Research Report

STEPHEN M. WORMAN, DAVID R. FRELINGER, DAVID A. SHLAPAK, KATHERINE PFROMMER, KELLY ELIZABETH EUSEBI, JENNY OBERHOLTZER

Designing *A Strange Game*

A Nuclear Wargame for the 21st Century

For more information on this publication, visit **www.rand.org/t/RRA1204-1**.

Published by the RAND Corporation, Santa Monica, Calif.

Library of Congress Cataloging-in-Publication Data is available for this publication.

ISBN: 978-1-9774-1236-2

About This Report

This report details the theoretical motivation and design decisions underpinning a two-player, card-driven wargame designed by the RAND Corporation in fiscal year 2019. It also serves as a quick primer on how to play the game. The game was motivated by the twin observations that there is a lack of wargames that seriously consider nuclear weapon employment and a lack of tools available to teach stakeholders about the challenges of thinking through nuclear weapon employment. Therefore, this report will be of interest to those looking to use the game, expand on this work, or design similar games. The wargame itself is aimed at players of all experience levels and will be of interest to those in the policymaking community, the nuclear enterprise, and professional military education.

RAND operates under a "Federal-Wide Assurance" (FWA00003425) and complies with the *Code of Federal Regulations for the Protection of Human Subjects Under United States Law* (45 CFR 46), also known as "the Common Rule," as well as with the implementation guidance set forth in DoD Instruction 3216.02. As applicable, this compliance includes reviews and approvals by RAND's Institutional Review Board (the Human Subjects Protection Committee). The views of sources utilized in this study are solely their own and do not represent the official policy or position of DoD or the U.S. Government.

Funding

Funding for this research was made possible by the independent research and development provisions of RAND's contracts for the operation of its U.S. Department of Defense federally funded research and development centers.

Acknowledgments

Thank you to Stacie Pettyjohn for helping develop and articulate the need for the game in the first place. Kate Giglio deserves immense thanks for helping make this report accessible to a wider audience. Thank you also to our play testers and reviewers, Jennifer Brookes, Gian Gentile, and Francis Gavin, whose insights elevated the game and increased play immersion. Finally, we owe a deep debt of gratitude to Lisa Jaycox, Susan Marquis, and the whole RAND Initiated Research team for funding the development of this game. We thank Jennifer Kavanagh, Stephen Watts, and Molly Dunnigan for helping shepherd this document through to release. Finally, we would also like to thank our peer reviewers, Abby Doll and Becca Wasser, whose thorough review of the report greatly improved its overall quality. All of your contributions have greatly improved the quality of the final product. Any remaining deficiencies are the sole responsibility of the authors.

Summary

Although the Cold War has become a distant memory, nations continue to rely on nuclear weapons as the ultimate deterrent against large-scale adversarial attacks. Despite this, however, there has been a gradual decline in the understanding of nuclear dynamics within the U.S. national security enterprise since the early 1990s. This has put the United States at a potentially dangerous disadvantage in a new era of strategic competition with near-peer countries.

To assist the U.S. Department of Defense (DoD) and other stakeholders addressing the subsiding interest in and knowledge of a continued threat, RAND Corporation game designers and subject-area experts developed *A Strange Game,* named in reference to the 1983 techno-thriller movie, *Wargames,* which presents thermonuclear war as a conflict that no one can win. *A Strange Game,* however, very much concerns the present day and the future in that it gives players an opportunity to explore the problems of near- or longer-term future intra-war deterrence where the taboo against the use of nuclear weapons has broken down.

This report provides the scientific and theoretical background that informed the creation of the *A Strange Game* prototype. It is important to note that it is not a simple how-to-play guide; that is provided with the game package. Instead, this report offers relevant context that went into game design. Therefore, it is useful to those considering adopting the game, game masters who will want to conduct fully informed gaming sessions, and players wanting a first-hand account of the diplomatic and military concepts used in the game. The information can also assist other game designers as they work toward the development of further games that immerse participants in environments designed to improve decisionmaking before, during, and after conflict.

Nuclear War in Theory and Practice and in the Game

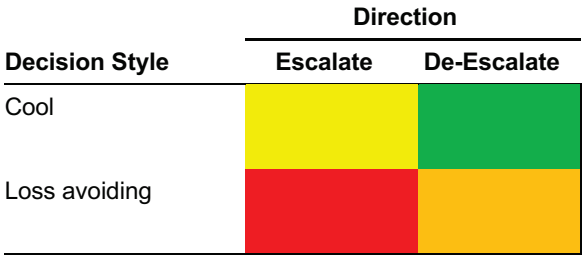
The game was designed to provide the players with a realistic sense of the immense power and the striking limitations of nuclear weapons. Players are challenged to think about *airbursts* (exploding the bomb at a preplanned altitude over the target such as was done over Hiroshima and Nagasaki) and *ground bursts* (exploding the bomb on a fairly small area) and trade-offs in hitting soft and hardened forces, as well as ground forces. In brief, players will experience one of the paradoxes of nuclear weapons: the same weapon that would kill 100,000 or more people when used over a city might have difficulty putting a battalion of 50 or so armored fighting vehicles and a few hundred soldiers out of action for long.

Aside from introducing players to nuclear weapons effects and nuclear option sets, there are fundamental elements of nuclear theory, described next, that the players will come to appreciate.

Escalation: Traditional positions posit that the metaphor of a war is an escalation ladder; crises *ascend* the ladder as they grow in intensity or extent because of the deliberate choices of

decisionmakers on the two sides. Prospect theory, adopted from behavioral economic theory, provides a second model. It demonstrates how people choose among alternatives that all entail risk and uncertainty and concludes that most people are loss-averse and will take risks to avoid total loss. Figure S.1 below suggests—using stoplight color codes to denote the relative desirability of each cell's outcome—that there are four interesting potential tendencies in war escalation. The game was developed in such a way that players can potentially accumulate a large set of observations to help gain insight into what kinds of circumstances determine which box takes precedence and when.

Figure S.1. Notional Outcomes Based on Decision Style and Escalation Direction



NOTE: Green = most favorable, no risk of war, desirable; yellow = relatively favorable; orange = not desirable; red = full conflict, least desirable.

Signaling: There are many examples of implicit and explicit nuclear threats being used in attempts to influence others (Dwight D. Eisenhower in regard to the Korean War in 1953 and China vis-à-vis the Union of Soviet Socialist Republics in 1969 are just two). Thus far, nuclear war threats have remained signals that remind adversaries of a nation's nuclear capabilities and ability to take action. Evidence and current thinking suggest that such signals are, at worst, dangerous or, only slightly better, largely ineffective. Within wargames, conversations regarding nuclear use similarly discuss these threats as signals to the adversary. Sometimes the message is simple: "watch your step" or "you have crossed a red line." What the target of the attack might hear, however, is, "You just used a nuclear weapon on me" and the target thus may feel compelled to respond to the perceived message rather than the intended one. Wargame participants who are sincerely committed to limiting escalation—but are unwilling to be defeated or coerced into changing their goals by an adversary's nuclear use—might (although trying to convey constraint) unleash a plunge into the escalatory abyss. This will be apparent immediately to players of *A Strange Game* in that the opportunities to communicate with the opposing side are tightly controlled.

"How did we get here?" Another important learning point of the game is to lead players down a path that has the potential to escalate to nuclear weapon employment. The core concept is to show how events can seemingly unfold in a relatively orderly way and still lead to crossing the nuclear threshold. From a practical perspective, this prevents rejection of the scenario by the

players. From a pedagogical perspective, it allows players to experience a conflict slowly spiral out of their control or to see what happens when more risk-accepting commanders decide to use nuclear weapons early.

"Now what?" Crucially, the game does not prejudge which mode and direction of travel will predominate movement on the escalation ladder, but (by compelling participants to respond to an initial, low-level nuclear use) it creates a forum for exploring the question. Traditionally, most wargames end when nuclear weapons are employed. *A Strange Game*, on the other hand, only truly begins at the point of nuclear weapon employment. There is nothing in the game's systems or prewritten scenario that dictate a second nuclear weapon must be used because even a decision to not to use nuclear weapons is important for the players' learning. This question of "Now what?" or "Where do we go from here?" is the heart of the game; players are forced to decide how to carry on: Do they escalate? Are they willing to let a nuclear demonstration go unanswered? Being able to do so in a low-stakes environment like a light-weight, fast-playing wargame allows for multiple iterations and players to explore multiple variations of the same story with little consequences, while accumulating insights into the nature of the problem along the way.

Game Description in Brief

A Strange Game is a two player, card-driven wargame designed to be played rapidly.[1] The players, who represent notional theater military commanders responsible for managing a large-scale theater war, face the challenges associated with prevailing, limiting, or even just terminating the war prior to a large-scale nuclear exchange. The game captures commander duties that have significant escalation potential based on the progression of a conventional war rapidly approaching the point where nuclear weapons will come into play and the duties needed to deal with the consequence of any use of nuclear forces.

Not all decisions in *A Strange Game* are in the hands of the players. The respective national command–level decisionmakers can and do make unilateral decisions in response to how the war is progressing and enemy actions that can drive one side or another to try and shift the war outcome to more favorable terms. The players can attempt to keep the war from escalating through both their own actions and by working to influence the opposing national command–level leadership's actions.

A critical aspect of this national command–level decisionmaking outside the control of the player is the temperament and value system of the national command–level leadership. This value system is hidden from the opposing side. These factors are integrated to form critical

[1] Although card-driven game designs are primarily found in the commercial domain, they are gaining greater traction in the professional space. For an example of a prior use of a card-driven design in the policy context, see Becca Wasser, Jenny Oberholtzer, Stacie L. Pettyjohn, and William Mackenzie, *Gaming Gray Zone Tactics: Design Considerations for a Structured Strategic Game*, RAND Corporation, RR-2915, 2019.

thresholds for actions; distinct success and failure criteria in the context of the theater of war; and differing perceptions on the importance of losses or successes in a variety of spheres such as differing target classes, losses from enemy actions, and success or failure on the battlefield. These all ultimately come together to drive the likelihood and type of actions that might be taken and the military choices that would have been preplanned to allow the military to execute the objectives of the national command–level leadership.

Conclusion

This nuclear wargame is aimed at players of various experience levels and was developed to bring analytic and design rigor to an area of wargaming which is traditionally underserved. *A Strange Game* is a modular, tailorable experience that can be expanded or reduced depending on the players. Additionally, information gleaned from a variety of sources can be used to shape the assessed damage from attacks, leadership sensitivities to those attacks, and possible options for responses. The base wargame construct allows for the use of several different national command–level leadership temperaments to be played and for the players to experience how the game's trajectory can be shaped by those changes.

A prototype of the game has been developed and the team has started deploying it with different DoD stakeholders. In the future, the game will be developed in three ways to enhance the player experience. First, the team will add in more visual elements and supplements for the players during the scenario events. The team will next update the scoring system to reflect more and more varied Red and Blue subject-matter expert judgement. The third change is to create a new scenario deck and expand *A Strange Game* to cover a different region. These three areas represent some of the most promising areas for future game development.

Table of Contents

Figures

Tables

Chapter 1. Introduction: Shall We Play a Game?

