

Comments on NRC Study Mandated by Section 1674 of the FY2020 NDAA

Prof. Martin Hellman, Stanford University

The key questions.

The most important questions for this study to address are:

How great are the risks of nuclear terrorism and nuclear war?

What is an acceptable level of risk and are those risks at an acceptable level?

If either the risk of nuclear terrorism or the risk of nuclear war is at an unacceptable level, a third question becomes important:

How can the risk be reduced?

My answers to those key questions.

As explained below, my research indicates that the answers to those questions are:

The risk of a full-scale nuclear war is currently unacceptably high, all by itself. This initial study therefore can focus on estimating that risk.

A full-scale nuclear war would be catastrophic beyond imagination and its probability is on the order of 1% per year (i.e., in the range of roughly 0.3% to 3% per year).¹ This is an unacceptably high risk and demands our attention.

Some see far too much risk in our current nuclear posture and have proposed changes to reduce the risk. Others see the current risk as both acceptable and necessary; they fear that the proposed changes will have the opposite of their intended effect and increase risk. Therefore, the first key step is to determine whether or not the current level of risk is acceptable. Only then can proposed risk reduction measures be evaluated.

¹ This range is justified in the section “How great is the risk of nuclear war, and is it at an acceptable level?” on pages 2-5.

Is nuclear terrorism a greater risk than nuclear war?

Some have argued that, in this post-Cold War world, nuclear terrorism is a greater risk than nuclear war.² I disagree based on the following reasoning, which measures risk by the expected number of deaths.

A nuclear terrorist attack would be unlikely to kill 100,000 people, while a full-scale nuclear war would be likely to kill over a billion. That 10,000:1 ratio means that nuclear war would have to be at least 10,000 times less probable than nuclear terrorism for terrorism to be the greater risk.

There is significant uncertainty in those numbers, but even with more conservative numbers (e.g., 1 million deaths from nuclear terrorism and 100 million from nuclear war) the ratio would still be so large that nuclear war would continue to be the greater risk.

This is not to say that we should neglect the risk of nuclear terrorism. Rather, even though nuclear terrorism appears to be the lesser risk, it and nuclear war would entail such huge losses that both deserve more attention than they currently receive. Also, there is coupling between the two risks that should be considered in a future, more detailed study.

This initial study can focus on estimating the risk of nuclear war because, as shown below, that risk is unacceptably high all by itself. That makes the total nuclear risk also unacceptable.

How great is the risk of nuclear war, and is it at an acceptable level?

There is a divergence of opinions about the current level of risk as seen from the following statements by two former Secretaries of Defense.

James Schlesinger expressed the view that the risk of a nuclear war is at an acceptable level [when he stated](#) in a 2009 interview that we will need a strong nuclear deterrent over a time period “that is measured at least in decades ... [and] in my judgment ... more or less in perpetuity.”

² For example, in a 2014 press conference in the Hague, [President Obama asserted](#) that, “Russia is a regional power ... I continue to be much more concerned when it comes to our security with the prospect of nuclear weapon going off in Manhattan.” Similarly, in the 2010 video documentary, *Nuclear Tipping Point*, Colin Powell stated that, “The real threat now is not from states that understand that you cannot use these weapons without inviting suicidal response, but from terrorists.” While risk levels today are different from when those statements were made, it still is important to deal with those beliefs.

In contrast, former Secretary of Defense Robert McNamara saw the risk as unacceptable. In the 2003 documentary, *Fog of War*, he stated: “The major lesson of the Cuban missile crisis is this: the indefinite combination of human fallibility and nuclear weapons will destroy nations.”³

For the reasons given immediately below, for this initial study, I concentrate on estimating the probability of a full-scale nuclear war, bypassing both its consequences (which is one component of its risk) and the risk of lesser, limited nuclear wars. Later, more detailed studies can deal with those issues.

I have not estimated the consequences of a full-scale nuclear war because they would be so catastrophic that, for the risk to be at an acceptable level, the probability of a nuclear war would have to be acceptably small.

I also have not estimated the risk of limited nuclear war because if, as my research indicates, the risk of a full-scale nuclear war is unacceptably high, that alone tells us that remedial action is needed. It also makes this initial study more manageable because it need only assess the risk of a full-scale nuclear war, and within that context, only its annualized probability.

An estimate of the annualized probability of a full-scale nuclear war is expressed in percent per year or comparable units. The estimate also needs to take into account the significant uncertainties that exist, and therefore should be a range instead of a simple, point estimate.⁴

Looking backward in time, this annualized probability was highly time-varying, peaking during the Cuban missile crisis and being elevated during incidents such as the 2008 Georgian War and the ongoing Ukrainian War.

Looking into the future, it is impossible to tell when similar such events will occur, so a time-invariant model is both reasonable and perhaps the only one possible.

In papers that I published in [2008](#) and [2011](#), I advocated the use of quantitative risk analysis (QRA) both to estimate and reduce the annualized probability of a full-scale nuclear war. I still advocate the use of QRA to find ways to reduce that probability, but I now prefer a simpler approach for getting an initial estimate that is accurate enough for determining whether it is at an acceptable level. Later, more detailed studies might use

³ Transcript [available online](#). The above quote starts at 14:50 on the DVD.

⁴ The uncertainty in the estimate might also be expressed as a (subjective) probability distribution over that range, but that decision is better left for a later, more detailed study. See B. John Garrick, “Principles and Practices for Quantifying Global Catastrophic Risks,” in *Quantifying Global Catastrophic Risks*, September 16, 2018. [Accessible online](#).

a QRA framework to estimate the probability more accurately, but that seems unnecessary and impractical in this small, initial study.

This simpler approach takes account of the significant uncertainties that exist by only estimating the annualized probability of a full-scale nuclear war to an order of magnitude, or if need be, within a few orders of magnitude.⁵

An estimate of 10% per year is almost surely too high since we have survived sixty years of mutually assured destruction (MAD) without experiencing any use of nuclear weapons, much less a full-scale exchange. If the annualized risk were 10% per year, we would have had to have been extremely lucky since then there would be less than one chance in 500 of surviving 60 years without a nuclear war.⁶

Similarly, whether one has studied potential failure mechanisms in detail, or one only knows about periods of major risk, 0.1% per year seems too low — that would be equivalent to believing that current policies could be continued for approximately 1,000 years before we experienced a full-scale nuclear war.⁷

That reasoning leaves 1% per year as the order of magnitude estimate for the probability of a full-scale nuclear war. Since this is an order of magnitude estimate, it spans the range from roughly 0.3% to 3% per year.

Even if 0.1% per year could not be excluded from the possible range, that too would seem unacceptably high since, over the next century, it would accumulate to almost a 10% probability of civilization being destroyed.

The above arguments show the importance of not only estimating the annualized probability of a full-scale nuclear war, but also establishing the maximal acceptable such probability. Would 0.01% per year be acceptable? 0.001%? Or some other bound?

⁵ I am indebted to Dr. James Scouras of Johns Hopkins' Applied Physics Laboratory for pointing out that my simpler, order of magnitude argument was more appropriate at this point in time. He also noted that a QRA would have to be done very carefully to prevent any biases from affecting the conclusion. Scouras was Chief Scientist of the Defense Threat Reduction Agency's Advanced Systems and Concepts Office from 2007 to 2009.

⁶ As noted above, former Secretary of Defense Robert McNamara has argued that we have been lucky to make it thus far without experiencing a nuclear war. If he is correct, 10% per year might have to be reconsidered, but that question is better left to future studies.

⁷ I have informally polled approximately 1,000 people over the last 10 years and the vast majority have agreed that 10% seems too high and 0.1% seems too low. While they are rare, there have been exceptions in both directions. A more formal [2018 poll](#) found similar results.

If, for example, 0.0001% per year were deemed to be the maximal acceptable annualized probability for a full-scale nuclear war, then remedial action would be required even if the committee were to estimate that a lower bound on that probability was 0.001% per year — ten times higher.

Different opinions on the maximal acceptable probability can be incorporated into a range and techniques such as expert elicitation can be used to improve that estimate.

It also might be decided that, rather than a single fixed number, the maximal acceptable probability should decrease over time. A value that would be unacceptable over a century might be acceptable over a decade.

How can the risk be reduced?

If this study concludes that the nuclear risk we face currently is unacceptably high, we need to address the question, “How can the risk be reduced?”

