What's Next In Nuclear Arms Control?

by

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Abstract. The evolution of alert forces is reviewed in order to judge the utility and feasibility of proposals to de-alert nuclear forces. Two new types of risk must be avoided in implementing de-alerting-- instability caused by competitive re-alerting, and vulnerability of the de-alerted forces. Cooperative assurance of non-launch should be emphasized in the near term, and major emphasis should be placed on accelerated reductions in START II and III and in a Post-START limit to 1000 warheads each for Russia and the U.S., including ALL warheads and weapon-usable materials. Key to

achieving this goal are techniques for permanent demilitarization of nuclear weapons before they can be eliminated.

Introduction.

There is a general impression that the threat of nuclear weapons has vanished with the end of the cold war, and it is difficult to get funds and focus to reduce a nuclear threat that most people think does not exist.

Instead, the interest of public and legislators is consumed with scandal, counter-scandal, NATO expansion, and other relative trivia, while the physical capacity to destroy another society and even our civilization continues to exist.

START I limits deployed strategic weapons in Russia and the U.S. to 6000 "accountable", but it sets no limit to reserve or otherwise undeployed warheads. Similarly, START II will limit deployed warheads on each side to 3000, but the 1994 Nuclear Policy Review in the United States explicitly sets a reserve force of similar magnitude, and there are no treaty constraints on undeployed U.S. or Russian nuclear warheads. It has long been argued that the Russian Duma is averse to ratifying START II because they do not now have enough single-warhead land-based missiles to fill their quota, and they don't have the money to build them; hence START II assures the U.S. of "superiority" in deployed strategic weaponry.

On the other hand, the U.S. Administration is prevented by law from negotiating START III until Russia ratifies START II, although discussions (but not negotiations) do seem to have taken place.

Not a negotiating forum, Pugwash has long considered the practicality of steps than are not being pursued seriously by governments, and this service is needed now.

There are various dimensions of the nuclear threat:

1. Numbers of warheads and their yields.
2. Readiness to launch.
3. Responsiveness.
4. Degree of control.
5. Survivability of forces.
6. Survivability of command structure.
7. Reconstitutability.
8. Virtual forces whether in the hands of traditional nuclear weapon states, newly arrived weapon states, or sub-national groups.
9. And finally, the degree of animosity of the weapons' possessor towards the U.S. or other possible adversary.

It is clear that the threat of destruction of a target country by a force of 30,000 strategic warheads is not much different from that from a force of 5000 strategic warheads, and the nuclear hazard could even be greater with the smaller force.

Just to pick a few of the other dimensions, that of readiness and responsiveness, which are much discussed these days, we note that a ready force did not arise totally our of caprice, but was an apparent necessity according to the perception of the strategic situation.

The Origin of Launch-on-Warning.

Those readers with long memories will recall my having published in the 1980s several pieces which considered launch-on-warning (LOW) or launch-under-attack (LUA) as stabilizing influences-- in contrast to the general view at that time and the near-universal view at present. In the early days of strategic nuclear weapons, the U.S. had its weapons on bombers, which would take eight hours or more to reach their targets from bases in the United States.

Furthermore, even after the Soviet Union acquired large numbers of strategic nuclear weapons, Soviet nuclear weapons would require hours to reach the United States. The investment by the U.S. and Canada in a distant early warning system (DEW) ensured that U.S. bombers with their nuclear weapons could take off from the relatively few U.S. airfields on which they were based, before being destroyed by air-delivered Soviet bombs. Indeed, this was a necessity, because a single nuclear weapon could destroy an entire airfield, together with all the airplanes based on it. A relatively few Soviet nuclear weapons could thus eliminate the U.S. retaliatory capability.

The same was true of the Soviet Union, although their airfields were more protected by the vast expanse over which they were presumably situated, and in any case the long flight time of U.S. strategic aircraft. An enormous emphasis in the Soviet Union on radars and early warning in general helped to stabilize the situation during the era of strategic aircraft.

The advent of strategic ballistic missiles of course changed the calculus totally. It was no longer possible to have a large number of aircraft take off from the small number of airfields within the 20 minutes or so that one might have of warning of an attack by ICBM, and the 10 minutes or so after the detection of SLBM attack on the United States. Aircraft began to fly continuous alert missions, loaded with nuclear weapons, and the vulnerable land command structure was augmented by supposedly invulnerable airborne command posts and leadership aircraft.

