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My remarks today will focus on how we can preserve the deterrence of conflicts as a key strategy for the United States as we formulate our national security strategies for the future. Thus, let me start with the now traditional etymology lesson on the word "deterrence." It comes from the Latin root word "terre," meaning "to frighten with an overwhelming fear," as in the English antecedent "terror." When you add the prefix "de" its meaning becomes "to frighten someone from taking a particular action." In security matters, deterrence becomes "a means to prevent certain hostile actions by instilling overwhelming fear about the consequences of taking those actions."

My friend Larry Welch, who has been a fellow member of the USSTRATCOM Strategic Advisory Group Subcommittee on Deterrence Policy, places a "value judgment" into that formulation; deterrence then becomes a means to prevent aggression by a nation through maintaining an ability to "hold at risk" assets within that nation which they are likely to value more than they value the action we are trying to deter.

Note that deterrence is always an intermediate step, rather than a final solution – it only buys time to find permanent solutions. It does not address the underlying factors that led to the crisis in the first place; for that, other strategies are required. In fact, as deterrence succeeds in preventing crises from escalating to hostilities or war—it will leave behind a frustrated enemy, for which we should be prepared to take subsequent corrective steps in crisis resolution accordingly. Thus, we should combine our deterrence threats with reassurances that his base problems will be considered, but only if there are no hostilities on his part.

We should consider the history of United States/Soviet nuclear deterrence as a prototype—almost the "textbook solution"—and proceed to take up the problems of the emerging multilateral world, in which other actors possess weapons of mass destruction (WMD). We will undoubtedly find these situations to be of equal or greater complexity. Yet with the lessons of history as our guide, I find cause for optimism about the enduring nature of deterrence processes to prevent major wars.

We appear to have gotten it about right, and have subsequently gained some understanding that the Soviet Union had begun to think about deterrence in a somewhat similar way. Thus, we have reason to believe that we can do as well in adapting the process of deterrence to serve us and the world in deterring future conflict.

How can it serve the world of the future? If deterrence can produce an overwhelming fear in anyone who considers committing major acts of aggression, then it becomes an antidote to war. If we create and communicate deterrence correctly, it becomes an antidote that is administered prior to an attack, unlike most medical antidotes. Of course we must be ready to administer it any time: pre-war or intra-war. We frequently speak of nuclear deterrence for (1) preventing war, (2) keeping it from escalating, or (3) war termination. This deterrence has served as "a sobering force," and it can serve to not only prevent wars from starting, but it can cap the level of military destruction that might otherwise result. Deterrence can force all sides to "come to their senses." Thus, I have come to believe that in the near term the world would become more dangerous, not less dangerous, were nuclear weapons—certainly United States weapons—to be absent from today's scene.

Of course, the world has changed significantly, and we must constantly adapt our policies to that changing world. I believe that nuclear deterrence must remain a cornerstone of our defense posture for many, many years to come, at least until such time as nations cease stockpiling major weapons systems for use against others.

To adjust our deterrence policy I believe the "traditional" four categories of targets we focused on during the Cold War should be changed somewhat to the following four general target sets that we should "hold at risk" in order to deter: (1) weapons of mass destruction, (2) the leadership that is fomenting aggression, (3) military forces capable of exporting aggression, and (4) war supporting infrastructure and industry.

I have never supported the arguments of those who advocate a "no first-use policy" for nuclear weapons—not because I ever believed that the United States was likely to pre-empt in using nuclear weapons. In fact I would think we are least likely to use them first.

By its very nature, "no first-use" policies (or worse, a treaty on such) would tend to undercut the very basis of deterrence and allow a potential aggressor to hope they might get by with their aggressions. Our policy foundations should always favor those who keep the peace, and never those who would break it through acts of aggression.

