World Nuclear Arsenals, Modernization Programs, and Employment Doctrines and Policies

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Overview

- 1. Status and history of world nuclear forces
- 2. National arsenals and modernization programs
- 3. Doctrines & strategies
- 4. Weapons yields and collateral damage
- 5. "Great Power Competition" effects
- 6. Summary and conclusions

1. History and status of world nuclear forces



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

- 55,200 warhead stockpile reduction
- 56,900 warheads dismantled
- 4,000 retired warheads currently awaiting dismantlement

Trend: pace of reductions slowed, everyone is modernizing, new types, increasing role, reaffirmation of importance, indefinite possession



Today: 9,300+ warheads in stockpiles (13,400 if counting retired warheads awaiting dismantlement)

US and Russia possess 91% of global inventory; **each has more than 4 times more warheads than the rest of the world combined**: 18 times more than third-largest (China)

Decreasing: US, (Russia?), Britain Increasing: China, (Russia?) Pakistan, India, North Korea Steady: France, Israel

1. Comparisons

Stockpiles down to 1950s level...but that's where comparison ends:

1950s arsenals were mainly tactical weapons

2020s arsenals are mainly strategic

1950s strategic arsenals were inaccurate and with very high yield

2020s strategic arsenals are accurate with lower yield and many low-yield

There were no arms limits in 1950s

New START limits force structures and deployed launchers and warheads

People should stop comparing with Cold War







2. US arsenal overview

- DOD stockpile of 3,800 warheads (5,800 if including retired awaiting dismantlement)
- Arsenal organized in "quadrat" of launchers: SSBN, ICBM, bombers, fighters
- Less than half of stockpiled warheads are deployed
- About 900 warheads on alert
- Posture assumes significant upload in crisis
- Nearly all types of non-strategic nuclear weapons were unilaterally scrapped after end of Cold War
- New types of low-yield warheads in production or development
- Stockpile might increase in future
- Strategic and regional war plans integrate nuclear and conventional capabilities

Type/Designation	No.	Year deployed	Warheads x yield (kilotons)	Warheads (total available)
ICBMs				
LGM-30G Minuteman III				
Mk12A	200	1979	1-3 W78 x 335 (MIRV)	600 ^b
Mk21/SERV	200	2006 ^c	1 W87 x 300	200 ^d
Total	400 ^e			800 ^r
SLBMs				
UGM-133A Trident II D5/LE	240 ⁹			
Mk4A		2008 ^h	1-8 W76-1 x 90 (MIRV)	1,486'
Mk4A		2019	1-2 W76-2 x low (MIRV) ¹	50 ^k
Mk5		1990	1-8 W88 x 455 (MIRV)	384
Total	240			1,920'
Bombers				
B-52H Stratofortress	87/44 ^m	1961	ALCM/W80-1 x 5-150	528
B-2A Spirit	20/16	1994	B61-7 x 10-360/-11 x 400 B83-1 x low-1,200	322
Total	107/60 ⁿ			850°
Total strategic forces				3,570
Nonstrategic forces				
F-15E, F-16 DCA	n/a	1979	1-5 B61-3/-4 bombs x 0.3-170p	230
Total				230 ^q
Total stockpile				3,800
Deployed				1,750 ^r
Reserve (hedge and spares)				2,050
Retired, awaiting dismantlement				2,000
Total Inventory				5.800

2. US modernization

ICBM

- Minuteman III life-extension completed
- Enhanced warhead fuzes/W87-1 warhead planned
- GBSD (ICBM replacement) in development

SSBN / SLBM

- Trident II D5 SLBM life-extension underway
- SSBN replacement development (12 planned)
- Enhanced W76-1 warhead deployed
- Low-yield W76-2 warhead deployed
- W88-1 warhead life-extension development
- W93 warhead planned

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
- · Sea-launched cruise missile (SLCM) development

Infrastructure

- Uranium Processing Facility (secondaries) construction
- Plutonium production facilities (primaries) construction
- Nuclear command and control (networks, terminals, satellites)
- · Warhead surveillance/simulation facilities upgrades













US is **reducing** its overall arsenal but **increasing** types/capabilities of weapons

2. Russian arsenal overview

- Stockpile of 4,310 warheads (6,370 if including retired awaiting dismantlement)
- Arsenal organized in "Quadrat" of strategic launchers and wide range of non-strategic nuclear forces
- A little over one-third of stockpiled warheads are deployed
- Non-strategic warheads (mostly) in central storage
- About 1,000 warheads on alert
- Less upload capacity than USA but growing
- Large inventory (~1,870) of non-strategic warhead to compensate for inferior conventional forces
- US DIA projects overall stockpile "likely to grow significantly" over next decade mainly due to expected increase in number of non-strategic nuclear weapons
- Russia strike plans thought to be more basic and less nuanced than US plans

