A Stability Strategy for Nuclear Arms Reductions

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Abstract

The Obama administration has upheld the enduring United States commitment to reduce the size of its nuclear arsenal in concert with other nuclear states. While nuclear arsenal reductions are likely reduce the possibility of nuclear terrorism and accidental nuclear war, if performed without careful consideration they can introduce instabilities in response to minor perturbations in the geopolitical environment. This paper presents a strategy that is being developed as a framework for ensuring the nuclear complex is balanced during stockpile reductions such that global security and the critical U.S. deterrence capabilities
remain stable.

In his landmark speech in Prague, President Obama announced his commitment to working on further reductions in the U.S. nuclear weapon stockpile and to leading similar efforts worldwide. Following this charge, the Obama administration has re-engaged the international community in open discussion of nuclear reductions and recently concluded negotiations with Russia on a treaty to replace the now-expired Strategic Arms Reduction Treaty (START).

Nuclear arsenal reductions are nontrivial because of their influence on geopolitical stability. A country's perceived security is currently dependent on the size of the nuclear stockpiles of their allies and potential adversaries. The individual value placed on each nuclear weapon increases as stockpile sizes decrease and nuclear weapons production capabilities evolve. As such, the complexities of

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deterrence and stability strategies must also change and will require more long-term planning than was required for either creating or maintaining a state-of-the-art stockpile. One of the key challenges facing the United States is to develop an arms-reduction strategy that maintains and has the potential to increase global stability while avoiding pitfalls that would result in geopolitical instability.

Among a number of factors, stockpile reductions require consideration of the motivating factors behind the acquisition of nuclear weapons and the impact weapons-in-being have upon the global security environment. It is clear that many states developed nuclear weapons to dissuade their adversaries' use of weapons of mass destruction; meanwhile, others developed their nuclear stockpiles to deter to conventional threats. The driving factors behind possession of nuclear weapons vary greatly around the world and therefore require a policy tailored to enable nuclear reductions across this spectrum of motivation for proliferation and arms buildup.

Verification of warhead numbers is inherently more difficult than counting delivery systems and motivates new requirements for the conscious management of latent capabilities. The ability to reconstitute a nuclear stockpile will depend on the technical competencies, production capabilities, and capacity to produce nuclear explosives. If nuclear states are able to reduce their nuclear stockpiles below a few tens of warheads, the latent capabilities of both nuclear and non-nuclear states will require significant consideration in international policy because the influence of a single warhead has increased. The capability and capacity to produce a warhead also contributes to the nation's overall deterrence strategy by providing not only the know-how and ability to constitute an arsenal but also the ability to assess the capabilities of a potential adversary.

Furthermore, arms reductions, if conducted asymmetrically, may jeopardize the viability of counter-force doctrines and can affect an ally's sense of security. In the case of multilateral reductions, alliances require detailed considerations and careful consultations with those involved to be aware of the potential for responses to changes in alliance policy. Furthermore, the relative value of each weapon increases as the total number of weapons-in-being decreases, placing existing extended deterrence models at risk. The probability of restraint from nuclear engagements in times of crisis or conflict increases – resulting in self-deterrence to nuclear use. Such a self-deterrence effect would in turn decrease the likelihood of nuclear engagements, but may be perceived by an adversary as a non-deterring strategy

except in response to the gravest actions. The concept of a "nuclear umbrella" or extended deterrence could at some point fail if an adversary begins to test or gains knowledge of predefined "tripwires" or thresholds to nuclear use.

As derived from existing counterforce strategies associated with extended deterrence and the sense of security that these strategies impart, the framework for reducing the size of the stockpile must be resilient against political instabilities and conflict escalation. Nuclear stockpiles and production capabilities currently influence stability in conflicts and crises; and, are likely to continue to play an important role in the international environment. Further, the need for careful management of the latent capabilities of a nuclear complex increases as reductions and the possibility of disarmament are discussed – the ability to re-arm being a natural concern if tensions were to rise in a world with few or no nuclear weapons.

