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Back to the Future: Balloons in the Modern Security Paradigm

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Introduction

It is clear from the coverage and commentary on the recently downed Chinese high-altitude surveillance balloon that it caught America's defense establishment on the back foot. These and other of China's recent activities appear to be manipulating U.S. strategic warning. The U.S. public, much less U.S. leaders, appear to lack a full understanding of the impact this could incur on our deterrence and strategic stability.

Whereas the detection and intercept of the balloon off the coast of the U.S. mainland on February 4, 2023, developed a great deal of interest in the press, public, and government, much of the attention at the time was devoted to the physical characteristics, trajectory, and intercept of the balloon. This essay, however, concentrates on the impact of such balloons on strategic warning, deterrence, and crisis stability. It also explores the reasons for the extreme care taken in intercept, interpretation, and attribution.

Balloons acquire military significance if the attached sensors can transmit information through satellites to foreign decisionmakers and their weapons systems—that can impact U.S. national security. By traversing the United States, the Chinese balloon, with its sensors, clearly degraded U.S. strategic stability as it threatened its "value." The balloon produced virtual damage by observing U.S. territories not normally accessible to them. The balloon also caused self-deterrence, apparent in the initial U.S. response, since we did not act immediately. However, the interception of the balloon without accompanying offensive actions against Chinese "value" improved stability. If that is understood, and appropriate actions are taken, the balloon incident could ultimately have a positive outcome.

	A strikes 1st		B strikes 1st	
	A	B	A	B
Cost to deter	xM	M	xM	M
Cost to self	M-xM	xM	xM	
Total	M	(1+x)M	2xM	M

Understanding Deterrence

Many in the media, academia, and the military use the word deterrence without a clear definition of the word. This essay uses a definition worked out by Air Force General Glenn Kent approximately 40–50 years ago,[1] which was useful in discussing deterrence with Russia during the Strategic Defense Initiative (SDI) throughout the 1980s.[2] It is based on the cost of producing stability, which is broken down as the cost to each side participating in an engagement. Each side's cost is composed of two elements:

Total cost =
cost to deter + cost of damage to self

For example, in the recent balloon engagement between China and the United States, China's cost to deter is its cost for using assets such as sensors, balloons, and communications for deterrence, where they could be used for other applications. Its cost of damage is the cost to its assets with value, which includes their infrastructure and population. The costs of the military systems themselves are usually small compared to that value, so they are typically ignored. Importantly, the costs for deterrence and damage are not commensurate.

The cost to deter balloons seems like it should be small because they do not have other obvious military functions. They do no damage directly, but they can provide information to other systems that can. The issue is whether their direct effect or their indirect effect through other systems matters. If balloons are part of a system that can produce damage to a competitor's value, they can indirectly produce damage to value—which is the key element in deterrence. It appears the Chinese balloons are tied through sensors and satellite transmissions to weapons systems, so they impact U.S. value. Thus, they do have costs to deter and damage.

A simple example illustrates the importance of information in determining the order of operation and costs of offensive engagements. It indicates that, for current strategic forces, a warning system supported by balloons with satellite relays could be well-suited for a country with smaller forces and no defenses like China. Balloons would be simpler and cheaper, and they could provide an appropriate revisit time for warning.

The impact of information on deterrence and stability can be illustrated with a simplified model. It regards sides A and B. B has M missiles. A has xM missiles, where x is a percentage, or a fraction less than one. Information determines what could happen depending on who strikes first. As the table illustrates, when A is the first striker, if A uses all its missiles, it can destroy xM of B's missiles. B can only strike back with M – xM missiles, causing that much damage to A. Adding its cost to deter and cost to self, the total cost to A

A cockpit view of the high altitude Chinese surveillance balloon in shot down in February 2023.
Source: U.S. Department of Defense Photo

is M. As x increases, A's damage decreases, which offsets its cost for additional missiles.

B has invested M to deter and suffers xM damage, so its total cost is (1 + x)M, which is greater than A's total cost. If x approaches 1, the total cost to B approaches 2x, or twice A's total cost. Thus, striking first can more than offset A's disadvantage in missiles. Based on A's first-striker advantage in virtual costs, this situation is unstable. If stability fails, B's realized costs are about twice A's.

If B strikes first, its M missiles can destroy all of A's xM missiles—it is assumed B uses all missiles, as they have no other use in this model. A cannot strike back. A's cost to deter is xM, and damage is xM, so its total cost is 2xM. B's investment in deterrence is M. It has no damage, so its total cost is M. Thus, A's cost is greater than B when x is greater than .5, so this configuration is unstable on virtual costs. It would realize that ratio of costs if deterrence failed.