Type/name	Russian designation	Launchers	Year deployed	Warheads x yield (kilotons)	Total warheads
Strategic offensive weapons					
ICRM-					
ICBMS	06 2014	45	1000	10 500 (000 (1000))	4003
SS-18 Mb Satan	RS-20V	40	1988	10 X 500/800 (MIKV)	460
SS-19 M3 Stiletto	100NUTTH)	0	1980	6 X 400 (MIKV)	0-
SS-19 M4	? (Avangard)	2	2019	1 x HGV	2
SS-25 Sickle	RS-12M (Topol)	36	1988	1 x 800	36
SS-27 Mod 1 (mobile)	RS-12M1 (Topol-M)	18	2006	1 x 800?	18
SS-27 Mod 1 (silo)	RS-12M2 (Topol-M)	60	1997	1 x 800	60
SS-27 Mod 2 (mobile)	RS-24 (Yars)	126	2010	4 x 100? (MIRV)	504°
SS-27 Mod 2 (silo)	RS-24 (Yars)	14	2014	4 x 100? (MIRV)	56
SS-X-28 (mobile)	RS-26 (Yars-M)		17	4 x 100? (MIRV)	~
SS-X-29 (silo)	RS-28 (Sarmat)	-	(2020)	10 x 500? (MIRV)	-
Subtotal			302		1136 ^d
SLBMs					
SS-N-18 M1 Stingray	RSM-50	1/16	1978	3 x 50 (MIRV)	48°
SS-N-23 M1	RSM-54 (Sineva)	6/96	2007	4 x 100 (MIRV) ^f	3849
SS-N-32	RSM-56 (Bulava)	3/48	2014	6 x 100 (MIRV)	288 ^h
Subtotal	han be (band)		10/160		720
Bombers/weapons					
Bear-H	Tu-95 MS	21/30	1984	6-16 x AS-15A ALCMs	196
Bear-H Mod	Tu-95 MSM	18/20	2015	14 x AS-23B ALCMs	252
Blackjack	Tu-160	11/13	1987	12 x AS-15B ALCMs, or AS-23B, bombs	132
Subtotal		50/68 ^k			580 ¹
Subtotal strategic offensive forces		530 ^m			~2,436 ⁿ
Nonstrategic and defensive weapons					
ABM/Air/Coastal defense					
SA-20/SA-21	S-300/S-400	~1000	1992/2007	1 x low	~290
Gazelle	53T6	68	1986	1 x 10	68°
SSC-1B Sepal	Redut	8 ^p	1973	1 x 350	4
SSC-5 Stooge (SS-N-26)	K-300P/3M-55	48	2015	(1 x 10) ^q	20
Land-based air					
Bombers/fighters (Tu-22M3/Su-24M/Su-34/ MiG-31K)		~300	1974/2006/1983	ASMs, bombs	~500
Ground-based					
SS-21 Scarab SSM	9K79. Tochka	-	1981	1 x 10-100	
SS-26 Stone SSM	9K720, Iskander-M	132	2005	1 x 10-100	70
SSC-7 GLCM	9M728		2005	1 4 1 4 1 4 4	
SSC-8 GLCM ⁵	9M729	201	2017	1 x 10-100	20
Naval	200122	20	2017	1 × 10-100	20
Submarines/surface shins/air (LACM_SLCM					
ASW, SAM, DB, torpedoes)					~900
Subtotal nonstrategic and defensive forces					~1,870
TOTAL STOCKPILE					~4,310
Deployed					1.572
Reserve					2,740
Datised washands avaiting dismantlement					2000
Retired warneads awaiting dismantlement					2,060
lotal inventory					6,370

2. Russian modernization

ICBM

- SS-27 Mod 2 (RS-24/Yars) replacing SS-25 and SS-19 at mobile and silo regiments
- SS-29 (RS-28/Sarmat) to replace SS-18 at Dombarovsky and Uzhur
- New warheads including hypersonic glide vehicle (Avangard) initially on SS-19
- Burevestnik (9М730, буревестник) nuclear-powered GLCM in early development

SSBN / SLBM

- Borei SSBN fielding (8 planned, possibly 10-12) with SS-N-32 SLBM
- Delta IV SSBN upgrade of SS-N-23 SLBM (Sineva/Layner)
- Status-6 (Poseidon, Посейдон) nuclear-powered UUV drone developing

Bombers

- Upgrades of Tu-160 (Blackjack) and Tu-95 (Bear)
- Production of enhanced Tu-160 planned
- New bomber (PAK PA) in development
- New AS-23B ALCM (Kh-102) fielding