Former Secretary of Defense William Perry and Tom Collina conclude their recent book with “ten recommendations for a safer world.”⁸ These include ending the president’s sole authority to launch a nuclear attack, prohibiting launch on warning, prohibiting US first use of nuclear weapons, retiring all land-based ICBMs, and limiting strategic defense. Some other national security experts oppose Perry’s and Collina’s recommendations out of the belief that those changes would have the opposite of their intended effect and hurt our national security.

Before we can decide whether specific actions such as those recommended by Perry and Collina will enhance or detract from our national security, we must first better understand the level of risk of our current approach. An action that would be dangerous if the current annualized probability of a full-scale nuclear war were 0.0001% per year might become highly desirable if, instead, that probability were 1% per year. Hence, the first two questions that I believe this study needs to address are key for determining not only whether the risk needs to be reduced, but also how to reduce it if needed.

Appendix VII describes a different risk reduction step that we can take whether or not the current risk is at an acceptable level. This approach is risk-free because, by itself, it makes no concrete changes in our national security posture. Instead, it examines some of the assumptions that underlie our current thinking about national security, but that

⁸ William J. Perry and Tom Z. Collina, *The Button: The New Nuclear Arms Race and Presidential Power from Truman to Trump*, BenBella Books, Dallas, TX, 2020, pp. 208-219.

are questionable on closer examination. If any of those assumptions are wrong, correcting them has the potential to enhance our national security in profound ways. But merely questioning them is risk-free. I have relegated this approach to an appendix because the committee may not have time to get that far and I wanted the main section of these comments to be as succinct as possible.

Description of appendices.

Appendix I describes a number of events that made the 1962 Cuban missile crisis more dangerous than is generally recognized.

Appendix II describes a number of other Cold War events with heightened nuclear risk.

Appendix III describes a number of post-Cold War events with heightened nuclear risk.

Appendix IV addresses whether a quantitative estimate of the risk of nuclear war is possible.

Appendix V discusses the possible application of Quantitative Risk Analysis (QRA) for reducing the risk of a nuclear war.

Appendix VI discusses the possible application of Quantitative Risk Analysis (QRA) for estimating the risk of a nuclear war.

Appendix VII examines a number of assumptions that underlie our current thinking about national security, but that are questionable on closer examination.

Appendix I: Some events that heightened the risk of the Cuban missile crisis.

The events described in this appendix are helpful in estimating the level of risk that our nation faced during the Cuban missile crisis, and that it would face if a similar crisis should reoccur.

This is particularly important since different participants in the crisis have expressed highly divergent estimates of the level of risk. ExComm⁹ member C. Douglas Dillon stated, “we didn’t think there was any real risk of a nuclear exchange”¹⁰ and Kennedy’s National Security Advisor McGeorge Bundy [estimated that risk](#) at “one in 100.” At the other extreme, Kennedy speech writer Theodore Sorensen quotes the president as saying the odds of war were “somewhere between one out of three and even,”¹¹ and Secretary of Defense McNamara remembers thinking he might not live out the week.¹²

Estimates made at the time of the crisis also need to be reevaluated in light of information that only became known afterward, such as the first two items below.

American destroyers attacked Soviet submarines that, unbeknownst to them, were armed with nuclear torpedoes. On October 27, at the height of the crisis, American destroyers intercepted a Soviet submarine near the quarantine line and forced it to surface by dropping “practice depth charges.” Forty years later, we learned that this and two other Soviet submarines that also were forced to surface carried nuclear torpedoes.¹³ The presence of these nuclear weapons was unknown to their attackers or to any other Americans at that time.

[According to](#) a member of the submarine crew, its captain was under severe physical and psychological pressure; mistook the practice depth charges for regular “killer” depth charges; believed that World War III might already have started; and gave orders for the nuclear torpedo to be armed. Fortunately, according to this same crew member, the captain was talked down and admitted a humiliating defeat by surfacing.

⁹ Early in the crisis, President Kennedy formed a high level Executive Committee to advise him. It is frequently abbreviated as “ExComm.”

¹⁰ James G. Blight and David A. Welch, *On the Brink: Americans and Soviets Reexamine the Cuban Missile Crisis*, Hill and Wang, New York, 1989 , page 72

¹¹ Theodore C. Sorensen, *Kennedy*, Harper & Row, New York, 1965,p. 705.

¹² Robert S. McNamara, *Blundering Into Disaster*, Pantheon Books, New York, 1986, p. 11.

¹³ William Burr and Thomas S. Blanton, “The Submarines of October: U.S. and Soviet Naval Encounters During the Cuban Missile Crisis,” National Security Archive Electronic Briefing Book No. 75, October 31, 2002, accessible at. An English translation of the crew member’s recollection of the captain’s wanting to use the nuclear torpedo is [accessible online](#).

American decision makers who advocated invading Cuba did not know that the Soviets had deployed battlefield nuclear weapons to repel such an attack. While President Kennedy eventually decided on a naval blockade, he and almost all the other American decision makers initially favored airstrikes against the missiles, to be followed by an invasion.¹⁴ None of these decision makers knew that the Soviets had placed battlefield nuclear weapons on Cuba to deter and, if need be, to repel such an invasion.¹⁵

Significant support for an invasion continued even after Khrushchev had acquiesced to the naval quarantine. An October 28, 1962, Top Secret [Memorandum for the Secretary of Defense](#) from the Joint Chiefs of Staff concluded “that the only direct action which will surely eliminate the offensive weapons threat is air attack followed by invasion and is, in the long run, the best course of action.”¹⁶

At the height of the crisis, an American U-2 strayed into Soviet airspace, creating a risk that nuclear air-to-air missiles would be used. On October 27, which became known as “Black Saturday,” a U-2 piloted by USAF Captain Chuck Maultsby¹⁷ became lost on an intelligence gathering mission over the Arctic and accidentally flew into Soviet airspace. MiG fighters were scrambled to intercept Maultsby, while F-102s from Alaska were sent to protect him and escort him home. Due to the crisis, the F-102s’ conventional air-to-air missiles had been replaced with nuclear-armed missiles. As noted by Stanford Professor Scott Sagan, “the only nuclear weapons control mechanism remaining was the discipline of the individual pilots in the single seat interceptors. The critical decision about whether to use a nuclear weapon was now

¹⁴ Sheldon M. Stern, *The Week the World Stood Still: Inside the Secret Cuban Missile Crisis*, Stanford University Press, Stanford, CA, 2005, pp. 40-41, 67-69, 87-90. Sheldon Stern was the Historian at the John F. Kennedy Presidential Library from 1977 to 1999 and is often regarded as the world’s leading expert on deciphering the low-quality audio tapes which JFK secretly made of many meetings during his presidency. Stern’s book is derived from those tapes, and can therefore be considered primary source material.

¹⁵ Aleksandr Fursenko and Timothy Naftali, *One Hell of a Gamble*, W. W. Norton & Company, New York, 1997, p. 212.

¹⁶ The suspicions of the Joint Chiefs were not unwarranted since the Soviets earlier had lied about the presence of the missiles. However, unknown to the Chiefs, the Soviet battlefield nuclear weapons increased the risk that their proposed solution would lead to nuclear war.

¹⁷ While it is not critical to what I say above, some accounts refer to Maultsby as a major in the Air Force, while others call him a captain. I have used the latter since [it comes](#) from the usually reliable National Security Archive website. I suspect that the references to him as a major were written after he had attained that rank.

effectively in the hands of a pilot flying over Alaska.”¹⁸ Fortunately, the MiGs never reached Maultsby’s U-2 or the nuclear-armed F102s.

An American U-2 was shot down over Cuba. Approximately one hour after Maultsby became lost and penetrated Soviet airspace, USAF Major Rudolf Anderson was shot down and killed by a Soviet surface-to-air (SAM) missile while on a U-2 reconnaissance mission over Cuba. Four days earlier, JFK and his advisors had agreed that, if a SAM downed a U-2, the offending SAM site would be attacked.¹⁹ But, when Major Anderson’s U-2 was shot down, Kennedy had second thoughts, probably because our killing Soviet personnel would put Khrushchev in the same escalatory bind in which Kennedy found himself. Kennedy’s reversal infuriated the military.²⁰

The United States gave numerous indications that it intended to invade Cuba, causing Castro to tell Khrushchev to launch his missiles preemptively. The goal of a two-week-long American military exercise involving tens of thousands of military personnel, which started the day before the crisis erupted, was to execute an amphibious assault on a Puerto Rican island whose fictitious dictator was named “Ortsac” – “Castro” spelled backwards.²¹ In the months before the missiles were discovered, congressmen, senators and the American media excoriated Kennedy for allowing the Soviet military buildup in Cuba, many demanding an invasion. The September 21 cover story in TIME magazine argued, “The only possibility that

¹⁸ Scott D. Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons*, Princeton University Press, Princeton, NJ, 1995, pp. 136-137.