Both sides see an advantage to striking first. Their average cost is each 1.5 times M, but either side could reduce that by 50 percent by striking first. That is the source of instability. There is no way to determine who should strike first based on this model—or more complicated models for that matter—so it is left to accident or external forces to determine their order. This reality is a truly unstable situation.[3]

Yet, either side can remove their uncertainty by striking first. One way to do so is to preempt their adversary or launch on warning (LOW). If either knows the other side plans to strike, it can act first so that its missiles are not caught on the ground. The cost to A for either preemption or LOW is the same as A striking first, regardless of whether they had first intent, and works to their benefit. Therefore, warning systems that can detect launch or preparation for launch are appropriate for a country with a smaller missile force and little defense.

For such warning systems, survivability is not required. The absence of continuous signals from the warning assets could itself serve as a signal of probable launch. Interruption of the signal could, of course, be

for other reasons, in which case a preemptive attack would be launched in error. This point is important to assessing the recent balloon episode.

Sensors on balloons could serve as such a warning system. As explained, a country like China with a smaller missile force and little defense like China might find such a system adequate and simple to implement. Although China claims to have a policy of no first use, a LOW policy might be consistent with their thinking.

In using these kinds of systems, China appears to be manipulating our strategic warning to enable a LOW policy. The question now is how this impacts U.S. deterrence. China does not appear to understand the seriousness of its interference. Furthermore, it is not clear yet that the Biden administration is sure how to react. It would be appropriate for a government-sponsored study group to consider its impact and the modifications needed to U.S. warning assets to address new threats. The study might also assess the difficulty and expense of modifying older systems built for threats from the Cold War era versus recapitalizing our assets with modern systems.

The balloon incident in February illustrates deterrence issues in action. While domestic political issues eventually forced the administration to act on balloons, the airspace incursion apparently forced our defense leaders to think through the role balloons might play in overall offensive systems rather than just their technical attributes. The fact that these considerations are as yet undetermined might indicate why the administration has been careful with attribution and discussion of the characteristics and capabilities of the payload recovered.

However, the length of time it took for the United States to choose a course of action is only another indication that the understanding of deterrence has degraded since the end of the Cold War. During the SDI, from 1983 to 1993, the United States spent the better part of a decade discussing deterrence with Soviet and Russian analysts, academics, military experts, and politicians. They produced a fundamental agreement that was reported in a joint report with the director-then president of the Kurchatov Institute, and a Russian Federation scientific leader in the nuclear field to this day, Evgeny Velikhov. That report resulted in the proposal for a joint missile defense that President Yeltsin presented to President Clinton.[4] However, the United States did not act on it, which essentially ended discussion of the subject for decades.

Conclusion

The recent balloon incident degraded stability. It has significance and implications for deterrence beyond the confusion over one balloon. At the same time, the incident revealed how far the understanding of deterrence has degraded in the United States since the end of the Cold War. This needs to be addressed. A deeper understanding of these issues could have applications for NATO in regards to the ongoing war in Ukraine and other conventional exchanges; the balloon incident illustrates what Russia is willing to risk and take advantage of in terms of in terms of virtual costs and real costs, for example. These deterrence dynamics should be explored in greater depth.

The model used here, based on Gen Kent's tried definition of deterrence, illustrates the importance of information in determining the order of operations, and costs, of nuclear and other offensive engagements. It indicates that, for a country like China with smaller nuclear forces and no defenses, the current configuration of strategic forces favor a preemptive policy supported by sensors on balloons with satellite relays.

It also indicates that intercepting balloons without accompanying offensive actions against Chinese value should improve stability, as it did in February. However, it's clear the deterrence dynamics of this incident are still not fully understood. What is needed now is a government-sponsored study group to assess the modifications needed to our warning systems to address these and other new threats that affect deterrence and stability.

Endnotes

1 Glenn A. Kent and Randall J. DeValk, *Strategic Defenses and the Transition to Assured Survival*, Report R-3369-AF (Santa Monica, CA: RAND, October 1986). Gen Kent was the commander of DOD JCS Weapon System Evaluation Group.

2 Greg Canavan, "Costs of Symmetric Strategic Games with Defenses," World Federation of Scientists, Erice, 1992; reissued as Greg Canavan, "Costs of Symmetric Strategic Games with Defenses," Los Alamos Report, LA-UR-22-30170, September 30, 2022.

3 Robert Powell, *Nuclear Deterrence Theory* (Cambridge, University Press, 1990).

4 Canavan, "Costs of Symmetric Strategic Games with Defenses."

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