The title of this chapter recalls the famous question asked by the War Operation Plan Response or WOPR supercomputer in the 1983 technological thriller, *Wargames.* "Global Thermonuclear War," one of WOPR's gaming options, allows players to explore nuclear threat, escalation, and battle. Although the movie is rooted in Cold War tensions and technophobia, WOPR's question about this "strange game" is still relevant today. Nations continue to rely on nuclear weapons as the ultimate deterrent against large-scale adversarial attacks; yet there has been a gradual decline in the understanding of nuclear dynamics within the U.S. national security enterprise since the early 1990s, and a renewed focus on great-power competition suggests that an improved understanding of these issues would be beneficial.[2]

To renew working knowledge and interest in this area, RAND Corporation researchers designed a wargame entitled *A Strange Game*. The game provides players with a new way to learn about fundamental dynamics of nuclear weapon employment theory. The game is serious but easy to learn, quick to play, consists primarily of card decks and game boards, and is fairly portable. The primary value of *A Strange Game* is that it offers its players a better awareness of current-day nuclear strategies, plans, threats, and blind spots that might exist in U.S. national security knowledge.

In this report, the RAND game design team capture the theoretical foundations underpinning the prototype creation of *A Strange Game.* The information here can help game masters conduct meaningful, fully informed gaming sessions and assist players in better understanding the diplomatic and military concepts in the game. The information can also assist other game designers as they work toward the development of further realistic games that immerse participants in realistic environments designed to improve decisionmaking before, during, and after conflict.

A Strange Game: Subject, Audience, and Value

Understanding the purpose of *A Strange Game* first requires a common understanding of three key game elements. The three elements define the entire scope of the game—that is, they identify (1) the subject of the game; (2) who should play the game (i.e., its audience); and (3) the

[2] Concerns regarding the employment of nuclear weapons in conflicts of all sizes have come up in recent wargames. For two such examples, see Stacie Pettyjohn, Becca Wasser, and Chris Dougherty, *Dangerous Straits: Wargaming a Future Conflict over Taiwan*, Center for a New American Security, 2022; Becca Wasser and Jennie Matuschak, *Risk and Responsibility: Managing Future Iranian Weapons of Mass Destruction Threats*, Center for a New American Security, 2022.

game's value to its players. The game is based on three puzzles which are only meaningful to players once these three concepts are grasped.

The Subject of the Game: Things Nuclear

Our use of the term *nuclear* encompasses three sub-topics or three *things nuclear*. These three topics are explored in depth in the next chapter, but, in brief, we define them as follows:

- **Nuclear weapons:** What they are, how, they work, in what shapes and forms they exist.
- **Nuclear weapons effects:** What happens when nuclear weapons of various types are actually used in various ways against different kinds of targets.
- **Our understanding of nuclear weapons:** For nearly half a century, strategists, scholars, and decisionmakers expended countless hours and spilled endless ink arguing over the "whats, whys, whens, and wheres" of nuclear weapons. Rather than retread these arguments, we take advantage of this enormous heritage of thinking. This helps to assure that we avoid reinventing the wheel or somehow reinvent the proverbial square wheel.

Who Can Play or Benefit from the Game: The National Security Enterprise

The primary audience—those intended to play the game or benefit from the insights garnered during game play—is the national security enterprise. This refers to the broadest construction of individuals and organizations engaged in informing, debating, and deciding U.S. defense and foreign policy. It of course includes the U.S. Departments of Defense (DoD), the U.S. State Department, the National Security Council, and the intelligence community (IC). But it also includes other government agencies with equities in defense, foreign policy, or nuclear weapons, most especially the Department of Energy, which is responsible for managing the nation's nuclear weapons development complex.

But the net goes wider still. Those in nonprofit research organizations and for-profit consulting firms who advise and support officials in Washington, D.C. might also be interested in this game. So too might scholars and academics whose research and writings focus on national security topics and whose careers frequently vector into and out of research organizations and government positions. Their most eager and talented students—the next generations of policymakers, outside policy experts, and academic thinkers—also have a stake. Box 1 summarizes the potential benefits to players that the game offers and which ultimately informed game design.

Box 1. *A Strange Game* Is Designed to Help Players:

- develop an appreciation for the power and limitations of nuclear weapons
- contemplate what comes after a nuclear weapon is used and how to reach war termination
- consider whether and how one can communicate or signal by using nuclear weapons
- develop an appreciation of the power and limitations of attempts by third parties to limit escalation.

The Value of A Strange Game: Working Through Complex Geopolitics, Competition, and Threats

Finally, geopolitical context is central to this game and its utility for DoD audiences and other players. The United States sees itself as part of a competition with near-peers, none of whom have spent the past 30 years ignoring nuclear weapons When the Trump administration's 2018 National Defense Strategy singled out these competitions as the nation's key future security challenge, it increased the urgency of planning scenarios for the DoD in which nuclear weapons cast a long and deep shadow. Nuclear weapons loomed large even in important lower-priority scenarios, like potential conflicts with North Korea and, to a lesser extent, Iran. Addressing this need and helping the national security enterprise study the associated challenges is the core purpose of this game.

What we might retrospectively call the first nuclear era (1945 through the end of the Cold War and collapse of the Soviet Union in 1989–91) was characterized by rapid technological developments and an ever-increasing military demand for nuclear weapons outstripping the pace of research into their management and employment. As first the United States then the Soviet Union moved from circumstances of nuclear scarcity to plentitude, theory and strategy raced to catch up.

Although much seminal work was conducted from the late 1940s through the early 1960s, it was not until Robert McNamara's term as secretary of defense under presidents John F. Kennedy and Lyndon B. Johnson that the fundamental tenets of late–Cold War nuclear doctrine—the centrality of a secure second-strike deterrent underpinning a variety of nuclear employment options from the battlefield to the homeland and the acceptance of mutual vulnerability to devastation—were for all intents and purposes codified.[3] Subsequent qualitative and quantitative changes in nuclear weapons—the growth of the Union of Soviet Socialist Republics (USSR)'s intercontinental ballistic missile (ICBM) force, the deployment by both sides of multiple warheads on thousands of individual missiles, the ever-increasing accuracy of missile guidance—did little to alter this situation.[4]

---

[3] For examples of this seminal work, see Bernard Brodie, ed., *The Absolute Weapon: Atomic Power and World Order*, Harcourt, Brace and Co., 1946; Bernard Brodie, *Strategy in the Missile Age*, Princeton University Press, 1959; Thomas C. Schelling, *The Strategy of Conflict*, Harvard University Press, 1960; Herman Kahn, *On Thermonuclear War*, Princeton University Press, 1961; and Glenn Herald Snyder, *Deterrence and Defense*, Princeton University Press, 1961. For a recounting of the evolution of nuclear strategy through the mid-1960s and beyond, see Fred Kaplan, *The Bomb: Presidents, Generals, and the Secret History of Nuclear War*, Simon & Schuster, 2020.

[4] This was not for want of trying. *Mutually assured destruction* or MAD is, after all, a label for a situation, not a doctrine nor a strategy. Furthermore, neither Washington, D.C. or Moscow accepted MAD as a desirable strategy—or, perhaps more accurately, as the least dangerous of all available options. Whether it was the USSR's deployment of heavy ICBMs like the SS-18 that posed an existential threat to the U.S. land-based missile force, or President Ronald Reagan's strategic Defense Initiative, both sides (at least intermittently) sought to break out of the MAD world.

Despite significant reductions in the sizes of many great powers' nuclear arsenals since the early 1990s, nothing much about this underlying reality has really changed. What has changed has been the level of attention that the United States pays to nuclear issues. After the Cold War ended, new security problems came to the fore: so-called rogue states, such as Iraq; genocidal warfare in the Balkans; humanitarian crises around the world; and, eventually, the threat of violent extremism. Each of these was at one time or another the focus of U.S. defense planning, and none had a serious nuclear dimension. So, nuclear weapons gradually slipped to the extreme periphery of most defense professionals' awareness. If we consider 15 years—about the average time it takes a U.S. military officer to rise from O-1 to O-5 in rank (lieutenant colonel in the U.S. Army, U.S. Air Force, and U.S. Marines and commander in the U.S. Navy and U.S. Coast Guard)—as a generation, we are rapidly entering the third generation of U.S. defense professionals who have spent their entire careers in this post-nuclear world.

No game can carry the weight of creating nuclear expertise. But gaming has proven an effective way of allowing players to engage and learn about complex topics through the power of interactive and experiential learning. Games can, probably should, and almost certainly will play a role in introducing many to the challenges of great-power competition in the nuclear age.

Organization of This Report

The next chapter summarizes the uses, effects, and limitations of nuclear weapons that were used to inform *A Strange Game.* Chapter 3 goes deeper into nuclear war by summarizing theories behind it that informed the design of the game. Specifically, we pay close attention to how a conflict can escalate into the use of nuclear weapons. Chapter 4 describes the major mechanics of the game, contextualizing each within the information presented in the previous chapters. Chapter 5 concludes this report by discussing further possible iterations of *A Strange Game* in the coming decade.

This work is supported by two appendixes. Appendix A offers a detailed description of the methods used to develop *A Strange Game* scoring. Appendix B provides a close look at the methods used to develop the Limited Nuclear Option (LNO) cards used in the game.

Chapter 2. Things Nuclear: Weapons and Effects

As a bit of Cold War–era black humor had it, one nuclear weapon can indeed ruin your whole day. None of our discussion here should be read as suggesting that a nuclear weapon is just another bomb. But the facts are that the three primary damage processes generated by a nuclear explosion—blast, heat, and radioactivity—all have particular modes of interacting with specific targets and will therefore have diverse effects across them.[5] Therefore, providing the players with a realistic sense of the immense power and the striking limitations of nuclear weapons is of paramount importance and is the purpose of this chapter.

Soft and Hardened Targets: Effects and Limitations

The classic image of a nuclear attack is probably a detonation over an urban area; this is, after all, the only manner in which nuclear weapons have ever actually been employed. And the use of the word *over* in this context is very deliberate. Strikes similar to those that destroyed Hiroshima and Nagasaki will almost certainly involve what is called an *airburst*—exploding the bomb at a preplanned altitude over the target. The optimal height of the detonation varies with the size of the bomb and the desired effects.

Typically, the purpose of using an airburst is to maximize the range to which the bomb's instantaneous effects—blast, thermal pulse, and so-called *prompt radiation*—are felt for a given level of damage. The disadvantage of this approach is that it somewhat reduces the *maximum* impact of those effects at any given point—the energy of the blast is distributed more evenly across a larger area—and, in general, produces minimal long-lasting radiation-nuclear fallout, the creation of which requires that dirt and particles of pulverized wreckage be sucked up into the fireball and irradiated before being deposited back on the earth's surface, sometimes a great distance from the original explosion.[6]

This trade-off of a larger area covered by, in nuclear terms, weaker effects is acceptable in attacking a large, soft area target like a city. The materials and construction methods used in

---

[5] This discussion of nuclear weapons effects is based largely on Samuel Glasstone and Philip J. Dolan, eds., *The Effects of Nuclear Weapons*, U.S. Department of Defense and U.S. Department of Energy, 1977. This book is the benchmark unclassified text on the topic. A useful summary can be found in U.S. Congress Economic and Social Consequences of Nuclear Attacks on the United States: A Study Prepared for the Joint Committee on Defense Production, U.S. Government Printing Office, 1979. Furthermore, Glasstone and Dolan (1977) is contextualized in U.S. Congress Office of Technology Assessment, *The Effects of Nuclear War*, U.S. Government Printing Office, May 1979.

