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Unloved but Necessary: Nuclear Arms in the Coming Decades

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Introduction

Stanley Kubrick's dark comedy film of 1964 *Dr. Strangelove* had a subtitle: "How I Learned to Stop Worrying and Love the Bomb". Nuclear weapons will probably never be loved – save for a few deeply disturbed people – but we have learned to tolerate them and to bury our worries. Unfortunately, like income taxes and proctologists, there are times when one must think about uncomfortable subjects. It is time to give some thought to the Bomb once more.

It can be easily argued the nuclear weapons are central to a strong inhibition among the world's great powers towards keeping crises from getting out of control, and a desire to keep wars small, limited and regional.

It can also be easily argued that possession of nuclear arms brings a strong urge to nations that own them to restrain themselves from threatening to use these weapons... even though the requirements of deterrence mean that a country's nuclear arms and delivery systems must be seen to be workable. Old Theodore Roosevelt's admonition "Speak softly and carry a big stick" is the applicable point, although some newcomers to the nuclear club may not abide by this practice.

Of course, one should keep one's nuclear stick in working order. The central dichotomy of nuclear deterrence is that the ability to use violence must be appreciable in order to not use violence. While a lot of their citizens seem to have trouble understanding this paradigm, the Western democracies need to modernize their nuclear forces.

It took the United States (with Britain and, more or less, France in tow) decades to hammer out working protocols with the USSR about the deployment and numbers of nuclear weapons in the world. It would be both dangerous and wasteful not to build on these accomplishments and to carefully draw China into the same relationship.

It is equally obvious that the 'prestige' of having nuclear arms is real enough; and this has driven some nations to develop arms and delivery systems for themselves. However, some of the newer members of the nuclear club really shouldn't be there; and seem likely to challenge the benefits of membership. Perhaps it is time to change some of the club rules.

The Long Uneasy Peace

It has been 72 years since the United States used two atomic bombs to convince Japan that unconditional surrender was its only option to conclude the Second World War. The Japanese cabinet meeting of the evening of 9th August, 1945 also learned that a Soviet

juggernaut of 1.5 million Red Army soldiers was crushing the defences of Japanese-occupied Manchuria. There was also a massive Anglo-American fleet of 21 aircraft carriers and 16 battleships looming off Honshu busy sending bombs and shells at a variety of targets. However, it seems for some members of the cabinet that the atom-bomb was the clinching argument to finally accept the Allied demand.

It is important to remember that nuclear weapons have not been used in anger since 1945. It is also important to remember that the First World War of 1914-18 claimed some 16 million lives and the Second World War took some 76.8 million. Respectively, these were 0.89 percent of the World's estimated population in 1913 and 3.3 percent of the estimated 1940 population.¹ Humanity hasn't since come close to any conflict this violent while the world's population has more than tripled since 1940.

Of the conflicts that have been started since the Second World War ended, none (possibly excepting the 1996-2003 Great African War in much of the Congo) have claimed more than five million lives.² Every conflict waged since 1945 has been limited in some combination of intensity, location, and means.

One of the clearest examples of the restraining effect of nuclear weapons can be drawn from the rivalry between India and Pakistan. The intercommunal violence between Hindus, Muslims and Sikhs during the 1947 partition of the two claimed somewhere between 500,000 and 1,000,000 people – killed in rioting and affrays with agricultural tools, hunting arms and so on.

With independence, both nations had control of military forces but at the time these amounted to little more than infantry. The 1947-48 Kashmir War was fought with over possession of the Kashmir and took some 7,500 lives. The frontier between the two nations remained restless, and another 1965 border spat escalated to air and tank battles – after which Moscow and Washington jointly stepped in to bring the fighting to a halt.

In 1970, Pakistan started a vicious crackdown on Bengali separatists in East Pakistan (now Bangladesh), and India started to pass support to the insurgents. In consequence, in 1971 Pakistan attacked India and an all-out-war ensued – with Pakistan getting the worst of it in 13 days of fighting. The US, USSR and China were all too-keenly interested in the developing crisis and had to both restrain themselves and the belligerents.

