

# Thinking About Nuclear Weapons

by *Hunter Hustus*

## Resumé

Under år 2020 var det 75 år sedan de första kärnvapnen detonerade över Hiroshima och Nagasaki. Alltsedan dess har kärnvapnets användning varit föremål för omfattande analys och diskussion. Argumenten känns igen över decennierna samtidigt som kärnvapenstaterna uppvisat en påtaglig ovilja att nedrusta sina arsenaler. En nedrustning som av breda grupper stöder sig på argumentet att det rör sig om ytterligt destruktiva stridsmedel. Oaktat fortsätter mänskligheten att leva under hotet om kärnvapnets användning. Samtidigt skulle det tjäna såväl en upplyst allmänhet som beslutsfattare om det funnes en djupare förståelse för varför kärnvapenstaterna fortsätter att hålla fast vid sitt innehav. I denna artikel ger författaren sitt perspektiv med utgångspunkt i erfarenheter från USA.

WE RECENTLY NOTED the 75<sup>th</sup> anniversary of the bombing of Hiroshima and Nagasaki that began the nuclear age. Commentary regarding the motivation for use of the atomic bomb and the continued existence of nuclear weapons has been consistent for decades. The arguments don't change and nuclear powers remain stubborn in their refusal to disarm. That's because advocates for disarmament and policy makers within nuclear armed states are arguing over different things.

The disarmament perspective is straightforward and accessible to the general public, perhaps even intuitive. Of course, disarmament advocates are correct in claiming nuclear weapons are the most destructive weapons ever created. They remain so after 75 years. The speed in which such force can be unleashed is almost incomprehensible. Living under this looming threat has, and still does, cause anxiety for many. However, it's undeniable that efforts to bring about nuclear disarmament through presumptive moral campaigns or other efforts invoking international law have failed to substantively influence nuclear weapon states.

The position of nuclear armed states is counterintuitive and thus less accessible to those on the outside. A deeper understanding of how nuclear powers perceive these weapons would benefit those seeking change. More importantly, policy makers and military officials in non-nuclear states would benefit from a better understanding of why nuclear powers retain these weapons, whether they ultimately agree, or not, with the rationale.

Perspectives, and thus strategies, among nuclear powers differ and all merit study. However, here I rely on my personal experience of the U.S. nuclear perspective as the object of examination. The U.S. is a unique nuclear power in several ways and, by far, more information is available regarding its technical capabilities and development of doctrine and strategy than of any other nuclear power.

Below, I present a perspective on the role of nuclear weapons in U.S. security strategy. I start with a few basics to provide a common foundation regarding concepts. I then describe some U.S. goals and tension among them. I close with ...

Therefore, I start with a very short review of nuclear weapons characteristics and effects. I do this to provide a common foundation for the and emphasize how nuclear weapons are unique, both quantitative and qualitative ways.

## Unique physical effects of nuclear weapons

Like non-nuclear explosions, nuclear weapons create blast effects. Nuclear blast effects differ in the speed of the blast wave and potential distance of destruction. But that blast effects are generally only 40 to 50 percent of weapon's effects. Thermal, ionizing, and residual radiation comprise between 35 and 55 percent of nuclear weapons effects. The thermal energy is emitted from the fireball in two pulses. The first, the flash, is quite short and carries only about one percent of the energy. The second is longer, lasting up to 20 seconds, and creating temperatures above 3,000°C. This starts fires and interacts with the later arrival of the blast wave. The rest is in ionization and fallout (if the fireball touches the ground).

All nuclear weapons are the same in that they share all these effects. However, all nuclear weapons are not the same as their individual effects can vary dramatically in quantity and quality. The largest nuclear weapon ever tested had a nuclear yield several million times more powerful than the smallest, which was far less than some conventional explosions. The level of potential destruction is determined not just by the physics, but weapons design and targeting factors.

Warfare has been a consistent endeavor across the totality of history. Many millions of people have been killed and many states eliminated in conflict between powerful actors. Major warfare was a laborious endeavor.

But *The Bomb* made such destruction possible in a very short time. It changed some things, and didn't change others.

Regarding nuclear issues, a strategist's attention is first and foremost on other nuclear powers. Nuclear powers are the primary audience. Non-nuclear powers do not occupy a significant portion of our thought space.

Since their development, U.S. strategists have considered nuclear weapons foundational to the security of the U.S. and its allies. These strategists focus on the deterrent effect of nuclear weapons and view U.S. nuclear posture as defensive in nature.

## Unique psychological effects of nuclear weapons

As destructive as nuclear weapons can be, strategists and theorists often focus on psychological effects, the influence of these weapons on adversary decision making. The purpose of sustaining nuclear forces is to generate a strong level of deterrence. Here, I'll use Henry Kissinger's<sup>1</sup> definition:

Deterrence requires a combination of power, the will to use it, and the assessment of these by the potential aggressor. Moreover, deterrence is the product of those factors and not the sum. If any part is zero, deterrence fails.

