Counterforce Capabilities of Conventional Strategic Arms

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Questions to be discussed

- Why the topic is important?
- What types of conventional arms should be a subject of concern and regarded as strategic?
- What measures need to be taken to resolve the issue of strategic conventional arms in the near term?

Why the topic is important?

- Survivability of remaining smaller nuclear forces will be a key condition to pave the way for further nuclear cuts, as long as the paradigm of Mutual Assured Destruction is alive.

- There is a deep concern in Russia about survivability of its future deterrent as there are no limits on development of ballistic missile defenses and conventional strategic arms.

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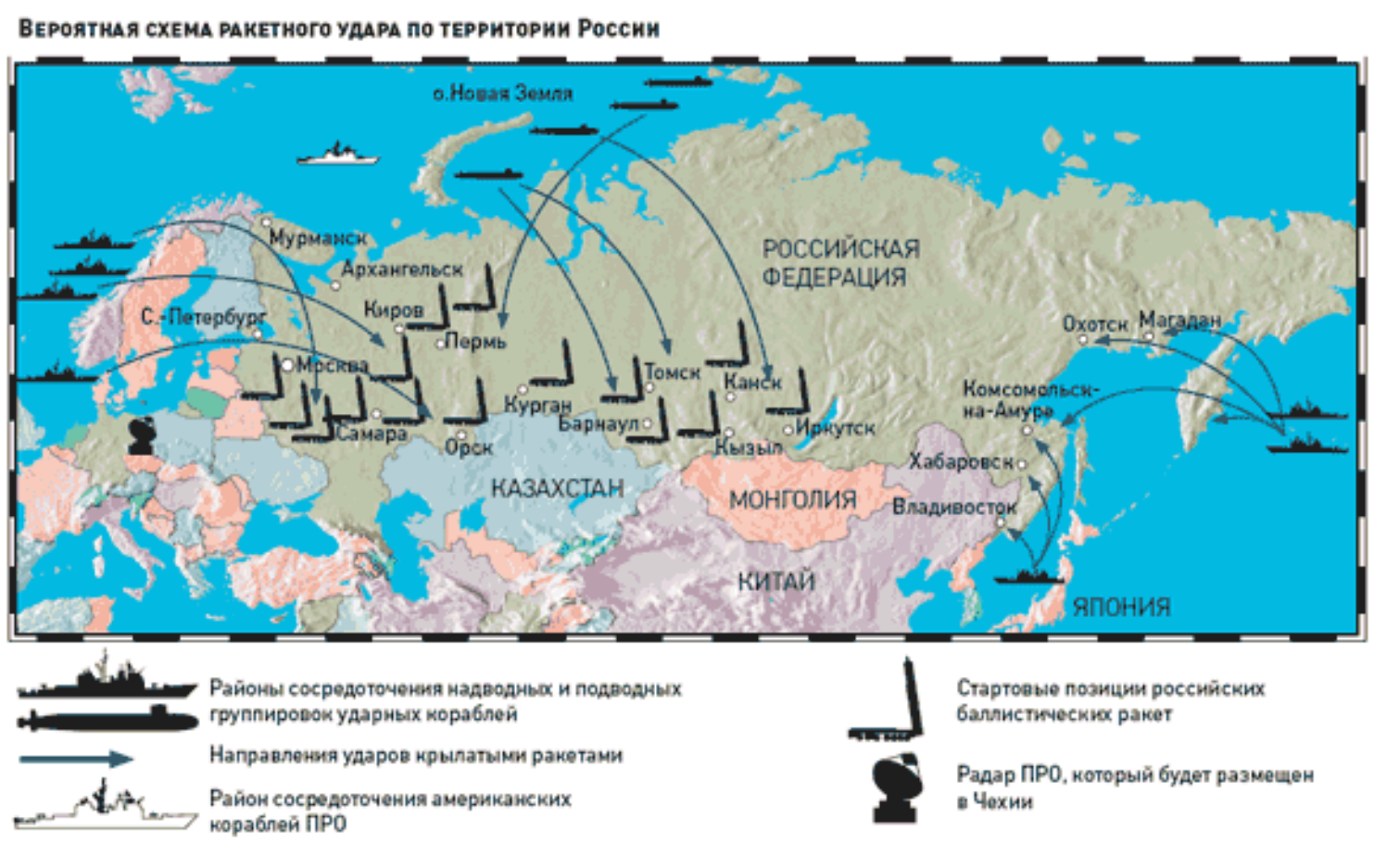