¹⁹ Sheldon Stern, *The Cuban Missile Crisis in American Memory: Myths versus Reality*, Stanford University Press, Stanford, CA, 2012, p. 30 notes: “[JFK] rejected ExComm demands to implement his earlier decision to destroy the SAM site that had fired the fatal missile.” As noted earlier, Stern is one of the top scholars on these matters. A slightly “noisy” transcript of the tapes appears in Timothy Naftali and Ernest May (Editors), *The Presidential Recordings: John F. Kennedy: The Great Crises, Volume 3*, Norton, New York, 2001, p. 115. On page 124 Kennedy refers to “this plan we just agreed on this morning” and the editors add in brackets “for retaliation if a U-2 were shot down.”

²⁰ National Security Archive chronology of the Cuban Missile Crisis, [accessible online](#), page 377, column 1, first paragraph of 4:00 PM entry.

²¹ Laurence Chang and Peter Kornbluh (Editors), *The Cuban Missile Crisis, 1962: A National Security Archive Documents Reader*, The New Press, New York, 1998, pp. 370-371. Note that the page numbers are for the 1998 edition, not an earlier one.

promises a quick end to Castro ... is a direct U.S. invasion of Cuba.”²² Castro became convinced that an invasion was imminent and, knowing of the Soviet battlefield nuclear weapons, he believed that a nuclear war would follow. He therefore suggested that Khrushchev “should launch a preemptive [nuclear] strike against United States.”²³

Seven months before the crisis, the Joint Chiefs of Staff (JCS) suggested blowing up an American ship in Guantanamo Bay and blaming Cuba in order to create support for an invasion.

In March 1962, the Chairman of the Joint Chiefs, Army General Louis Lemnitzer, sent Defense Secretary Robert McNamara a [list of proposals](#) known as Operation Northwoods, outlining ways to generate American public support for an invasion of Cuba. Two suggestions read: “We could blow up a U.S. ship in Guantanamo Bay and blame Cuba. ... We could foster attempts on lives of Cuban refugees in the United States even to the extent of wounding [them].”²⁴

On the first day of the crisis, at a meeting of President Kennedy and his key advisors, Attorney General Robert F. Kennedy similarly suggested: “We should also think of whether there is some other way we can get involved in this through Guantanamo

²² “The Nation: The Presidency: The Durable Doctrine,” *TIME*, vol. 80, No. 12, September 21, 1962, pp. 17-20; Robert Dallek, *An Unfinished Life*, pp. 539-540; and Richard Ned Lebow and Janice Gross Stein, *We All Lost the Cold War*, Princeton University Press, Princeton, 1994, pp. 20-21.

²³ Jerold L. Schechter, translator and editor, with Vyacheslav V. Luchkov, *Khrushchev Remembers: The Glasnost Tapes*, Little, Brown, Boston, 1990, pp. 176-177: “Castro suggested that in order to prevent our nuclear missiles from being destroyed, we should launch a preemptive strike against United States. He concluded that an [American] attack was unavoidable and that this attack had to be preempted. In other words, we needed to immediately deliver a nuclear missile strike against the United States.” After being removed from office, Khrushchev put these memoirs on tape and smuggled them out of the Soviet Union. This is a translation of those tapes. Their authenticity was initially questioned, but after censorship was lifted, Khrushchev’s son Sergei vouched for their authenticity

²⁴ The link is to the originally TOP SECRET document, signed by General L. L. Lemnitzer, Chairman of the Joint Chiefs of Staff, clearly showing the authenticity of these otherwise hard-to-believe facts. The quotes used in this paper are in “Annex to Appendix to Enclosure A: Pretexts to Justify US Military Intervention in Cuba.” They are easier to find in [a searchable version](#) of the document.

Bay ... you know, sink the Maine again or something.”²⁵ RFK had made similar proposals at least twice before, on April 19, 1961, and August 21, 1962.²⁶

The Joint Chiefs advocated similar proposals during the crisis. On October 28, 1962, in a Top Secret [Memorandum for the Secretary of Defense](#), they suggested “a series of provocative actions,” including having US destroyers “inadvertently” violate Cuba’s three-mile limit; “harass Cuban shipping;” and “incite riots on Cuban side of Guantanamo fence ... [to] justify our providing military assistance to laborers.” The memorandum stated that, “The purpose of these actions is to induce the Cubans to fire on US elements, or make some mistake which would make politically acceptable and justify subsequent US air strikes or invasion.”

While the above incidents might be hard to comprehend as serious proposals from today’s perspective, they fit the pattern of that time, including covert sabotage against Cuban targets and assassination attempts on Castro’s life. These incidents help to explain why Castro and Khrushchev were so fearful of an American invasion and the nuclear risk that produced.

President Kennedy took actions that extended the crisis for months after the public thought it had ended. After Khrushchev agreed to remove his missiles from Cuba, Kennedy seized on a wording ambiguity²⁷ to expand his list of demands beyond removal of just the missiles. This kept the crisis simmering and out of public view.²⁸

When a minor part of the deal fell apart, Kennedy also questioned whether our pledge not to invade Cuba was still effective, even though that commitment was comparable

²⁵ Timothy Naftali and Philip Zelikow, *The Presidential Recordings, vol. 2*, Norton, New York, 2001, p. 452; and Sheldon M. Stern, *The Week the World Stood Still, ibid*, p. 50.

²⁶ Stephen G. Rabe, *The Most Dangerous Area in the World: John F. Kennedy Confronts Communist Revolution in Latin America*, University of North Carolina Press, Chapel Hill, 1999, p. 207, footnote 19.

²⁷ Instead of promising to remove the missiles, [Khrushchev said](#) he would remove “the arms which you described as offensive.” Khrushchev probably used these words to drive home the point that he regarded the missiles as defensive, intended not to attack the US but to prevent a second American invasion of Cuba. But Kennedy seized on this wording ambiguity to demand the removal of a number of additional weapons systems that he regarded as offensive.

²⁸ Laurence Chang and Peter Kornbluh (Editors), *The Cuban Missile Crisis*, The New Press, New York, 1998, p. 394, pp. 396-398. On November 5, 1962, Khrushchev warned Kennedy that his “additional demands ... [risk bringing] our relations back again into a heated state in which they were but several days ago.”

in importance to the Soviets' promise to remove their missiles.²⁹ American invasion plans peaked on November 15, three weeks after the public thought the crisis had ended³⁰ and plans for assassination attempts on Castro's life continued until at least 1963.³¹

In the month before the crisis erupted, Kennedy and Khrushchev each drew lines in the sand that later boxed them in. Under pressure from Congress and the press over the Soviet buildup, on September 4, President Kennedy warned the Soviets that “the gravest issues would arise” if they introduced “offensive ground-to-ground missiles” into Cuba.³² When the Cuban missiles were discovered in mid-October and nuclear war seemed imminent, Kennedy noted that “it doesn't make any difference if you get blown up by an ICBM flying from the Soviet Union or one from 90 miles away,” and regretted his earlier ultimatum by stating that, “Last month I should have said we don't care.”³³

On September 11, Moscow drew its own line in the sand when it warned that “one cannot now attack Cuba and expect the aggressor will be free from punishment. If this attack is made, this will be the beginning of the unleashing of war.”³⁴

Predictions of disaster were ignored. In the spring of 1962, nuclear-armed American missiles became operational in Turkey, adding to Khrushchev's motivation to base similar Soviet weapons in Cuba.³⁵ A risk of this nature had been foreseen several years earlier by President Eisenhower, when the Turkish deployment was first being

²⁹ Richard Ned Lebow and Janice Gross Stein, *We All Lost the Cold War*, p. 345.

³⁰ David G. Coleman, “The Missiles of November, December, January, February ... The Problem of Acceptable Risk in the Cuban Missile Crisis Settlement,” *Journal of Cold War Studies*, vol. 9, No. 3, 2007, pages 5-48.