But the hazard of hasty launch was apparent to many, and impelled a very costly program of hardening U.S. ballistic missiles as they were deployed. A second approach to survivability was the basing of strategic ballistic missiles on submarine launched ballistic missiles (SLBM), which together with numerous hardened silos (the 1000-missile Minuteman force) seemed to provide for awhile a survivable deterrent. In his autobiography "Krushchev Remembers", the Soviet leader recalls being informed by his son that U.S. land-based missiles were protected by hardened silos, while Soviet

missiles were exposed in their launching positions; Krushchev recalls then giving the order to build missile silos.

The evolution of technology made it possible to improve ICBM and even SLBM accuracy to the point in the 1960s at which opposing ICBM silos would appear threatened; still, even the no-longer survivable ICBM force could be guaranteed to remain in working order by being used before it was lost. Its effectiveness as a deterrent to all-out nuclear attack could thus be preserved, at the price of increased risk of its launch on mistaken evaluation that a massive attack had been launched. In the absence of launch on warning (or of launch under attack), a vulnerable retaliatory force facing what was thought to be an implacable enemy's similarly vulnerable force presented the logical imperative of preemptive launch. The world was saved from that catastrophe by further hardening programs, by the introduction of mobile missiles that survived by uncertainty about their location, and by the reluctant acceptance that the Triad (nuclear weapons on strategic bombers, on land-based missiles, and on submarine-launched strategic ballistic missiles) was still a deterrent if only the strategic submarines would survive a massive counter-force initial nuclear strike.

And in any case, the command structure from the political leader on down to the command to the silo itself had never been tested in actual nuclear war. Not only were various critical nodes in this process subject to destruction more readily than the hardened weapons themselves, but they might also have been vulnerable to specifically nuclear effects such as electromagnetic pulse (EMP).

Although it makes no difference now how we arrived at the present situation that requires remedy, it might help to avoid future self-imposed vulnerabilities to recall for a moment how the situation of vulnerable silo-deployed forces arose.

I have indicated that it was the technology that permitted accurate reentry vehicles (RVs) that raised the possibility of such vulnerability. But it was the decision to improve accuracy with this technology that actually produced such vulnerability. In the case of land-based missiles, the missile is in its silo long enough and in a fixed pre-surveyed position, so that if the on-board instrumentation is of good enough quality (gyroscopes and accelerometers) the missile could have sufficient accuracy to destroy a hardened silo, even with a warhead of modest yield. A further requirement for a system of passive reentry is to have a sleek reentry vehicle that would reach the ground supersonically, and not an RV that would slow down in the air and be blown off course by winds. An alternative approach providing accuracy with blunt RVs would involve a maneuvering RV (MaRV) and terminal guidance within the atmosphere; the most precise and simplest technique would use the global positioning system (GPS), although one might expect that GPS would be turned off during nuclear attack. A Russian "GPS" known as GLONASS could also be used.

Given these implications of accuracy of strategic weapons, much U.S. attention was devoted in the 1960s and early 1970s to intelligence about the achievable accuracy of Soviet ICBMs and SLBMs.

In the United States, Representative Brooks of Massachusetts emphasized the instability (and thus the increased risk of massive nuclear war that would result) if the thousands

of U.S. SLBM warheads would achieve silo-killing accuracy. This would force the Soviet ICBM force into a posture of launch-on-warning, so that the weapons would be poised always to be launched within minutes of such warning, with predefined targets. Since the missiles would not be in their silos to be destroyed, Brooks questioned not only the wisdom but the value of increased SLBM accuracy. President Nixon responded that that such accurate SLBM would not be deployed during his Administration, but went ahead with the development program even so. And U.S. SLBMs now have that accuracy.

The other half of the threat originates from the policy demand for such silo-killing capabilities, which emerged as a matter of logic during the early 1960s. Providing a strategic rationale of deterrence for maintaining the three-part strategic force constituted of ICBM, SLBM, and strategic aircraft components, McNamara emphasized that these were designed to handle the "greater than expected threat." And if that threat did not materialize, the forces would not be totally useless in case of the outbreak of nuclear war, because they could be used for "damage limitation." If enough U.S. warheads survived initial attack, and if no enormous antiballistic missile system (ABM system) were in reality deployed at the time of nuclear war, it would be foolish to use nuclear weapons to strike again and again an urban or commercial area already destroyed many times over by such warheads. Instead, these essentially surplus warheads would be used for Damage Limitation-- they would reduce the ability of the Soviet Union further to damage the United States.