I believe we can improve our deterrence message by declaring and meaning the following:

1. **The United States will never directly target civilians or non-war-fighting populations.**
2. **We do not maintain nuclear weapons for war-fighting purposes, but as "weapons of last-resort."**
3. **We keep our nuclear arsenal only to assure any potential adversary that our capability to destroy those four essential categories of their military power is so certain that it will restrain them from committing aggressions in the first place. It is in this prior restraint that we want them to have no doubts as they contemplate our deterrent message.**

The new regional powers we have referred to as "rogue states" do cause us the most concern at present, and are the ones we must deter from acts of aggression. We should take comfort that these concerns are greatly muted to those we faced during the Cold War.

Regional states could cause enormous damage to those around them, and could potentially cause serious harm to the United States should they directly attack us. I believe we can feel secure because the likelihood that they would not be deterred from major aggression is small. In fact, I believe the threat of significant war is smaller than at any time in my life or yours. We should all rejoice for that.

But where do we go from here?

I have never put much faith in the notion that "complete and total disarmament" is a realizable goal in any near term. The nature of man as a species is sufficiently complicated, and we have repeatedly shown our inability to organize ourselves as world citizens, to put much hope in being able to truly "outlaw" war and aggression any time soon.

I see the path to peace as one of creating greater and greater alliances—not just in the NATO countries, but also in every corner of the globe. I would suggest the priorities ought to be in Southeast Asia, then all of Europe and Asia, South America, then the Middle East, and Africa. I believe the collective security that NATO provides its members has done more for the citizens of those realms than anything else in their histories.

I believe the United States was quite serious in putting forward the Baruch Plan, to share the responsibility for nuclear weapons among nations, as well as the burden of maintaining a common arsenal. I would wish that international institutions would gain the level of competency to earn the level of trust that might allow such a proposal to again be seriously considered.

I believe we have a formula, which can maintain the peace in the interim. Spreading collective security alliances steadily around the world—until all nations are allied—with the benefit of standing under the nuclear deterrence umbrella, just as the NATO partners have stood together for over 50 years, is the route to bringing a Baruch Plan into being.

Let me close the portion of my talk on policy with a quote from Ronald Reagan—March 23, 1983: "The defense policy of the United States is based on a simple premise…. We will never be an aggressor. We maintain our strength to deter and defend against aggression—to preserve freedom and peace."

You will notice that I did not mention terrorists groups and other non-state actors. While the concepts in this talk apply to nation states, which have defined territories and physical assets that can be held at risk by our deterrent forces, the threat to retaliate for violent acts of aggression is a potent force to preserve the peace. But if there is no "return address" or lands or sanctuaries with physical assets to be targeted, the deterrent becomes hollow. Acts by terrorists apparently cannot be directly deterred with nuclear (or other) weapons.

However, we can substantially cap the level of violence by ensuring that any nation-state giving either assistance or sanctuary to terrorists will be held directly responsible, should major aggression occur. The threat of retaliation to any state regimes that support terrorists can be a powerful disincentive to such adventurism, and we should not rule out any weapons in order to give maximum effectiveness to our deterrent message.

In that regard, those of us who watch these rogue states have noted that, for several decades, they have been seeking ways to escape the otherwise-sure United States deterrent by either hiding their valuable targets or burying them so deeply underground to be out of reach to attack by United States weapons.

Uninformed (or uncaring) critics have falsely attributed United States motives in developing new nuclear weapons as a desire to build new "tactical or battlefield weapons." That is not the case. Our interest is clear: We need to have some of these weapons available that could strike such strategic targets in order to hold them at risk. This ensures that no aggressor can escape our deterrent and its effects in securing peaceful behaviors. Earth penetrators prevent anyone from breaking the deterrent equation—thus they are needed to preserve the peace.

The world is not static. Many hate the idea that deterrence has put an end to major acts of aggression. I can assure you it will ultimately be a losing argument to reject new warheads that deter aggression by raising accuracy and reducing yield. Think about it – such weapons result in increased lethality against military targets and WMD targets, but they also greatly reduce the lethality against people! It would appear to be more a universal good than not.