³¹ United States Senate Report No. 94-465, *ALLEGED ASSASSINATION PLOTS INVOLVING FOREIGN LEADERS: An Interim Report of the Select Committee to Study Governmental Operations with respect to Intelligence Activities*, November 20, 1975, US Government Printing Office, page 85.

³² Laurence Chang and Peter Kornbluh (Editors), *The Cuban Missile Crisis*, p. 367.

³³ Timothy Naftali and Philip Zelikow, *The Presidential Recordings, vol. 2*, Norton, New York, 2001, p. 441 and p. 433.

³⁴ Richard K. Betts, *Nuclear Blackmail and Nuclear Balance*, The Brookings Institution, Washington, DC, 1987, page 112.

³⁵ Fedor Burlatsky, *Khrushchev and the First Russian Spring*, Charles Scribners Sons, New York, 1991, p. 171.

considered. Even though Castro was not yet in power, minutes of a 1959 meeting quote Eisenhower as seeing a parallel to a possible Soviet deployment in Cuba:

If Mexico or Cuba had been penetrated by the Communists, and then began getting arms and missiles from [the Soviets], we would be bound to look on such developments with the gravest concern and in fact ... it would be imperative for us [even] to take ... offensive military action.³⁶

In spite of recognizing this danger, Eisenhower set in motion events that resulted in our missiles being deployed to Turkey.

During the crisis, Kennedy forgot that we had similar missiles in Turkey. On the first day of the crisis, October 16, JFK expressed shock at Khrushchev's recklessness in deploying nuclear-armed missiles so close to our shores. Obviously forgetting that he had deployed similar missiles in Turkey earlier that year, JFK argued, "It's just as if we suddenly began to put a major number of MRBMs in Turkey. Now that'd be goddamn dangerous." Kennedy's National Security Adviser, McGeorge Bundy, had to remind him that we had done exactly that. Then, instead of seeing Khrushchev's move in a new light, Kennedy and his advisers used tortured logic to portray the Soviet's Cuban missile deployment as fundamentally different from ours in Turkey, in direct contradiction to what the president had just said.³⁷

Domestic politics often trumped national security. Some of President Kennedy's actions during the Cuban missile crisis were motivated more by domestic politics than by national security. Early in the crisis, Secretary of Defense Robert McNamara noted: "I'll be quite frank. I don't think there is a military problem ... This is a domestic, political problem."³⁸

In a later, October 23, 1962, conversation between the president and his brother, Robert Kennedy said, "Well, there isn't any choice. I mean, you would have been, you would have been impeached." To which JFK replied, "That's what I think. I would have been impeached. I think they would've moved to impeach."³⁹

³⁶ Barton J. Bernstein, "Reconsidering the Missile Crisis: Dealing with the Problem of the American Jupiters in Turkey," pages 55-129, in James A. Nathan (Editor), *The Cuban Missile Crisis Revisited*, St. Martin's Press, New York, 1992. The Eisenhower quote is on page 58.

³⁷ Sheldon M. Stern, *The Week the World Stood Still*, p. 50.

³⁸ Timothy Naftali and Philip Zelikow, *The Presidential Recordings, vol. 2*, Norton, New York, 2001, p. 464; McNamara's quote is in two pieces, with others speaking in between.

³⁹ Timothy Naftali and Ernest May, *The Presidential Recordings: John F. Kennedy: The Great Crises, Volume 3*, Norton, New York, 2001, p. 173.

Appendix II: Some other Cold War nuclear risks.

April 17-19, 1961, The Bay of Pigs Invasion. Planning to overthrow Castro's regime started under the Eisenhower administration, was inherited by Kennedy, and came to a head in this failed invasion attempt. It and subsequent US covert actions aimed at regime change in Cuba played a role in Khrushchev's offering, and Castro's accepting, Soviet nuclear weapons to prevent a second invasion attempt. America's feeling of humiliation contributed to public support for a second invasion, but this time with a large enough American force to ensure success. See Appendix I's entry "The United States gave numerous indications that it intended to invade Cuba, causing Castro to tell Khrushchev to launch his missiles preemptively."

October 22-28, 1961, Berlin Crisis. West Berlin was a symbol of freedom to the United States and a thorn in the side of Moscow. A 2009 [US Army history](#) notes that, in October, "tensions ... nearly escalated to the point of war," with Soviet and American tanks facing off at Checkpoint Charlie. In addition to other risks associated with this standoff, each of the tank commanders – both Soviet and American – had the ability, though not the authority, to start a fire fight which would have increased the risk of war.

November 22, 1963, JFK's Assassination. According to [a National Security Archive publication](#): "Fears that Moscow might have masterminded the president's killing rose sharply when the CIA was unable to locate Soviet Premier Nikita Khrushchev for 24-48 hours afterwards." That same publication quotes CIA officials as fearing that Khrushchev might be "either hunkering down for an American reprisal, or possibly preparing to strike the United States."

June 5-10, 1967, Six Day War. This war engendered many risks, including [an allegation](#) by former Secretary of Defense Robert McNamara that the United States and the Soviet Union "damn near had war" as a result of the Soviets misinterpreting actions by a US aircraft carrier.

October 1969, Nixon's "Madman Nuclear Alert." [As related](#) by Prof. Scott Sagan and Prof. Jeremi Suri, President Nixon ordered a military alert for the ostensible purpose of responding "to possible confrontation by the Soviet Union." But, it was a ruse. Nixon's chief of staff H.R. Haldeman says that Nixon told him:

I call it the Madman Theory, Bob. I want the North Vietnamese to believe that I've reached the point that I might do *anything* to stop the war. We'll just slip the word to them that "for God's sake, you know Nixon is obsessed about Communism. We can't restrain him when he is angry — and he has his hand on

the nuclear button” — and Ho Chi Minh himself will be in Paris in two days begging for peace.⁴⁰

Despite efforts by Nixon and Kissinger to minimize the chances of an accidental escalation, Sagan and Suri detail a number of dangerous military activities that occurred.

October 6-25, 1973, Yom Kippur War. As with the 1967 Six Day War, there were a number of nuclear risks in 1973. As one example, on October 24, the Israeli army was poised to capture the 22,000-man Egyptian Third Army and its large cache of Soviet military equipment. Soviet General Secretary Leonid Brezhnev [sent a letter](#) to President Nixon suggesting that a joint US-Soviet force be sent to enforce [UN Security Council Resolution 338](#) that called for a cease fire, and that had been supported by both the US and the USSR.

On receipt of Brezhnev’s letter, a National Security Council meeting was immediately called. Probably seeing a joint Soviet-American military effort as infeasible, the meeting focused on Brezhnev’s warning, “that if you find it impossible to act jointly with us in this matter, we should be faced with the necessity urgently to consider the question of taking appropriate steps unilaterally.” In response, the NSC ordered US forces to Defcon III, an action that [the Soviets saw](#) as “irresponsible.”⁴¹

The crisis ended the next day when Kissinger [successfully applied strong pressure](#) on Israel not to capture or destroy the Egyptian Third Army.

November 9, 1979, false alarm due to training tape. According to former Secretary of Defense Robert Gates:⁴²

[President Carter’s National Security Advisor Zbigniew] Brzezinski was awakened at three in the morning by [General William] Odom, who told him that some 220 Soviet missiles had been launched against the United States. ... Brzezinski was convinced we had to hit back and told Odom to confirm that the

⁴⁰ H.R. Haldeman with Joseph DiMona, *The Ends of Power*, New York, Times Books, 1978, p. 83. Emphasis is in the original.

⁴¹ The author of the cited article, Victor Israelian, was a visiting professor at Pennsylvania State University when he wrote it, but in 1973, he worked at the Soviet Foreign Ministry and attended the Politburo meeting held in response to the US moving to Defcon III. Israelian states, “Brezhnev expressed his indignation at the fact that the Americans had prepared their troops for military action. He and his colleagues characterized Nixon’s decision as irresponsible.”

⁴² Robert M. Gates, *From the Shadows: The Ultimate Insider’s Story of Five Presidents and How they Won the Cold War*, New York, Simon & Schuster, 1996, page 114. The National Security Archive has [an online account](#) of the incident.

Strategic Air Command was launching its planes. When Odom called back, he reported that he had further confirmation, but that 2,200 missiles had been launched—it was an all-out attack. One minute before Brzezinski intended to telephone the President, Odom called a third time to say that other warning systems were not reporting Soviet launches. Sitting alone in the middle of the night, Brzezinski had not awakened his wife, reckoning that everyone would be dead in half an hour. It had been a false alarm. Someone had mistakenly put military exercise tapes into the computer system.