A scenario of conventional disarming strike against Russia
Source: Mikhail Volzhenski, *Izvestia*, May 28, 2007

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A scenario of conventional disarming strike against Russia

Source: Admiral Ivan Kapitanets, Ret.,"The Navy in Wars of the Sixths Generation", Veche, 2003

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Deployed Russian strategic launchers: the past (START MOU Data) and future (estimates)

	July 1991	December 2001	July 2009	Projections for 2020
ICBMs	1398	726	465	~ 230
SLBMs	940	332	268	~ 160
Bombers	162	78	76	~ 70

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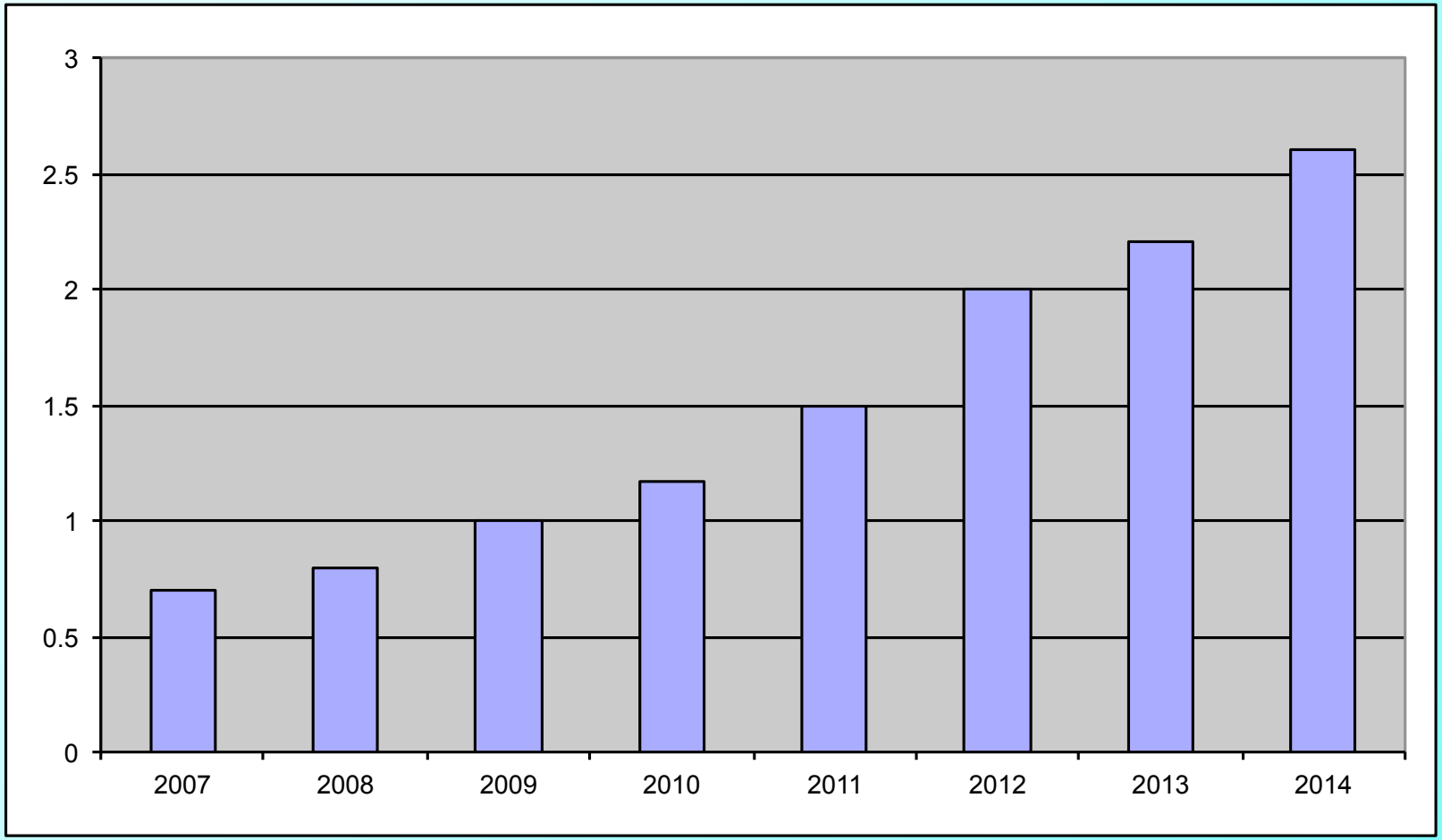
National Defense order in Russia: the past and plans for future (in trillion Rubles)



