

National Research Council Briefing

Risk Analysis Methods for Nuclear War and Nuclear Terrorism

Prof. Martin E. Hellman, Stanford University

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Thank you for inviting me to meet with you today. The issue you are addressing — how to assess the risk of nuclear weapons being used in anger — is perhaps the most important one facing our nation. Unfortunately it is also largely ignored. Your report has the potential to remedy that dangerous situation and I appreciate your critically important work.

Those wanting a copy of this briefing can find it at the tinyurl shown on screen: tinyurl.com/Hellman421. Moving on to the presentation,

if the probability of a full-scale nuclear war — which I will abbreviate to “nuclear war” — were 1 in 100 million each year, that would be comparable to the risk of an extinction level asteroid hitting the Earth and former Secretary of Defense James Schlesinger would have been on firm ground when [he said](#) that we will need to depend on nuclear deterrence “more or less in perpetuity.” But, if the probability were 1% per year, Schlesinger would be dangerously wrong and another former Secretary of Defense, Robert McNamara, would have been right when [he said](#) that doing so “will destroy nations.”

Determining which of them was right requires quantifying the probability of a nuclear war, that became the focus of my research, and I [called for Congress](#) to authorize a National Academies study “on the potential risks posed by nuclear weapons, both from nuclear terrorism and nuclear war.”

Two years ago, Congressman Jim Cooper, Chairman of HASC’s Strategic Forces Subcommittee, made that study — this study — a reality.

In January 2020, Chairman Cooper wrote to the presidents of the three National Academies outlining what he thought Congress would find most helpful from this study, including: “I hope that the study committee will examine whether even crude estimates (e.g., to an order of magnitude) could be useful in assessing and improving our national security.”

This fits under your third task: “Assess the role that quantitative and non-quantitative analytical methods can play in estimating [the] risks of nuclear terrorism and nuclear war.”

NAE member Vinton Cerf and I have [companion pieces](#) in the *Bulletin of the Atomic Scientists* addressing the latter question: What is the probability of a nuclear war? I argue for a quantitative approach, while Vint prefers a qualitative one. Whichever you prefer, I encourage you to read those two short articles, which only takes five minutes.

My article outlines a simple approach for getting a crude, but still useful quantitative estimate that I hope this committee will consider incorporating into its report as an initial estimate, to be followed by later, more detailed approaches, such as expert elicitation or a carefully done quantitative risk analysis.

I start with an extreme case: a risk of 1% per day is clearly too high; otherwise we would not expect to live out the next year.

Similarly, a risk of one in a million per year is clearly too small.

Next, increase the lower bound and decrease the upper bound, an order of magnitude at a time, until you come to values that cannot easily be ruled out.

Based on our knowledge of events such as the 1962 Cuban missile crisis, the 2008 Georgian War, the 2014 Ukrainian Revolution, and more, I, along with most people with whom I have done this experiment, end up with 10% per year being too high and 0.1% per year being too low, leaving 1% per year as our order of magnitude estimate for the probability of a nuclear war.

At that level of risk, a child born today would have worse than even odds of living out his or natural life without experiencing the devastation of civilization in a nuclear war.

Better estimates are possible and should be investigated, but this first, crude estimate is useful for deciding whether Schlesinger was right that we will need to depend on nuclear deterrence “more or less in perpetuity” or McNamara was right that doing so “will destroy nations.”

In his companion piece, Vint, uses a story that conveys the risk in a more intuitive fashion:

Imagine that a man wearing a TNT vest were to sit down next to you and tell you that he wasn't a suicide bomber. Rather, there are two buttons for setting off his explosive vest. One was in the White House with Trump for the last four years, and recently was given to Biden. The other is with Putin in Moscow. You'd still get away as fast as you can! Why, then, has society “sat here” for decades assuming that, just because the Earth's explosive vest has not yet gone off, it never will?

One of the questions I have been asked to address today is highly relevant to assessing whether or not the risk of a nuclear war is currently acceptable: “What are the most likely scenarios that could lead to the use of a nuclear weapon?”

Nuclear terrorism, including a dirty bomb, is a more likely event than nuclear war. But a nuclear war would kill at least hundreds of times more people, so unless its probability is hundreds of times smaller, it is the larger risk. Society is dangerously wrong in focusing only on the risk of nuclear terrorism and neglecting that of nuclear war.

If you agree with my analysis, you will have answered another question posed by Chairman Cooper in his letter to the Academy presidents: “Also using very approximate estimates, I hope the committee can assess the current belief that nuclear terrorism poses a greater risk to our nation than does nuclear war.”

Returning to scenarios that could lead to a nuclear war, in my opinion, the most likely is a regional conflict that escalates out of control due to mistakes on both sides, as happened in 1962’s Cuban missile crisis. One would hope that we learned our lesson and would never repeat the mistakes of 1962, but we came dangerously close just thirteen years ago, in what I call the 2008 Cuban bomber mini-crisis.

A brief description of this event is in [the comments](#) I provided to this committee. Some other examples I use today also can be found there. Here’s what happened.

In 2008, the US was planning an Eastern European missile defense system that Russia saw as threatening its nuclear deterrent. In response, elements within the Russian military threatened to deploy nuclear-capable bombers to Cuba, hopping over our missile defenses. Fortunately, more moderate elements prevailed, but if they had not, a crisis comparable to 1962’s could have resulted.

While there are a number of similar steps in the accident chains that led to 1962’s crisis and 2008’s mini-crisis, I only have time to cite three:

First, the US planning to deploy missiles near Russia’s borders — in Turkey in 1962; in Poland in 2008.

Second, Russia responding in kind, using Cuba as its base both times.