[6] Although the dynamics of any nuclear explosion are complicated and no single rule absolutely applies, generally, an airburst where the *fireball*—the bubble of superheated glowing plasma and gas that grows out from the explosion—does not quite reach the ground will both maximize the area affected by the immediate weapon effects and minimize fallout.

most civilian construction—wood, glass, unreinforced concrete and brick, steel or aluminum siding—are vulnerable to even modest amounts of *overpressure*—the term used to describe the shock wave moving outward from the explosion. Structures made of heavy, reinforced materials, such as bridges or earthquake-tolerant buildings, are more resistant. But to the extent that the attacker desires to devastate a city (or a military target, such as an above-ground logistics facility or unhardened airbase), an airburst is usually the appropriate mechanism.[7]

Other uses require other approaches. To destroy a hardened underground structure, such as a missile silo or a buried command center, the desired effect is *ground shock*—basically, causing a hyper-localized but extremely intense shallow earthquake that cracks and crushes the target. Accomplishing this requires a detonation at the surface so that the maximum amount of the blast energy can couple to the ground.[8] Because a *surface* or *ground burst* focuses most of the blast's energy on a fairly small area, its effects are far more intense at the point of detonation but decrease rapidly with distance, compared with an airburst.

Ground bursts do kick up enormous amounts of fallout because of the amount of dirt and other debris drawn up into the fireball and rendered radioactive. The distance to which this debris is carried depends on the size of the bomb. A weapon big enough for its mushroom cloud to rise into the stratosphere can deposit fallout hundreds of miles from the detonation, just as radioactive debris from the Chernobyl explosion was detected as far away as western Europe.[9]

Cities, then, along with soft military targets can be devastated by weapons that use airbursts as their primary mode of attack. Hardened or underground structures—a category that includes many important military targets—would be attacked with surface bursts. What of fielded military forces—armored brigades and airbases with reinforced blast-resistant shelters for aircraft? It depends.

Ground Unit: Uses Against, Effects, Limitations

A ground unit in an operational mode—dug in on defense or advancing in a tactical formation with vehicles spread out—is not particularly vulnerable to the blast effects of a typical small tactical nuclear weapon. Soft-sided vehicles like trucks would clearly be at similar risk to

---

[7] Even here, though, it is important to avoid overgeneralization. For example, heavy industrial machinery and equipment, such as traditional large machine tools or cranes at a seaport, can survive even relatively close contact with a nuclear detonation largely intact. In Hiroshima and Nagasaki and atmospheric nuclear tests in Nevada, there were many examples of industrial lathes and similar machines being relatively undamaged even when the enclosing buildings were reduced to rubble.

[8] For some very hard or deep targets, the nuclear warhead might even need to penetrate the Earth's surface and explode underground to produce the necessary shock.

[9] International Atomic Energy Agency, "Frequently Asked Chernobyl Questions," webpage, undated. Although fallout can be deadly, except in those areas where it is most-intensely deposited, personal protection can be as simple as staying indoors for a few days to weeks—an experience less unthinkable after the coronavirus disease 2019 shutdowns. Buildings and vehicles otherwise undamaged can be rinsed down. More difficult to clear is terrain, a point to which we will return.

their civilian counterparts if caught in the detonation, but tanks and other armored vehicles would be far more survivable. The main direct effect on a formation like this would be via the high-energy prompt radiation that could penetrate armored hulls and reach the crew inside. Large enough instantaneous doses (above about 200 rem[10]) would almost cause radiation sickness but not render the personnel incapable of performing military duties in a somewhat degraded manner; some of the personnel at the higher-end would suffer debilitating or fatal effects. Still larger doses—above about 1,000 rem—are usually fatal over a period ranging from hours to 14 or so days. Thin-skinned vehicles would offer virtually no protection from prompt radiation, but heavier armor would attenuate it; the extent of the protection offered depends on the thickness and nature of the armor; proximity to the blast; and the yield of the weapon, which determines the relative proportions of the various forms of radiation released by the blast.

It is useful to note that the lower the *yield*—the explosive power—of a weapon, the more that the prompt radiation effects dominate its effects. That is, for the weapons one typically envisions being used against battlefield targets, with yields in the low kilotons (kt), the radius for lethal radiation propagation may exceed that for blast.[11] This further suggests that the primary lethality mechanism in an attack on deployed ground forces is likely to be radiation.

Another way of affecting ground force operations with a nuclear attack—though not necessarily inflicting casualties or direct damage—is to use the effects of a nuclear blast in essence to shape the terrain within which the unit is operating or across which it must travel. In a heavily wooded area, an airburst could be used to blow down trees in front of an advancing unit (or on top of a dug-in one) to create a large-scale obstacle to movement. A surface burst could also be used either to create choke points by destroying a critical bridge; causing a landslide across a highway; or depositing highly radioactive fallout across the vicinity, creating temporary no-go zones.[12] In any of these cases, significant military engineering effort would likely be needed to overcome the effects of the attack, delaying movement or reducing defensive effectiveness.

---

[10] A *rem* is an arbitrary unit of radiation absorption, as opposed to exposure, which is typically measured in roentgens.

[11] A *kiloton* is a measure of explosive power equal to the detonation of 1,000 tons of TNT (compared with a *megaton*, which equates to 1 million tons). As the size of the weapon increases, blast effects increasingly dominate until, by 15 kt or so, anyone exposed to a lethal dose of prompt radiation would almost certainly have been immediately killed by the shock wave. Some recent wargames have sought to explore whether the yield of the weapon makes a difference in how it is employed. For an example of this, see Andrew W. Reddie and Bethany L. Goldblum, "Evidence of the Unthinkable: Experimental Wargaming at the Nuclear Threshold," *Journal of Peace Research*, 2022. An important caveat is that not all scholars agree with the appropriateness of exploring this type of question through gaming as envisioned by Reddie and Goldblum. For one such rebuttal, see Jenny Oberholtzer, Abby Doll, David Frelinger, Karl Mueller, and Stacie Pettyjohn, "Applying Wargames to Real-World Policies," *Science,* Vol. 363, No. 6434, March 29, 2019.

[12] As with prompt radiation, heavy armored vehicles would have an advantage in traversing fallout-strewn areas. Not only would the armor reduce the dose of radiation reaching the crew, but by moving at high speed, the amount of time spent in the stricken area can be minimized. Troops on foot or traveling in less–well protected vehicles would be less fortunate.

How Nuclear Effects Inform Game Play

From this chapter, we begin to see one of the paradoxes of nuclear weapons: the same weapon that would kill 100,000 or more people when used over a city might have difficulty putting a battalion of 50 or so armored fighting vehicles and a few hundred soldiers out of action for long. This important difference is one that is often not recognized even by military professionals. The nuclear use options built into this game create appropriate learning opportunities for participants.[13]

[13] An airbase or other target that has characteristics of both hard targets (tanks, runways, hardened aircraft shelters) and soft targets (cities with unhardened structures, including important maintenance facilities and above-ground fuel storage) unsurprisingly respond in a mixed fashion to nuclear attack. A sufficiently accurate ground burst can put a large crater in a runway or destroy several hardened shelters and spread dangerous levels of fallout around the installation (and often the surrounding countryside) but would do relatively little damage to much of the rest of the base. An airburst, meanwhile, would do more limited damage to the hardened components but would potentially destroy any aircraft parked outside shelters along with softer buildings. Because of the sheer size of most air bases (or other military bases, for that matter), multiple nuclear weapons might be needed unless the weapons were quite large.

Chapter 3. Nuclear War: The Theory Behind the Practice

All games serve as an abstraction of reality, focusing on what their designers believe are the key aspects of the system, and this game is no different. Aside from introducing players to nuclear weapons effects and LNO sets in general, there are fundamental elements of nuclear war theory that our game introduces to players, namely (1) escalation, (2) signaling, (3) "How did we get here?" and (4) "Now what?" This section explores each of these concepts in turn.

Escalation: Climbing Up or Falling Down the Ladder?

In his influential book *On Escalation: Metaphors and Scenarios*, strategist Herman Kahn popularized the "useful metaphor" of the escalation ladder—a "convenient list of the many options facing the strategist in a two-sided confrontation . . . that facilitates the examination of the growth and retardation of crises."[14] Kahn adopts the traditional position that the ladder is something a crisis would ascend as it grew in intensity or extent as a result of the deliberate choices of decisionmakers on the two sides. He avers that rungs can be skipped and that the ladder can, again through deliberate choice, be climbed down.

His discussion of escalation, along with most subsequent ones, warned of the dangers of an uncontrolled spiral to levels of ever-greater violence but (again like most other discussions) holds out the prospect that, faced with catastrophe, leaders would manage to negotiate and compromise on war termination outcomes in which even the winning side offers concessions to avoid further destruction. Kahn even argues that, unlike mass wars like the first two world wars, a thermonuclear war

> [m]ost likely would be . . . run by government authorities and technicians, with little or no attention paid to the immediate problems of support from, or the morale of, the civilian population. It would probably be fought relatively coolly, and be guided by considerations of national interest little affected by propaganda or popular emotion.[15]

The world thankfully has very little experience with decisionmaking on the brink, let alone in the midst, of nuclear war. This lack of evidence makes it difficult to be definitive in assessing how coolly leaders might respond in such circumstances. There are at least two alternative perspectives that might suggest a less sanguine conclusion.

The first is rooted in Robert Jervis' "Hypotheses on Misperception" published in 1968. His argument addressed the ways in which actors misinterpret "both others' actions and their

[14] Herman Kahn, *On Escalation: Metaphors and Scenarios*, Transaction Publishers, 2010, p. 37. Page references are from the Kindle version of the book and may vary from the pagination of print editions.

[15] Kahn, 2010, p. 201.

intentions."[16] Several the 14 hypotheses Jervis puts forward are relevant to expectations regarding leaders' choices in a nuclear crisis. The very first, that "decision-makers tend to fit incoming information into their existing theories and images," for example, has clear implications.[17] In the midst of a conflict in which nuclear use has been initiated, a leader is likely to have developed a set of beliefs about her (hostile) adversary's goals and intentions, and their actions will mainly be evaluated through these lenses.

And, especially as the information coming from the other side will almost certainly be ambiguous, we tend to run into two others of Jervis' hypotheses: (1) that the more ambiguous new information might be, the more likely it is to be jammed into the decisionmakers' pre-existing framework and (2) "that there is an overall tendency for decision-makers to see other states as more hostile than they are."[18] A review of Jervis' seminal essay suggests that there is a likelihood for leaders on both sides to feel themselves incentivized to escalate. Furthermore, in the information age, there are questions about how nontraditional forms of conflict, such as cyberattacks, could increase or decrease both the risks of misperception and escalation.[19]

The second comes from one of the most important models to emerge from the behavioral finance literature: prospect theory. Prospect theory, in brief, demonstrates how people choose among alternatives that all entail risk and uncertainty and concludes that "people are loss-averse; since individuals dislike losses more than equivalent gains, they are more willing to take risks to avoid a loss."[20] The side that is losing in what appears to be a high-stakes confrontation will, according to this, be prone to escalate—engaging in risky behavior in an attempt to cut its losses. The phenomenon of "people appear[ing] to be so willing to pay additional costs in order to justify or recover sunk costs" points in the same direction—that the escalatory process, once initiated, might more resemble a barely controlled fall down a ladder versus a coolly rational climb up.[21] As Figure 3.1 below suggests—using stoplight color codes to denote the relative

---

[16] Robert Jervis, "Hypotheses on Misperception," *World Politics*, Vol. 20, No. 3, April 1968, p. 454.

[17] Jervis, 1968, p. 455.

[18] Jervis, 1968, p. 475.

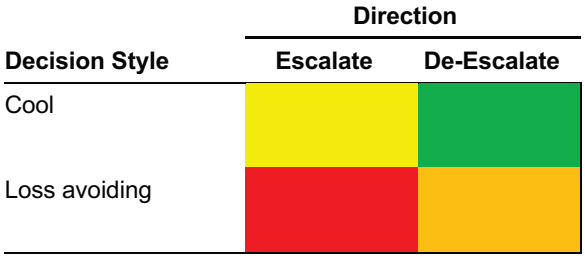
[19] For at least one wargame exploring the question of how cyberattacks might affect nuclear escalation, see Jacquelyn Schneider, Benjamin Schechter, and Rachael Shaffer, "Cyber Operations and Nuclear Use: A Wargaming Exploration," *Social Science Research Network Electronic Journal*, November 2021.