With these concerns in mind, this paper presents a strategy that is based upon the premise that arms reductions must be performed in such a way as to not perturb geopolitical stability. While this paper represents a work in progress, it highlights one possible strategy for stable arms reductions. Starting with initial arguments presented by John Immele and Richard Wagner, we discuss the need for careful regulation of the production capability alongside the deployed and non-deployed stockpiles. The United States nuclear posture greatly affects the strategic postures of other states, and vice-versa. Our hypothesis is that the nuclear capabilities retained for the nation's strategic posture must be balanced with the number of weapons-in-being to ensure the geopolitical environment is stable and secure from nuclear use when subjected to unpredictable pressures.

While arms reductions are enacted, the distribution and make-up of nuclear forces are governed by capabilities and responsiveness requirements. Careful consideration of these factors will retain the necessary stability in the geopolitical environment to help maintain stability as we seek continued progress towards the total elimination of nuclear stockpiles.

The Nuclear Weapons Debate

Over the last two years, there has been increased discussion of a goal of abolition of nuclear weapons from the world. In 2007, four U.S. statesmen – George Schultz,

William Perry, Henry Kissinger, and Sam Nunn[2] – renewed the 22 year old Inaugural call by President Reagan[3] to seek the total elimination of nuclear weapons. The article prompted a debate that pitted those who placed a high priority on the importance of the deterring effect of nuclear weapons against those who were eager to achieve prompt and dramatic reductions in nuclear stockpiles (all the way to total abolition) in order minimize the risks of nuclear use, further nuclear proliferation, and nuclear terrorism.

President Obama carried this debate into his 2008 presidential campaign by pledging to work towards worldwide reductions in nuclear arsenals. Among the driving factors for these reductions are increasing fears of nuclear terrorism, the failure of the nonproliferation regime, and accidental nuclear war. As part of his administration's agenda, he vowed to pursue work on four treaties during his first term: a follow-on to the existing START arrangement, the Comprehensive Test Ban Treaty, the Nuclear Non-Proliferation Treaty (NPT), and a Fissile Material Cutoff Treaty.[4] All of this effort was towards the goal of reducing the number of nuclear weapons worldwide and eventually eliminating them.

However, deterrence worked well in the Cold War and still works today.[5] Then, as now, nuclear weapons are regarded as playing an important role in preventing large scale conflict. For example, the November 2008 Lashkar-e-Tayyiba Mumbai attack that left 166 civilians dead could have easily precipitated a war between two nuclear powers, India and Pakistan.

The Indian Government has accused Pakistan of providing at least tacit material assistance to Lashkar-e-Tayyiba (LeT),[6] Pakistan vehemently denies having

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[2] George Shultz, William Perry, Henry Kissinger, and Sam Nunn, "Toward a Nuclear-Free World," *The Wall Street Journal*, January 15, 2008, page A13.; and, Douglas Hurd, Malcolm Rifkind, David Owen and George Robertson, "Start worrying and learn to ditch the bomb," *The Times of London*, June 30, 2008.George Perkovich and James Acton, *Abolishing Nuclear Weapons*, Adelphi Paper 396 (London: International Institute for Strategic Studies, 2008)

[3] Ronald Reagan, "Second Inaugural Address," (speech, U.S. Capitol, Washington D.C., January 21, 1985).

[4] Barack Obama, "Remarks by President Barack Obama" (speech, Hradcany Square, Prague, Czech Republic, April 5, 2009), http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered.

[5] Keir Lieber and Daryl Press, "The Nukes We Need: Preserving the American Deterrent," (Foreign Affairs, Nov/Dec 2009. Vol. 88, Iss. 6; pg. 39).

[6] Press Trust of India, "Pak government sponsored 26/11 attack: Prosecution," *The Times of India*, March 9, 2010.

any involvement in the attack.[7] While evidence of official Pakistani government sponsorship for the Mumbai attack appears inconclusive, the restraint exercised by the Indian Government remains remarkable. Nuclear deterrence likely tempered India's response and allowed India's allies enough time to facilitate diplomatic resolutions.