It was predictable, however, that once such an application (even secondary) was stated for U.S. strategic weapons, efforts would be made to improve the performance of weapons in that role. During the Nixon Administration, Secretary of Defense James R. Schlesinger promoted Damage Limitation from a secondary capability to what soon became a design criterion for the U.S. strategic force-- the role of second-strike counterforce. Never mind that second-strike counterforce was far more difficult to achieve than a first disarming strike: the Soviet Union (according to the SSCF scenario) would have launched a strategic nuclear attack against the United States, presumably attempting to disarm the U.S. as well as to destroy it. In order to deter such an attack (or if such an attack actually came, then to limit damage caused to the United States) U.S. weapons would be launched (second, of course) against remaining Soviet strategic nuclear and delivery capabilities.

Even though it was emphasized in the 1960s that strategic force vulnerability was more apparent than real so long as one silo-based force of single-warhead missiles faced another of similar size, the apparent vulnerability increased greatly with the U.S. decision to place multiple independently targeted reentry vehicles (MIRVs) on the silo-based missiles. The first consequence, of course, was not an increase in vulnerability, because it was an expansion of the force; thus for any number of silos destroyed, more weapons would be left than if MIRVs had not been deployed on our side. But with the enhancement of warhead numbers in the Soviet inventory, and later with the negotiation of roughly equal limits on offensive warheads, the self-inflicted vulnerability became a real worry.

Indeed, without the obsolescent bombers and the SLBMs of doubtful survivability (at least on the Soviet side), the reliance on mutually vulnerable silo-based MIRVed ICBMs

could be imagined to contribute to an outright instability: under the worst-case scenario, the side that struck first could destroy almost all of the silo-based warheads. The universal remedy, however, was to be ready at all times to launch the retaliatory force before it could be destroyed in this way. Indeed, a lot of ink was spilled and thought expended on ways in which the other side might even so achieve a first-strike capability and execute such a first strike.[1]

Seen in this light, launch-on-warning is a posture, however reluctantly adopted, that saves the world from the nuclear war that would result from the frank instability of mutual vulnerability. Absent LOW (assuming, for instance, that it would take more than 30 minutes to ready missiles for launch), and absent good information on the missile preparations on the other side, one side might feel that the other would at any time prepare its missiles for a disarming strike (all the while professing calm and friendship), and launch them in a disarming wave of annihilation. And each side, knowing that the other had it in its power to do this and so to end forever the threat to its hegemony or survival, would contemplate doing it first. So LOW intervenes as a salvation, and brings its own risks.

With LOW on both sides, neither side need fear intentional destruction by the other side, and that is a plus. On the other hand, there is a likelihood greater than zero that the force that is ready to be fully launched in 20 minutes might be given that command by accident, by miscalculation, or by some cataclysmicly troublesome individual. To avoid this problem (and, in my opinion, to enlarge the force and approach more closely to a first-strike capability!) the U.S. went to great lengths to avoid a dependence on LOW, while at the same time commanders of the Strategic Air Command and more recently of the Strategic Command, have assured political leaders (e.g., in Congressional testimony) that they do indeed have the capability of launching under attack.

I have rehearsed these aspects of particular hazard of the strategic confrontation, in order to avoid them as we move in the post-cold-war era to a lower level of nuclear threat, but also to put in context the current proposals to reduce the risk of accidental or inadvertent launch of nuclear weapons.

Options for Reducing the Threat From Existing Nuclear Weapons.

The 1997 report of the Committee on International Security and Arms Control of the U.S. National Academy of Sciences[2] builds on the START process of arms reduction with Russia by urging a START III at a level of 2000 deployed warheads (which could be achieved rapidly if the Russian Duma ratified START II with the provision that START III be signed within 60 days), followed by a Post-START regime to limit U.S. and Russian nuclear warheads to a total of 1000 each.

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[1] In this context a "first strike" really means a disarming strike against the retaliatory force. It does not mean simply using nuclear weapons "first."

[2] "The Future of U.S. Nuclear Weapons Policy," available at http://www.nap.edu. SEARCH the site for the full-text report.

This level of 1000 would be very different from START III at 2000 deployed warheads, because START I, II, and III do not limit non-deployed strategic warheads or tactical warheads, or reserve nuclear components that might be used in either strategic or tactical roles. We have already noted that the U.S. plans to retain some 10,000 nuclear warheads under a START II regime of 3000 deployed strategic warheads. The Post-START level of 1000 total would require agreed provisions for transparency[3] that would permit each side to be confident that the other did not have reserve nuclear components or materials (weapon-usable plutonium or enriched uranium). Further reductions would need to involve commitments on the part of the other nuclear weapon states-- Britain, China, and France-- and could surely move rapidly to a level of 100-300 each and possibly to the elimination of national nuclear weapon forces or even to a total prohibition of nuclear weapons.