[20] Behavioral Economics, "Prospect Theory," undated. See, also, Amos Tversky and Daniel Kahneman, "Advances in Prospect Theory: Cumulative Representation of Uncertainty," *Journal of Risk and Uncertainty,* Vol. 5, No. 4, 1992.

[21] Rose McDermott, "Prospect Theory in Political Science: Gains and Losses from the First Decade," *Political Psychology,* Vol. 25, No. 2, 2004, p. 300. Several of the authors each have decades of experience in wargaming nuclear scenarios, and these theoretical predictions align with their observations of player behavior. The simplest way to summarize these is that, once nuclear use has begun, players are extremely reluctant—to the point of engaging in behavior that negates obvious de-escalation options—to let the other side be the last to use nuclear weapons. This "getting the last word" phenomenon is rather striking in its pervasiveness, even in situations where, to a cool observer, it is obviously unnecessarily dangerous. Of course, gaming introduces artificialities and

desirability of each cell's outcome—there are four interesting potential tendencies. By creating a game that is reasonably simple and fast to play, our goal–among others–was to enable the accumulation of a larger set of observations to help understand what kinds of circumstance determine which box takes precedence. Of course, any escalation outcome can deliberate, inadvertent, or accidental. However, such were not considered in the prototype of this game but may be represented in later versions as needed.

Figure 3.2. Notional Outcomes Based on Decision Style and Escalation Direction



NOTE: Green = most favorable, no risk of war, desirable; yellow = relatively favorable; orange = not desirable; red = full conflict, least desirable.

Signaling: Nuclear Weapons as the Bluntest of Instruments

Most of the literature on nuclear weapons and signaling pertains to nuclear brandishing rather than use. The most straightforward explanation for this is, of course, that there are multiple examples of implicit and explicit nuclear threats being used in attempts to influence others—notably Dwight D. Eisenhower during the Korean War in 1953, China vis-à-vis the USSR in 1969, and Richard Nixon apropos Vietnam in 1969 and in the waning days of the 1973 Arab-Israeli War—but, fortunately, we have no experience of weapons being employed for the purpose.[22] Regarding the relative utility of such signaling, the authors of a 2013 Center for Naval Analysis report said it well and succinctly.

> Nuclear weapons cast a long shadow, and thus their influence is likely to be continuously factored into strategic decisions rather than neglected in such a way

constraints that might make player behavior different from national decisionmakers in a real crisis or conflict. See Erik Lin-Greenberg, Reid B. C. Pauly, and Jacquelyn G. Schneider, "Wargaming for International Relations Research," *European Journal of International Relations*, Vol. 28, No. 1, 2021, pp. 92–94.

[22] Informative examination of the latter two cases—the most recent known examples of a superpower seeking to brandish its nuclear capabilities as a signal to another—are Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security*, Vol. 9, No. 4, Spring 1985 and Scott D. Sagan and Jeremi Suri, "The Madman Nuclear Alert: Secrecy, Signaling, and Safety in October 1969," *International Security*, Vol. 27, No. 4, Spring 2003. On the 1969 "secret nuclear alert," also see W. Burr and J. Kimball, "Nixon's Secret Nuclear Alert: Vietnam War Diplomacy and the Joint Chiefs of Staff Readiness Test, October 1969," *Cold War History*, Vol. 3, No. 2, January 2003.

> that signals are necessary to remind decision-makers of their [sic] salience of nuclear forces.[23]

Even nuclear signaling short of employment is regarded by most analysts as fraught—"ineffective and dangerous" in the words of one.[24] Once put on heightened alert, for example, nuclear forces often begin operating according to rules and procedures designed to reduce those forces' vulnerability to attack, versus maintaining close national-level control over their status ("in command but out of control"), the assumption behind those rules and procedures being that political leaders would not have authorized increased readiness except in the face of a grave threat.[25]

Mounting evidence also suggests that such attempted manipulations of nuclear risk are largely ineffective. Nixon's "madman alert" in 1969 "failed to produce 'results.'"[26] Even the reputedly most successful use of nuclear coercion—the Eisenhower administration's 1953 threats to use nuclear weapons against North Korea and China if an armistice was not concluded—were, despite his own articulated confidence in their importance, at best disputed in terms of effectiveness.[27]

Within wargames, conversations regarding nuclear use often entail detailed discussions of how they can be employed primarily as a "signal" to the adversary. What communication is intended can vary. Sometimes the message is simple: "watch your step" or "you have crossed a red line." Other times it can be complicated: "Please note that our attack had the following specific characteristics, all of which should indicate to you that despite its superficially escalatory nature, we actually wish to limit further escalation."

What the target of the attack mostly hears, however, is, "You just used a nuclear weapon on me" and the target thus feels compelled to respond to the perceived message rather than the intended one. The messaging dynamic is especially prevalent once one or the other side has initiated nuclear use; the game enters a phase where communicating via nuclear detonation tends to become a core theme of each side's actions. In these situations, signaling attempts—which typically use tit-for-tat (plus or minus some margin) communication strategies despite

---

[23] Elbridge A. Colby, Avner Cohen, William McCants, Bradley Morris, and William Rosenau, *The Israeli "Nuclear Alert" of 1973: Deterrence and Signaling in Crisis*, Center for Naval Analysis, April 2013, p. 4.

[24] Sagan and Suri, 2003, p. 180.

[25] Sagan and Suri, 2003, p. 179.

[26] In October 1969 Nixon tested his "'madman theory 'of coercive diplomacy'" in an attempt to convince China and Russia that the United States was willing to contemplate any course of action, including the nuclear of nuclear weapons, to force an end to the Vietnam conflict. Quite clearly, it did not work out as hoped (Sagan and Suri, 2003, p 150; Burr and Kimball, 2003, p. 148, quoting Nixon's speech of November 3, 1969).

[27] See, for example, Rosemary J. Foot, "Nuclear Coercion and the Ending of the Korean Conflict," *International Security*, Vol. 13, No. 3, 1988–1989.

circumstances that are rarely symmetrical regarding stakes and relative vulnerability—can become rather nuanced.[28] For example, communication patterns can unfold as follows:

- I am seeking to respond to your attack in a tit-for-tat manner; however, I am "adding one" to convey my determination not to be intimidated.
- You struck one specific high-value target of mine for which you have no direct counterpart. In order to convey a tit-for-tat message, I therefore have to hit these seven lower-value targets on your side.
- You have thus far confined your use of nuclear weapons to the battlefield and have had real effects. In order to achieve parallel impacts on you, I have to strike into your homeland. This should not be considered escalation.

In the end, however, the conveyed message is different from the desired one, and the action is almost inevitably seen as more hostile than the actor intended.[29] To return to our just-prior discussion, this dynamic of signals of restraint being interpreted as escalatory messages is another reason why escalation might better be seen as a tumble down a ladder versus a reasoned step-by-step scaling of one. Wargame participants who are sincerely committed to limiting escalation—but are unwilling to be defeated or coerced into changing their goals by an adversary's nuclear use—will, although trying to convey constraint, instead unleash a plunge into the escalatory abyss.

How Did We Get Here?

Another important learning point of the game is to lead players down a path which RAND's previous wargames suggest has the potential to escalate to nuclear weapon employment.[30] The core concept being that, rather than start players at the moment of nuclear first-use, we show how events can unfold in a relatively orderly way and still lead to crossing the nuclear threshold. The scenario designed for this game builds on RAND's extensive institutional expertise wargaming various conflicts and provided players with a scripted, seven-move prelude to nuclear war. The decision to begin the wargame prior to nuclear employment is two-fold. From a practical perspective, it prevents rejection of the scenario by the players. From a pedagogical perspective, it allows players to experience a conflict slowly spiral out of their control or to see what happens when more risk-accepting commanders decide to use nuclear weapons early. Crucially, even if the players refuse to use nuclear weapons, the pre-scripted portion of the scenario culminates in nuclear weapon use by Red forces, thus posing the central theoretical question the game is seeking to help players explore: "Now what?"

---

[28] All these examples reflect discussions and decisions the authors have observed in wargames involving experienced national security professionals, in and out of uniform.

[29] In conformance with Jervis' hypothesis described earlier (1968).

[30] David A. Shlapak and Michael Johnson, *Reinforcing Deterrence on NATO's Eastern Flank: Wargaming the Defense of the Baltics*, RAND Corporation, 2016.

Now What?

Crucially, the game does not prejudge which mode and direction of travel will predominate movement on the escalation ladder—but by compelling participants to respond to an initial, low-level nuclear use (the game scenario, as described previously, begins with a "saber-rattling" nuclear test), it creates a forum for exploring the question. Traditionally, most wargames end when nuclear weapons are employed, but *A Strange Game* only truly begins at the point of nuclear weapon employment. Crucially, there is nothing in the game's systems or prewritten scenario that dictate a second nuclear weapon must be used because even a decision to not use nuclear weapons is important for the players' learning. This question of "now what?" or "where do we go from here?" is the heart of the game; players are forced to decide how to carry on. Do they escalate? Are they willing to let a nuclear demonstration go unanswered? Being able to do so in a low-stakes environment like a light-weight, fast-playing (i.e., in two hours or less) wargame allows for multiple iterations and players to explore multiple variations of the same story with little consequences. The goal is to allow players to interrogate their implicit assumptions about what and how events would unfold to demonstrate that, in reality, events are unlikely to unfold in anything resembling that manner.

How Nuclear War Theory Informs Game Play

This chapter has touched on only a subset of the important issues surrounding the meaning of nuclear weapons in international security and their possible impacts on a conflict. It has, for example, totally neglected the problem of small nuclear arsenals owned by vulnerable powers, and the unique escalation risks associated with any confrontation involving them. Nor has it dealt with questions of the peacetime security of nuclear weapons or the procedures for their handling and management or the always-complex set of issues surrounding nuclear proliferation. In part, this is because no overview of the manifold realities of nuclear weapons can coherently cover the entirety of that waterfront. But, mainly, it is because *A Strange Game* focuses on a narrower but utterly vital set of questions: those surrounding the brandishing and use of nuclear weapons in a crisis or conflict. Other games, or perhaps expanded versions of this one, could seek to explore other circumstances; but in a world of reemerged great-power competition, those highlighted by *A Strange Game* seem especially germane and powerfully important.

Chapter 4. Game Design and Gameplay

The previous chapters laid out the policy need for *A Strange Game* and presented some of the science and theory behind the use of nuclear weapons. This chapter provides detail on how to play *A Strange Game*. It also provides considerable information for the reader on how the game was designed.

It should be noted that this chapter is not intended to be either a complete set of game rules or a step-by-step rule book. These are provided with the game package. Instead, we offer here an overview of the game's systems and important analytic decisions made by the design team. We do include descriptions of game goals, setup, and basic game play here, however, to provide fuller context to game play.