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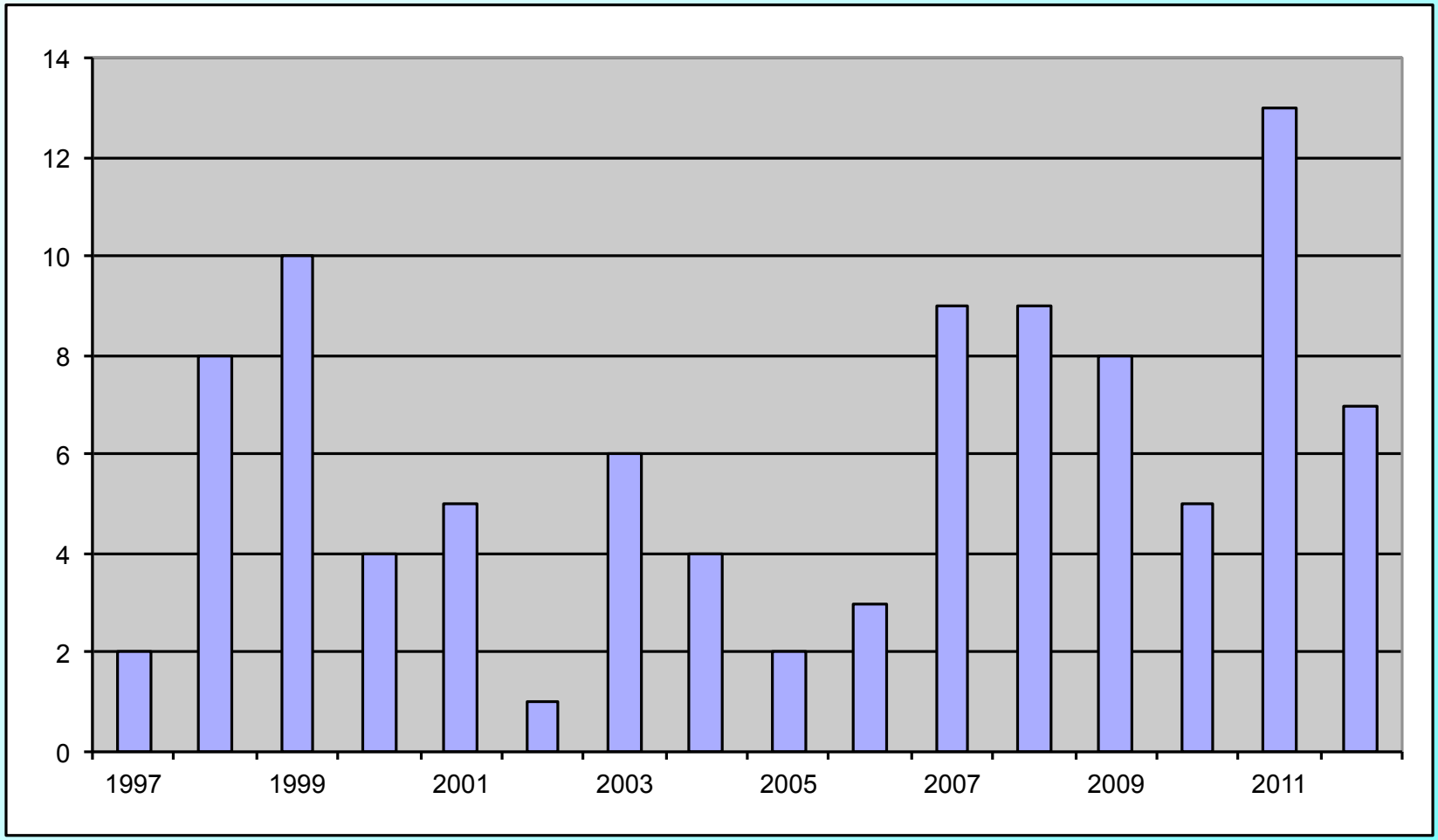
New ICBMs (“Topol-M” and “Yars”) deployment rate in 1997-2012



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If conventional precision guided weapons have counterforce capabilities, some of widely shared views have to be revised:

Single warhead silo based ICBMs are not stabilizing (as well as MIRVed ones), provided that no limits are imposed on conventional PGWs.

