Nuclear War: Inevitable or Preventable?

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The Nuclear Gamble

Almost everyone agrees that nuclear weapons cannot be used to advantage because to do so would be suicide. But the policy of nuclear deterrence requires that those weapons always be ready for use. Deterrence is therefore a gamble that what we are always ready to do, we will not ever do. The gamble has worked for the last forty years but, in the long run, is it a good bet?

Probability theory is a natural approach for evaluating the nuclear gamble. The early contributions of Blaise Pascal, Pierre de Fermat, and Christiaan Huygens all had as their main consideration the expected winnings in games of chance. (1) From there it was a short leap to expected losses, as in insurance or medicine, and finally to diverse applications from communications satellites to quality control. This paper expands the area of application to the most serious issue of all time — preventing a nuclear holocaust. But, as in the early days, the stage is best laid with a surprising result from gambling.

Coin Tossing. Coin tossing is the archetypal game of chance. Two players, A and B, bet a dollar on whether tossing a fair coin will show heads or

tails. A tosses and B calls. If B guesses correctly, A must pay him a dollar and vice versa. A very simple, not too interesting game.

The game becomes more interesting — positively intriguing to some, judging by the sums that have been lost — if B not only guesses the outcome, but also gets to decide the size of the wager on successive tosses. This is the situation in casinos that offer roulette. The gambler chooses red or black and also the size of his bet.

Returning to the fair coin toss, A reasons that there is no harm in letting B vary the size of his bet. A fair game is a fair game whatever the size of the wager. But B thinks differently.

B bets a dollar on the first toss and calls heads or tails at random — neither is more likely to win than the other. If he wins, he stops and is a dollar ahead. If he loses, he bets two dollars on the second toss. If he wins the second time, he stops and is a dollar ahead, having lost $1 on the first toss and having won $2 on the second. If he loses on the first two tosses, he doubles his bet again, betting $4 on the third toss, etc.

This doubling approach, known as the Martingale Strategy, is one of the oldest "sure win" gambling strategies around: B keeps doubling his bet until he wins. (2) When he does, he is a dollar ahead. And he is bound to win eventually. He cannot keep guessing wrong forever, even if he wants to! Try it and see. With high probability, no one will have to wait more than thirty tosses before he wins. Only one in 1 billion should be that unlucky.

While this strategy guarantees that B will inevitably win, there is a flaw: The strategy only works if he has unlimited funds at his disposal. (3) With any finite amount of money, there is a small chance of losing the whole sum. This small chance of a large loss exactly offsets the large chance of a small ($1) win, keeping the game fair. But that is not the point of this paper. Now we come to the serious part.

Pistol Roulette. Consider a new game in which A repeatedly tosses the coin and B calls heads or tails each time. The game continues until B guesses incorrectly, at which point he is shot. Just as B was sure to win in the doubling strategy, he is sure to die at this game. Try it — without the gun. Before, no one was likely to go beyond thirty tosses to win a dollar; now, no one is likely to go beyond thirty tosses before he will be shot. The chance of surviving thirty tosses is roughly one in 1 billion!

This suicidal game is like loading one chamber of a two-chambered revolver, spinning the cylinder, putting the gun to your head, and pulling the trigger — a game we will call "pistol roulette." If we change the game to the usual version, with a six-chambered revolver, the probability of being killed with each pull of the trigger is one-sixth instead of one-half. The lower probability changes the time scale until you expect to be killed, but

does not change the inevitability of that result. Because the probability per trial is one-third what it was before, you expect to live three times as long. But, if you play this game day in and day out, your death is merely delayed. In the same way, playing with one bullet in a 600-chambered revolver prolongs the process - you expect to live one hundred times as long as with a six-chambered revolver. But that does not change the inevitability of your death. If you play once each day, you might be lucky enough to live several years. Or you might be unlucky enough to go in the first month — there is roughly a 5 percent chance of that.

Nuclear Roulette. What does pistol roulette have to do with nuclear war? During the Cuban missile crisis, President Kennedy estimated the odds of nuclear war as being "somewhere between one out of three and even." So the Cuban missile crisis was equivalent to nuclear roulette — a version of pistol roulette in which the entire world is at stake — with a two- or three-chambered revolver.

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The events support Kennedy's view: Early in the crisis, most advisors recommended military action to remove the missiles, a so-called "surgical strike." Later assessments by these same advisors concluded that, far from being "surgery," such action almost certainly would have meant a catastrophic war with the Soviet Union. (4, 5)

George Ball, one of Kennedy's senior advisors, wrote that when he met with the other advisors many years after the crisis, "much to our own surprise, we reached the unanimous conclusion that, had we determined our course of action within the first forty-eight hours after the missiles were discovered, we would almost certainly have made the wrong decision, responding to the missiles in such a way as to require a forceful Soviet response and thus setting in train a series of reactions and counter-reactions with horrendous consequences."

In his chronicle of the event, Robert Kennedy reports that one of the members of the Joint Chiefs of Staff "argued that we could use nuclear weapons on the basis that our adversaries would use theirs against us," and that "the B-52 bomber force was ordered into the air fully loaded with atomic weapons. As one came down to land, another immediately took its place in the air." The air of tension that this created was almost ignited when, at the height of the crisis, an American reconnaissance plane accidentally strayed into Soviet airspace. Khrushchev challenged Kennedy,

"What is this? … an intruding American plane could easily be mistaken for a nuclear bomber." (4)

These events justify Kennedy's estimate that the Cuban missile crisis created a high probability of nuclear war and was equivalent to a game of nuclear roulette with very few unloaded chambers in the gun. Crises of lesser magnitude also threaten the world, and on a much more constant basis. There are more chambers in the gun — the probability of disaster is smaller for each pull of the trigger — but that does not change the inevitability of the gun going off.