To Nuke or Not to Nuke? That Is the Question

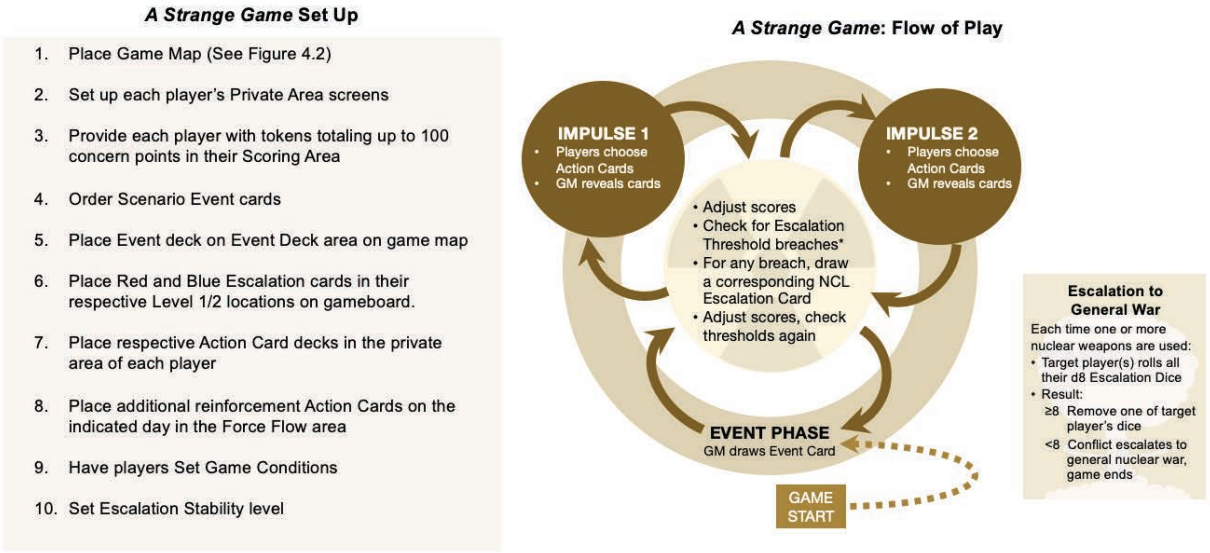
Unlike family tabletop games, professional wargames typically do not offer players a chance to win or lose, per se. Rather, wargaming offers exploratory and learning opportunities, enabling players to work through warfighting concepts, explore scenarios, test strategies, and assess how different posture choices can affect different outcomes. *A Strange Game* also offers such opportunities, and, thus, the game ends when the two sides—Blue and Red—agree to stop the conflict or when the use of a nuclear weapon triggers escalation to a general nuclear war. As in real international conflict, this is not simple. Hidden information in the game creates opportunities for the different sides to misperceive signals. Dialogue between the players on opposing sides is tightly controlled to simulate the limits of real-world crisis communication and avoid cheap talk.[31]

Game Setup and Flow

Figure 4.1 offers both a written and illustrated summary of game flow and play. The left of the figure summarizes activities pertaining to *A Strange Game* from game setup to finish. The right side of the figure shows the game flow. This can be thought of as a loop: Once the players enter the game (bottom of the figure), they become immersed in a cycle of play that consists of two impulse rounds (turns). Figure 4.1 is meant as a simple reference to give context to the descriptions of the game pieces, moves, and player decisions described below.

[31] In economics, *cheap talk* generally refers to informal communication that does not affect the payoffs of the actors (i.e., it is costless to undertake.) Joseph Farrell and Matthew Rabin, "Cheap Talk," *Journal of Economic Perspectives*, Vol. 10, No. 3, 1996, pp. 103–104.

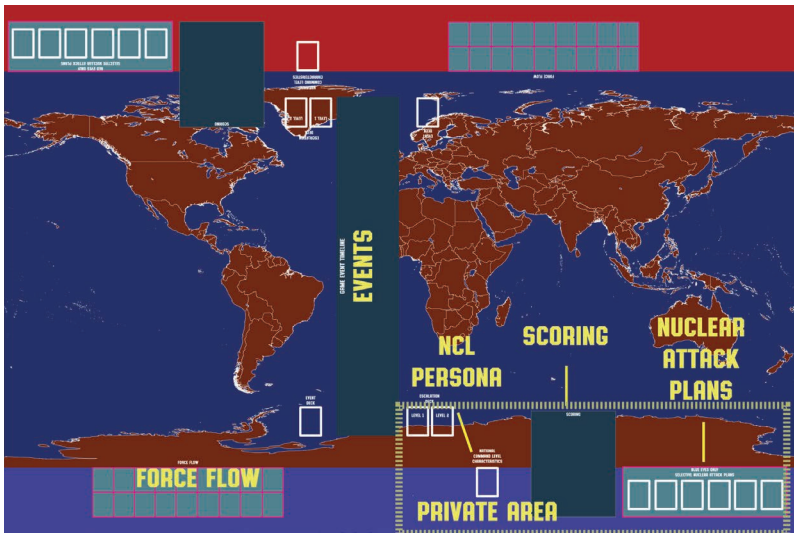
Figure 4.1. Summary of *A Strange Game* Setup and Flow of Play



Game Map and Privacy Screens

The game is played on a game map, which should be set out ahead of the event. Figure 4.2 is the prototype game map. Although the prototype is focused on conflict between two great powers—the United States and Russia— the game can be recreated to focus on any two nations.

Figure 4.2. Example of *A Strange Game* Play Map



NOTE: Although only one side is specifically highlighted (in yellow) here, each side is a mirror image of the other and all labels are duplicated on the actual printed game map.

The two main players representing the two nations will each be working within a "private area." The screens included with the game should be setup to maintain secrecy. Each player

should be given tokens totaling up to 100 concern points in their scoring area. As the viewer will note, the game map has designated spaces for different types of game cards that will drive game decisions and set parameters. Each type of card is explained in this chapter.

Choosing National Command Authority Packages

The first-choice players of *A Strange Game* need to make is to choose the national command authority (NCA) package. Inside this package is the following:

- **NCA personality card:** This card indicates to the player, through the use of scoring modifiers, what sorts of targets the NCA is especially interested in, both offensively and defensively. Additionally, the NCA card provides the players with a sense of when their command authority might be tempted to unilaterally escalate the conflict.
- **Prewritten briefing:** This provides the player a sense of the objectives their side is trying to achieve in the conflict, when nuclear use is authorized, and a sense of the manner in which the NCA would like the player to conduct the conflict.
- **Set of LNOs**: These provide the players with preset strike packages, similar to what a targeting cell would generate. They may be executed in whole or in part once nuclear use has been authorized by a given side's NCA.

National Command Authority Personality Cards

The NCA card provides the player with a sense of the kind of leadership the player serves under (e.g., how aggressive), their leadership's concerns, and how likely the NCA is to unilaterally escalate the conflict. At its most basic, the NCA card serves to free the player from political and strategic decisions and focus on the task at hand. In practice, this information serves to help guide the player's actions and might influence what action cards or targets they might pick while playing the game.

The NCA card contains information, in the form of scoring adjustment modifiers, that lay at the heart of the scoring system. Each card provides information on how much the notional policymakers at the NCA value particular outcomes in terms of gains and losses as linear addition to the objective score provided by action, LNO, and event cards. Figure 4.3 provides an example NCA personality card and highlights the various information contained therein. Table 4.1 shows the different types of NCA personalities included in the prototype version of *A Strange Game.*

Figure 4.3. Example National Command Authority Personality Card

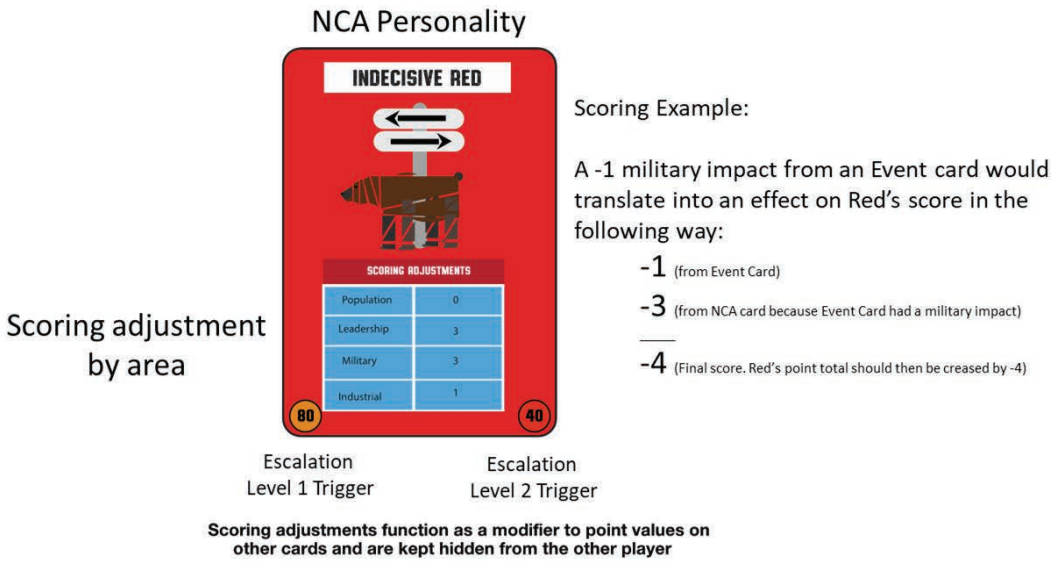


Table 4.1. List of National Command Authority Personalities Provided in Game Prototype

Red Team	Blue Team	Risk Profile
Pensive Red	Pensive Blue	Loss Avoidant
Indecisive Red	Indecisive Blue	Neutral
Aggressive Red	Aggressive Blue	Risk Acceptant

Table 4.2 provides the scoring modifiers and escalation levels for each of the NCA personalities listed in Table 4.1. It is important to note that, for the prototype version of the game, these scoring modifiers and escalation thresholds were set by the subjective judgement of the team using a combination of subject-matter expertise and a desire to provide interesting variation for the players. Future versions of the game should prioritize getting experts on specific historical examples of Red and Blue leadership and adjusting the modifiers to bring the scoring adjustments in line. Alternatively, entirely new personalities might be generated.

Table 4.2. List of National Command Authority Scoring Adjustments and Threshold, by Personality Type

Name	Population	Leadership	Military	Industrial	Escalation Thresholds (Level ½)
Pensive Red	1	5	0	3	70/40
Indecisive Red	0	3	3	1	80/40
Aggressive Red	0	5	3	1	90/50
Pensive Blue	5	0	1	3	60/30
Middle Blue	3	0	1	5	70/55
Aggressive Blue	1	1	3	5	80/50

Action, Event, Play

As noted, the sequence of play can be thought of as a simple game loop (Figure 4.1). The loop consists of drawing one or more cards from the event deck, which represents the game scenario and reflects an event of significance that both players must observe. Players simultaneously play out the event in two impulses. During each impulse round, players choose a type of card to play, hand it to the game master, and the game master reveals both simultaneously.

The game loop was designed to avoid player adjustment to their adversary in the first move but still allows an adjusted second move to the observed interaction in the first move. Cards from the action deck or LNO cards can be played that can modify player scores or facilitate communications. Players can pass blank actions during a move so the other player will not know that a player has passed on an impulse and could adjust their actions to take advantage of the opposing player being passive.

Scoring adjustments occur after each step. This allows for the possibility of an escalation event occurring immediately following a given impulse, which could further adjust scores and, in theory, trigger other escalations; cause a shift toward a more dangerous escalation deck; or, *in extremis*, cause general nuclear war to erupt.

We now offer a closer look at each game element as designed.