Whether invoked unilaterally as a means for asserting sovereignty and enhancing a state's security or offered through assurances as an alternative to proliferation, the contributions of nuclear weapons to deterring large scale war are important to preserving geopolitical stability. President Obama recognized the continuing role nuclear weapons at Prague in April 2009, when he stated, "As long as these weapons exist, the United States will maintain a safe, secure and effective arsenal to deter any adversary, and guarantee that defense to our allies."[8] These weapons will in all likelihood continue to exist for as long as the geopolitical environment motivates their existence.

The current focus on abolishing nuclear weapons is arguably a distraction from the real problem. Some proponents of nuclear abolition have the misconception that a world free of nuclear weapons means a safer world. Nuclear weapons are indeed to be feared, but are not the root cause of fear and instability. Rather, the continued existence of these weapons is a symptom of the disease known as global insecurity. There are many compelling reasons states seek to acquire nuclear weapons, including the protection of regimes, existential threats, security of resources, and to counter overwhelming conventional capabilities. Thus, it is likely that as long as motivations exist, so too will the desire to preserve or acquire nuclear weapons.

There are a number of counter examples of countries who have virtually all of the required capabilities to produce nuclear weapons, yet refrain from doing so. Security assurances and with local political considerations, as well as the high cost of developing and maintaining an arsenal, create the necessary environment to engender a sufficient level of security without acquiring nuclear weapons. Thus, n*uclear*

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[7] Jane Perlez and Salman Masood, "Pakistanis Deny Any Role in Attacks," *The New York Times*, November 29, 2008, http://www.nytimes.com/2008/11/30/world/asia/30pstan.html. and "Pakistan denies involvement in 2008 Mumbai attacks after allegations," Joe Brooks, BNO News, March 31, 2010 available at http://wireupdate.com/wires/2683/pakistan-denies-involvement-in-2008-mumbai-attacks-after-allegations/.

[8] Barack Obama, Prague, April 2009

weapons are not the disease, just a symptom of one. The current nuclear states and potential proliferators will need to address the fundamental drivers behind the desire to possess nuclear weapons before the world can reasonably accede to a world without nuclear weapons. However, this reality does not suffice as an excuse to postpone nuclear arms reductions indefinitely. It should be acknowledged that part of the solution to this problem is to reduce the number of nuclear weapons worldwide.

Assessing Arsenal Reductions:

Aside from South Africa and arguably the former Soviet states, there are very few historical examples where a state has willingly given up a superior weapon when similar weapons were held by potential adversaries. Stability in the geopolitical environment should be the primary consideration of military capabilities and requirements. In a world of zero nuclear weapons, one is a very big number; therefore, stockpile reductions need careful consideration of the potential response by both the nuclear and non-nuclear communities. For the United States, there are a set of initial considerations for stockpile reductions that can be summed up in three questions:

- What current nuclear states will equivocally reduce their stockpile sizes in response to our reductions?
- What states that are currently seeking nuclear arms will cease their ambitions if we reduce our stockpile?
- What non-nuclear states would seek to possess nuclear weapons if we reduce our stockpile?

What current nuclear states will equivocate?

Unilateral disarmament is unlikely to result in unequivocal reciprocation by all states that possess nuclear weapons. Russia, Pakistan, India, and France reserve the right to use nuclear weapons in response to invasions or attacks with weapons of mass destruction. Furthermore, many states will not reduce their stockpiles until their primary adversary does; for example, India will only engage in arsenal reductions if Pakistan reciprocates.