And third, Americans and Russians each saw their own deployments as defensive and the other’s as offensive.

The third step above highlights an over-arching scenario that could lead to nuclear war. We are basing our national security strategy on assumptions that turn out to be questionable on closer examination. Even one incorrect assumption can turn an otherwise logical strategy into a house of cards, and our thinking about national security turns out to be based on a number of questionable assumptions.

My report, [Rethinking National Security](#) — also provided to this committee — lists a dozen such assumptions, with the most fundamental posed in a [summary statement](#) that has been signed by former Secretary of Defense Leon Panetta among others.

That statement starts out:

When World War II ended in 1945 our nation was secure from attack. Since then, we have invested trillions of dollars in an effort to improve our national security. ... Yet, absurdly, we now can be destroyed in under an hour.

The statement then asks:

In this age of nuclear weapons, pandemics, cyberattacks, terrorism, and environmental crises, is national security becoming inseparable from global security? If so, how do our current policies need to change?

Many scenarios that end in nuclear war start because we assume that we can win a war with a nuclear armed adversary, without the war going nuclear. That assumption is questionable as can be seen from several entries in my comments where war games surprised the players by ending in global nuclear war. The most recent occurred three years ago, when Air Force General John Hyten, then STRATCOM's Commander, [described a war game](#) that ended what he called “bad.” He clarified: “bad meaning it ends with global nuclear war.”

Assuming that wars, especially major ones, will not end “bad” is a potentially fatal mistake that is involved in many scenarios that end in a nuclear war. Examining that and other assumptions, such as those enumerated in my report on [Rethinking National Security](#), comes under tasks 4 and 5 of [this study's description](#).

The first three appendices of my comments list a number of scenarios that could have resulted in a nuclear war. In this limited time, I will cite just one, which also occurred after the Cold War ended. I focus on that period to counter society's mistaken assumption that the threat of nuclear war ended when the Berlin Wall came down.

In June 1999, as NATO peacekeeping troops moved into Kosovo, American General Wesley Clark ordered British Lieutenant General Sir Mike Jackson to take actions that

Jackson feared would lead to combat between NATO and Russian troops at the Pristina Airport. Clark's and Jackson's accounts agree that a heated argument ended with Jackson telling Clark, "Sir, I'm not starting World War III for you."¹

Clark states that he gave that order to Jackson because, "I didn't want to face the issue of shooting down Russian transport aircraft if they forced their way through NATO airspace. ... [and] I expected that when NATO met the Russians with determination and a show of strength, the Russians would back down."² Clark was probably right about the Russians backing down, but to assess the risk we would have to quantify *probably*, something that deserves analysis either by this committee or a later study.

Fortunately, London backed Jackson, ending the crisis.

I was also asked to address how I see the risk of nuclear war evolving five or ten years from now.

In my opinion the greatest risk will still be mistaking assumptions as facts, with one of the most important being that national security is primarily a zero-sum game in which we buy our security at the expense of other nations. Yet, the more we threaten North Korea, the more likely it is to increase its nuclear capabilities, including the ability to strike the American homeland.

So, somewhat surprisingly, one way to make the US more secure is to make North Korea more secure. But we often do the opposite. For example, in 2017, [John Bolton](#) wrote: "I have argued previously that the only durable diplomatic solution is to persuade China that reunifying the two Koreas is in its national interest as well as America's, thus **ending the nuclear threat by ending the bizarre North Korean regime.**" (emphasis added)

There is much more that I could say, but I want to leave time for questions. So I will conclude by summarizing the four main points I have made plus one more:

First, whether you prefer a quantitative or a qualitative approach for estimating the risk of a nuclear war, there is sufficient unclassified data to determine whether or not the current level of risk is acceptable. Classified information is not needed to show that the risk of a nuclear war is unacceptable, even in a preliminary study such as this.

¹ General Wesley K. Clark, *Waging Modern War*, Public Affairs, New York, 2001, p. 394; and General Sir Mike Jackson, *Soldier: The Autobiography*, Bantam Press, London, 2007, p. 272.

² General Wesley K. Clark, *ibid*, p. 395

Second, this study can reach useful conclusions that can inform Congress and the nation. It needn't just be a "study for a study."

Third, our nation has been wrong to focus almost exclusively on the risk of nuclear terrorism. That risk deserves our attention, but so does the risk of nuclear war.

Fourth, many of the assumptions that currently are used in developing the nuclear strategy of the United States are questionable on closer examination and should be reviewed as part of this study as well as later, in more depth. Rethinking national security has the potential to greatly increase our security while incurring no risk. This is in contrast to changes in our nuclear posture that might incur some risk, such as reducing our nuclear arsenal.

This leads to the fifth and last point I want to emphasize. Contrary to what many people implicitly assume, we do not face a binary choice between nuclear deterrence as now practiced and nuclear abolition. If I had a magic wand that could make all the world's nuclear weapons disappear tomorrow, I would not wave it. With nothing else changed, each nation would race to be the first to reconstitute its arsenal, and whichever nation won would be sorely tempted to use its weapons while it temporarily enjoyed a nuclear monopoly. With [over 5,000 warheads](#) in the US arsenal we have at least 5,000 options in between deterrence as usual and abolition; and reexamining the assumptions that underlie our thinking about national security provides even more options.

While the approach I have suggested today and summarized in the above conclusions fits within the charge Congress gave you, it can also be interpreted in other ways.

If this committee has not yet considered the approaches that I have outlined, and especially those that Chairman Cooper hoped to see addressed, I encourage members who want them included in this study to call for an open, objective discussion. My call for this study asked that it be done by the National Academies because of its long history of treating sensitive issues in that exemplary fashion, and I place my trust in that record.

Thank you.