In 1974, India tested its first atom bomb. Both nations are now nuclear-armed powers. While their border is still restless, neither nation has seen its warships, tanks and military

¹ 1914 and 1940 population estimates come from Angus Maddison, *The World Economy Historical Statistics Vol.2.*; OECD, Paris, 2003. The tally of dead for the First World War vary from 15.4 to 18.4 million people, the exact tally for the Second World War cannot be determined, particularly as estimates from China are very rough – but the author's estimate for the war is 76.8 million people (John Thompson; *Spirit over Steel: A Chronology of the Second World War (Mk II)*; Carrick Publishing, Toronto, 2014.

² Most Westerners are blissfully unaware of the Great African War, and it although it officially ended in 2003, straggling elements are still active and the probable death toll has topped 5.4 million. For further reference consult Gerard Prunier; *From Genocide to Continental War: The "Congolese" Conflict and the Crisis of Contemporary Africa*; Hurst and Company, London, 2009

aircraft engage the other. It is clear that nuclear arms have inhibited conventional conflict.

The go-to reference on conflicts up until 1992 was the work compiled by R. Ernest Dupuy and Trevor N. Dupuy, this was last published as *The Harper Encyclopedia of Military History from 3500 BC to the Present* (Harper, New York, 1993). The book naturally lists innumerable crises, clashes, and rivalries of the Post War Era that – like that of India and Pakistan – failed to escalate into a nuclear confrontation or general wide-spread multi-state conventional conflicts with millions of combatants.

So, if nuclear weapons have inhibited major conflict over the last seven decades, how do we keep this benefit working for the next seven decades?

It won't be easy.

Evolving Considerations

Leaving aside the not-inconsiderable issue of radioactivity, the main (and most predictable) element of a nuclear weapon is the blast it produces. At heart, they are a superior form of high explosive; hence the rough comparison to so many thousand or million tons of TNT -- and they have the following effects.

50% casualties to:	1 Kiloton	10 Kilotons	100 Kilotons	1 Megaton
People in the open	1,000m	2,154m	4,642m	10,000m
Automobiles	600m	1,293m	2,785m	6,000m
Reinforced concrete structures	200m	431m	928m	2,000m
Windows, roof tiles, etc.	1,400m	3,016m	6,498m	14,000m

While scaling the potential effect of a nuclear weapon to the damage it might cause is fairly simple, it is also not that accurate. There are numerous variables to consider and the historical example of Hiroshima is really not a reliable yardstick. The city was in a flat shallow bowl that focused much of the initial blast, and its light wooden construction was easily set aflame by the thermal effects of the 'Little Boy' bomb, which was equivalent to 16 Kilotons. 'Fatman' at Nagasaki was a 20 Kiloton weapon but caused less damage and fewer fatalities due to the more convoluted terrain of the city.

The left-handed gift of the Hiroshima bombing was that humanity was left with a strong impression of what nuclear weapons can do to a city. However, the closest survivor to the Hiroshima epicenter, Akkilo Takakura, was about 300 metres from that point in the lobby of a reinforced concrete building.³

As aside: Many people describe nuclear weapons by comparing them to the Little Boy bomb and – for instance – a 300 kiloton weapon might be described as being “20 Hiroshimas”. One might as well read commodities reports in terms of Obols per Pood over Versts compounded per Kalend.

Many of our assumptions about nuclear targeting are based on the city designs of 50-60 years ago; but humanity's growing urbanization is seeing more and more of us live in dense urban cores with many reinforced concrete buildings. Of course, glass sheathed

³ <http://www.atomicarchive.com/Docs/Hibakusha/Akiko.shtml>

buildings with steel cores – another common modern construction technique – might be just as vulnerable to the effects of blast as brick and wooden buildings.

Circular Error Probable (CEP) is the mean way of assessing the accuracy of a nuclear delivery system. If CEP is rated as 200m, it means that 50% of the time, a missile will arrive within 200m of its mean aim point. It will come within 400m 93% of the time, and within 600m 99.68 % of the time.

If the CEP of a nuclear weapon is larger than the blast radius of the warhead it carries, what the artillery call ‘servicing the target array’ is going to require a lot more weapons... or a bigger warhead. The CEP of ballistic missiles has been improving for years, with the net result that warhead size is shrinking.