December 25, 1979, Soviet invasion of Afghanistan. This invasion was seen ominously in the US, with *TIME* columnist Strobe Talbott [referring to it](#) as “the Soviet army’s blitz against Afghanistan,” and warning that “the Soviet jackboot was now firmly planted on a stepping stone to possible control over much of the world’s oil supplies.”⁴³

The day after the invasion, President Carter’s National Security Advisor Zbigniew Brzezinski stated in a memo to the president: “the Soviet intervention in Afghanistan poses for us an extremely grave challenge.”⁴⁴

The British Ambassador to Moscow from 1988-1992, Sir Roderic Braithwaite, [saw the invasion very differently](#):

The Russians did not invade Afghanistan in order to incorporate it into the Soviet Union, or to use it as a base to threaten the West’s oil supplies in the Gulf, or to build a warm water port on the Indian Ocean. They went in to sort out a small, fractured and murderous clique of Afghan Communists who had overthrown the previous government in a bloody coup and provoked chaos and widespread armed resistance on the Soviet Union’s vulnerable Southern border.

Whoever is right, and there may well be some truth in both perspectives, the Soviet invasion produced a crisis. President Carter embargoed US shipments of grain to the Soviet Union and boycotted the 1980 Moscow Summer Olympics. Some of the rebels

⁴³ Talbott later served President Bill Clinton as Deputy Secretary of State. Talbott’s appraisal is disputed by Lieutenant General (US Army, Retired) Karl Eikenberry, Commander of the American-led Coalition forces in Afghanistan from 2005 to 2007 and our Ambassador to that country from 2009 to 2011. In a private communication Eikenberry told me, “Given the geographic constraints and geopolitical realities, it is not at all clear why Talbott thought this was so.”

⁴⁴ Brzezinski memo to Carter “Reflections on Soviet Intervention in Afghanistan,” December 26, 1979. This memo is included in a [large collection](#) of documents, which fortunately appear to be in chronological order. This memo is PDF pages 221-223 in my saved version.

whom we aided added risk by crossing from Afghanistan *into the Soviet Union* to carry out acts of sabotage and propagandize the local Muslim population.⁴⁵

The Soviet invasion and our response to it helped lay the foundation for 9/11 and the ongoing war in Afghanistan since many of the Afghan *mujahideen*, including Osama bin Ladin, later turned against the West. Thus the nuclear risk attributable to 9/11 and subsequent events is traceable in part to these much earlier events.

Pakistan's nuclear arsenal is another risk that can be traced in part to the Soviet invasion of Afghanistan. Brzezinski's memo cited above went on to say (emphasis added; see page 3, item B, of the memo), "we must both reassure Pakistan and encourage it to help the rebels. This will require a review of our policy toward Pakistan, more guarantees to it, more arms aid, and, alas, *a decision that our security policy toward Pakistan cannot be dictated by our nonproliferation policy.*"

June 20, 1983, Proud Prophet war game escalates uncontrollably. The outcome of war games is usually classified, so it was unusual — and helpful in assessing risk — when Prof. Paul Bracken was able to detail the results of this 1983 war game in which he was involved:⁴⁶

This wasn't any ordinary war game. ... Proud Prophet [used] actual decision makers, the secretary of defense and the chairman of the Joint Chiefs of Staff. To make it as realistic as possible, actual top-secret U.S. war plans were incorporated into the game. ...

American limited nuclear strikes were used in the game. The idea behind these was that once the Soviet leaders saw that the West would go nuclear they would come to their senses and accept a cease-fire. ... But that's not what happened. The Soviet Union ... responded with an enormous nuclear salvo at the United States. The United States retaliated in kind. ...

A half billion human beings were killed in the initial exchanges and at least that many more would have died from radiation and starvation. ... This game went nuclear big time, not because Secretary Weinberger and the chairman of the Joint Chiefs were crazy but because they faithfully implemented the prevailing U.S. strategy, a strategy that few had seriously thought about outside of the confines of a tight little circle of specialists. I have played other games that

⁴⁵ Steve Coll, *Ghost Wars: The Secret History of the CIA, Afghanistan, and Bin Laden, from the Soviet Invasion to September 10, 2001*, Penguin, New York, 2004, page 90.

⁴⁶ Paul Bracken, *The Second Nuclear Age: Strategy, Danger, and the New Power Politics*, Times Books, New York, 2012, pp. 82-88.

erupted, and they shared this common feature, too. A small, insulated group of people, convinced that they are right, plows ahead into a crisis they haven't anticipated or thought about, one that they are completely unprepared to handle. The result is disaster.

We know that some later war games ended similarly as detailed in Appendix III's entries "2004, war games escalate uncontrollably" and "2018, war games escalated out of control."

September 1, 1983: South Korean airliner is shot down by the Soviets. Korean Air Lines flight 007 was shot down by a Soviet SU-15 interceptor over Sakhalin Island, killing all 269 aboard, including Georgia Congressman Lawrence McDonald. The airliner went off course and strayed into Soviet airspace over the Kamchatka Peninsula, where a Soviet missile test was scheduled for that day. The plane left Soviet airspace, but re-entered a second time over Sakhalin Island, where it was shot down. President Reagan [characterized this tragedy](#) as a "crime against humanity [that] must never be forgotten ... It was an act of barbarism, born of a society which wantonly disregards individual rights and the value of human life and seeks constantly to expand and dominate other nations."

As can be seen from the above quote, this tragedy occurred during a time of heightened tensions between the US and the USSR, and it created additional risk.

Five years later, on July 3, 1988, the USS *Vincennes* shot down Iran Air 655, killing all 290 people on board. The next day, when President Reagan was asked about a possible comparison between that tragedy and KAL 007, he replied that, "there was a great difference. ... There's no comparison."⁴⁷ Later evidence shows that the president

⁴⁷ Federal News Service Archives, "QUESTIONS AND ANSWERS WITH PRESIDENT REAGAN REGARDING: USS VINCENNES SHOOTING DOWN OF IRANIAN AIRCRAFT WHITE HOUSE SOUTH LAWN 12:00 P.M. EDT MONDAY, JULY 4, 1988." The full text of Reagan's answer is only accessible through the Federal News Service, but [a 7/5/1988 Washington Post article](#) has some of President Reagan's answer.

was relying on incorrect information.⁴⁸ Analysis therefore might uncover additional risks that were present in the KAL 007 tragedy due to misperceptions.

November 1983, Able Archer exercise. I include this incident even though there is [disagreement](#) surrounding the level of risk that it entailed. In fact, I felt it important to include *because of* those disagreements, so that any readers who are familiar with only one perspective will become aware of the other as well.

On the one hand, former Secretary of Defense Robert Gates has characterized Able Archer as “one of the potentially most dangerous episodes of the Cold War.”⁴⁹ On the other hand, the above-linked article cites Harvard Prof. Mark Kramer as dismissing such assertions as “a mere myth.”

Whichever side is right, and again there may well be elements of truth in both perspectives, relations between the superpowers were very poor during the early 1980s, producing a heightened risk of war. Able Archer occurred just two months after KAL 007 had been shot down and less than eight months after President Ronald Reagan’s “Star Wars” speech that greatly alarmed the Soviets.

Gates wrote that Soviet leader Yuri Andropov developed a “seeming fixation on the possibility that the United States was planning a nuclear strike against the Soviet Union” and “that such a strike could occur at any time, for example, under cover of an apparently routine military exercise.”⁵⁰ Able Archer was just such an exercise, simulating the coordinated release of all of NATO’s nuclear weapons.

⁴⁸ As one example of incorrect information on which President Reagan relied, [he said](#): “the plane [Iran Air 655] began lowering its altitude. And so I think it was an understandable accident to shoot and think that they were under attack from that plane.” While initial reports from the *Vincennes* incorrectly stated that Iran Air 655 was descending, in an August 19, 1988 press briefing, the Chairman of the Joint Chiefs of Staff, Admiral William J. Crowe, corrected that error: “One of the [*Vincennes*] radar operators reported at 11 miles that the aircraft [Iran Air 655] was no longer climbing and that the altitude had commenced to decrease, a report that was not supported by a subsequent review of the Aegis tapes.” Admiral Crowe’s statement is [accessible online](#) as document 259 on page 458 of a large collection.