Action Cards

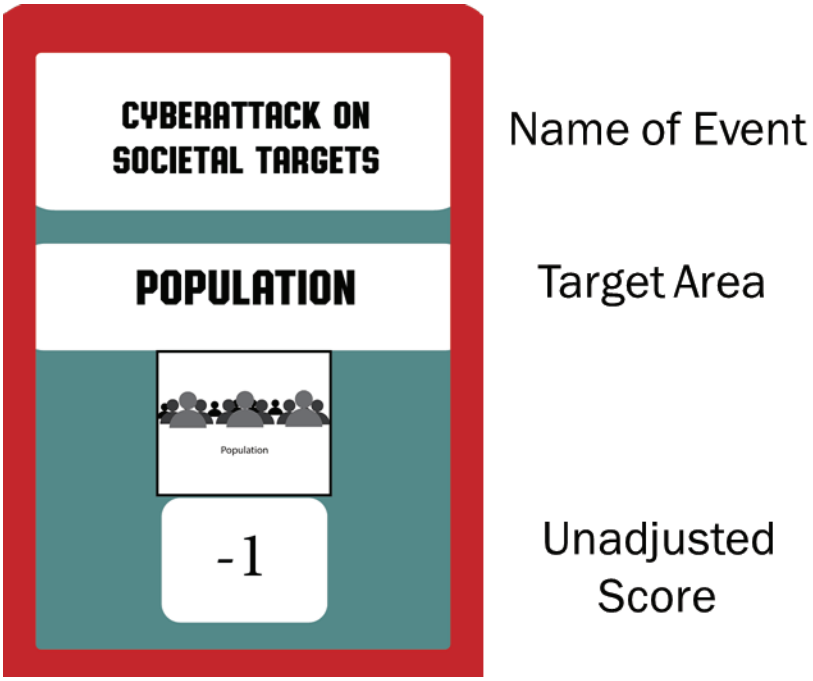
Action cards are the primary way players interact with each other in the game and allow the players to conduct all manner of operations not directly requiring the use of nuclear forces. Action cards are one of the two types of cards the players can use at their discretion. The action cards allow for the players to conduct sets of operations above and beyond what might ordinarily be conducted in the active combat phase and serve to capture major actions undertaken by the commander in the theater. The actions fall into the following few broad categories:

- military actions and conventional strikes
- unconventional warfare
- cyber and information warfare
- diplomatic overtures and player to player communications
- war termination or de-escalation actions.

These cards were designed and created to provide the players with non-nuclear options and even allow the player to potentially avoid using a nuclear weapon at all. As the game is designed to be a learning experience and to help the players think through the use of nuclear weapons, the decision to not use a nuclear option is as significant as the decision to employ them. Action cards effect a given target type, corresponding to the types listed on the NCA personality card.

Typically, only a single scoring value is provided at the bottom of the action card, as the action deck is intended to be fairly generic. That being said, when an action card is played against an opponent, the player who placed the action card receives a positive score increase equal to the value on the card plus the scoring modifier on their NCA card corresponding to the appropriate target type. Action cards are refreshed at a rate of one square per turn via the force flow section of the game board. In the scenario designed for the prototype, Blue starts with fewer action cards compared with Red, but Blue enjoys a greater number of cards in the force flow queue to represent operational dynamics present between the dyad. Figure 4.4 provides an example action card for reference.

Figure 4.4. Example Action Card



Signaling Through Action Cards

As discussed in Chapter 3, a key aspect of thinking about nuclear weapons is signaling. Therefore, *A Strange Game* is designed to be a game of hidden preferences and to teach players about messaging through the use or nonuse of nuclear weapons. One of the ways that the design of the game reinforces this learning point is through limiting communication or table talk between the players during the game. Special action cards (e.g., demarche or back channel negotiations) provide the means by which players can communicate. When such a card is played, the player who is using the card during a given impulse, or half of a turn, writes the message they wish to convey to the player onto the card itself and hands it to the game master. The game master reads the message to the opposing player who has the option to respond or not respond via their own method of communication on the next impulse.

By way of example, imagine that the Red player plays the demarche action card with the following note written on it during impulse 1: "Cease your offensive immediately, or we will be forced to escalate." On the following impulse (in this case impulse 2) the Blue player plays the back channel negotiations card with the following message written on it: "We are willing to de-escalate, but we cannot agree to your primary objective." This is an example of how intra-game communication is intended to work in *A Strange Game*. The choice of card (i.e., back-channel negotiations) itself sends a message alongside the actual message written by the player. One of the primary ways game play ends is with mutual player agreement on war termination, and it is through this communication mechanism that such mutual agreement can be reached.

Limited Nuclear Options

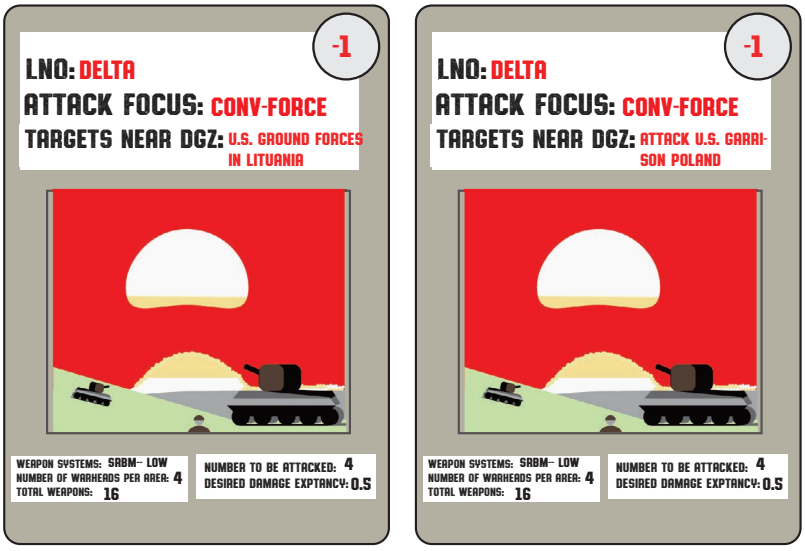
Several LNO sets, packages containing several individual cards, are given to each Red or Blue team based on the NCA personality card the player chose at the start. These cards function as a special type of action card and include information about the specific nuclear weapon deployed, target, and damage done to the target. There is a reference spreadsheet available as a supplementary game material outlining why the amount of damage occurred and an attachment to describe why the target and weapon were chosen for each other. Player use of LNO cards is shaped by their NCA personality and the escalation level, described in more detail below.

An LNO card consists of a given number of attacks designed to accomplish specific tasks with an appropriate number of weapons to produce the desired effect. The LNOs are grouped into sets of preplanned options that have an overarching objective and given a North Atlantic Treaty Organization (NATO) phonetic designation (i.e., alpha, beta, charlie, etc.) to indicate which cards belong to which package. Players have the option to execute either an entire LNO set during one impulse or a single card from a given set. When playing either a single LNO or the entire package the player must physically place radiation tokens on the board to indicate where the strike takes places. This is important both to ground the players in the fact that real world locations are being struck and to help aid the player in attempting to signal their intent; the

choice to strike or not strike a certain target or region may present an opportunity outside verbalization to convey intent to the opposing side. Figures 4.5 and 4.6 provide examples of both a single LNO card and a notional LNO package, respectively. Appendix B provides a closer look at the methods our team used to develop the LNO cards.

Figure 4.5. Sample Limited Nuclear Option Card

Figure 4.6. Sample Limited Nuclear Option Set



Event and Scenario Cards

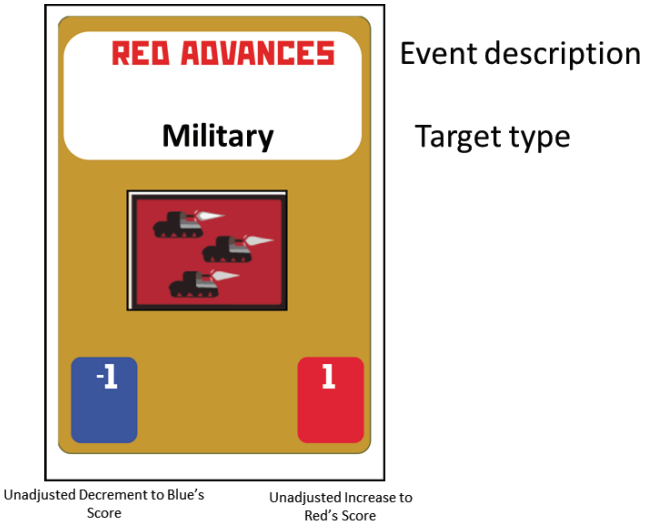
Event cards, of which scenario cards are a specific subset, represent the broader conflict over which the player does not have direct control. Figure 4.7 provides an example of an event card

for reference. Whereas action cards are used at the discretion of the player, event and scenario cards are drawn each round. They were designed to accomplish two important tasks within the game:

- **Force the players into a world where nuclear weapons have been used.** This stops the players from simply not considering nuclear weapons.
- **Provide a prompt for players on the conventional side**, forcing them to deal with and, at least, consider nuclear weapons not only in the context of a two-way nuclear exchange but as a tool in war where more common military issues are being dealt with by the players. They serve as the main drivers of the game's broad trajectory.

Scenario cards are a special type of event card which have been presorted to tell a particular story and (in the scenario designed for the prototype game) serve to set the stage for a world that has broken the nuclear taboo, thereby absolving the players from being the first to fire a nuclear weapon. The scenario cards are stacked in such a way as to simulate a portion of a notional conflict, and to provide the players with a logical progression of events leading to a nuclear first use by an NCA, by way of a nuclear demonstration over the water. Following that use of nuclear weapons, the prewritten scenario ends and generic event cards are used. These event cards continue to contribute to the game by replicating some of the military and political actions that will be occurring even after the first nuclear weapon use, which might theoretically drive the war over an escalation threshold for additional NCA nuclear use.

Figure 4.7. Example Event Card



NOTE: Scenario cards are functionally identical to event cards except they have a "Move #" printed along the bottom of the card to indicate how the deck should be assembled and when they should be played.

Escalation Stability Level

As discussed in Chapter 1, one of the most important game mechanics is that which governs nuclear escalation. One of the chief theoretical concerns of nuclear weapons employment is managing the crisis and preventing it from spiraling out of control. This is represented in the game by a mechanic called the escalation stability level. This nuclear escalation stability level in the game dictates the propensity of the NCA to act independently of the theater commander's intention and to conduct activities with greater risk of escalation by way of crossing critical thresholds for the adversary; leading an adversary to establish a posture that is difficult to control, such as the effective pre-delegation of the authority to employ nuclear weapons; or through damaging or corrupting systems the adversary may be depending on for effective control of its own nuclear forces and warning systems. In essence, it is the game's manifestation of Kahn's escalation ladder discussed previously.

From a mechanical perspective, these escalatory thresholds provide a heuristic by which the players can gauge how their fictional NCA views the conduct of the war and can provide a motivation to act or not act. It also serves as a *de facto* safe guard against player inaction by having the game take additional actions against the opposing player as the situation deteriorates. Escalation can theoretically be set at the outset at any of the three following levels reflecting the NCA strikes without consultation with the theater commander:

- **Level 0 (default start state):** NCA has not reached a critical threshold for employing nuclear forces without coordinating with theater commander. No nuclear strike, and authorization may be delegated to the theater commander for operations in preauthorized strike packages. LNOs cannot be executed at this time.
- **Escalation level 1**: NCA has executed a limited nuclear strike based on crossing a critical threshold without coordinating strike with the theater commander. Strikes are characterized as being, in general, more limited in nature, reflecting NCA objectives. LNO release authority has been granted. A variant here provides predelegation to the players. Draws from the escalation decks only occur when thresholds are crossed.
- **Escalation level 2**: NCA has executed a limited nuclear strike based on crossing the second critical threshold without coordinating strikes with the theater commander. Strikes are characterized as being, in general, both larger and striking more sensitive targets than level 1 attacks. Players retain LNO release authority.

Increasing escalation levels reflect the heightened readiness of the nuclear forces, warning systems, and the likely mindset of the decisionmakers leading countries in direct armed conflict.