De-alerting nuclear forces may lead to increasing vulnerability of nuclear forces, and, as a result, – to destabilization.

Ballistic missile defenses are viewed as a tool to defend against an impaired second strike:

«...Global missile defense cannot be discussed apart from the strategic offensive weapons. The undeniable link between missile defense and strategic offensive weapons is axiomatic. Taken together they can become a strategic complex able to deliver “first disarming strike”... Furthermore, we see a direct link between US plans for global missile defense and the prompt global strike concept which means the ability to strike any point on the globe within an hour of the relevant decision. This concept, when combined with global missile defense, becomes a means for world domination, politically and strategically. This is a rather serious factor which undermines the principles of mutual deterrence and mutual security and erodes the architecture of strategic stability...»

Anatoly Antonov, Director, Security and Disarmament Department, Russian Ministry of Foreign Affairs Speaking notes at NATO-Russia Council Meeting, October 17, 2007

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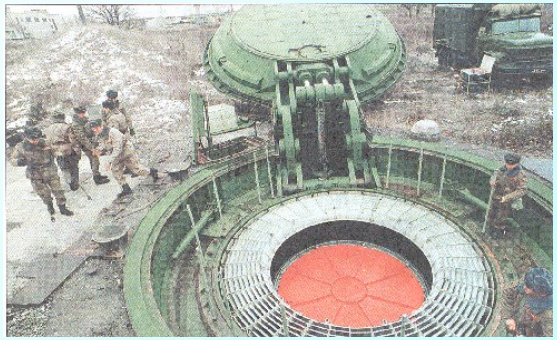
What types of conventional Precision Guided Weapons (PGWs) should be a subject of concern and regarded as strategic?

Requirements to Fulfill a Counterforce Mission

- Precision (terminal guidance, in-flight targeting capability)
- Sufficient destructive power
- Long range
- Short flight time or difficult to be detected (at launch, on-flight)

Characteristics of the Russian ICBM silo launchers



ICBM Type	SS-19	SS-18
Diameter, m	4.6	5.9
Vertical size, m	29.8	39
Diameter of ICBM container, m	2.9	3.5
Horizontal size of the cover, m	7.6 (diameter)	6.5x6.5
Thickness of the cover, m	1…1.5	1.5…1.8
Weight of the cover, t	260…360	500…600

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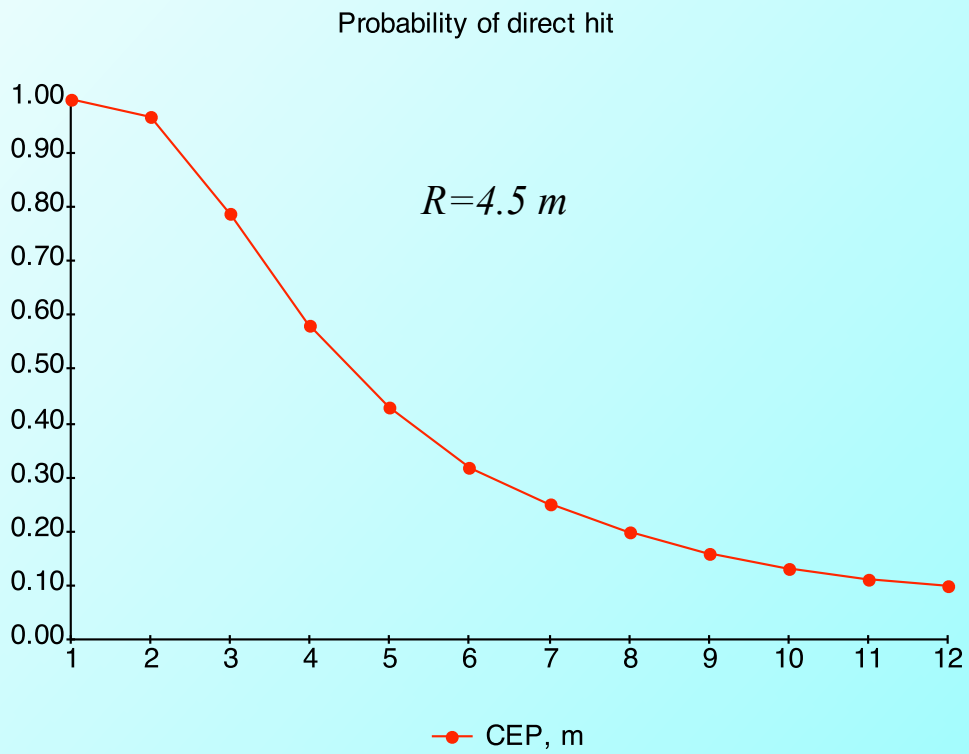
Probability of ICBM silo destruction **p** with a weapon of given **CEP**



