large, integrated plan to a **family of plans** applicable in a **wider range of scenarios.**”
- Provides “**more flexible options** to assure allies, and dissuade, deter, and if necessary, defeat adversaries in a **wider range of contingencies.**”
- OPLAN 8010-12 is the nuclear employment portion (formerly SIOP) of OPLAN 8010 Base Plan, “a global deterrence plan” that represents “a significant step toward **integrating deterrence activities across government agencies and with Allied partners.**”
- Directed against six adversaries: Russia, China, North Korea, Iran and 9/11-type WMD scenario



- Includes four types of nuclear attack options:
 - Basic Attack Options (BAOs)
 - Selective Attack Options (SAOs)
 - Emergency Response Options (EROs)
 - Directed/Adaptive Planning Capability Options
- Strike options can range from one or a few to hundreds of warheads against:
 - Military forces (nuclear/conventional)
 - WMD infrastructure
 - Military and national leadership
 - War-supporting infrastructure

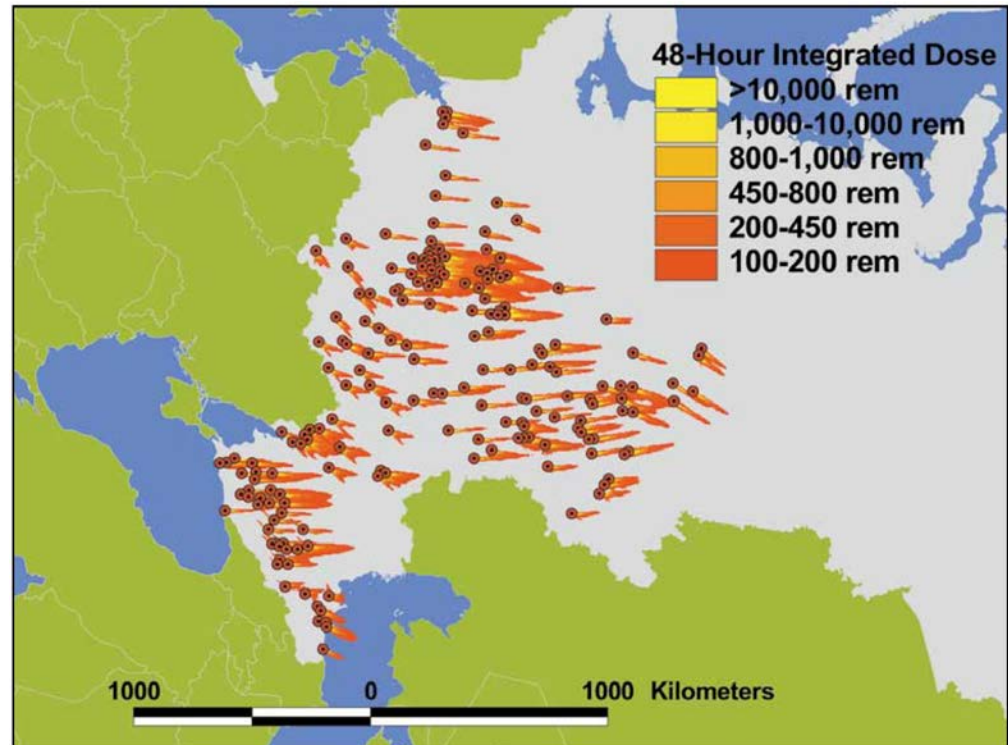
3. Strategy and challenges

Destructive capability of even a single SSBN is enormous.

A single US SSBN can deliver more explosive power than the explosive power in all the bombs dropped in World War II

One US SSBN at sea is the world's sixth-largest nuclear-power

US has 14 SSBNs and deploys 1,000 nuclear weapons on its subs



Source: Matthew McKinzie, et al., The US Nuclear War Plan: A Time For Change, NRDC, 2001, <https://www.nrdc.org/sites/default/files/us-nuclear-war-plan-report.pdf>

4. Arms control challenges

New START treaty limits overall strategic nuclear forces, but no sub-limits on naval (or other) forces

Both US and Russia declare arsenals and SSBN bases are subject to on-site inspections

New and different types (Russian's long-range torpedo) not covered by New START

No limits on non-strategic nuclear weapons

Many possible options for arms control...if there is the political will to make it happen

Potential Arms Control Measures For Sea-Based Nuclear Weapons

Type	Description
Numerical limits	Limit on missile launch tubes Limit on reentry-bodies Limit on total number of platforms
Operational norms	Don't harass, trail, or hunt SSBNs Don't deploy close to potential adversaries Don't launch more than two missiles during flight tests Don't surge large numbers of SSBNs
Confidence-building	Disclose which platforms and weapons have nuclear capability Disclose total numbers of platforms and weapons Notify of deployment from home base Load missiles in view of satellites Exchange test-launch telemetry Announce long-term force level plans Limit war-fighting mission Limit strategy to truly retaliatory second-strike role

FAS

FEDERATION OF AMERICAN SCIENTISTS

www.fas.org

QUESTIONS?