<u>ICBM</u>	<u>Range</u>	<u>CEP</u>	<u>Warheads</u>	<u>Service</u>
Atlas CGM-15E	14,480km	1,400m	1x 3.75 MT	1961-65
RT-2 SS-13 Savage	8,000 Km	1,900m	1x 600 KT	1968-76
Minuteman II LGM-30F	12,500 Km	200m	1x 1.2 MT	1966-98
MR-UR-100 Spanker	10,250 Km (MIRV)	500m	4x 400 KT	1978-93
Minuteman IIIB LGM-30G	12,800 Km	220m	3x 335 KT	1980-Now
RT-23 Scalpel Mod-2	10,100 Km	250m	10x 450 KT	1989-Now

The truly unknowable statistic involves reliability. Ballistic missiles and the warheads they deliver are highly complex machines. The rocket has to ignite and burn accurately; the guidance system has to work, the arming system has to overcome the many safeguards against accidental detonation, and the warhead itself must detonate properly. If all these major components work with a 95 percent chance of reliability, that means firing an ICBM at a target still comes with an overall 81.4 percent chance that the warhead will go off somewhere in the close vicinity of the target.

Needless to say, both the Russians and the Americans frequently test components of their nuclear delivery systems, and the results are usually kept quiet. As a general rule of thumb in the late Cold War, it seemed safe to assume that overall Russian reliability rates were around 80 percent and American weapons were 90 percent reliable. This, however, remains an assumption.

It also remains that weapons – even nuclear warheads – do not age well. Pumps, couplings, hoses, and much else need to be replaced; metal stress wears on bombers and submarines, and fuel decays. It is possible that Russia’s financial woes in the 1990s bit into their maintenance cycles, but Moscow has been engaged in a major upgrade of its nuclear weapons since those days. No American administration in recent years has cared to open public debate on replacing their aging nuclear weapons systems.

In general, warhead size is decreasing as accuracy has increased. Reliability remains suspect but is probably generally improving.

There are two broad functions for nuclear arms:

Counter-Force: This pertains to nuclear weapons fired at missile silos (assuming the contents haven’t been fired on the receipt of early warning of an attack), submarine

pens, headquarters bunkers, and other hardened targets protected by reinforced concrete. Accuracy rules all here and counter-force weapons are 'usually first strike' weapons.

Counter-Value: This is a polite euphemism for killing people in huge numbers and turning cities into radioactive rubble; but herein lies the heart of nuclear deterrence. If you have somehow managed to knock out my command structure and most of my nuclear weapons, can I still so savage and brutalize your people that you will never dare to attack me? For both Russia and the United States, the answer to this has been "Yes", and it must remain such in the future.

The Current Arms Control Environment

In 2010, the latest version of START (the Strategic Arms Reduction Treaty) imposed new limitations on the size of the nuclear inventories of Russia and the United States. Both are rapidly working to finish their compliance with the Treaty, although the Russians are in the middle of a modernization of their strategic nuclear inventory. Holdings, as of April 2016, are:⁴

Delivery Vehicle	Number	Introduced	Warheads	Total Warheads
SS-18 M6 Satan	46	1988	10x 500/800 Kt	460
SS-25 Sickle	20	1980	6x 400 Kt	240
SS-27 Mod 1 Silo based	18	1997 (silo)	1x 800 Kt	18
SS-27 Mod 1 Mobile	60	2006	1x 800 Kt	60
SS-27 Mod 2 Mobile	63	2001	4 x 100 Kt	252
SS-27 Mod 2 Silo based	10	2014	4 x 100 Kt	40
SS-N-18 M1	16 in 2 Delta III submarines	1978	3 x 50 Kt	96
SS-N-23 M1	16 in 6 Delta IV submarines	2007	4x 100 Kt	384
SS-N-32	16 in 3 Delta IV submarines	2014	6x 100 Kt	288
Bear H-6 Bomber	32	1981	6x weapons	192
Bear H-16	31	1981	16 x weapons	496
Blackjack Tu-160	13	1987	12 x weapons	156

⁴ Hans M. Kristensen, Robert S. Norris, Russian Nuclear Forces, On-Line, 15 April 2016, Bulletin of the Atomic Scientists, Volume 72, 2016; with reference to the text of the 2010 START Treaty (retrieved from <https://www.state.gov/documents/organization/140035.pdf>)

The Russians will soon deploy new silo and road/rail based SS-27s, and a new heavy ICBM is supposed to be ready in 2020. The first Borei Class missile submarine should be commissioned in the same year.

