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Increasing Warning and Decision Time ('De-Alerting')

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Launch-ready Nuclear Postures

Both the Kremlin and the White House routinely re-issue presidential nuclear guidance that requires their respective nuclear forces to be constantly prepared to fight a large-scale nuclear war with each other at a moment's notice. These forces are assigned long lists of targets, running into the thousands on each side, to strike in the event of war, and they are expected to inflict serious damage with high probability on all target categories – opposing nuclear forces, conventional forces, war-supporting industry, and leadership. The forces cannot achieve this wartime objective of high 'damage expectancy' if the opposing forces destroy them first, and so both strategic arsenals kept on launch-ready alert. Their command and early warning networks maintain a constant vigil and readiness to launch the forces on warning of incoming warheads fired by the opposing side.

This fuse is no longer today than it was during the Cold War. Both nuclear superpowers manage their strategic arsenals in almost exactly the same manner as they did during the Cold War.

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How short is this fuse? Many hundreds of missiles on land and sea are fully armed, fueled, and targeted. The land-based missiles in silos will fly as soon as they receive a few short computer signals whose transmission is as simple as stroking a few keys on a keyboard, hitting 'enter,' repeating the sequence once more, and then turning two keys in unison. The sea-based missiles on submarines will pop out of their tubes as soon as their gyroscopes are spun up, the onboard computer uploads their wartime targets and arms their warheads, and additional computer signals open the hatches and ignite the steam generators that propel the missiles to the surface.

If the Kremlin and the White House ordered the launch of their alert strategic missiles right now, this minute, without any prior notice and advance preparation, the amount of firepower unleashed and the speed of its release would be astonishingly large and rapid. U.S. land-based launch crews would receive the order almost instantaneously, remove launch keys and codes from their safes, compare the authorization codes in the launch order with those in their safes, insert their launch keys, punch in the number of the selected war plan that automatically instructs their missiles which specific target file to pull from their computer files and what trajectory to fly, key in the 'enabling code' contained in the launch order that arms the warheads on the missiles, and turn the launch keys that transmit the 'fire' command to the dispersed unmanned missiles in underground silos.

The time needed to execute all of these steps in the Minuteman fields of central plains America: one to two minutes. (They are called Minuteman for a reason.) At sea, analogous steps taken by submarine crews include retrieving a special firing key from a safe inside a safe, the access code to which is provided by the launch order from higher authority. From that point in time until missiles leave their tubes in quick succession only about 12 minutes would elapse.

Very similar procedures and timelines apply in Russia. Extremely high launch readiness for large numbers of alert missiles prevails on both sides. About one-third of their total strategic forces are poised for immediate launch under normal conditions. The combined firepower that could be unleashed within these short time frames measured in minutes is

approximately 2,654 high-yield nuclear warheads (1,382 U.S. and 1,272 Russian) – the equivalent of approximately 100,000 Hiroshima bombs (assuming the Hiroshima bomb yielded 15 kilotons of explosive power).

A high degree of vigilance suffuses the entire U.S. and Russian chains of nuclear command and warning, from the bottom all the way to the top. In the warning centers, such as the hub of the U.S. early warning network in Colorado, crews labor under the pressure of tight deadlines to assess and report whether a satellite or land radar sensor indicating a possible threat to North America is real or false. Events happen almost daily, sometimes more than once daily, which trigger this assessment drill that is supposed to yield a preliminary assessment within three minutes after the arrival of the initial sensor data.[2] Analogous drills take place under comparable deadlines in Russia. A rush of adrenalin and rote processing of checklists, often accompanied by confusion, characterize the process.[3]

If their early warning assessment determines that a nuclear missile attack is possibly underway, the entire chain of nuclear command in the United States or Russia would immediately kick into high gear with thousands of duty crews and nuclear support personnel involved. The same rush of adrenalin and rote decision-making by checklist drive a process whose intensity and deadlines practically rule out any chance for careful deliberation. An emergency conference involving the presidents and their top nuclear advisors would be convened, whereupon on the U.S. side the commanding duty officer at Strategic Command headquarters in Omaha would brief the U.S. president on the nature of the apparent attack, the wide array of response options, and their anticipated

[2] These frequent occurrences involve diverse events – e.g., nations launching rockets to place satellites in space; developmental tests of military and civilian rockets; combat use of rockets of all kinds (including short- and medium-range rockets as well as intercontinental range); and airplanes using after-burners. Assessment drills are also triggered by natural phenomena – sunlight reflected from clouds, for instance, and even wildfires may be detected by infrared heat sensors on surveillance satellites designed to detect the hot plumes of rockets during their 2-4 minute first-stage burn.