I find false those arguments that by having such weapons the likelihood of the use of nuclear weapons increases. That is not at all the case. Increased lethality against the four targets mentioned previously ensures that they are held at risk! Thus, the certainty that our deterrence will work is preserved.

Technical Challenges for our Deterrent Forces

- **Large Challenge in Aging/Obsolete/Declining Reliability Carrier Vehicles**

  It is curious that much nuclear delivery vehicle technology has made its way to be used in advanced conventional systems (e.g., CALCM's and c-Tomahawks), but essentially none of the advances in conventional delivery technology has made its way to nuclear delivery systems. We can do this but still have the ability to ensure that conventional and nuclear are always distinct (a key driver for any future arms control agreements).

  Some of the features that it would be desirable to transfer from conventional to nuclear delivery systems are: (1) higher accuracy, for bombs as well as cruise missiles and supersonic reentry vehicles, (2) larger memory sets to store a large database of targets, (3) consider use of GPS (as one of various targeting assist options).

- **Hidden Targets are a Growing Problem (large roofs, tunnels into cliffs, deep underground tunnels with hidden entrances, etc.)**

  WMD and leadership targets are extremely difficult to locate, as our poor intelligence in Iraq has demonstrated. Large military targets are more easily held at risk, as are most war-producing industries and infrastructures.

• Hardened and Deeply-buried Targets also becoming more and more of a challenge (as our experience in both Serbia and Iraq showed)

> **Better earth penetrators (conventional and nuclear) are needed, which have capability to penetrate through hard rock or reinforced concrete slabs.**

• The science-based stockpile stewardship effort is enjoying some major successes, but other areas are still as challenging as ever.

> **We have introduced entirely new designs for neutron generators that have not been qualified through underground nuclear effects tests. I caution to add that the "underground laboratory" was always a somewhat stretched compromise for qualifying devices for their hardness against radiation effects—primarily because (a) the fluxes of various radiations of interest that were produced in UGT's could not match (well) the threat conditions of interest, in either amounts, spectrums, or simultaneity (e.g., of neutron and gamma levels) and (b) they already involved large extrapolations through computer modeling. The new devices have been simulated with a very great fidelity and precision in the modeling to know where it was most likely to fail and then these areas were successively strengthened.**

• A side note (even though there is a later session on testing): We have not really changed in any major respect the problem cited in the CTBT testimony of 1999 that we must preserve the ability to test our nuclear weapons if necessary to fully diagnose or to fix problems that may well arise as these devices age. There remain a variety of views as to the "odds" that we will have to test for these reasons sooner rather than later, but there is little support within our community but that "we need to protect the right to conduct some tests to guarantee the stockpile performance, reliability, safety, or security against problems that may arise."

> **My conversations with other nuclear weapon state scientists convinces me that this viewpoint is widely shared—all would agree that the decision to abide by a moratorium on nuclear tests "was not technically-based."**

• The "war on terrorism" has not left the nuclear weapons community untouched by concerns.

> **The worry over the paradigm shift caused by September 11, 2001, that terrorist groups can plausibly bring large numbers of suicide soldiers to undertake major operations has caused us to revise the "design basis threat" for security and guarding of US warheads and special nuclear materials. For example, we previously worried most about terrorist attempts to steal (i.e., remove) a nuclear device from its storage area. Today we must be concerned about terrorists entering our storage areas with the intention to detonate our weapons <u>in</u> <u>place</u>.**

Similarly, even though we gave plausibility that, as WMD devices and materials became more and more ubiquitous, the concern that terrorists could get their hands on them and actually use them to help penetrate our security, and thus get their hands on US nuclear weapons, has moved from a theoretical possibility to a major concern. We are still adapting to counter these new threat conditions. The best result will undoubtedly be a

combination of technology features (internal and external to the weapons themselves) and better security protections.