Tactical

- Tu-22M3M (Backfire) upgrade with Kh-32 ASM
- Su-34 (Fullback) fielding (replacing Su-24)
- New attack sub and surface ships fielding
- SS-N-30A SLCM (3M14, Kalibr) fielding
- SS-N-26 SLCM (3M55, Yakhont) fielding
- SSC-8 GLCM (9M729) fielding
- SSM (SS-26, Iskander) fielding (replacing SS-21)
- SAM (S-400) fielding, S-500 developing
- ABM (A-135) upgrade (A-235) developing
- Kinzhal/MiG-31K ASBM developing/fielding
- Zircon hypersonic developing











Russia has been *reducing* its overall arsenal but US claims non-strategic arsenal is now **increasing**















2. Chinese arsenal overview

Chinese arsenal includes a few hundred nuclear warheads, mainly for use by land-based ballistic missiles (DOD says "low-200s" "operational)

MIRV added to one silo-based ICBM (DF-5B) and expected on some new mobile DF-41

SSBN fleet evolving in increasing

Bomber force has been reassigned nuclear mission (dormant for decades)

Overall stockpile slowly growing. DID projects "China is likely to at least double the size of its nuclear stockpile" over the next decade

Strategy based on "minimum" deterrent with nofirst-use and no attack against non-nuclear countries

Mix of nuclear and conventional version source of potential crisis instability

Table 10.6. Chinese nucl	ear forces, .	January 20	20		
Type/Chinese designation (US designation)	Launchers deployed	Year first deployed	Range (km) ^a	Warheads x yield	No. of warheads ^b
Land-based ballistic missiles ^c	188 ^d				172
DF-4 (CSS-3)	e	1980	5 500	1 x 3.3 Mt	
DF-5A (CSS-4 Mod 1)	10	1981	12000+	1 x 4-5 Mt	10
DF-5B (CSS-4 Mod 2)	10	2015	12000	3 x 200–300 kt MIRV	30
DF-5C (CSS-4 Mod 3)				MIRV	
DF-15 (CCS-6 Mod 1)		1994	600	[1 x 10–50 kt]	$\cdot f$
DF-21 (CSS-5 Mod 2/6)g	40	1996/2017	2 100	1 x 200–300 kt	40
DF-26 (CSS)	72	2017	>4000	1 x 200–300 kt	36
DF-31 (CSS-10 Mod 1)	8	2006	>7 000	1 x 200–300 kt	8
DF-31A/AG (CSS-10 Mod 2)	48	2007/2018	>11 200	1 x 200–300 kt	48
DF-41 (CSS-X-20)		[2020] ^h	>12 000	3 x 200–300 kt MIRV	
Sea-based ballistic missiles ⁱ	48				48 ^j
JL-2 (CSS-NX-14)	48	2016	>7 000	1 x 200–300 kt	48
Aircraft ^k	20				20
H-6K (B-6)	20	2009	3 100	1 x bomb	20
H-6N (B-6)		[2025]		1 x ALBM	
H-20 (B-20)		[2020s]			
Cruise missiles ¹					
Other stored warheads ^m					80
Total	256				320 ^m

2. Chinese modernization

ICBM / IRBM / MRBM

- DF-31A (CSS-10 Mod 2) fielding
- DF-5B (CSS-4 Mod 2) with MIRV
- DF-26 fielding
- DF-31AG fielding
- DF-41 in development (MIRV)
- New silos at Jilantai training area

SSBN / SLBM

- 4 Jin (Type-094) operational (2 more fitting out)
- JL-2 (CSS-N-14) SLBM probably operational
- Type-096 SSBN in development with JL-3 SLBM

Bombers:

- Bomber force recently reassigned nuclear mission
- H-6K possibly with nuclear capability
- H-6N with ALBMs, one of which might be nuclear
- H-20 next-generation bomber in development









2. Chinese modernization

"Over the next decade, China is likely to at least double the size of its nuclear stockpile..."