A player's escalation score starts at 100 and changes through the course of the game as a result of action and event cards through the scoring mechanisms described in the next section. The escalation stability level is a simple representation of the complex mix of technical, military, political, sociological, and psychological factors that influences the likelihood policymakers would take actions that lead to large scale use of nuclear weapons. A key element here is to use escalation levels as a way to create pressure from the national command level in the form of possible nuclear strikes in the event the player did not avoid critical thresholds. The player is

essentially trapped between a war that is progressing along its own trajectory and NCA actions that can lead to increased likelihood of uncontrolled escalation.

As the situation deteriorates, the chance of uncontrolled escalation increases. In the game, the chance of unintended consequences ultimately leading to general nuclear war is simulated through die rolls every time the nuclear threshold is crossed. The number of dice provided to the player to roll is determined based on the threat level column in the following table; each player starts with a total of four and this is decreased as the escalation level increases. The game starts at level 0 for both players, and when (in the prototype game) the first scripted nuclear weapon occurs, the player responsible moves both players from level 0 to level 1. Hereafter, players continue to move up the threat level together. The players are then each presented with the number of dice indicated. Whenever a given threat level is reached (i.e., each time a given side executes all or part of an LNO package), the following procedure should be followed for all threat levels as referenced in Table 4.3 below:

1. After an escalation card is played, the attacker rolls all dice.
2. Lookup threshold for appropriate level of escalation of the victim in the game based on the attacker's current state.
3. Dice are rolled; if above threshold, general war averted. Escalation will stay at current level.
4. Remove one die from the side that launched the attack if that side has more than three dice. The number of dice never drops below two dice.

The threat level attempts to capture the state of both the attacker and the attacked in single value. The idea here is that the danger of the attack reflects back on the attacker much as might happen from someone removing the safeties of the bomb.

Table 4.3. Game Loss Threshold and Saving Score Chart

Threat Level	Number of Dice	Critical Score for Save (Sum of Dice)	Probablity of Save (Percent Rounded)
Level 1	4 d6	8	97
Level 2	3 d6	8	84
Level 3	2 d6	8	42
Level 4	2 d6	10	17

NOTE: *d6* refers to a six-sided die. Thus, *n* d6 means the number of six-sided dice to roll. For example, 4 d6 means the player should role four six-side die (yieding a number value between 4 and 24).

Scoring—Key Concepts

Critical to communicating the consequences associated with different strategies in a wargame is the scoring system. This allocates damages and points for each action card. The scoring system links events and actions (and can be applied to LNO and escalation events) to the escalation stability scores; central to the play of *A Strange Game*. It has been designed to allow for the use

of a consistent approach that separates events into categories of small, medium, and large impacts that are played within the game.[32] This methodology allows designers to potentially rebalance the game to account for situations where it might be better to reflect the outcomes of preexamined scenarios or to rebalance the game so that it becomes clearer how a shift in event balance might impact play and alter perceptions of the ongoing conflict.

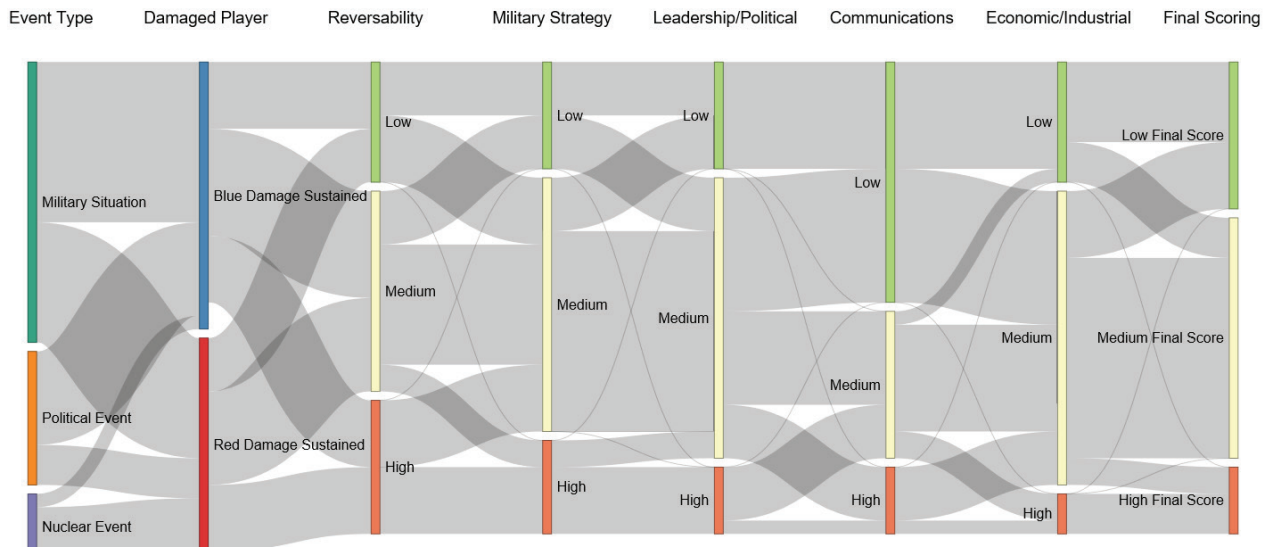
In Figure 4.8, we show how each of the 37 unique event cards were categorized across multiple variables, including across each kind of event, the agent receiving damage, and the domain of war.[33] At the end of the diagram, it shows the distribution of cards across the final score categories of low, medium, and high. The categories we defined are represented as nodes in the diagram, and the designation of the individual cards into each node are the links between each node. The two nodes on the left hand of the diagram are categorical and provide information on the cards themselves. The first node shows the event cards in terms of the type of event they best represent. The next node indicates which player sustains damage from a particular event (i.e., for the card "Blue attacks Red air base," Red would sustain damage). The gray bars connecting these two nodes indicate the number of cards from each event type that also are events in which a Red or Blue player is damaged. For example, there are a total of 19 military situation cards. Of these, 12 cards indicate Blue damage sustained, and 9 indicate Red damage sustained. Based on these numbers, the gray bar splits proportionally between Blue and Red damage sustained, creating a flow of information.

[32] The scoring system is a radical simplification of complicated, multi-factor systems used in many decisionmaking models. The simplification here was made to ease the workload on the player and to allow for rapid play of the game. It also was designed to allow for more-complicated approaches to be used where multiple factors are tracked in different categories (political, military, social, economic, etc.) if that is seen as desirable, where rules for triggering events and feedback loops could be incorporated. While all interesting, most of the trade-offs are then in the minds of the NCA, and the rulesets become complicated.

These more-complicated systems would be more suitable for a computer-mediated game, although the problem of creating a family of rules or interaction models that have been trained to mimic real-world cases would still persist. Overall, the simpler system is probably better when the focus is not on the NCA behavior, but on how players cope with entities that might be pressuring them in a nuclear warfighting situation. The simplicity allows for (1) easily adjusting thresholds based on expert input to get, at least, some broad idea of impact, (2) create a unified scoring system that can motivate the game, and (3) hew close enough to real-world decisionmaking to still be instructive.

[33] The diagram used to show the relationship between events and the gates is a *Sankey diagram*, which is a type of flow diagram in which the width of the arrows connecting each node is proportional to the flow rate. It has primarily been used to represent energy flows, but this medium has also been used to show a broader set of information. A famous example is Charles Minard's Map of Napoleon's Russian Campaign of 1812, in which the flow of the surviving French army over time is transposed over a geographic map that tracks the actual route of their campaign.

Figure 4.9. Sankey Diagram Detailing Card Scoring Logic



The next five nodes show the assessment of potential impact from the event cards for each domain of war category. Same as the categorical flow of information above, the gray bars show the flow of information between each node and indicate how many event cards were categorized into each damage category based on the answers from the questionnaire for that domain. This type of visualization helps show several types of trends. It allows for insight into overall categorization of event cards by node. For example, we can see that military strategy and leadership/political nodes had a majority of medium assessed cards, likely indicating that most events had some higher-level impact on these two categories, reflecting the broad responsibilities and uncertainties they must account for during a conflict. On the other hand, the communications category had a majority of low cards, indicating that many of the events, although having some level of impact, generally had to specifically target communication in order to reach a higher level of impact.

We can also see how damage assessment categorization changes between each node. Events that fall into high damage categorization generally remain assessed as high or, in some cases, medium. None of the cards, as ordered in this diagram, move from low to high or high to low damage assessment. This indicates that events on the extremes of the impact spectrum tend to have similar rankings across all domain categories, although those that fall somewhere in the middle can have more variation as their effects are harder to quantify. The flow of cards to and from medium damage is much more active in terms of moving to different categories. The final node on the left shows the resulting final scoring and categorization of each card. The distribution shows that the majority are designated medium and the least as high damage.

Every player starts with 100 level of concern (LOC) points, and there is no mechanical maximum or minimum point limit the player can have. Higher point totals are considered better, insofar as the player is moving away from their NCA's escalation threshold. In real terms, these

are meant to represent an amalgamation of different elements of national power (economy, military, political, population) that the nation cares about. In game mechanic terms, these serve as a visual cue to the player about the progress of the conflict. Throughout the game, this number moves up or down based on events in the game. The magnitude of change is dictated by the combination of the player's persona and objective score reported by the action, event, or LNO cards. The player's NCA card contains information that serves as private adjustment to the publicly viewable score listed for the event.

The players point totals within the game are generally adjusted by a base score set of –5, –3, –1, 0, +1, +3, +5. These values roughly correspond to small, medium, or large levels (positive or negative) of impact on the conflict or adversary. The particular range was chosen to simplify calculations while playing the game and decrease the cognitive load on the player by simplifying mental math. These base scores are, in turn, modified by how greatly the NCA cares about the class of event, which serves to magnify the impact of all nonzero scores in event, action, escalation, or LNO cards. Because any card played effects both sides and each side's NCA might value different actions differently, outcomes can either be zero or variable sum.

The calculated LOC score interacts with threshold value (privately available to each player) indicated by the NCA command card and dictates when particular escalation events will be triggered, which represent national command–level interventions. The thresholds are treated as explicit by the player but with the optional addition of a stochastic element whereby a random card is drawn from the appropriate escalation deck. In-game scoring changes come in the form of cards being played during the game, which can either add to or subtract from their score. The LOC score itself is mechanically used only to determine if cards need to be drawn from an escalation deck and motivate player action in the game. There is no winning or losing score a player can achieve.