$$p = 1 - (0.5)^{\left(\frac{R}{CEP}\right)^2}$$

R – an “equivalent” radius of a circle of ICBM silo vulnerability

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Required **CEP** and number of weapons to disable an ICBM silo

$$CEP \le \alpha(p) \cdot R$$

$$N \ge \beta(p) \cdot \left(\frac{CEP}{R}\right)^2$$

p	α	β
0.9	0.55	0.33
0.99	0.39	6.65
0.999	0.31	10

CEP, m	1	2	3	4	5	6	7	8	9	10	11	12
P=0.9	1	1	2	3	5	6	9	11	14	17	20	24
P=0.99	1	2	3	6	9	12	17	22	27	33	40	48
P=0.999	1	2	5	8	13	18	25	32	40	50	60	72

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Types of weapons to be discussed

- Conventional ICBMs and SLBMs
- Prompt Global Strike weapons
- Heavy bombers
- Missiles deployed in converted launchers of SSBNs
- Long range SLCMs deployed on submarines and surface ships
- Other types of arms (tactical bombers, antisubmarine warfare, etc.)

Proving that either long range conventional SLCMs threaten to silo ICBMs or they pose no threat at all is a difficult task

Dennis M. Gormley, “The Path to Deep Nuclear Reductions, Dealing with American Conventional Superiority”, IFRI Paper, Fall 2009:

Tomahawk SLCMs **do not represent a threat to silo launchers** for two reasons:

- The warheads that the Tomahawk delivers are incapable of effectively disabling silo launchers;
- The range of the cruise missiles is too short to attack all missiles in silo launchers deployed within the borders of the Russian Federation.

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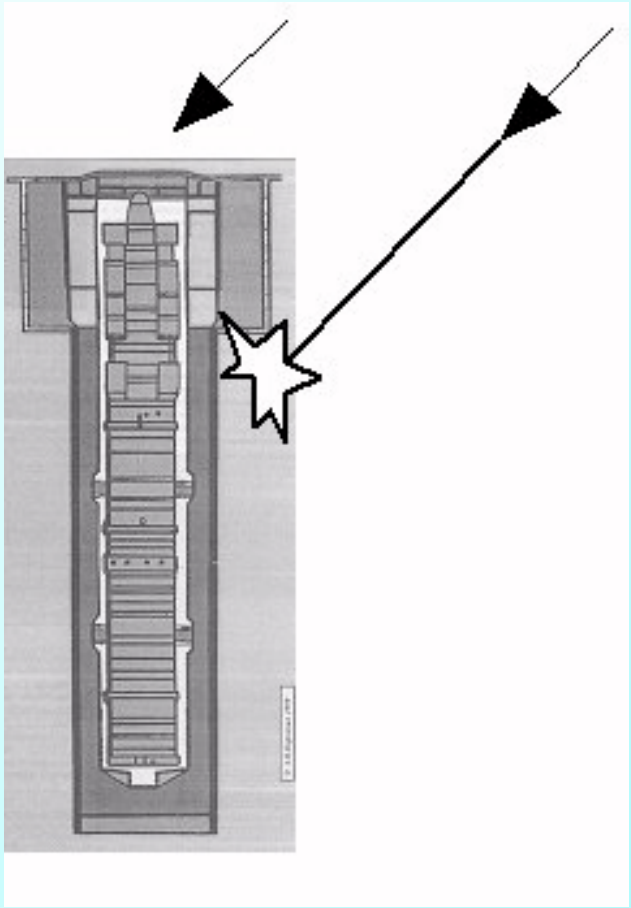
Primary mechanisms for disabling silo ICBMs



- Kinetic effect weapons
- Shaped charge weapons
- Electro-magnetic pulse (?)