DIA, May 2019

For that projection to come true, China would have to field more than 300 warheads for about 140 additional launchers. Likely assumes deployment of:

- 2 dozen additional DF-31AG ICBMs
- 2 dozen additional DF-26 IRBMs
- 2 dozen DF-41 ICBMs with MIRV
- 2 Type 096 SSBNs with MIRV
- 3 dozen nuclear-capable bombers



Past DIA projections for Chinese nuclear arsenal have been wrong

2. French and British arsenal overviews

France:

Arsenal stabilized around 300 warheads Structured in Dyad of SSBNs and bombers Aircraft carrier also has nuclear mission Modernization continuing

	No.	Year first	Range	Warheads	No. of
Туре	deployed	deployed	$(km)^a$	x yield	warheads
Land-based aircr	aft				
Rafale BF3 ^b	40	2010-11	2 0 0 0	1 x [up to 300 kt] TNA ^c	40
Carrier-based air	craft				
Rafale MF3 ^b	10	2010-11	2000	1 x [up to 300 kt] TNA ^c	10
Submarine-laund	ched ballistic m	issiles ^d			
M51.1	16	2010	>6000	4–6 x 100 kt TN-75	80 ^e
M51.2	32^{f}	2017	>9 000 ^g	4-6 x 100 kt TNO	160
M51.3 ^h	0	[2025]	>[9000]	[up to 6 x 100 kt] TNO	0
Total					290 ⁱ

Britain:

Arsenal reduced to Monad: only SSBN

Of about 195 warheads in stockpile, 120 are "operationally available"

Only 40 warheads deployed at sea

One SSBN at sea can carry 16 SLBMs but only 8 are operational

Stockpile reduction to 180 planned for mid-2020s

Table	Table 10.4. British nuclear forces, January 2020							
Туре	Designation	No. deployed	Year first deployed	Range (km) ^a	Warheads x yield	No. of warheads		
Subma	Submarine-launched ballistic missiles ^b							
D5	Trident II	48	1994	>7 400	1–8 x 100 kt ^c	195–215 ^d		

2. French and British modernizations

France:

SSBN / SLBM

- M51.2 SLBM fielding with TNO warhead
- M51.3 SLBM in development
- New SSBN in early design phase

Bombers

• New ASN4G 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



Britain is reducing its arsenal

SSBN / SLBM

- SSBN Dreadnought in development (4 planned)
- SLBM (Trident II D5LE) fielding
- New warhead planned with US Mk-7 reentry-body

Infrastructure

 Joint UK-French warhead surveillance testing technology center development

2. Pakistani arsenal overview

Stockpile of up to 160 warheads

Focus on land-based missiles but emerging seabased deterrent

Fielding of tactical nuclear weapons

Several cruise missiles developing

Claim of MIRV development (doubtful; only one flight test so far)

Fissile material production increasing

"Minimum deterrent" concept has been replaced by "full spectrum" deterrent

Type (US/Pakistani designation)	Launchers deployed	Year first deployed	Range (km) ^a	Warheads x yield ^b	No. of warheads ^c
Aircraft	36				36
$F-16A/B^d$		1998	1600	1 x bomb	
Mirage III/V	36	1998	2 100	1 x bomb or Ra'ad ALCM ^e	36
Land-based missiles	120 ^f				120
Abdali (Hatf-2)	10	2015	200	1 x 5–12 kt	10
Ghaznavi (Hatf-3)	16	2004	300	1 x 5–12 kt	16
Shaheen-I (Hatf-4)	16	2003	750	1 x 5–12 kt	16
Shaheen-IA (Hatf-4) ^g		[2020]	900	1 x 5–12 kt	
Shaheen-II (Hatf-6)	18	2014	2000	1 x 10–40 kt	18
Shaheen-III (Hatf) ^h		[2022]	2750	1 x 10–40 kt	
Ghauri (Hatf-5)	24	2003	1250	1 x 10-40 kt	24
Nasr (Hatf-9)	24	2013	70	1 x 5–12 kt	24
Ababeel (Hatf)			2200	MIRV or MRV	ⁱ
Babur GLCM (Hatf-7)	12	2014	350 ^j	1 x 5–12 kt	12
Babur-2 GLCM (Hatf)		<i>k</i>	700	1 x 5-12 kt	••
Sea-based missiles					
Babur-3 SLCM (Hatf)	0	1	450	1 x 5–12 kt	0
Other stored warheads ^m					4
Total	156				160 ^m

2. Pakistani modernization

MRBM / SRBM

- Shaheen III MRBM (Hatf-6) in development
- Shaheen II MRBM (Hatf-6) fielding
- Ababeel MRBM in development (MRV/MIRV?)
- NASR SRBM (Hatf-9) 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 completed
- Uranium enrichment facility upgrade











Pakistan is increasing its arsenal

2. Indian arsenal overview

Stockpile of up to 150 weapons, focused on bombers and missiles

Development of longer-range missile force is focused on deterring China

Slowly emerging SSBN force

Claim of MIRV development

Rumors of nuclear cruise missile, but no evidence

"Minimum deterrent" and no-first-use policy have constrained posture, but role against all WMD and uncertainty expressed by government officials raise questions.