Nevertheless, the U.S., Russia, the UK, France, and China – the five recognized nuclear powers and permanent members of the UN Security Council (the "P-5") – are the most likely states to jointly reduce their arsenals given the current relationships, conventional military capabilities, and economic interdependencies as well as their obligations under the NPT.[9] The U.S. and Russia possess far greater arsenals than all remaining nuclear weapon states combined; thus, they must reduce their arsenals first. The U.K. and France have already reduced arsenal sizes and are expected to slowly continue their reductions as the Russian and American arsenals decrease in size.[10]

China's response to stockpile reductions, on the other hand, is uncertain. In track-two dialogues, the Chinese delegates were reported as stating that it would be unreasonable for them to consider nuclear arms reductions until the U.S. and Russia stockpiles are near parity with the size of their arsenal. However, with four nuclear weapon states as neighbors, China will likely be hesitant to engage in significant nuclear reductions until Pakistan, India, and North Korea also engage in reductions.

What states will cease seeking nuclear arms?

Incentivizing states to end their quest for weapons of mass destruction will be a tremendous challenge. Iran and Syria are thought to seek weapons of mass destruction to counter the overwhelming conventional capabilities of the West and Israel. Having observed the US-led coalition invade Iraq in less than six weeks, they may see little alternative to possessing weapons of mass destruction as a viable deterrent. Furthermore, states may view developing nuclear weapons as a viable method of extortion, as North Korea did in the 1990s when it received concessions in the form of fuel and food.What non-nuclear states would seek to possess nuclear weapons?

Disarming, if done unilaterally, may motivate several states to acquire nuclear weapons. Nuclear assurance has been a policy of the United States and its allies, France and the UK, as a measure to support their obligations under the Nuclear Nonproliferation Treaty. There are a number of countries in Europe, South America, and Asia that have latent capabilities that could support the production of nuclear

[9] Article V of the Nuclear Non-Proliferation Treaty
[10] At some point during the reductions, however, Russia must consider the combined stockpile of the U.S. and its allies, UK and France, in the context of NATO and mutual defense agreements.

weapons. The peaceful intent of the nuclear programs in these states can change rapidly in response to external pressures. For example, Japan and South Korea could have strong motivations to seek nuclear weapons to help deter potential attacks by North Korea and China. Without the support of nuclear states, non-nuclear states might feel vulnerable to coercion or invasion.

Considerations with Smaller Stockpiles

In order to preserve stability, all of the nine current nuclear weapon states must verifiably disarm together. Asymmetric stockpile reductions potentially have two negative consequences: (1) increased incentive for a larger stockpile-holder to engage in preemptive strikes, and (2) shift the lesser stockpile-holder's counter-strike doctrine from counter-force to counter-value.[11]

As numbers approach zero, the value of each weapon increases; therefore verification and use-validation will have greater emphasis, must incorporate modern technical means, and must have effective enforcement measures coupled with rewards to those that abstain from nuclear weapons production or development. Imbalances in stockpile sizes can provide the larger stockpile-holder with the perception that they have a military advantage over other nuclear states. This may lead said state to calculate that it can eliminate its adversary's entire active stockpile and still have weapons in reserve for additional operations.

Asymmetric reductions also increase the risk that the possessor of a smaller stockpile would shift from a counter-force posture to a counter-value deterrence doctrine. The legal basis requiring a counter-force doctrine is the Additional Protocol I, Articles 50-52 which requires that "Attacks shall be limited strictly to military objectives."[12] It further defines a military target as that "which by [its] nature, location, purpose, or use makes an effective contribution to military action and whose total or partial destruction …offers a definite military advantage." However, a state with an insufficient nuclear stockpile to offset the nuclear forces and military

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[11] Geneva Convention Additional Protocol prohibits the intentional targeting. A threshold exists in U.S. military policy in accordance with the Geneva Conventions' rule (Art. 51 (5) b) that the unintended civilian consequences/casualties may not be: "excessive in relation to the concrete and direct military advantage anticipated."

[12] Geneva Convention Additional Protocol I, Articles 50-52, 1977

assets of an adversary may be compelled to threaten to strike population centers by targeting large cities in order to deter preemptive strikes.