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Comparative analysis of antitank guided weapons (ATGW) capabilities

	Dragon	Milan-2T	Dragon-2	TOU-2A	Hot-2
Weight of the missile, kg	6.12	6.6	10	21.5	23.5
Weight of the warhead, kg	2.5	2.9		6	5
Weapon caliber, m	0.122	0.115	0.122	0.152	0.132
Weapon length, m	0.745	0.77	0.85	1.14	1.27
Range, km	1	2	1	3.75	4
Max. speed, m/s	110	200		210	280
Penetration length, mm	430	880	950	> 1000	> 1100

In early 1997, Lawrence Livermore successfully tested a shaped charge that penetrated 3.4 meters of high-strength armor steel.

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Potential area of attack by conventional “Tomahawk” long range SLCMs (1/2)

Source: Dennis M. Gormley, The Path to Deep Nuclear Reductions, Dealing with American Conventional Superiority, IFRI Paper, Fall 2009

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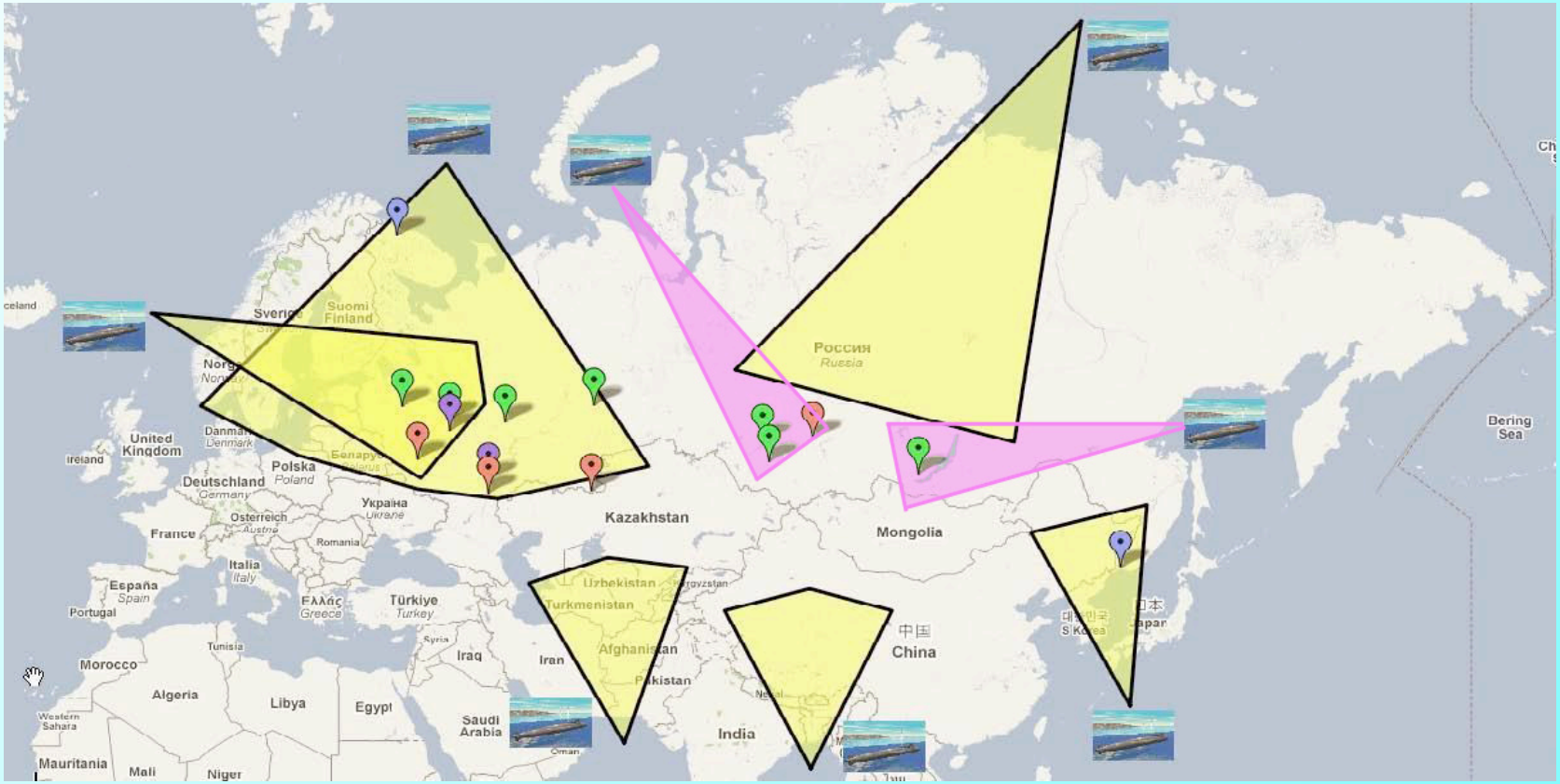
Potential area of attack by conventional “Tomahawk” long range SLCMs (2/2)



The lavender sections depict the reach of Tomahawk cruise missiles launched from nuclear submarines patrolling at a minimal distance from shore.