Debate about modernization and potential counterforce-like strategy

Type (US/Indian designation)	Launchers deployed	Year first deployed	Range (km) ^a	Warheads x yield ^b	No. of warheads ^c
Aircraft ^d	48				48
Mirage 2000H	32	1985	1850	1 x bomb	32
Jaguar IS	16	1981	1600	1 x bomb	16
Land-based ballistic missiles	70				70
Prithvi-II	30	2003	250 ^e	1 x 12 kt	30
Agni-I	20	2007	>700	1 x 10–40 kt	20
Agni-II	12	2011	>2000	1 x 10-40 kt	12
Agni-III	8	[2014]	>3200	1 x 10-40 kt	8
Agni-IV	0	[2020]	>3 500	1 x 10-40 kt	0
Agni-V	0	[2025]	>5000	1 x 10–40 kt	0
Sea-based ballistic missiles	14				16
Dhanush	2	2013	400	1 x 12 kt	4^{f}
K-15 (B05) ^g	$1/12^{h}$	2018	700	1 x 12 kt	12
K-4	ⁱ		3000	1 x 10-40 kt	
Cruise missiles ^j					
Other stored warheads ^k					16
Total					150 ^k

2. Indian modernization

ICBM / IRBM / MRBM

- Agni VI ICBM in development (MRV/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 ShLBM fielding

Infrastructure

- Plutonium production reactor planned
- Breeder reactors developing



India is increasing its arsenal

2. Israeli arsenal overview

Туре	Range (km) ^a	Payload (kg)	Status	No. of warheads
Aircraft ^b				
F-16I	1600	5400	98 aircraft in the inventory; a small number (1–2 squadrons) is believed to be equipped for nuclear weapon delivery.	30
Land-based ballisti	c missiles ^c			
Jericho II	1500 - 1800	750- 1000	c. 50 missiles; first deployed in 1990.	25
Jericho III ^d	>4000	1000- 1300	Became operational in 2011–15 and is gradually replacing Jericho II.	25
Cruise missiles				
			Unconfirmed reports suggest that Dolphin class diesel-electric submarines have been equipped with nuclear-armed SLCMs; Israeli officials have declined to comment publicly on the reports.	10
Total			common parent, on the reporter	90 ^e

Israel is neither increasing nor reducing its arsenal

Stockpile of ~90 non-assembled warheads

Rumors about 200-400 warheads greatly exaggerated

Land-based missile force upgraded to Jericho III

Rumored SLCM capability (unconfirmed)

Acquiring US F-35, which will have nuclear role in US and NATO allies' arsenals

2. Israeli modernization

IRBM

• Jericho III IRBM fielded

SSG / SLBM

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

Bomber

- F-35A fielding. Future nuclear?
- * 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

2. North Korean nuclear capabilities*

ICBM / IRBM / MRBM**

- Hwasong-7 (Nodong) MRBM deployed
- Hawsong-9 (KN-4, Scud ER) MRBM deployed
- Pukguksong-2 (KN-15) MRBM in early development
- Hwasong-10 (BM-25, Musudan) IRBM in development?
- Hwasong-12 (KN-17) IRBM in development
- Hwasong-13 (KN-08) ICBM in development
- Hwasong-14 (KN-20) ICBM in development
- Hwasong-15 (KN-22) ICBM in development
- Hwasong-16 (KN-?) ICBM in development

SSBN/SLBM

- Sinpo SSBN in development
- Pukguksong-4 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 have been able to produce a warhead for its medium-ran Nodong and SCUD missiles. But it is doubtful it has deliverable warhead for longer-range missiles, none of which have been fielded yet. Sufficient fissile material for 20-60 warheads but assembled number is unknown, no more than 20-30 warheads.
- ** Not all missiles necessarily be full-scale weapons programs; some may be technology development projects.



North Korea is **increasing** its arsenal and significantly expanding its delivery vehicles

3. Nuclear doctrines and strategies

Nuclear doctrine expresses the goals and missions that guide the deployment and employment of nuclear weapons

Nuclear strategy expresses how to threaten or employ nuclear weapons to achieve political and military objectives

This is expressed in a variety of political and military guidance and planning documents

Shaped by decades of nuclear competition, history, institutions, funding, leadership

Resistance to reducing role – especially quickly and substantially

How much of what is needed to deter?

There is a significant difference in how the public debate and the nuclear planners determine nuclear requirements

The public concludes only a few dozen or hundred nuclear weapons are needed to deter any rational adversary

The nuclear planners agree, but most of their requirement comes from what they have to do *after* deterrence fails

This leads to vastly different conclusions about how much is enough

3. Doctrines and strategies: United States

Declaratory policy:

The United States would only consider the employment of nuclear weapons in extreme circumstances to defend the vital interests of the United States, its allies, and partners. Extreme circumstances could include significant non-nuclear strategic attacks. Significant non-nuclear strategic attacks include, but are not limited to, attacks on the U.S., allied, or partner civilian population or infrastructure, and attacks on U.S. or allied nuclear forces, their command and control, or warning and attack assessment capabilities.