Conversely, regional security models help prevent the need for unilateral deterrence and counter-value targeting. As the world shifts its focus towards regional security structures like NATO, large collections of countries begin to provide a nuclear-equivalent deterrence effect. However, the possibility of a large-scale, region-versus-region conflict may increase as well – something nuclear deterrence has helped prevent for the last 65 years.

Coalitions made up of conventionally armed militaries demonstrated extraordinary capabilities against moderately-equipped adversaries. For example, the successful U.S.-led invasion of Iraq, Operation Iraqi Freedom, demonstrated Western conventional military capabilities able to undertake extremely selective targeting while incurring minimal casualties. Military leaders around the world expressed amazement, and discomfort, at the low number of casualties taken by the coalition forces in contrast to the Iraqi defense forces. India's General Sundarji stated that one lesson from Operation Desert Storm was not to fight against the United States without having weapons of mass destruction.[13]

While conventional arms sales by China, Russia, and North Korea will narrow the conventional capability gap, many states retain or seek weapons of mass destruction to counter the overwhelming conventional capabilities of the U.S. and its allies. This desire to possess regime-preserving deterrence capabilities places some states at odds with the arms control and disarmament priorities. Therefore, while nuclear stockpiles shrink around the globe, the certainty requirements associated with treaty verification and compliance will increase.

At small stockpile numbers, arms control requires equal attention to the production complex as well as the size and genetics of the nuclear stockpile. Greater emphasis is placed on perfecting intelligence through rigorous verification and compliance inspections. Treaty verification shifts from the current model of simply counting vehicles to counting individual warheads and nuclear materials. The production capabilities of any nation will require limits through treaties like a

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[13] See: Steven Lambakis, James Kiras, and Kristin Kolet, *Understanding "Asymmetric" Threats to the United States* (Fairfax, VA: National Institute for Public Policy, 2002). On page 34, footnote 227 says "Statement made by General Sundarji to Kathleen Bailey in 1993, http://www.missilethreat.com/repository/doclib/20021000-NIPP-asymmetricthreats.pdf

verifiable Fissile Material Cutoff Treaty, but novel enrichment technologies like Separation of Isotopes by Laser EXcitation (SILEX) may result in harder-to-detect clandestine facilities.[14]

A Stability Strategy for an Uncertain Future

As long as nuclear weapons exist in the hands of potential adversaries, nuclear know-how, production capabilities, and delivery systems will be required as a hedge. Safety, reliability, and desired mission space will affect decisions on nuclear weapons' genetic diversity and delivery mechanisms for smaller stockpiles. The nuclear complex requirements are thus determined by balancing the speed of transitioning non-deployed (ready-reserve) weapons into active status, warhead production capacity, and the hedge required to counter emerging threats or nuclear arms breakout.

The overarching concept of stable nuclear arms reductions is resiliency to minor changes in stockpile size or balance. A stable nuclear environment is one in which minor increases or decreases in deployed stockpile, ready reserve, or production rates do not result in either run-away increases in nuclear arms or nuclear war.

In order to maintain stability, nuclear assets must be carefully managed with consideration of readiness and restraint. These nuclear assets include weapons and supporting infrastructure, as well as the science and technology bases.

Consider the current model most nuclear states have today. The arsenals are described by three categorical groups: a deployed stockpile, a ready reserve, and a production line. Historically speaking, the most important inventory to consider has been the deployed stockpile. These are the weapons that are ready to be used on a moment's notice, either on the tips of missiles or associated with flight lines for bombers. The second inventory is the "ready reserve." These non-deployed nuclear units are maintained in secure storage to serve several functions including replenishing the deployed stockpile when there are recalled units, unique mission

[14] SILEX LLC, http://www.silex.com, and http://www.armscontrolcenter.org/policy/nuclearweapons/articles/100209_letter_nrc_laser_enrichment_north_carolina/