⁴⁹ Robert M. Gates, *From the Shadows: The Ultimate Insider’s Story Of Five Presidents And How They Won The Cold War*, Simon & Schuster Paperback, New York, 1996, pp. 270-272.

⁵⁰ *ibid*

Appendix III: Some post-Cold War nuclear risks.

By enumerating a number of post-Cold War nuclear risks, this appendix raises questions about the belief that the nuclear threat ended with the fall of the Berlin Wall. It is worth noting that many of these events occurred during the 1990's, a decade that is usually thought of as having very little nuclear risk.

1991 Soviet coup attempt: In August 1991 a coup attempt was mounted against Soviet President Mikhail Gorbachev. While the coup failed, the chaos and [uncertainty surrounding control of the Soviet nuclear arsenal](#) increased nuclear risk.

1993 Russian Constitutional Crisis: This was a small civil war between parties loyal to Yeltsin and others loyal to the Russian parliament. The Russian Parliament Building was shelled and there were over 600 casualties, including 187 dead. The first 20 seconds of this [Radio Free Europe/Radio Liberty video](#) graphically depicts the chaos.

1995-1996, Third Taiwan Straits Crisis: Taiwan's declaring its independence would be so intolerable to the People's Republic of China that it could precipitate a war that might drag in the United States. In 1995, over the strenuous objections of the PRC, Taiwan's pro-independence president, Lee Teng-hui, was granted a visa to visit the United States. The PRC was incensed and conducted missile tests to express its anger. A *New York Times* [book review](#) starts off: "The possibility of a shooting war between the United States and the People's Republic of China was suddenly made real to Bill Clinton in early March 1996."

This crisis has repercussions down to the current day. China's current, aggressive stance is partly a response to [the humiliation](#) that it felt when Clinton, in a show of military force, sent two aircraft carrier battle groups to the area in March 1996.

The Taiwanese independence movement [is still active](#) and in a [2018 statement](#) Lieutenant General Ben Hodges (US Army, Retired) thinks that "in 15 years — it's not inevitable, but it is a very strong likelihood — that we will be at war with China."

1999-present, NATO expansion: Prior to the breakup of the Soviet Union, Russia had a large buffer between it and NATO — a buffer that it felt it needed in light of Hitler's devastating 1941 invasion. That buffer shrank considerably in 1999 when Poland, Hungary, and the Czech Republic were admitted to NATO, and disappeared in 2004 when Estonia, Lithuania, and Latvia became members.

Russia feels not only threatened, but also cheated because, in a February 9, 1990 meeting, Soviet President Mikhail Gorbachev [was assured](#) by US Secretary of State James Baker that, if Gorbachev allowed the reunification of Germany within NATO,

“NATO’s jurisdiction would not shift one inch eastward.” Even though this was not a legally binding guarantee and Gorbachev later [took actions](#) that raised questions about whether Baker’s assurance still applied, Russia feels cheated, thereby creating nuclear risk.

A [2019 Radio Free Europe/Radio Liberty dispatch](#) quoted NATO Secretary-General Jens Stoltenberg as saying that it was “clearly stated that Georgia will become a member of NATO,” even though that article describes “the Kremlin’s fierce opposition” to such a move.

1999 Pristina Airport crisis: 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 could 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.”⁵¹

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.”⁵² Clark was probably right about the Russians backing down, but to assess the risk we would have to quantify *probably*, and then analyze what might happen if the Russians’ response differed from the one Clark expected.

2002-present, North Korean nuclear crisis: North Korea and the US [came close](#) to fighting a second Korean War in June 1994, over the North’s nuclear program. Intervention by former President Jimmy Carter resulted in the [1994 Agreed Framework](#)⁵³ that averted war and was in place until 2002. North Korea did its first nuclear test four years later in 2006 and, in 2018, [was estimated](#) to have a nuclear arsenal of 10-20 warheads.

⁵¹ 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.

⁵² General Wesley K. Clark, *ibid*, p. 395.

⁵³ The link is to a transcribed State Department version of the Agreed Framework. It is accurate except for one insignificant typo that I found when I compared it to a copy of the original, signed agreement in the Hoover Institution’s archives. At one point the State Department’s version says, “The U.S. and D.P.R.K. **will cooperated** in finding a method ...” whereas the original documented read, “The U.S. and D.P.R.K. **will cooperate** in finding a method ...”

Relations have been extremely tense in recent years, including White House pressure early in 2018 to develop plans for [attacking a North Korean missile](#) on its launchpad. Should the US and North Korea go to war, there is some risk of losing one or more American cities, either by a missile attack or a smuggled weapon. If China became involved in the war, the risk would increase markedly.

2004, war games escalate uncontrollably. Echoing Appendix II's entry about the 1983 Proud Prophet war game escalating uncontrollably, a [2008 RAND Project Air Force report](#) noted that:

In 2004, Director of Air Force Strategic Planning Major General Ronald J. Bath sponsored a war game in which uncontrolled escalation occurred, surprising players and controllers alike. ... this experience was just one in a series of escalatory events occurring in major war games over the past several years.

See also this appendix's entry "2018, war games escalated out of control."

2008 Cuban bomber mini-crisis: In July 2008, elements within the Russian military [threatened to deploy](#) nuclear capable bombers to Cuba. This threat was in response to the US planning an Eastern European missile defense system that [Russia felt](#) threatened its nuclear deterrent.

In his confirmation hearings as USAF Chief of Staff, General Norton Schwartz testified that this would cross a red line.⁵⁴ Fortunately, more sober-headed elements in Russia prevailed and the threat did not materialize. If the Russians had based nuclear capable bombers on Cuba, a crisis comparable to 1962's might have resulted.

2008 Georgian War: In August 2008, Russia invaded Georgia after the latter tried to reclaim its breakaway region of South Ossetia, resulting in attacks on a Russian peacekeeping force.⁵⁵ The danger was compounded because most Americans were unaware that an EU investigation [concluded](#) that Georgia fired the first shots, "which was followed by a disproportionate response of Russia." Reflecting the mood of many Americans at the time, Vice Presidential candidate [Sarah Palin said](#) that the United States should be ready to go to war with Russia if the conflict flared up again.

⁵⁴ Nominations Before the Senate Armed Services Committee, Second Session, 110th Congress, page 365.

⁵⁵ [Volume I](#) of the EU investigation's report states: "At least as far as the initial phase of the conflict is concerned, an additional legal question is whether the Georgian use of force against Russian peacekeeping forces on Georgian territory, i.e. in South Ossetia, might have been justified. Again the answer is in the negative."

2012-present, Senkaku-Diaoyu Islands: An ongoing dispute between Japan and China over the Senkaku-Diaoyu Islands [heated up in 2012](#) when the governor of Tokyo took actions that provoked China. According to a 2015 *New York Times* [article](#), “At least once every day, Japanese F-15 fighter jets roar down the runway, scrambling to intercept foreign aircraft, mostly from China,” and [the risk continues](#) down to the current day.

This dispute puts the ability to start a fire fight in the hands of individual pilots and ship captains who often engage in aerial and naval games of chicken. Should war break out between China and Japan, the 1960 US-Japan Security Treaty commits us to come to Japan’s aid. The general risk of allies taking actions that could result in nuclear war will be discussed in Appendix V.

2014-present, Ukrainian crisis: The Ukrainian crisis coupled with Russia’s conventional inferiority has led Vladimir Putin to make [nuclear threats](#). The risk of further escalation is increased because the US and Russia each see the other party as solely to blame.

2015, Turks shoot down a Russian jet: The ongoing Syrian civil war could have produced a major crisis in November 2015, when Turkish F-16's [shot down](#) a Russian SU-24 near its border with Syria, and Turkmen Syrian rebels killed the pilot. If Russia had retaliated against Turkey, which fortunately it did not, Turkey could have cited our NATO commitment to treat an attack on them the same as if we had been attacked. As with the above-described Senkaku-Diaoyu dispute, this is an example of a general risk that will be discussed in Appendix V.

This event would be even more dangerous if allegations prove true that the Turks ambushed the Russian jet. [Pierre Sprey](#), a longtime defense analyst and a member of the team that developed the F-16, [is among those](#) making such accusations.