The CISAC report, as with other proposals for reducing the nuclear threat, proposes parallel and urgent steps to move nuclear weapons from their current state of high alert, only cosmetically palliated by their having been "detargeted". The fundamental problem is Russia's perception of the vulnerability of their own strategic nuclear forces and the apparent lack of confidence on both sides in the survivability of their nuclear command systems to ensure retaliation after experiencing a massive nuclear attack. Some proposals to reduce the readiness of nuclear strategic forces might well add to strategic instability rather than reduce it-- such as a requirement to have strategic missile-launching submarines carry no warheads for their missiles.

Since the Russian state of readiness to launch is caused by Russian perception of U.S. capabilities to destroy their retaliatory force or their command structure, proposals to reduce this threat of a hair-trigger Russian force center on increasing the time required to fire the U.S. force. A fundamental problem is that a disarming first strike does not require a force on hair-trigger alert or capable of launch on warning or of launch under attack. Even the first-generation U.S. force of missiles fueled with liquid oxygen and kerosene could have been launched on a schedule to provide simultaneous launch of the majority of the force, even if the preparations would have taken hours to complete. So proposals to reduce readiness must accept that Russia would likely retain the ability to return to the present state of LOW in case U.S. forces were not verifiably stood down. These questions are addressed more fully in a paper[4] presented at the Amaldi Conference in Paris. A very useful compilation of proposals for reducing the alert levels of nuclear forces is now available.[5]

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[3] The argument that Russian and especially U.S. warhead dismantling capacity cannot handle reductions more rapid than 1500 per year or so is highly misleading. First, the capacity at the U.S. site at Pantex, Texas, is limited by the short-sighted view that the job is finite and does not warrant hiring of additional staff. More important is the option of irreversible demilitarization of warheads beyond those permitted in the agreement, taking advantage of some of the technical features of these warheads. For instance, in the early 1990s, U.S. teams rendered hundreds of U.S. deployed warheads incapable of creating any nuclear yield, by feeding large amounts of metal wire into the "hollow pit" via the boost-gas fill tube. The same approach, using brittle wire that could not be removed, would serve to permanently demilitarize warheads in a verifiable fashion.

[4] "De-alerting Nuclear Retaliatory Forces," R.L. Garwin, available at http://www.fas.org/rlg.

[5] Memo from Joseph Cirincione to Council on Foreign Relations Independent Task Force on Reducing the Risk of Nuclear War, Feb. 6, 1998.

Certain measures could and should be taken unilaterally:

- The U.S. could put motion detectors on its Minuteman silo covers, broadcasting in a secure code once per minute that the detector has not moved. This would compensate for the gaps in the Russian constellation of launch detection satellites.

- Russian submarines in port are apparently capable of launching their missiles at dockside, although U.S. submarines are not. Submarines in port are totally vulnerable to a nuclear strike, even to a warhead of accuracy far poorer than what is now available. Submarines on patrol, deemed invulnerable, could be sent to patrol out of range of their targets, and ballast could be added in a verifiable fashion to SLBMs that may have had warheads downloaded under START, in order to reduce the missile range. But the measures adequate and perhaps acceptable to reduce the threat of alert missiles on submarines on patrol are hardly applicable to submarines in port.

Discussion.

The U.S. should improve its security by providing Russia with verifiable assurance of non-launch of U.S. silo-based missiles and with similar assurances, as may be possible, of non-launch of submarine based missiles.

In practice, neither Washington nor Moscow can be confident that there are not already nuclear weapons pre-emplaced in the capital, so no prudent nation would rely on retaliation dependent on warning (or even on launch on warning).

Other means of de-alerting should be pursued as politically possible, in view of the important improvement in security that would be achieved while such means are in effect-- with due attention to the likelihood that each side will want to retain the ability to reconstitute its current alert and responsive status. De-alerting proposals must be evaluated with the recognition that competitive re-alerting would offer a new type of risk of nuclear war.

In general, de-alerting should not be regarded as a substitute for START III or for Post-START arms reductions, but a valuable goal to be pursued in parallel with reductions and permanent demilitarization of nuclear warheads and materials.