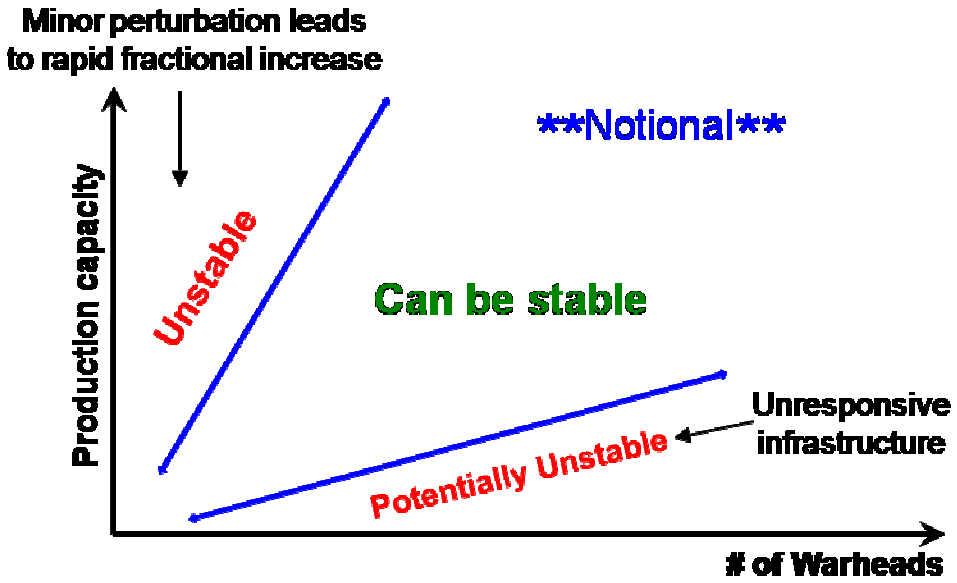

Figure 2 A notional stability diagram showing regions of instability when considering production capacity and number of warheads.

requirements, or if weapons have been used. And finally, most states possess active production lines for nuclear weapons.

The requirements for a nuclear complex are determined by balancing:

- speed of transitioning a non-deployed ready reserve stockpile into active deployment,
- warhead production capacity, and the
- hedge required to counter rapidly emerging threats or breakout

Dr. Richard Wagner and Dr. John Immele proposed that a stability region exists for the nuclear complex and infrastructure.[15] In their model, the abscissa (or x-axis) is the *deployed stockpile* or number of deployed weapons. The ordinate axis is the *infrastructure capability* or the latent capability to produce warheads in a defined

[15] John D. Immele and Richard L. Wagner, "The US Nuclear Weapon Infrastructure and a Stable Global Nuclear Weapon Regime," (paper presented at the third annual Conference on Strategic Weapons in the 21st Century, Washington, D.C., January 27, 2009). Available as Los Alamos Report number LA-UR-09-00339.

unit of time, e.g., warheads per year. Here, the model is simplified to consider only the production capability of the nuclear complex, but the science and engineering capabilities of the complex certainly contribute to the stability arguments in the long term (see Figure 1).

There is a central region of stability that is surrounded by three instability regions. The region near zero is not considered here due to the effects of complex interactions including the strongly destabilizing potential of a single warhead in an otherwise zero warhead world. The next unstable region, discussed below, is where there is a large production capability and a small stockpile. And, an unstable region exists where there is a large stockpile and very small production capability because of the inability to effectively replace failing designs or expand the mission capabilities afforded by the existing stockpile.

A large production capacity combined with a small stockpile is unstable for two reasons: (1) responsiveness and (2) overcompensation in a crisis. In the first case, there is a time lag between when a production line is initialized and when first production units are operationalized. In the second case, a minor perturbation in the geopolitical environment results in a rapid increase in the stockpile size.

Consider, for example, a situation where a state with a large production capacity observes an adversary developing new warheads. Given a perceived threat, the production capacity is used to augment the number of warhead in the stockpile. A large increase in the stockpile size can precipitate a similar response by the adversary, further escalating tensions.