[3] On the occasions of the two major false alarms in U.S. history (caused by human error and computer malfunction, respectively), it took the crews 8 minutes instead of 3 to resolve the confusing contradictory indications, resulting in their being immediately relieved of duty ("fired") both times. Cases in Russia were similarly fraught with confusion.

consequences for Russian physical and human resources. The time allocated for this briefing is as little as 30 seconds depending on the nature of the attack. The U.S. president then would come under intense pressure to absorb this complex set of data, weigh the consequences of the various options, and choose a course of action. His decision window is typically twelve minutes, although under certain extreme conditions it can be much shorter.

The extraordinarily brief time for such a momentous decision is driven by four factors: the 30 minute flight time for an intercontinental missile, and about one-half that for an submarine-launched missile; the time required to validate and characterize the attack, using two separate sources of warning data to ensure high confidence; the time required to convene a phone conference of the principals involved in the decision process, and the time required following presidential decision to encode and transmit that decision worldwide to the strategic nuclear forces. Any delay in transmitting the response order runs the risk of losing retaliatory forces to the other side's attack, thus undermining the calculus of expected damage for the response option chosen by the national leadership. This risk is compounded in the event of a so-called "decapitation strike," that is, an opening attack on the leadership. Under this circumstance, the integrity of a retaliatory response is greatly compromised, thus calling into question the very calculus upon which nuclear deterrence is based.

Given these acute conditions, it is no wonder that as much of the response process as possible is designed to be quasi-automatic. It can reasonably be described as going to war by checklist, enacting a prepared script, with little margin for human error or technical malfunction. The nuclear war machinery on both sides has a hair-trigger quality. And that quality has been a constant in the nuclear equation for decades despite the Cold War's end. Both of the traditional nuclear rivals still stand ready to inflict apocalyptic devastation on one another in a first or second strike whose essential course would be run in less than one hour.

Why De-Alert?

There are a host of reasons why removing the hair-trigger on their missiles is an urgent priority. Beyond the familiar arguments about the inherent danger of accidental and unauthorized nuclear attack lurk shadowy new threats such as cybernetic threats to the nuclear command and warning systems. The nuclear command systems today operate in an intense information battleground on which more than 20 nations including Russia, China, and North Korea have developed dedicated computer attack programs.[4] These programs deploy viruses to disable, confuse, and delay nuclear command and warning processes in other nations. At the brink of conflict, nuclear command and warning networks around the world may be besieged by electronic intruders whose onslaught degrades the coherence and rationality of nuclear decision-making. The potential for perverse consequences with computer-launched weapons on hair-trigger is clear.

Other information warfare programs are designed to infiltrate and collect information on, for example, the schedule of the movement of nuclear warheads during peacetime. Hacking operations of these sorts are increasing exponentially as the militaries of the world increasingly depend on computer and communications networks. The number of attempts by outside hostile actors to break into Defense Department networks has surged by 10-fold in the past couple of years. Hostile intrusion attempts against Pentagon computer systems now run in the neighborhood of 1,000 per day. (China is especially active.)

Among the possible terrorist threats posed by cyber-attack: terrorists could spoof early warning sensors and generate false alarms that precipitate nuclear overreactions; or terrorists may get inside the command and communications networks controlling nuclear forces. They might gain information useful to interdicting and capturing weapons, or

[4] Estimates based upon Adam J. Hebert, "Information Battleground", Air Force Magazine, Vol. 88, No. 12, December 2005. www.afa.org/magazine/Dec2005/1205info.html.

unauthorized actors might even discover ways to inject messages into the circuits.[5] Clearly, keeping nuclear forces ready to fly instantaneously upon receipt of a short stream of computer signals carries real risk.