Paul Bracken in this volume describes how a minor crisis ignited World War I in just this way. There was only a small probability that the assassination of Archduke Ferdinand in 1914 would lead to general war in Europe. But with sufficient pulls of the trigger, even such a limited terrorist attack in an out-of-the-way place can be the act which ushers in catastrophe.

Every "small" war pulls the trigger in nuclear roulette. Because the US and the USSR back different sides, the conflict in Nicaragua has the potential for disaster. The Iran-Iraq war is another. Because Saudi Arabia provides Iraq with vital financial aid, Iran has threatened to cut off the flow of Saudi oil. Such action would be likely to bring American military action against Iran. This would be as unacceptable to the Soviets as it would be for America if the Soviets attacked Mexico. The USSR and Iran share a border.

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Every day in which a missile or computer system can fail also pulls the trigger in nuclear roulette. It has been established that on December 28, 1984, a Soviet cruise missile went off course and flew over Finland and Norway. The results of such an accident can be horrendous, particularly if it happens in a more populated part of Western Europe, in the Mideast, or during a time of tension.

In 1979 and the first half of 1980, there were 3,703 low-level false alerts in the United States alone. A few were sufficiently serious to come within minutes of launching nuclear war. One false alert lasted for a full six minutes before the error was discovered — a dangerously long time considering that the flight time for some submarine-launched ballistic missiles is less than ten minutes. (6) Because it takes time to detect a launch and orders must be given some minutes before retaliation can take place, the decision time is even shorter or nonexistent.

Even events as dangerous as the Cuban missile crisis could be repeated. General Edward Meyer, former army Chief of Staff, reported that during his tenure, "a naval quarantine or blockade of both Nicaragua and Cuba" had been considered. (7)

Inevitability

Every day, the United States depends on 30,000 nuclear weapons for its security. Every day, the Soviet Union depends on 20,000 nuclear weapons for its security. These weapons are ready for use. There are plans for how to use them, so every day there is a small probability they will be used. In the metaphor of nuclear roulette, every day, we pull the trigger of the many-chambered nuclear gun pointed at the head of civilization.

Every day, there is a small chance that one of the forty conflicts going on in the world will escalate. With many of these wars touching upon the perceived vital interests of the major powers, with the experience of the past forty years in the Middle East, with the experience of the 1962 Cuban crisis, there is ample evidence that every war pulls the trigger.

Every day, there is a small chance that a Third World hot spot will escalate and push the interlocking command and control systems of the US and the USSR into instability. There is an unhealthy parallel between today's military plans and those which catapulted Europe into World War I. Each time the far-flung military forces of the two great powers go on alert, the trigger is pulled in nuclear roulette.

Every day, there is a small chance that failures in high technology military equipment will start an accidental nuclear war. Every computer error, every false alert, every test missile that goes off course, pulls the trigger.

Every day, there is a small chance that a governmental or military group high up in either nation will succumb to group dynamics to such a degree that individual judgment will be lost and rash decisions made. Each time a team is called upon to decide how to respond to a provocative incident, each time warriors gather to decide what steps to take, the trigger is pulled.

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Each of the hundreds of thousands of people with responsibility for nuclear weapons who drinks or uses drugs adds a small increment to the chance for nuclear war. Each time a custodian of nuclear materials, or nuclear plans, or keys to a nuclear facility, uses alcohol or other drugs, the trigger is pulled.

Every day, there is a small chance that terrorists or renegade governments will construct a nuclear weapon. The know-how, the materials, and

the places where such construction can occur are scattered all over the globe. Fissionable material suitable for use in weapons is produced as an unwanted by-product at every civilian nuclear power plant in the world. More than 100,000 nuclear weapons could be built from the world's current nuclear wastes. Every coffee cup of fissionable material that a terrorist might obtain pulls the trigger in nuclear roulette. (8)

Each of these probabilities, by itself, is small. But taken together over a year's time, they add up to a cumulative probability which is no longer small. Taken together over a decade, the probability is significant. Taken together over a century, they make nuclear war virtually inevitable. We cannot continue on our present course forever.

What Is Enough?

Freezing nuclear arsenals at their current levels would help, but would not change the inevitability. Nor would cutting the number of nuclear weapons in half from 50,000 to 25,000. Twenty-five thousand nuclear weapons is still 25,000 potential accidents, each far more destructive than Chernobyl. Even eliminating all existing nuclear weapons would not alter the logic. We will always know how to build new ones and, during war, there would be tremendous pressure to do so. So what can we do? What is enough?

The only thing that will work is to address each of the small probabilities that together add up to inevitability. We have to change the thinking that drives us to stockpile tens of thousands of nuclear weapons, place them in depots that are increasingly vulnerable to terrorist attack, and guard them with people subject to the influence of alcohol or other drugs. We can no longer allow the survival of civilization to be dependent on the error-free operation of high technology defense systems — or on the rational functioning of sometimes irrational human beings. We have to stop threatening military force. We have to stop engaging in small wars.

While we must change each of these, there is a common source. It is the mentality of war which spawns each of these individually small, but collectively disastrous, risks. It is the mentality of war which is the conceptual umbrella. It is the mentality of war which drives us every time we pull the trigger in nuclear roulette.

The only way to survive pistol roulette is to put down the gun. The only way to survive nuclear roulette is to move from the mentality of war to a totally new way of thinking.

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