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Nuclear Tomahawk range estimates

Table 2: Estimated maximum straight-line ranges (in kilometers) for several speeds and at several constant altitudes for a nuclear Tomahawk cruise missile[a]

	Altitude *kilometers*		
	Sea level	**3.05 kilometers**	**6.10 kilometers**
V = Mach 0.55	3,330	3,890	4,000
V = Mach 0.65	3,020	3,860	4,490
V = Mach 0.75	2,650	3,580	4,550
$V = V_{best}$[b]	3,400	3,920	4,600

a. Some insight into the variations of range with speed and altitude shown in this table can be gained by looking at figure 3 of appendix A, which shows the optimum missile speed (for best range) as a function of altitude and missile fuel weight. For example, figure A-3 of appendix A shows that the optimum speed at sea level varies between about Mach number $M = 0.45$ and $M = 0.61$. Thus if the missile is constrained to fly at a constant speed, $M = 0.55$ will give a greater range than either $M = 0.65$ or 0.75. At an altitude of 6.1 kilometers, however, $M = 0.75$ will give the best range, as over most of the missile flight the optimum speed is above $M = 0.7$.

b. The ranges in the line "$V = V_{best}$" are calculated using an optimized speed that varies with the missile weight.

Source: George Lewis & Theodore Postol, *Science & Global Security*, 1992, vol.3

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What measures need to be taken to resolve the issue of strategic conventional arms in the near term?

New START contains the following measures with respect to conventional strategic arms

- Numerical limits on Intercontinental Ballistic Missiles (ICBMs), Submarine Launched Ballistic Missiles (SLBMs), ICBM and SLBM launchers, deployed warheads on conventional ICBMs and SLBMs;

- Transparency measures with respect to those strategic delivery systems equipped for conventional armaments, for which similar systems equipped for nuclear armaments exist (ICBMs, ballistic missile submarines, heavy bombers);

- Limited transparency measures with respect to those strategic delivery systems equipped for conventional armaments, for which similar systems equipped for nuclear armaments have been eliminated or converted to systems equipped for conventional armaments (SSGNs, heavy bombers).

- Strategic conventional arms are limited by the New START Treaty to a much lesser extent than by the old treaty. The New Treaty does not prohibit development of some types of strategic arms that were banned by the

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Measures Envisaged for Existing and Future Types of Strategic Conventional Arms in the New START:

Limits for conventional ICBMs and SLBMs

- 700 deployed ICBMs, SLBMs and heavy bombers;
- 1550 warheads on deployed ICBMs, SLBMs and nuclear heavy bombers;
- 800 deployed and non-deployed launchers of ICBMs, SLBMs and heavy bombers

Deployment of soft-site launchers of ICBMs and SLBMs is not limited.

Transparency measures with regard to delivery systems converted to carry conventional arms, are applied only provided that converted systems are located at bases specified in the Treaty.

Upon completion of the conversion of the last B-1B heavy bomber to a conventional heavy bomber, all B-1B bombers ceased to be subject to the Treaty.

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No obstacles for development or limits for deployment with respect to:

- Heavy bombers converted to heavy bombers equipped for non-nuclear armaments, such as conventional ballistic missile of air-to-surface type or conventional long range ALCMs. In particular, the New Treaty does not prohibit deployment of conventional long range ALCMs on B-1B heavy bombers;

- New types of heavy bombers, equipped for non-nuclear armaments, including conventional air-to-surface ballistic missiles and conventional long range ALCMs;

- Military airplanes, other than heavy bombers (with a range less than 8000 km), armed with conventional long range ALCMs;

- Conventional ground based long range cruise missiles (GLSMs) with a range exceeding 5500 km.

Suggested Measures

- Sides have to identify what types of conventional arms need to be considered as strategic
- Confidence building measures with respect to existing conventional arms, that are not the subject of the New START anymore
- Transparency measures with respect to long range Submarine Launched Cruise Missiles
- Limiting patrol areas of the submarines
- Limits and transparency measures on future strategic conventional arms