America's strategic nuclear forces rely on older platforms – but apparently much more attention is paid to the reliability of their components. Even so, it remains that the US will need to replace many of its platforms soon and complex weapons systems are not developed overnight. This was the American inventory as of 1 July 2016:

Delivery Vehicle	Number	Introduced	Warheads	Total Warheads
Minuteman IIIB (WG 78 warheads)	25, being reconfigured to WG 87 warheads	1980	3x 335 Kt	75
Minuteman IIIB (WG 87 Warhead)	406	1980	1x 475 Kt	406
Trident II D5 (all three versions)	288 on 14 <i>Ohio</i> Class Submarines.	1990	4x 800 Kt	920
B2 Stealth Bomber	20	1984	Mix of weapons	500
B52 H	93	1987		

Note that as a result of START Arms Control agreements many platforms are carrying less than they were designed to support. For example, Ohio Class submarines were designed to carry 24 Submarine-Launched Ballistic Missiles, but 20 is now usual. The DF5 Trident missile was designed to carry up to 14 W-88 warheads, where only four can now be fitted due to the Treaty's requirements.

Many bombers (like the Russian Bears and US B-52s) are versions of aircraft that first flew in the 1950s, but the current models tend to have been built in the 1980s. For arms control purposes, a nuclear bomber is counted as a single weapon with a mix of warheads carried as cruise missiles and/or free-fall bombs. Theoretically a bomber might be able to return to its base and reload with even more nuclear weapons, but on Day 2 of a strategic nuclear war, who's going to really care? Besides, there is a ceiling on the total allowable inventory of strategic nuclear warheads that includes cruise missiles and bombs.

The long negotiations between Moscow and Washington to limit nuclear arms began in the late 1950s and gives every appearance of having been accelerated after the 1961 Cuban Missile Crisis. There are many concrete achievements beyond those of the START Treaty limits on numbers of weapons and warheads.

- 1963 Partial Test Ban Treaty – Stopped nuclear testing in space, the atmosphere, in the oceans and limited them on land. The growing background radiation experienced in the 1950s has since ebbed.
- 1967 Outer Space Treaty – Banned the deployment of weapons of mass destruction in space.
- 1971 Seabed Arms Control Treaty – Banned the deployment of weapons of mass destruction on the ocean bed.
- 1974 Threshold Test Ban Treaty - Limited underground tests to less than 150 kilotons in size.

- 1987 The Intermediate-Range Nuclear Forces Treaty (INF) – eliminated short and intermediate-range land-based weapons, such as the SS-20 and Pershing-II. Since 2012, the Russians have signaled a growing unhappiness with the treaty, largely because of the proliferation of Intermediate-Range Nuclear Forces in Asia.

It should also be remembered that many of the nuclear weapons of the 1950s were made redundant by the increased technology of conventional weapons in the 1970s and '80s. For instance, nuclear armed torpedoes, air-to-air missiles and even man-packed atomic demolition backpacks were all superseded by new improvements in guidance systems and conventional explosives.

Regardless, greatest accomplishment of the decades of arms control negotiations has been the major reduction in the overall inventory of both Russia and the US. For example, the US stockpile peaked around 30,000 nuclear warheads in the early 1960s and has now shrunk to less than 6,800 – some 2,800 of which are waiting to be dismantled. The Russian arsenal has diminished to around 7,000 warheads with 2,510 scheduled to be dismantled.⁵

Bring China to MADness?

The nuclear relationship between the US and Russia was not entirely bilateral, it could accept the modest French and British nuclear arsenals. However, China is not what it was under Mao in the 1960s, and as a growing superpower it will have to be accommodated.