One may infer that this definition favors deterrence through threat of punishment, threatening a retaliation greater than the aggressor is willing to bear. Of course, deterrence can also be achieved by denial, such as dispersal or defenses that reduce the chance an aggressor will succeed. Both techniques raise the cost to the aggressor.

Two important takeaways are:

1. It is the aggressor's perspective that matters, not the one attempting to deter.

2. It is a cooperative endeavor. The aggressor must agree to be restrained and of course, must have confidence in the defender's assurance to not punish for an action not committed.

## How is the U.S. unique?

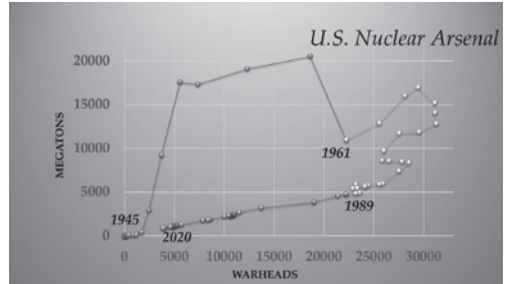
Another inference one might draw from this definition is that deterrence is intended to protect the defender from the aggressor, sometimes referred to as *Central Deterrence*. But, deterrence can also be employed to protect allies and partners from a common foe. United States nuclear strategy has been unique in its attempt to do what is commonly called *Extended Deterrence*. With the creation of NATO, the U.S. extended its “nuclear umbrella” to guarantee the security of its allies. The U.S. extended these guarantees before the USSR posed much of a nuclear threat to the U.S. homeland. So, emphasis on extended deterrence pre-dates U.S. preoccupation with central deterrence, deterring an adversary from attacking the U.S. and this has long influenced its strategists and decision makers.

There are at least three reasons the U.S. provides nuclear guarantees. It has a genuine interest in the security of its allies and partners. Such a strategy strengthens non-proliferation by reducing the desire of allies and partners to develop their own nuclear weapons capabilities. Finally, it desires to be the primary security partner of its allies and partners, it wants to come first.

## How much is enough?

I've posited that deterrence is about an aggressor's perception of one's capability and will, not numbers. Numbers are the dependent variable, not the independent variable and should be determined by strategy. Regardless,

the discussion is often about “How much is enough?” Does the U.S. have too many or too few? Here, the Y-axis is the total explosive power in the arsenal and the X-axis is the number of warheads. Each dot depicts the arsenal in a given year from 1945 to 2020.<sup>2</sup>



It comes as a surprise to many people that the U.S. arsenal changed so much over time. It's may also surprise some that the number of warheads is where it was in the mid-1950s. Of course, other characteristics of the arsenal are very different, which perhaps is most obvious in the wide difference in total explosive power.

I break the evolution of nuclear policy and strategy into four eras. The first, U.S. monopoly and superiority; the second is the Cold War; the third I call the Peace Dividend; and finally, the emerging Today and Tomorrow.

In each of these eras, I suggest we think of the drivers of the arsenal. What shaped it over time? I propose four drivers:

1. Perceived security environment.
2. Changes in technology.
3. Leadership desires, including strategy.
4. Budgetary considerations.

## Monopoly & Superiority

The first nuclear period, I call monopoly & superiority. It runs from the Manhattan Project to the building of the Berlin Wall.<sup>3</sup>

Technological factors shaping the arsenal included large warhead components and delivery systems with limited-accuracy. This led to the high-yield nature of the arsenal at that time. Another technological factor was the growth of air defense systems that increased vulnerability of nuclear bombers.

Despite these technical limitations, U.S. leadership endeavored to target military capabilities. This is usually called *Counterforce* targeting, the targeting of military and related capabilities, especially nuclear forces. U.S. leadership has continuously avoided *Countervalue* targeting, generally thought of as the targeting of populations.

Regarding the perceived security environment, the U.S. was rebuilding Europe with the Marshall Plan (1948), establishing NATO (1949, the same year the USSR detonated their first nuclear weapon), and attempting to contain the USSR as the ideological/political divide widened into what would become the Cold War.

These factors lead to the development in 1960 of the what is now referred to as the nuclear triad comprising the strategic nuclear delivery systems, the intercontinental ballistic missile, submarine launched ballistic missile, and nuclear-capable bombers.

## Cold War

The second era, the Cold War, spans 30 years starting with construction of the Berlin Wall. It continues through the Cuban Missile Crisis, Vietnam War, Six-Day War, USSR invasion of Afghanistan, U.S. deployment of nuclear intermediate-range ballistic missiles to Europe, the Chernobyl disaster, and ends with the fall of Berlin Wall in 1989. Nuclear deterrence was the centerpiece of U.S. grand strategy during the Cold War. There was continuous change in nuclear capabilities and strategies of the U.S. and USSR.