The simple fact that maintaining war-ready nuclear postures requires many hundreds of nuclear bombs to be moving around on alert or going back and for the between the field and bomb refurbishment facilities means that they are exposed to capture or theft during the most vulnerable phase of their operating cycle: transportation, the Achilles Heel of security. As long as traditional deterrent practices continue, it will be impossible to truly 'lock down' the arsenals to protect them from theft. Sooner or later, the Nunn-Lugar program will fail unless the day-to-day adversarial nuclear relationship built around combat-ready forces is ended.

An emerging consensus of strategic thinkers rejects the view that the demands of deterrence justify taking cosmic risks in the way nuclear forces are operated, while advancing the view that the demands of safety call for standing down those forces to buy a larger margin of safety against an array of known and unknown dangers. This consensus is giving new impetus to the agenda of de-alerting nuclear forces, as evidenced by the influential Wall Street Journal op-eds in 2007 and 2008 by George Shultz, Sam Nunn, Henry Kissinger, and William Perry calling for urgent steps to pave the way toward a world free of nuclear weapons. The 2007 article calls for the nuclear powers to change their "Cold War posture of deployed nuclear weapons to increase warning time and thereby reduce the danger of an accidental or unauthorized use of a nuclear weapon."

[5] An especially noteworthy example is the discovery by the commission of an unprotected electronic back-door into the naval broadcast communications network used to transmit launch orders by radio to the U.S. Trident deterrent submarine fleet. Unauthorized persons including terrorists may have been able to seize electronic control of shore-based radio transmitters such as the very low frequency facility at Cutler Maine, and actually inject a launch order into the network. The deficiency was taken so seriously that new launch order validation protocols had to be devised and Trident crews had to undergo special training to learn them.

How to De-Alert

How should the traditional nuclear rivals proceed down this path of de-alerting? In a research report prepared for the Hoover-NTI project on nuclear elimination, I propose a four-phase plan that steadily lengthens the fuse on nuclear forces by hours, days, weeks, and months.

In phase one, which is very near term, I recommend revising the nuclear war plans to eliminate massive attack options and launch on warning from the repertoire of response options available to nuclear decision-makers. Simple changes in emergency war procedures would suffice. The strategic missile forces could also be de-targeted, stripped of all wartime aimpoints. Reversing the new procedures and plans would take days. Re-targeting the missiles would take many hours. Although the verifiability of these steps is low, in theory this posture alteration would remove the threat of a surprise first strike and thereby relieve pressures for prompt retaliation, buying a margin of safety against accidental and unauthorized launch. A case can be made for implementing this de-alerting step unilaterally since it would help move the other side's finger away from the nuclear launch button.

In phase two, strategic missiles in silos would be isolated from external launch control, by flipping a safety switch inside each silo, as was done in 1991 when former President Bush de-alerted nearly one-half of the U.S. Minuteman force almost overnight. And submarines at sea would refrain from installing a critical electronic device on each of the missile tubes. By not installing these 'inverters', which ignite the steam generators that propel missiles out of their tubes, submarine launches would be precluded for many hours.

These simple, practical measures augment the procedural changes noted earlier, and have the added virtues of extending the time to re-alert the bulk of the forces by approximately 24 hours and of lending themselves to a modest degree of verification that would build confidence over time. Re-alerting missiles in silos would require dispatching maintenance troops to the missile fields to reenter each individual silo to flip the safety switch back on, a process requiring many hours to complete. Regarding submarines,

installing the ‘inverters’ to re-alert all 24 missiles on Trident boats would take about 18 hours.

Analogous measures can be implemented in the Russian posture, resulting in a stable nuclear balance that removes sudden first-strike and launch on warning completely from the array of response options available to decision-makers, and that all but eliminates the prospect of unauthorized actors, including terrorists, exploiting hair-trigger postures to cause a nuclear incident or actual firing.