A large deployed stockpile with a small production capacity is also unstable because a production capability is necessary to compensate for reduced confidence in the warhead performance or to address new mission requirements. Consider, for example, if an adversary acquires critical information on a particular warhead, they could focus resources on developing methods to exploit its vulnerabilities. In conflicts, the uncertainty in the efficacy of deterrence with a smaller stockpile can contribute to the increased confidence of an adversary.

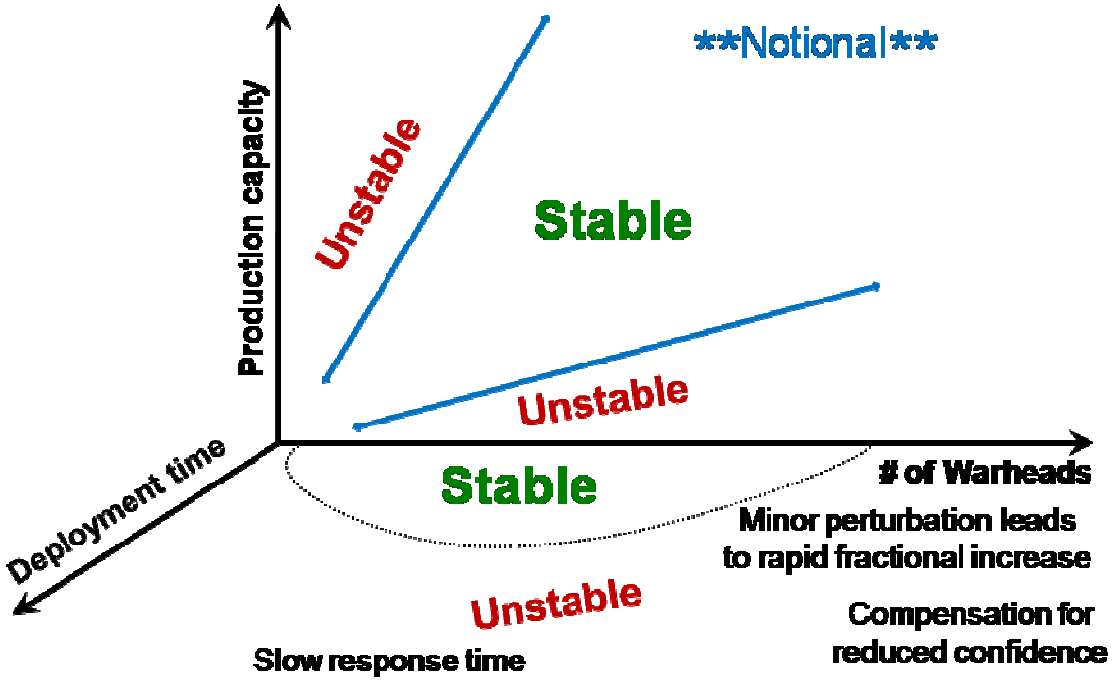

Figure 3 A third axis is required to account for the finite deployment time for both produced and stored nuclear units.

As discussed above, there is a finite period of time from when a production line starts fabricating a warhead to when it is deployed. Similarly, it takes time to move units from a ready reserve status into deployment. Both of these time factors affect the responsiveness of the nuclear stockpile, therefore, this drives a need for a third axis, represented as *deployment time* in Figure 2. The non-deployed or ready reserve stockpile is represented in the plane of zero production capacity, and the production deployment rate increases in the direction of the production capacity.

Ready reserves serve to offset some of the production capacity and improve the transition of non-deployed systems to active status. In cases where production is small, ready reserves may lead to complacency in stockpile stewardship, and therefore may increase the risk of reduced confidence at the same time. An additional instability region appears near zero, but far out in the deployment time wherein the complex is unable to provide a rapid response to a surprise attack. Rapid responses may also be required for protecting large force deployments from preemptive strikes by an already emplaced adversarial force.