2018, war games escalated out of control: At a [July 2018 conference](#), USAF General John Hyten, then STRATCOM’s Commander, described a war game that ended “bad.” He clarified that, “bad meaning it ends with global nuclear war.” This bears a dangerous resemblance to earlier war games escalating out of control as detailed in Appendix II’s entry “June 20, 1983, Proud Prophet war game escalates uncontrollably” and this appendix’s “2004, war games escalate uncontrollably.”

Appendix IV: Is a quantitative estimate of the risk of nuclear war possible?

For the reasons given earlier in these comments, this question can be reduced to: "Is a quantitative estimate of the annualized probability of a full-scale nuclear war possible?"

The problem lies primarily in quantifying the uncertainty in the estimate, not in quantifying the estimate itself. Especially in this initial study, we cannot determine if the probability is 1% per year versus 2% per year. But we can determine upper and lower bounds on the probability.

If someone were to maintain that the probability could be as large as 1% per day, we could clearly rule that out as too high: that would correspond to a 97% chance of a full scale nuclear war occurring within the next year since $0.99^{365} = 2.6\%$, which I rounded to 3%.

Similarly, if someone were to maintain that the probability could be as small as 0.001% per year, we could rule that out as too low: that would correspond to expecting nuclear deterrence as currently practiced to work for approximately 100,000 years.

Once those two extreme cases have upper and lower bounded the annualized probability, we can continue increasing the lower bound (0.001% per year) and decreasing the upper bound (97% per year) until values are reached that cannot be rejected out of hand.

The above arguments will not convince everyone and, for such people, another question arises: Can we responsibly bet the existence of our nation on a strategy if the risk of its failing is totally unknown?

Appendix V: Possible Application of Quantitative Risk Analysis (QRA) for Reducing the Risk of a Nuclear War.

Before examining the possible use of QRA, it is important to note two caveats expressed by risk expert and MIT Professor George Apostolakis in a 2004 paper:⁵⁶

Independent peer review is an essential part of the QRA process that allows later studies to improve on earlier ones. The first QRA in a new area is the beginning of the process and errors should be corrected, not criticized as if this first analysis were the end point of the process.

Decisions should be *risk-informed*, not *risk-based*. The insights gained from QRA need to be combined with those from other approaches in reaching decisions. They should not be used in isolation.

One of QRA's insights is that most catastrophes result from a progression of events called an *accident chain*. Looking at catastrophes in this way illuminates risk in the early stages of the accident chain, when most people fail to see the danger.

Without the QRA framework, if a catastrophe is averted at an early stage, the risk is often discounted. For example, if a backup cooling system kicks in when the primary cooling system fails, it can seem as if there was no danger because the system worked as designed. In contrast, QRA sees the early steps of an accident chain as the best place to try to avert the catastrophe to which it can lead. In this example, QRA would investigate if there is a cost-effective way to reduce the risk of the primary cooling system failing.

The July 2000 crash of the Concorde supersonic transport provides an illustrative example. Prior to that crash, the Concorde had the best empirical fatality rate of any commercial jetliner: 0 passenger fatalities per billion passenger-kilometers flown. Because there were so few Concorde flights, after the crash its empirical fatality rate was more than an order of magnitude worse than that of the subsonic fleet.⁵⁷

The accident chain that led to this crash had four basic steps:⁵⁸

⁵⁶ George E. Apostolakis, How Useful Is Quantitative Risk Assessment?, *Risk Analysis*, Vol. 24, No. 3, pp. 515-520, 2004.

⁵⁷ The data that I have indicates that, after this crash, the Concorde's empirical fatality rate was approximately 40 times higher than for the subsonic fleet. More precise data probably could be found.

⁵⁸ These four steps are taken from the official accident investigation, which is [accessible online in English](#). It should be noted that some [have disputed](#) its conclusions.

Step 1: During takeoff, a tire struck runway debris and blew out.

Step 2: The blow out caused a fuel tank penetration.

Step 3: Fuel leaking from the damaged tank caught fire.

Step 4: The fire caused the fatal crash.

Prior to this crash, data showed that step 1 (tire failure) occurred more than 30 times more frequently on the Concorde than for the rest of the jetliner fleet,⁵⁹ and that step 2 (penetration of a fuel tank) then occurred approximately 10% of the time (6 of 57 tire failures on the Concorde had that result).⁶⁰

While none of the earlier tire failures caused a fire (step 3) or a crash (step 4), it would seem that the abnormally high rate of tire failures and the rate at which they caused fuel tank penetrations (step 2) should have caused more alarm than they did. If alarms had been raised, a more careful risk analysis of the Concorde, including QRA, might have averted the fatal crash either by moving from bias ply to radial tires,⁶¹ by taking more precautions to prevent tire failures from causing fuel leaks,⁶² or by grounding the Concorde if those first two approaches proved inadequate.

So, even without using QRA to estimate the fatality rate of the Concorde prior to the fatal crash, the accident chain approach could have been used to reduce the risk of a crash by highlighting the need to reduce the Concorde's high rate of tire failures and resultant fuel tank penetrations.

In the same way, QRA appears useful for highlighting ways to reduce the risk of a nuclear war.

While, of course, nuclear weapons did not exist in 1914, the role that alliances played in producing the catastrophic First World War illustrates the risk of alliances producing

⁵⁹ The first paragraph on page 146 of the official [accident investigation report](#) states that the Concorde experienced tire failures roughly 70 times as frequently as the subsonic fleet over its lifetime, while from 1995-2000 the failure rate was 30 times higher than for the subsonic fleet. To be conservative, I used the lower figure.

⁶⁰ Page 93 of the official [accident investigation report](#) states that, of the 57 tire failures, "six led to penetration of the tanks." It is not stated how many of these fuel tank penetrations led to fuel leaks (some fuel tanks are self-sealing) or if any fuel leaks resulted in other ways (e.g., a blow out damaging a fuel line).

⁶¹ Radial tires would stay cooler during the high speed takeoffs and landings. A year after the crash, [Michelin introduced radial tires](#) for the Concorde.

⁶² *ibid* In addition to being radials, the Michelin tires were designed so that a blow out would fragment into small pieces and be less likely to penetrate a fuel tank.

a catastrophic war from a local crisis. Similarly, US or Russian allies sometimes took — and still take — risks with the potential to initiate an accident chain that leads to nuclear war:

Appendix I describes how, “The United States gave numerous indications that it intended to invade Cuba, causing Castro to tell Khrushchev to launch his missiles preemptively.” The footnote at this original entry makes it clear that Khrushchev did not agree. Castro was angry at Khrushchev for removing the missiles, especially without consulting him. There are even allegations that Cuban troops surrounded four of the Soviet missile sites in an effort to prevent their dismantlement, but that is disputed.⁶³

During the Cuban missile crisis, Cuba fired on American reconnaissance planes against the wishes of the Soviets. (This incident was not included in Appendix I.)

Appendix III’s entry “1995-1996 Third Taiwan Straits Crisis:” During this crisis there was a risk of the Taiwanese taking actions that could drag America into a war with China.

Appendix III: “2015, Turks shoot down a Russian jet.” As noted in this entry, fortunately the Russians did not retaliate, which could well have led to Turkey demanding American action against Russia under NATO’s Article V.

We could reduce the risk of our allies taking actions that might drag us into a war that we did not want with another nuclear power by making clear that our security guarantees only apply to unprovoked aggression against them. We also should do a risk-benefit tradeoff to determine which of our current security guarantees add to our national security and which detract from it.

Another risk that tends to occur early in an accident chain, and therefore tends to be overlooked, is lower level officers taking actions that could lead to combat with a nuclear-armed adversary. That risk is illustrated by the following events:

Appendix I: “American destroyers attacked Soviet submarines that, unbeknownst to them, were armed with nuclear torpedoes.” According to a

⁶³ Raymond L. Garthoff, *Reflections On The Cuban Missile Crisis*, The Brookings Institution, Washington, DC, 1989, pp. 100-101 including footnote 175. In his paper, “[Cuba and the Cuban Missile Crisis](#),” *Journal of Latin American Studies*, vol. 22, No. 1, February 1990, pp. 115-142, Philip Brenner states on page 135: “There is also the possibility that Cuban troops surrounded the ballistic missile sites from 28 October to 3 November, which would suggest that they were prepared to fight to prevent the removal of missiles.” He also references Garthoff, which is a reliable source as can be seen from Garthoff’s nuanced footnote, presenting evidence both ways.

crew member on one of the Soviet submarines, the captain gave orders to arm the nuclear torpedo, but was talked down.