The Chinese tested their first nuclear weapon in 1964 but have only recently started to produce and deploy a large number of nuclear weapons. They seem to have spent more time working on improving the quality of their nuclear weapons before investing in mass. Estimates as to the number of warheads that China has built vary widely, but given their inventory of plutonium and tritium they may have been able to build several hundred warheads. There are estimates, often of dubious quality, that they may have thousands.⁶

While the inventory of nuclear warheads might be debatable, delivery systems are not so easy to conceal. The 2010 *Military Balance* report of the International Institute of Strategic Studies held that China possessed:

	Missiles	Range	Year	Warheads	CEP
DF-5B ICBMs	10	+13,000 km	2015	3-8 MIRVs	?
DF-5A ICBMs	10	+13,000 km	1981	1x 4-5 MT	800m
DF-31A ICBM	24	+11,200 km	2015	1x 1 MT	?
DF-31 ICBM	12	+ 7,200 km	2006	1x 1 MT?	?
DF-4 ICBM	10	+ 5,500 km	1975	1x 3.3 MT	1,200m
JL-2 SLBM	24 in 2 Jin Class SSBN	+ 7,400 km	2015	3-4 90 KT?	?

⁵ See <https://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat>.

⁶ Kristiansen, Hans. "STRATCOM Commander Rejects High Estimates for Chinese Nuclear Arsenal.", *FAS*, 22 August 2012. The opposite view might be found at "China 'has up to 3,000 nuclear weapons hidden in tunnels', three-year study of secret documents reveals". *Daily Mail*. London. 2011-11-30

In addition to these intercontinental range weapons, China also had 118 Intermediate and medium range nuclear missiles – many of them road/rail mobile – which can reach targets inside India and Russia; 214 short range (less than 1,000 km range) road mobile missiles, and is now deploying a new family of land-attack cruise missiles, some of which may carry nuclear warheads. It is clear that China is rapidly upgrading its nuclear inventory, which explains Moscow's concerns.

Turning the bilateral Russian-American arrangements into trilateral ones with China will take decades; but the quickly achieved benefits could at least include verification of China's holdings and deployments and getting China to sign the Limited Test Ban Treaty.

As nuclear doctrines evolved in the 1950s and '60s, one major US influence was John von Neumann. He is the leading proponent of "Mutual Assured Destruction" (the MAD doctrine – and Neumann deliberately chose the acronym). This involved ensuring that sufficient nuclear weapons could survive a hypothetical first strike to inflict unacceptable damage to the attacker. He was followed by Herman Kahn whose willingness to discuss anything, no matter how unpalatable, led to him being parodied as Dr. Strangelove and the ideas in Kahn's 1960 book *On Thermonuclear War* are not widely understood. However, Khan believed that a nuclear war could be survivable and even winnable.

Calculations on what nuclear conflicts might achieve were common in the Cold War, and slide-rules detailing the results that might occur in variable conditions were widely issued in the US, and were even available to the public. However, the US Defence Department determined that 400 Megatons in counter-value targeting would kill 25 percent of the Soviet population and destroy 75 percent of its industry... anything beyond this would yield diminishing returns.⁷

However, there is reason to suspect that the predictions of what a nuclear weapon could achieve on a city was largely influenced by Hiroshima, and it might be time to reassess what nuclear weapons may actually do to a modern city. Moreover, Russia is smaller than the USSR was, and is more urbanized. The US might not need the same megatonnage devoted to counter-value tasks that it did before. On the other hand, the Russians might need even more for their deterrence model, and both will have to take China into account.

Given that a nation's deterrence models are something that the potential foe needs to understand, another perverse 'left-handed' benefit might accrue from funding new research on nuclear attacks and making the results public. For that matter, the figures needed for 25/75 percent destruction of population and industry in the US, Russia, and China might also be useful if published and shared.

If all three major nuclear powers commonly understood and agreed as to what it would take for one of them to brutalize the other two; it might represent a stabilizing aspect to nuclear policy for all three. Nuclear policy shouldn't be surreal, but it must be disturbing and sobering if we are to continue to enjoy the benefits that the bomb has brought to us.