In phase three, which would be completed within the 2012 Moscow Treaty timeframe, all warheads are separated from their delivery vehicles (missiles) but both warheads and missiles are widely dispersed in protected positions. For a notional U.S. strategic force of 14 Trident submarines and the planned force of 450 Minuteman silos, this de-alerting scheme calls for storing Minuteman warheads in 225 otherwise empty silos, adjacent to 225 silos housing the unarmed Minuteman missiles; and for storing Trident warheads on 11 boats in 11 otherwise empty tubes on each boat, adjacent to 11 tubes housing the unarmed Trident missiles. . The 12^{th} pair of tubes on each boat would hold a 5-ton capable crane and other equipment, in order to facilitate the remating of warheads to missiles if emergency circumstances would require it. The scheme assumes 2 boats are normally in overhaul, 9 are normally at sea, and 3 are normally undergoing light maintenance. Supplemented by 143 bomber warheads in local base storage, this scheme preserves a large margin of survivability under worst-case conditions of break-out and attack by opposing forces.

Reciprocal Russian measures would produce a resilient 500-warhead reserve force on each side that further extends the time to re-alert by weeks to months. Re-alerting the Minuteman force would entail dispatching warhead transport vans to retrieve the warheads in silos and transport them to the individual missile silos for installation. This reconstitution would under plausible assumptions take about 2 full weeks to bring the entire Minuteman force back to launch-ready status. For submarines, the mating of warheads to missiles would have to take place on the surface, in fairly calm waters, and would take about one-half day to fully reload the 11 missiles on a given boat after it had

surfaced and stabilized. In the case of strategic bombers, it would take 12 hours to upload the first group of bombers and 30 hours to upload the entire bomber force.

This scheme ensures the survivability of the forces, lends itself to verification using the random warhead inspections allowed under the START treaty, removes incentives for rushing to re-alert forces during a U.S.-Russian (or Chinese) crisis (the likelihood of which is remote in any case), and deeply reduces the role and saliency of nuclear weapons in our national security strategy. By applying to warheads as well as launchers it would promote the creation of an auditable database of warheads that in turn would facilitate progressive disarmament. It would also completely deprive unauthorized actors of any opportunity to induce a launch, and eliminate all risk of a mistaken launch on false warning.

In phase four, all nuclear warheads are transferred from combat field deployment to storage facilities on land. This consolidation of warheads over the next 4-6 years under strict surveillance and verification, combined with the lengthy reconstitution time of many weeks to months, would greatly marginalize nuclear weapons and take a long stride down the path toward elimination. It would also put the arsenals in a full 'lock-down' status that would be optimal for preventing the accidental or unauthorized use, or theft, of nuclear weapons.

However, this option must be implemented with great caution. Depots stocked with large numbers of warheads present a potentially lucrative target. The break-out of even a few weapons could pose an extreme threat if the opposing forces' nuclear ordnance is concentrated in only a few depots. Therefore before any transition to this storage option is completed, a number of pre-conditions should be satisfied.

First, monitoring and verification must be able to perform at a very high level with exact accounting of warheads in storage down to the single weapons unit. Second, all of the P-5 states and perhaps other nuclear states need to be involved in this option—even limited capabilities in the hands of third parties could pose a potentially severe threat to the locked-down forces of the U.S. and Russia. This de-alerting regime should thus be

comprehensively multilateral with stringent and enforceable monitoring and verification provisions. Third, given the enhanced threat represented by a single nuclear weapon, a strict re-alerting protocol would be essential should any nuclear nation deem it necessary to take this highly momentous and potentially destabilizing step. Fourth, similar protocols and constraints may need to be devised for conventional forces. A party that covertly begins to reconstitute its nuclear forces could use conventional forces to degrade an ostensible opponent's ability to respond in kind. Fifth and last, storage depots on land can and should be designed to withstand a small-scale nuclear attack. With respect to the U.S., the de-activated MX Peacekeeper and Minuteman silos slated for mothballing could be utilized to protect a stockpile of reserve warheads for submarines, land-based missiles, and bombers.