Appendix I: “American decision makers who advocated invading Cuba did not know that the Soviets had deployed battlefield nuclear weapons to repel such an attack.” In the event of an American invasion, the Soviet commander on Cuba had the ability, but not the authority, to use these tactical weapons. He therefore could have done so against the wishes of Moscow.⁶⁴

Appendix II: “October 22-28, 1961, Berlin Crisis.” Both US and Soviet tank commanders who faced off at Checkpoint Charlie had the ability, but not the authority, to start a firefight that could have escalated to war.

Appendix III: “1999 Pristina Airport crisis.” General Clark maintains that he had the authority to take the actions that caused Lieutenant General Sir Mike Jackson to tell him, “Sir, I’m not starting World War III for you.” But Clark’s lack of support from Washington and early dismissal as NATO’s Supreme Allied Commander Europe indicates that he may have been mistaken.

Appendix III: “2012-present, Senkaku-Diaoyu Islands.” The ability to start a fire fight lies in the hands of individual pilots and ships’ captains who often engage in naval and aerial games of chicken.

This risk could be reduced by issuing clear orders that approval is needed from Washington before taking any action that risked a firefight with troops from another nuclear power.

Permissive Action Links (PALs) and other mechanisms to prevent unauthorized use of nuclear weapons have already reduced this risk and similar mechanisms might be able to do so even further.

⁶⁴ Aleksandr Fursenko and Timothy Naftali, *One Hell of a Gamble*, W. W. Norton & Company, New York, 1997, p. 212, states that an order was drawn up giving the Soviet commander on Cuba the authority to use his tactical nuclear weapons under certain circumstances, but that only one of the two required signatures was affixed to it. Some authors maintain that the Soviet commander had the authority to use his tactical nuclear weapons under certain circumstances, but I have followed Fursenko and Naftali’s account since Fursenko had unparalleled access to secret Soviet archives.

The above examples indicate how QRA might be used to reduce the risk of a nuclear war and, of course, many more possibilities exist. However, before we can know if a proposed risk reduction measure would serve its intended purpose or would unintentionally increase risk, we need to determine if the current level of risk is acceptable. That determination will have a profound impact on our decisions as to which actions are desirable and which are not.

Appendix VI: Possible Application of Quantitative Risk Analysis (QRA) for Estimating the Risk of a Nuclear War.

Appendix V started with two caveats from risk expert and MIT Professor George Apostolakis. Of particular importance in this appendix is his caution that independent peer review be an integral part of the QRA process.

A QRA model will encompass many potential failure mechanisms with an even larger number of parameters that must be estimated. The large number of parameters creates the possibility for error or bias — even unconscious bias — to produce an erroneous conclusion. That danger is reduced by an independent peer review.

A complete QRA for nuclear war is not possible within the limited resources of this initial study, nor do I have the expertise to suggest how such a later study might proceed. Still, I hope that the following thoughts will prove useful.

Appendix V's description of the accident chain that led to the July 2000 fatal crash of the Concorde SST provides a useful model. Prior to the fatal crash, significant empirical data existed for step 1 (57 tire failures in 83,941 cycles) and step 2 (6 of the 57 tire failures resulted in fuel tank penetrations), but there was no data for step 3 (a fuel tank penetration causing a fire) or step 4 (a fire causing a crash).

As a very rough estimate, the probabilities of steps 3 and 4 could have been approximated by using the much larger database from the subsonic fleet. A better approximation would have resulted by modeling fuel flow from various possible sources of leaks, airflow around those leaks to possible sources of ignition, etc. The data from the subsonic fleet could then be adjusted to take into account differences between the Concorde and those jetliners.

A similar approach for estimating the risk of a nuclear war would make use of the significant empirical data that exists for early steps in accident chains that could lead to nuclear war, such as crises and false alarms.

It is only in the last stages of those accident chains that empirical data is lacking. The uncontrolled escalation of war games to full-scale nuclear war reported in earlier appendices provides some information on the risk of accident chains escalating to their final, catastrophic states once a conventional war has broken out between two nuclear powers. Even though we have almost no empirical data on how often such wars

occur,⁶⁵ if the risk of a conventional war between two nuclear powers escalating to a full-scale nuclear war is found to be unacceptable, plans for fighting a conventional war with Russia or China would need to be reexamined in that light.

It also is possible to estimate the risk of some crises escalating beyond the point where their accident chains were halted, but short of nuclear war. For example, the Pristina Airport crisis would have progressed to the next step in its accident chain if a different officer, other than Lieutenant General Jackson, had carried out General Clark's order that Jackson feared might result in World War III. The probability of that step occurring could be estimated by assessing what fraction of NATO officers at Lieutenant General Jackson's level would have followed General Clark's order. Clearly, there was at least one officer at that level or higher who would have done so: General Clark. War games could also provide useful data.

Another possible approach would be to estimate the annualized probabilities for crises of different magnitudes, without estimating the probability of their escalating to nuclear war. For example, how often should we expect crises comparable to 1962's involving Cuba? 1995-1996's involving the Taiwan Straits? 2008's involving Georgia? 2014's involving Ukraine? Are any of those of comparable magnitude so they can be grouped?

Yet another approach would be to view the Cuban missile crisis as a lower level failure of deterrence. As noted in Appendix I, on September 4, 1962, President Kennedy warned the Soviets that "the gravest issues would arise" if they introduced "offensive ground-to-ground missiles" into Cuba.⁶⁶ A week later, on September 11, Moscow drew its own line in the sand when it warned that "one cannot now attack Cuba and expect the aggressor will be free from punishment. If this attack is made, this will be the beginning of the unleashing of war."⁶⁷ Kennedy's threat failed to deter Khrushchev from placing missiles on Cuba and Khrushchev's threat failed to deter Kennedy and his advisors from contemplating — and in the case of the Joint Chiefs wanting — an

⁶⁵ The two possible exceptions are the 1969 Sino-Soviet conflict and the 1999 Kargil War between India and Pakistan. It is debatable whether these were of sufficient magnitude to be classified as wars.

⁶⁶ Laurence Chang and Peter Kornbluh (Editors), *The Cuban Missile Crisis*, p. 367.

⁶⁷ Richard K. Betts, *Nuclear Blackmail and Nuclear Balance*, The Brookings Institution, Washington, DC, 1987, page 112.

invasion of Cuba.⁶⁸ Thus, there may be useful empirical data on lower level failures of deterrence.

Appendix VII: A risk-free approach for reducing nuclear risk?

As explained in the earlier section, “How can the risk be reduced?” concrete changes in our national security posture must await determination of the current level of risk. Also as explained there, this appendix describes a step that can be taken safely even before that determination has been made.

That is because this approach makes no concrete changes in our national security posture. Rather, it examines assumptions which form the foundation for our current thinking about national security. Correcting any that are found to be wrong has the potential to enhance our national security in profound ways. But merely questioning them is risk-free.

This process of inquiry is at the core of a project called “Rethinking National Security,” of which this study is one component. The [project’s home page](#) lists several resources, starting with a short [summary statement](#) that has been signed by former Secretary of Defense Leon Panetta and a number of others with strong national security credentials.

[A report](#) “Rethinking National Security” expands on that statement by examining the key question that it raises — Is national security becoming inseparable from global security? — along with eleven others:

Have nuclear weapons kept the peace?

Does our “nuclear umbrella” provide protection?

Is our nuclear arsenal safe, secure, and effective?

Is a highly reliable nuclear arsenal necessary for our national security?

Is nuclear terrorism a greater risk than nuclear war?

⁶⁸ The first Soviet MRBMs were en route to Cuba at the time of JFK’s September 4 threat, but if deterrence had worked, Khrushchev would have turned the ships around before they reached Cuba. Also, Khrushchev’s deploying the missiles in secret, even though no international law was being broken and even though the US had openly deployed similar missiles in Turkey, indicates that he was aware of the significant risk that he was taking and that it did not deter him.

In what ways does our large military arsenal help our national security, and in what ways might it have a negative effect?

Is nuclear diplomacy with “rogue nations” a waste of time?

Is the United States the world’s sole remaining superpower?

Are our nation’s foreign, military, and cyber policies well thought out?

How has NATO expansion helped our national security, and how has it hurt?

Should the president have the sole ability to launch our nuclear weapons? Does he?

If time allows, I would encourage the committee to explore these assumptions.