The United States will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the NPT and in compliance with their nuclear non-proliferation obligations.

Given the potential of significant non-nuclear strategic attacks, the United States reserves the right to make any adjustment in the assurance that may be warranted by the evolution and proliferation of non-nuclear strategic attack technologies and U.S. capabilities to counter that threat.

"If deterrence fails, the initiation and conduct of nuclear operations would adhere to the law of armed conflict and the Uniform Code of Military Justice. The United States will strive to end any conflict and restore deterrence at the lowest level of damage possible for the United States, allies, and partners, and minimize civilian damage to the extent possible consistent with achieving objectives."

DOD, Nuclear Posture Review Report, 2018

Nuclear employment planning guidance:

Directs military to develop nuclear employment plants

"all plans must also be consistent with the fundamental principles of the Law of Armed Conflict. Accordingly, plans will, for example, apply the principles of distinction and proportionality and seek to minimize collateral damage to civilian populations and civilian objects. The United States will not intentionally target civilian populations or civilian objects."

> DOD, Report on Nuclear Employment Strategy of the United States, June 2013

3. Doctrines and strategies: United States



3. Doctrines and strategies: United States



Source: STRATCOM OPLAN 8044 briefing slide obtained under FOIA

- Cold War plan focused on large preplanned options against USSR (with China as side-chapter)
- Proliferation concern and 9/11 attacks triggered broadening of planning to "regional states" armed with WMD
- Terminology changed from deterring "nuclear" adversaries to deterring "WMD" adversaries anywhere
- "Living SIOP" and "adaptive planning" pursued increased flexibility
- OPLAN 8044 Revision 03 included executable strike options against regional proliferators (based on W Bush NSPD-14)
- CONPLAN 8022 preemption plan and Joint Doctrine 3-12
- Effect: mission proliferation (do more with less); plan more complex

3. Doctrines and strategies: United States



Source: STRATCOM OPLAN 8010 briefing slide obtained 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
- Cold War-type Major Attack Options (MAOs) appear to be gone
- 2007 plan directed against six adversaries: Russia, China, North Korea, Iran, Syria and 9/11-type WMD scenario
- Half did not have nuclear weapons; four were NPT members
- Since then, Syria has probably been removed from nuclear employment plans

3. Doctrines and strategies: United States

OPLAN 8010-12 planning objective:

"The goal of the application of force is to attack the appropriate enemy 'system' to eliminate the enemy's capability to continue to fight and influence key decision makers to cease hostilities. As a result, some adversary components may remain untouched but, because of the resulting attack, cannot function as part of a cohesive whole. This approach to strategy requires a thorough understanding of specific characteristics of the enemy system; in turn, this understanding generates a series of executable actions intended to produce specific and discrete effects on key components of the adversary's vital systems."

...and, yes, the US also has an "escalateto-deescalate" nuclear strategy:

OPLAN 8010-12 "emphasizes escalation control designed to end hostilities and resolve the conflict at the lowest practicable level, consistent with meeting national objectives. This plan follows a premise that to achieve escalation control, the US military and other instruments of national power will effectively match an adversary on multiple levels of conflict."

3. Doctrines and strategies: United States



STRATCOM slide illustrates how US/Allied action following adversary action is intended to compel him to chose a "off-ramp" to deescalate conflict

OPLAN 8010-12 de-escalation objective: "Develop readily executable and adaptively planned response options to de-escalate, defend against, or defeat hostile adversary actions...US activity results in de-escalation, adversary capitulation, or direction by the President or SecDef to de-escalate of US activities."

Due to better conventional capabilities, US can wait longer than Russia to escalate to nuclear use

3. Doctrines and strategies: Russia

2010 military doctrine: "The Russian Federation reserves the right to utilize nuclear weapons...

- 1. in response to the utilization of nuclear and other types of weapons of mass destruction against it and (or) its allies,
- and also in the event of aggression against the Russian Federation involving the use of conventional weapons when the very existence of the state is under threat.

Repeated in 2020 decree but with two more conditions:

- 1. Detection of launch of ballistic missiles against Russia and (or) its allies;
- 2. Enemy's "influence" on critical facilities needed for nuclear retaliation;

"...in the event of a military conflict - to prevent the escalation of hostilities and their cessation on conditions acceptable to the Russian Federation and (or) its allies."