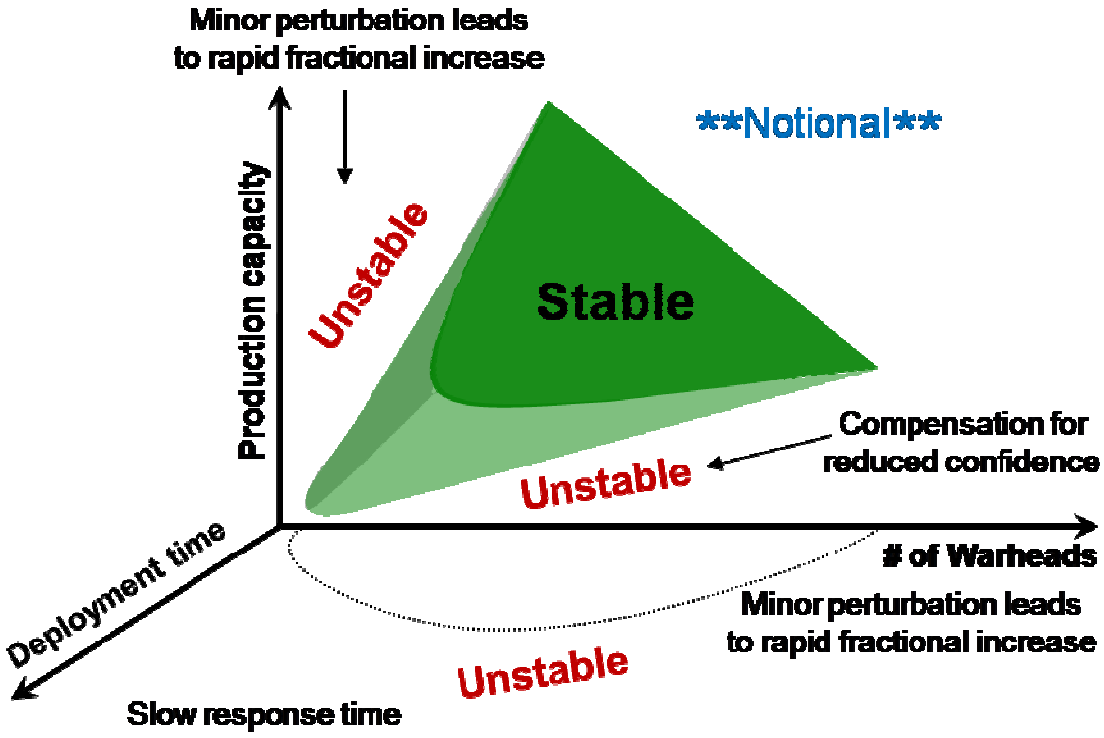

Figure 4 A notional representation of a complete stability region accounting for time-dependent production complex, ready reserve and deployed stockpiles.

Putting these elements together, we arrive at a "notional stability surface," shown in Figure 3. Ideally, the complex and the warhead numbers would be balanced to remain within the stable region. As arms reductions progress through a series of milestone points, each milestone should be identified to reside within the stable region.

It is important to note that this surface only addresses the warhead units themselves, and does not include the equally important elements of personnel and technical capabilities that form a complete nuclear complex. Technical competencies are a prerequisite for a responsive infrastructure to deal with significant variance findings and to accurately respond to emerging threats. Accordingly, high quality publications in non-weapons science also add to a state's ability to demonstrate

competence, and thus a credible nuclear deterrent, especially when testing is unavailable and warhead numbers are low.

The long term effects of retention of this technical base require significant consideration. The technical base may serve as a latent capability for the reconstitution of a nuclear stockpile. At the same time, laboratory capabilities are equally required to support detection (e.g., verification) and intelligence gathering, anticipate technological surprise, develop effective consequence mitigation measures, and to hedge against breakout. These arguments assert that there is an even greater need for technical competency as warhead numbers decrease. Furthermore, understanding how changes in warhead levels, production capacity and deployment time relate to one another and, collectively, affect geopolitical stability should be a subject of future studies.