⁷ Beckett, Brian; *Weapons of Tomorrow*; Plenum Press, New York, 1983, pg. 56

Considerations of Proliferation

The other nuclear armed nations of the world include:

<u>Nation</u>	<u>Warheads⁸</u>	<u>First Test</u>	<u>Government</u>	<u>Notes</u>
The UK	215	1952	Stable Democracy	Stable alliance partner
France	300	1960	Stable Democracy	Stable alliance partner
Israel	80	Not known	Stable Democracy	Western-Jewish state in the Arab Middle East.
India	110	1974	Democracy	Regional issues with Pakistan and China
Pakistan	140	1998	Unstable	May become a failed state.
North Korea	10	2006	Erratic Dictatorship	Aggressive and xenophobic.
Iran	?	Not yet	Theocratic Dictatorship	Aggressive, seeks regional dominance.

Britain and France have limited nuclear forces, partly as a consideration to their former status as great powers. The bilateral relationship between the US and Russia easily accommodated the inventories of both nations.

The UK has between 160 and 225 nuclear warheads and normally keeps one of their four SSBNs at sea with a load of Trident D5 missiles.⁹ The French have a force of 300 warheads deployed on a mix of SSBN submarines along with some bombers and cruise missiles.¹⁰ Besides keeping these weapons as symbols of national prestige, they also represent a limited deterrent for Western Europe that is semi-independent of the United States. The real American investment in Western European security came from the deployment of conventional forces assigned to NATO roles.

American-European relations may have taken a bit of a beating in recent years. If Western Europe feels that the American defence umbrella might not be there in the future, it may have no choice but to seek to build a substantial independent nuclear force of its own.

A larger European nuclear force is a complexity that the US (or Russia) doesn't need, and the price for keeping it at bay would involve maintaining a couple of US Army divisions and a fighter-wing (at least) deployed in Europe. Keeping the Americans committed to European security is an important part of non-proliferation.

Pakistan's nuclear weapons are largely focused towards India, although India also has a somewhat antagonistic view of China (there are unresolved border issues between the two as well as clashing regional power ambitions). India's technical abilities and economy make its nuclear abilities of greater concern. If the American-Russian bilateral relationship becomes a trilateral one with China, India may have to be consulted too.

⁸ Estimates from <https://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat>; Iran estimate is not from this source.

⁹ Ministry of Defence: *The United Kingdom's Future Nuclear Deterrent Capability*. National Audit Office. 5 November 2008.

¹⁰ Clair Mills, *The French Nuclear Deterrent*; House of Commons Library Briefing Note Number 4079, 29 June 2016.

Israel neither confirms or denies that it possesses nuclear weapons. The evidence strongly suggests that they do, perhaps having as many as 200 or so ready for delivery by intermediate range ballistic missile, cruise-missile, and as aircraft bombs. Israel strongly endorses nuclear non-proliferation, especially in the Middle East, and has not openly threatened any nation with its nuclear arms... which after all may or may not exist.

Israel's nuclear weapons are not a threat meant to impose its will on the neighbours; rather they are a pledge that if Israel is ever destroyed by its neighbours, it won't go alone. The ambiguity around Israel's nuclear arms is worth preserving and the world can leave the country out of its arms control considerations.

The same is not true of Iran. Tehran has made no secret of its nuclear ambitions, frequently threatens other nations with its developing potentials, and has alarmed the neighbours.¹¹ Likewise, North Korea has been noisy and obnoxious in its quest for nuclear weaponry, and has also given to making threatening remarks to other nations.¹²

The Saudis have long quietly tolerated the idea that Israel might be nuclear armed but didn't tolerate the late Saddam Hussein's nuclear ambitions. When the Israelis bombed the Iraqi Osirak Reactor site in 1981, both the Jordanians and the Saudis made the usual public noises about Israel's act and quietly did nothing. Gossip in Amman and Tel Aviv in recent years was that a similar reaction would occur if the Israelis went for Iran's nuclear sites – telling indicators in the Middle East. The reactions to an Israeli strike on a suspicious Iranian-North Korean project in Syria in 2006 were of a similar *pro forma* nature.