2020 Nuclear Deterrence Decree

3. Doctrines and strategies: Russia

US 2018 Nuclear Posture Review accused Russia of having an "escalate to de-escalate" doctrine:

"Most concerning are Russia's national security policies, strategy, and doctrine that include an emphasis on the threat of limited nuclear escalation, and its continuing development and fielding of increasingly diverse and expanding nuclear capabilities. Moscow threatens and exercises limited nuclear first use, suggesting a mistaken expectation that coercive nuclear threats or limited first use could paralyze the United States and NATO and thereby end a conflict on terms favorable to Russia. Some in the United States refer to this as Russia's "escalate to deescalate" doctrine. "De-escalation" in this sense follows from Moscow's mistaken assumption of Western capitulation on terms favorable to Moscow." "I've looked at the Russian doctrine. I've looked at Russian writings. It's not escalate to deescalate, it's escalate to win. Everybody needs to understand that."

STRATCOM Commander Gen John Hyten, 2017

"There is compelling evidence that at least one of our potential competitors...believes they can get away with striking us with a low-yield weapon. We cannot allow that perception to persist."

VCJCS Gen Paul Selva, 2018

Russian officials and independent military analysts dispute this characterization of Russian nuclear strategy

4. Weapons yields and collateral damage

A single nuclear weapon can destroy a city

A limited attack could make large areas uninhabitable

Many targets are in or near cities

Regional nuclear war could have significant climatic effects

Large nuclear attack could trigger nuclear winter







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4. Weapons yields and collateral damage



The fatalities (solid lines) and total casualties (dashed lines) in millions, immediately following nuclear attacks, versus the number of targets. Results for India (A) and Pakistan (B). Colors correspond to the yield assumed.

Toon, Owen B., et al. "Rapidly expanding nuclear arsenals in Pakistan and India portend regional and global catastrophe." *Science Advances* 5.10 (2019): eaay5478.

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4. Weapons yields and collateral damage

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 sixthlargest 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

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B61-12: Also a nuclear bunker buster?

4. Weapons yields and collateral damage

Planners seek to reduce radioactive effects on military operations by

- 1. Increasing accuracy and reducing yield
- 2. Optimizing heigh-of-burst to reduce fallout
- 3. Avoid overkill: only destroy what's needed
- 4. Using conventional weapons if possible

Current example from US modernization: B61-12 guided gravity bomb

Increased accuracy means targets that previously required large yield can be destroyed with smaller yield

"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)



4. Weapons yields and collateral damage

Common misperception that low-yield means non-strategic and that all strategic weapons are high-yield

In reality, there is significant mix of yields

Many tactical have high-yield option

Many strategic have low-yield option

Warhead	Low-yield options	Remarks
B61-3	Yes	Tactical bomb
B61-4	Yes	Tactical bomb
B61-7	Yes	Strategic bomb
B61-11	No	Strategic bomb
W76-1	No	Strategic warhead
W76-2	Yes	Strategic/tactical warhead
W78	No	Strategic warhead
W80-1	Yes	Strategic cruise missile
B83-1	Yes	Strategic bomb
W87	No	Strategic warhead
W88	No	Strategic warhead

4. Weapons yields and collateral damage



W76-2 low-yield Trident warhead: "ensure a prompt response option that is able to penetrate adversary defenses [to] help counter any mistaken perception of an exploitable 'gap' in U.S. regional deterrence capabilities."

The W76-2 was first deployed in late-2019 in the Atlantic and has since also been deployed in the Pacific 2018 NPR recommends acquiring two nuclear "supplements" to the arsenal with low-yield options to "enhancing our ability to tailor deterrence and assurance; expand the range of credible U.S. options for responding to nuclear or non-nuclear strategic attack; and, enhance deterrence by signaling to potential adversaries that their limited nuclear escalation offers no exploitable advantage."

- No evidence current capabilities can't do that (US already has ~1,000 warheads with low-yield options)
- No evidence adversaries believe US would be self-deterred by yield
- Signals US return to tactical nuclear thinking

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4. Weapons yields and collateral damage

More than half of the warhead types in the US stockpile have low-yield options (10 or less kilotons)

Warhead	Low-yield options	Remarks
B61-3	Yes	To be relaced by B61-12
B61-4	Yes	To be relaced by B61-12
B61-7	Yes	To be relaced by B61-12
B61-11	No	(To be relaced by B61-12)
W76-1	No	To be replaced by W93
W76-2	Yes	Added by 2010 NPR
W78	No	To be replaced by W87-1
W80-1	Yes	To be relaced by W80-4
B83-1	Yes	(To be relaced by B61-12)
W87	No	
W88	No	To be upgraded to W88-1

On need for new low-yield weapons: "Our force structure now actually has a number of capabilities that provide the president of the United States a variety of options to any numbers of threats."