Technological changes allowed for miniaturization and increased accuracy. These two factors combined to permit a decrease in the average yield of warheads. It also allowed development of nuclear warheads for a wide spectrum of missions. Something leadership thought necessary to thwart a Soviet attack through Central Europe.

It is in this era that strategic arms control emerged. The U.S. used arms control agreements to ensure the viability of its nuclear Triad and extended deterrent and disincentivize the USSR from pursuit of capabilities and force structures deemed destabilizing.

## Peace Dividend

The third era, I label the Peace Dividend. U.S. leadership reacted swiftly to the end of the Cold War. The perception of the threat environment, budget, and leadership desires combined to lead then President George H.W. Bush to issue two directives that changed the face of U.S. nuclear forces. Changes included:

- Deactivation of the decades-old Strategic Air Command.
- Removal of all nuclear bombers from their high readiness status.
- The cancelation of some, and limited production of other, strategic nuclear systems.
- Reduction in the number of air-delivered weapons in NATO.
- Removal of most tactical nuclear weapons from Europe.

Like the Bush Administration, the Obama Administration, declared a “reset” with Russia. President Obama's nuclear policy was a very public attempt to reduce the role and relevance of nuclear weapons within U.S. security strategy. Although it reaffirmed the nuclear triad, it prioritized the threat of

non-state actors obtaining nuclear weapons, and shifted efforts to arms control, nonproliferation, and disarmament.

Ultimately, the U.S. found it difficult, if not impossible, to reduce relevance of nuclear weapons when other states refused to follow its lead. Ironically, the increasing U.S. non-nuclear military capability displayed in the first Gulf War incentivized others to increase relevance of nuclear weapons in their security strategies.

## Today & Tomorrow

The optimism of the previous era has dissipated. The world continues to be in a nuclear age, one characterized by rapid geo-strategic changes and the proliferation of dual-use technologies. North Korea is becoming a threat not only in the region, but also to the homeland of the United States. China has expanded its nuclear capabilities. This is a world in which Moscow and others invoke nuclear weapons in scenarios that U.S. strategists thought were not now, nor never were nuclear.

## Conclusion

So, what does a nuclear strategist look like in this era. I think the parable of the Fox and the Hedgehog is instructive.<sup>4</sup> We all have a certain degree of Fox and Hedgehog, but for a minute, let's oversimplify. If you think about it, you can probably quickly identify Foxes and Hedgehogs in organizations you've worked within.

Hedgehogs are common in military intelligence, foreign ministries, and parts of career government bureaucracies. Hedgehogs seek mastery, dislike ambiguity, and have a high need for closure. They are about specialization.



Foxes are found in many start-ups, finance, and perhaps military special forces. They are generalists, open to ad hoc approaches and skeptical of their own level of certitude. This is where polymaths are found. If you are familiar with Karl Popper, Hedgehogs approach the world as if it were *clocklike* and foxes as if it were *cloudlike*.

What does this have to do with the way a U.S. nuclear strategist might think about nuclear weapons and deterrence? One must think like a fox to manage capabilities and sustain deterrence though changes in the security environment and technologies. However, one must always remember the one big thing the hedgehog knows, that nuclear weapons remain the only weapons that can produce utter devastation in a very short amount of time.

Throughout the nuclear era, U.S. strategists considered nuclear weapons foundational to the security of the U.S. and its allies. These strategists focused on the deterrent effect of nuclear weapons and viewed U.S. posture as defensive in nature. What did change considerably over time is U.S. nuclear policy and strategy due to factors such as: the perceived security environment, budget pressure, technological change, and leadership desires.

Such strategists believe that deterrence of war and the ability to inhibit an adversary's inclination for escalation requires a

range of credible nuclear capabilities and strategies that:

- make clear to any adversary that its attack plans are unlikely to succeed and, if attempted, the price would be too high,
- ensure the U.S. is never a position to be self-deterred.

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## Notes

1. Kissinger, Henry A.: *The necessity for choice; Prospects of American foreign policy*, Harper, New York 1961.
2. I'm indebted to Amb Ron Lehman of Lawrence Livermore National Laboratory for this graphic depiction.
3. Although these years are widely recognized as part of the Cold War period, I separate them to highlight the short timeframe of great asymmetry between U.S. and USSR nuclear capabilities.
4. For more information on this concept, see: [https://en.wikipedia.org/wiki/The\\_Hedgehog\\_and\\_the\\_Fox](https://en.wikipedia.org/wiki/The_Hedgehog_and_the_Fox).