Implications and Concluding Thoughts

This four-step de-alerting proposal would lengthen the fuse on strategic nuclear forces by progressively longer periods of time. The nuclear postures today are timed for firing forces *en masse* within minutes and seconds. Under this proposal, the reconstitution time of a coherent force would be initially extended by hours and days, then by days and weeks, and finally by weeks and months or longer.

Getting all U.S. and Russian strategic weapons into warhead storage depots under strict surveillance (*phase four*) would be a milestone of great significance. Not only would 'locking down' the arsenals allow for the maximum degree of security and safeguards to be imposed, but it would also so demote the military role and utility of nuclear weapons that the process of force deactivation would only accelerate. This path of de-alerting thus appears to offer the single most promising route to rapidly reducing a host of immediate and growing nuclear dangers and to moving the world closer to its ultimate destination of zero nuclear weapons.

De-alerting even at the initial phase, entailing the removal of massive attack options from the war plans, implicitly contests the axioms of nuclear strategy that have shaped the operational character of U.S. and Russian deterrent forces for nearly 50 years. Implementing any of the four steps presented in this report will hinge on re-

conceptualizing deterrence and transforming the traditional war-fighting strategies. De-alerting presents more than a mere technical challenge of devising verifiable ways to reduce reliance on prompt launch capabilities. It so challenges traditional deterrent concepts and operational practices that it must be grounded upon a visionary and enlightened conception of national and international security.

The core premise of that new conception is that the Cold War between the United States and Russia is finished and done, and that the prevention of nuclear terrorism and proliferation, and strengthening safeguards against the accidental and unauthorized use of nuclear weapons now lie at the core of their national security interests, and head the list of urgent nuclear priorities. The leaders of the United States and Russia have but to assert in their nuclear guidance that U.S.-Russian mutual nuclear deterrence no longer demands launch-ready forces servicing war-fighting objectives and the cosmic risks that such forces carry are no longer justifiable in the name of deterrence.

Such guidance would overturn the longstanding view that deterrence demands real-time coverage of a comprehensive and long list of military, economic, and leadership targets in Russia and China, a readiness to rapidly generate the full U.S. strategic arsenal to maximum alert during a crisis, and a pre-disposition to launch on warning of an enemy attack in progress.

Without visionary new presidential guidance, the default position will be the traditional one, and the path to standing down the Cold War postures will be obstructed. The default position, moreover, will create further barriers to de-alerting as it factors China's nuclear modernization and general economic rise into U.S. threat perceptions, deterrence thinking, and actual nuclear planning. Since China was reinstated in the U.S. strategic war plan in 1998 the trend has been to view it increasingly as the next 'designated enemy' for U.S. military planners and the rationale for maintaining a large U.S. nuclear arsenal on high alert.[6] The 2002 Nuclear Posture Review designated China as an

[6] China thus reappeared in the plan after a hiatus of nearly two decades, having been removed in the early 1980s by President Reagan following normalization of U.S.-China relations. Limited attack options for China were created by Strategic Command in January 1998 in response to President Clinton's nuclear guidance issued in November 1997 (NSDD-60). See Elaine Grossman, "Nuclear Weapons Expert Says

'immediate nuclear contingency' (whereas Russia was judged not to be an immediate threat) and that designation appears to have led to steadily increasing U.S. nuclear operations aimed at a growing list of Chinese targets.

This growing pressure on China may well induce it to adopt the traditional countermeasures that decrease warning and decision time and thus heighten the risk of inadvertent or unauthorized launch against the United States. Shortening the Chinese fuse and adding a third nation to the launch-ready alert club would scarcely represent progress in the quest for mutual nuclear safety. Indeed, additional nuclear states such as India and Pakistan are also very likely to gradually shorten their fuses and heighten risks of nuclear inadvertence in the absence of U.S. and Russian progress toward standing down their launch-ready forces.

The lesson suggested by these third-party complications is that a vision of nuclear de-alerting and force reduction ought to cast a wide net that brings all of the nuclear weapons states into the discussion, negotiation, regulation, and elimination. After all, that is the only path to a nuclear-free world.

U.S. Warfighting Plan Now Targets China," Inside the Pentagon, January 14, 1998; Bruce Blair, "Trapped in the Nuclear Math," op.cit. .