Gen John Hyten, March 2017



4. Weapons yields and collateral damage

Use of low-yield W76-2 (8 kilotons) instead of W76-1 (90 kilotons) would significantly reduce collateral damage and fatalities

Graphics show fallout from ground burst attack on Russian nuclear bunker in Kaliningrad

But it would still be destructive in attack on denser populated area

Source: Matthew McKinzie, US Low-Yield, Submarine-Launched Nuclear Warhead: Potential Scenarios, May 8, 2019





Hans M. Kristensen, Federation of American Scientists, 2020 | Slide 37

4. Weapons yields and collateral damage

Increased accuracy and reduced yield are part of plan to give President less dirty nuclear strike options

"...we are trying to pursue weapons that actually are reducing in yield because we're concerned about maintaining weapons that would have less collateral effect if the President ever had to use them."

Gen. Robert Kehler, October 2013

Weapons with increased accuracy and lower yield are more useable and could influence military recommendations to use nuclear weapons Does the relatively low yield and increased accuracy of the B61-12 change the way the military thinks about how to use the weapon?

"Without a doubt. Improved accuracy and lower yield is a desired military capability."

Would it result in a different target set or just make the weapon better?

"It would have both effects."

Gen. Norton Schwartz, January 2014

"If I can drive down the yield, drive down, therefore, the likelihood of fallout, et cetera, does that make it more usable in the eyes of some — some president or national security decision-making process? And the answer is, **it likely could be more usable**."

Gen. James Cartwright, November 2015

5. "Great Power Competition" effects

Post-Cold War thaw is over: US-Russia-China are now in official full-scale strategic and military competition. Climate has been coined "Great Power Competition"

That means all elements of national power translate that into action: doctrine, programs, operations

Although there has always been nuclear modernization, it is now explained as official response to "the other side"

New weapons are added to "strengthen deterrence"

Visible Dynamics:

Political: Hardening of rhetoric, bickering, accusation, blame

Doctrine/strategy: Updating and toughening of policy documents, doctrine changed, and strategy overtly directed at adversary

Operational: Exercises and day-to-day activities increase, move forward, closer, intentionally aggressive and threatening

5. "Great Power Competition" effects

United States

2017 National Security Strategy: Shift from focus on War On Terror to Great Power Competition, reinvigorating role of nuclear weapons against non-nuclear threats

2018 Nuclear Posture Review: Embrace Great Power Competition, all-of-the-above modernization, remove restraints on new nuclear capabilities, new weapons, enhance nuclear role against non-nuclear strategic attacks, nonproliferation profile reduced

2017-2020: Shredding of arms control and international agreements. Proactive arms control replaced with doctrine of complaints and grievances

2018-2019: Increased nuclear secrecy with re-classification of stockpile and dismantlement numbers

2014-2020: Increasing and more offensive operations and exercises closer to Russia and China









5. "Great Power Competition" effects

Russia

2000-2010 Military Strategy: Updated to include potential nuclear use against not only WMD attacks but also nonnuclear attacks that threaten survival of State

2014: Invasion of Ukraine, annexation of Crimea, ongoing war in Donbas (follows 2008 Georgia conflict)

1997-2020: Modernization of strategic and tactical nuclear forces. Addition of several new systems. Warhead stockpile possibly increasing

2004-2020: Increasing and more offensive operations and exercises closer to NATO countries accompanied by dangerous operations and explicit nuclear threats against individual countries

2010-2020: Growing militarization of Arctic









5. "Great Power Competition" effects

China

1995-2020: Massive general military modernization program undertaken to give China world stage status

1995-2020: Military operations further away from Chinese cost with frequent operations around Japan and Taiwan

2000-2020: Significant nuclear modernization with increased mobility, accuracy, diversity, and warheads

2015-2020: Annexation of international territory and construction of reef-island bases in South China Sea

2017-2020: Re-assignment of nuclear role to bombers to build Triad of nuclear forces







6. Summary and conclusions

Enormous reductions of nuclear weapons since Cold War

- but reductions have slowed

Several countries are increasing the number of weapons and/the types they operate

Universal modernization of arsenals intended to possess nuclear weapons for the indefinite future

Revival of strategic competition with increasing role and prominence of nuclear weapons in rhetoric, policies, and exercises

Increasing focus on non-strategic nuclear weapons and low-yield weapons to improve useability and communicate willingness to use

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QUESTIONS?

Hans M. Kristensen, Federation of American Scientists, 2020 | Slide 44