The Saudis have been less tolerant of Iran, and have purchased Chinese ballistic missiles.¹³ If Iran's ambitions proceed, the world can expect the Saudis to start shopping for nuclear warheads for those missiles and a regional arms race might well accelerate. Turkey might also press for defensive nuclear arms of its own.

Then-presidential candidate Donald Trump speculated in March 2016 that the growth of North Korea's nuclear capabilities might also lead South Korea and Japan to seek nuclear deterrents of their own.¹⁴ This speculation is not confined to Trump alone. North Korea's nuclear ambitions must be curbed, and the security of Japan and South Korea will have to be guaranteed, and not just by the US (although both nations trust the US more than they do China or Russia).

Providing security guarantees to a number of small nations who might be threatened by either Iran or North Korea may have to open another dimension to any emerging Trilateral Chinese-Russian-US Arms Control relationship – that of ballistic missile defences.

¹¹ For basic facts about Iran's weapons programs refer to <http://www.nti.org/learn/countries/iran/>; for a restrained note on Iran's recent misbehaviours see Kori Schake's "Missiles and More: Iran's Threats to Israel and the Middle East", *Strategika*, Issue 35, Hoover Institute, September 21, 2016

¹² For an overview refer to <http://www.nti.org/learn/countries/north-korea/>

¹³ <http://thediplomat.com/2014/01/china-secretly-sold-saudi-arabia-df-21-missiles-with-cia-approval/>

¹⁴ <http://www.cbsnews.com/news/donald-trump-japan-south-korea-might-need-nuclear-weapons/>

Anti-ballistic missile (ABM) defence is a difficult technical feat – especially if trying to achieve a kill on an incoming warhead without fitting an ABM with a nuclear warhead itself. Incoming missile warheads are fast... although their speed is also related to range. ICBMs are the fastest, short-range tactical missiles (such as the SCUDs fired in the 1991 Gulf War) are the easiest to hit.

The superior size of an ICBM also allows for penetrator aids to be added to the “bus” that carries the payload into space. MIRVs (the multiple-independent re-entry vehicles which are the nuclear warheads) could theoretically be programmed to change course or change their trajectory to further compound efforts to intercept them. Other penetrator aids could include decoy and jammers meant to spoof any radar guiding an ABM missile.

Both the US and Russia have built-in an ABM capability to some of their larger anti-aircraft missiles. Thus, the US RIM-67 Standard Naval SAM has evolved to the RIM-161 Standard 3, which can even intercept Intermediate Range Ballistic Missiles. The Russians have assented to the deployment of Standards in Europe positioned to intercept Iranian missiles. Japan has bought some, and Turkey is thinking of doing likewise. Russia’s S-300/SA-23 *Gladiator* SAM has similar capabilities as does their S-400/SA-21 *Growler*.

Limited ABM weapons are also being built and deployed by Israel and Taiwan, as well as by China and France. India has purchased some Russian systems.

Limited ABM abilities against ICBMs were also allowed under treaty to the US and to Russia; but both recognize (reluctantly on the part of some Americans) that broader deployment of ABMs capable of hitting ICBMs could reverse the trend to smaller strategic inventories.

Iran and North Korea have been avid in their eagerness to achieve the power-status they believe owning nuclear arms will convey. If the nuclear-tipped ICBM is the ticket to the Big-Boys Club, it might be time to change the entrance fee. Demonstrating the ability to build and deploy a workable ABM ability against ICBMs might be just the ticket.

Ballistic missile defences against short, medium and intermediate range ballistic missiles are in the interests of most nations. Limited defences against a small number of ICBMs or incoming MIRVs would be a stabilizing element and would protect against accidental launch. Possession of a limited ABM ability, with the permission of their peers, should be the new “prestige” item for the great powers.

The World has enjoyed 72 years without seeing nuclear weapons used in anger, and without seeing a massive conventional conflict on the scale of the Second World War. With careful diplomacy, the next couple of generations might be able to enjoy the same benefit. It might be strange, but it is surely not unnatural to stop worrying and love the bomb.

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