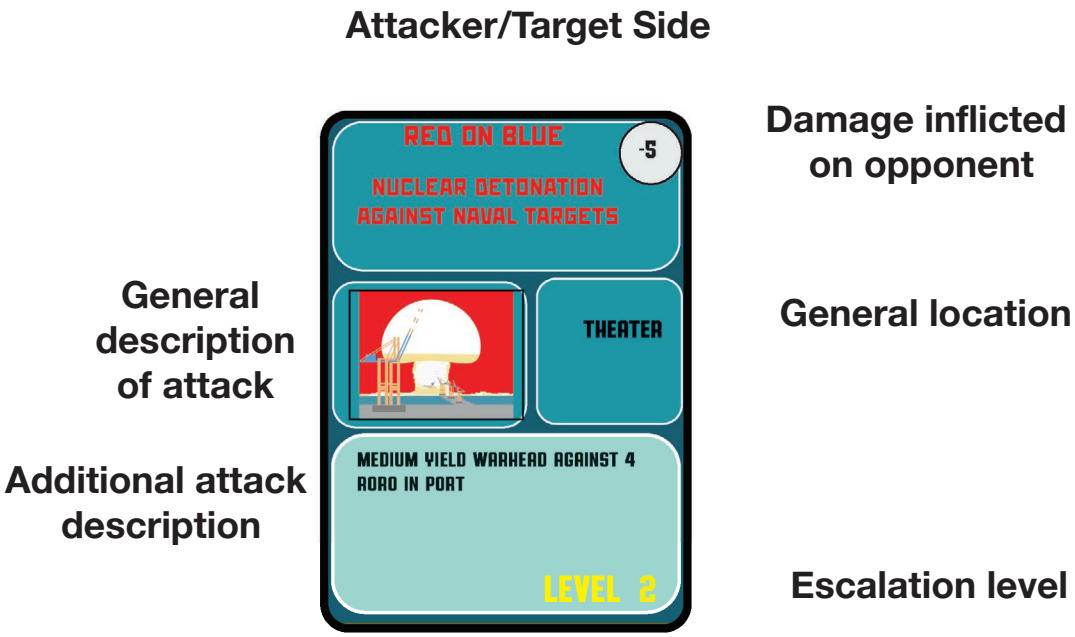
Escalation Cards

Whenever an escalation threshold is crossed, players must draw an escalation card from the escalation deck. This represents events beginning to spiral beyond the player's control. The underlying concept of the escalation cards is simple: They provide a degree of pressure on the player. This might arise from provocative strikes being executed by direct orders from national command level, over which the player has no control. The impetus for these strikes could be focused on addressing issues that might be outside the theater commander's purview, yet, oddly enough, might be triggered by perceived lack of success in the theater. The tiered escalation levels present in the game reflect the increasing severity of attack families that might be pursued and is designed to reflect the tendency of leaders looking to escalate yet retain a degree of control.

During game play, the use of escalation cards is fairly simple: When a player's score total falls below the thresholds indicated on their NCA card, an escalation card is drawn. The types of escalations can range from conventional attacks against military targets to nuclear attacks on

value targets. Cards have several elements: the attacker and victim of attack, observed event, location description, and severity level to indicate the deck in which the option is to be placed. Figure 4.10 shows a sample escalation card and provides a description of each piece of information contained on the card.

Figure 4.10. Example Escalation Card



The preferred sequence of use is as follows. Use of the level 1 deck is triggered by crossing the score threshold indicated on the bottom left of the player's NCA card. Cards should be drawn from the level 1 deck until level 2 thresholds are triggered by a player's score crossing below the scoring threshold indicated on the bottom right of the player's NCA card. The game was designed such that the first use of the level 1 deck occurs the first time the player's score threshold crosses the boundary. From then on, it is played when an event card specifically indicates usage of the level 1 deck, provided the escalation threshold has already been crossed. In the prototype, a single event is called unless the level 1 events are retriggered when they are fired again. Level 2 cards function identically to level 1 cards, only increasing in severity.

In the prototype game, one of the core ideas is for the players to be squeezed between the demands of the ongoing conflict that could conceivably be addressed through use of nuclear forces on one hand and the escalatory actions that might be taken by the NCA should the situation in the war deteriorate too much on the other hand. Furthermore, players can always elect not to respond any nuclear use; nothing in the rules require them to do so. Players can experience the pressures associated with both internal and external expectations for nuclear weapons use in the face of a provocation and think strategically about both using and not using nuclear weapons to achieve their longer-term strategic objectives.

Game End States

This final section details how the game ends, either via loss or war termination.

Loss State

General nuclear war occurs. This can happen through the escalation deck, accompanied by the failure of a player to reach or exceed the required number indicated in the critical score column in Table 4.3. Failure to meet or exceed this score represents events spiraling out of control toward general nuclear war.

Mutual War Termination

Aside from triggering a loss state as described above, the only other way for *A Strange Game* to end is through mutual player agreement to terminate the war. As we described in a prior section about player communication, intergame communication between the players is conducted through specific action cards. It is up to the players together to decide together whether to continue prosecuting the conflict or seek agreement to cease the conflict. Players should be reminded that there is no winning or losing points score; it merely serves as a heuristic for telling them how good or comfortable their side feels about the ongoing progress of the war. As in real conflict, which side won or lost the game after mutual war termination is reached is in the eye of the beholder.

Chapter 5. Conclusion: A Prototype and Its Future

The version of *A Strange Game* described herein represents the most basic version of the game. One can imagine any number of potential modifications or complications that could be introduced to meet future needs. That being said, the team has identified three useful ways that *A Strange Game* might be expanded in the future:

- Enhance the player experience by adding in more visual elements and supplements for the players during the scenario events.
- Refine and update the scoring system to reflect more and more varied Red and Blue subject-matter expert judgement.
- Create a new scenario deck and expand *A Strange Game* to cover a different region. As noted in the previous chapter, the prototype was designed around potential conflict between the United States and Russia. Subject-matter experts can help to pivot the game's focus to any two countries in the world.

Although these three areas represent some of the most promising areas for future game development, any future work on *A Strange Game* should take as its first step the creation of more player visual aids. One key lesson from the design and play tests of the game was that, as it is currently played, *A Strange Game* is more of a tabletop exercise than a game designed to be played by a general audience. That being said, with relatively minimal effort, faux news clippings, pictures, and other visual aids could be created to psychologically draw the players into the conflict, which will enhance immersion and hopefully create a more meaningful player experience.

On a more technical level, although the team developed an in-depth scoring system and used it internally, having more subject-matter experts weigh in on how they think cards should be scored would enhance realism. For example, players could be asked to think about delivery systems, missile defenses, prelaunch warnings, and nuclear counterstrikes on warning as a free action (i.e., *launch on warning*). This would obviously require not-insignificant amounts of effort. That being said, specialist audiences would likely be interested in tweaking event scoring to reflect their views of the damage level of certain cards, which the game system can handle. We have provided a detailed methodology as to how to do this in Appendix A. Ideally, this could be paired with the expansion of the game to a different theater. Finally, new scenario decks could be developed to represent different conflicts. Obviously, a new gameboard and new LNOs would need to be created, but this is also a promising area for future development.

Looking Forward

In the future we hope to add more complexity to the game. Specifically, this will allow actual circumstances during game play to modify how certain actions are scored. Some of these include the following:

- **Roll for success.** We assume each action undertaken by Red or Blue will be successful. However, a more reflective assumption would allow for some possibility of failure. Depending on the action, certain details like successful launch or cyberattack might be subject to a dice roll to determine whether it was undertaken successfully. If not successful, a predetermined set of scoring penalties will be put in place instead.
- **NCA modifier.** The assumed personality traits associated with Red and Blue could have significant consequences on the actions they choose to take and how they react to the actions of their adversaries. In scoring for the game, if a certain temperament category is either a 1 or 5, then the related scoring category is modified automatically as being a red category or green category, respectively.
- **Hardening and additional damage modifier.** The types of weapons used for some event or escalation cards will have an impact on how serious the damage will be on its target, as well as potential collateral damage. Some actions could be mitigated by hardening or resilience actions ahead of time. If stated in the beginning of the game, the damage associated with the event or escalation card will be reduced. On the other hand, some weapons can be modified to cause more extreme levels of damage, such as lacing a nuclear weapon with Cobalt. In these cases, certain categories will automatically be escalated to the red, and there will be increased damage (and possibly benefit) points
- **Further refining and validating scores.** The questionnaire on which scores are based is presented in Appendix A. The scores could be further validated if administered to a wider audience of subject-matter experts in warfare, nuclear weapons use, and military history. The Delphi method could potentially be used over a set of questions and with controlled discussion in order to reach a consensus on each score.[34] Prior to validation, the questionnaire would benefit from further consultation with a survey methodologist to ensure the questions are balanced in a way that does not skew scoring and to ensure wording and intent is clear.

Adding additional complexity to the game must be balanced against the need to keep the game simple and fast enough to be played with relatively new audiences. As the game is reviewed and additional input is gathered, we will continue to improve our scoring system and incorporate new elements that will benefit the entire game.

In conclusion, although we have completed our objective of providing a finished base version of *A Strange Game*, we have hopes that it will continue to expand and grow in several different directions. The need to learn and question our assumptions about the potential use of nuclear weapons is not going away any time soon and, in that sense, *A Strange Game* will be evergreen.

---

[34] Heather L. Noga, Elizabeth C. L. Walsh, Jenny J. Shaw, Jane Senior, "The Development of a Mental Health Screening Tool and Referral Pathway for Police Custody," *European Journal of Public Health*, Vol. 25, No. 2, April 2015.

Appendix A. Scoring Methodology Deep Dive

In the nuclear wargame, each player is able to play escalation and event cards that have political, diplomatic, and military elements associated with each action. To facilitate quick and smooth game play, each of these cards must have consequences and benefits abstracted into simplified point categories ahead of time. This appendix describes the diagnostic scoring method developed for every card featured in the game (except the NCA) and areas for growth in future iterations of the game.

Background

As noted in the introduction, *A Strange Game* is inspired by RAND nuclear escalation models developed in the 1980s and used in automated analytic wargames.[35] These models were developed to push the discussion of strategic nuclear analysis beyond the traditional exchange calculation and to consider how the interpretations of Red and Blue agent temperaments changed responses to escalation actions. This is the basis for the development of the NCA cards in the nuclear wargame deck. Escalation in these models extended the traditional definition of increasing the intensity or expanding the area of conflict to include more nuanced factors between adversaries. They instead used the definition posited by Thomas Schelling who considered escalation to be "bargaining over the limits of war."[36] In this sense, escalation occurs when an adversary crosses the understood (or implicit) boundaries between adversaries. There are two major components to consider in this definition of escalation: (1) the direct military value of escalation and (2) the effect on the opponent's will and perception on both the opponent's strength and their own strength.[37]

We use this as the underlying principle for determining how to consider damages and benefits when scoring escalation and event cards. The Schelling definition of escalation is reframed to consider each event card's escalation potential in terms of the following:

- Absolute damage: estimate of its physical area of effect and the duration of damages

[35] Paul K. Davis, Steven C. Bankes, and James P. Kahan, *A New Methodology for Modeling National Command Level Decisionmaking in War Games and Simulations*, RAND Corporation, R-3290-NA, 1986; Paul K. Davis, *Some Lessons Learned from Building Red Agents in the RAND Strategy Assessment System (RSAS)*, RAND Corporation, N-3003-OSD, 1989; Paul K. Davis and James A. Winnefeld, *The RAND Strategy Assessment Center: An Overview and Interim Conclusions About Utility and Development Options*, RAND Corporation, R-2945-DNA, 1983.

[36] Schelling, 1960.

[37] Charles Glaser and Paul K. Davis, *Treatment of Escalation in the RAND Strategy Assessment Center*, RAND Corporation, N-1969-DNA, 1983.

- Strategic implications: how the actions and resulting damages may be interpreted by different conflict domains, including political/leadership, military strategy, communications, and industrial/economic

Absolute damage is a factor of the physical boundaries crossed and area of effect of the action. In most cases, this is relevant to kinetic actions, such as a conventional or nuclear missile strike. To limit the possible combinations of missile strikes, the nuclear wargame has predeveloped strike packages associated with different objectives and levels of force. Each of these packages is created to reach a certain probability of success and, when scoring the strikes, we assumed they are carried out successfully. However, absolute damage is also applicable to nonkinetic actions such as cyber or political actions. Although less clear cut, these types of actions still have tangible effects on communications, data integrity, or international rules. In the case of a space attack or cyberattack, specific communication systems or strike capabilities can be targeted and damaged. In the political or diplomatic realm, specific country or alliance actions might force the closing of specific borders, pausing of hostilities, or opening of transportation hubs. Again, for the purposes of the game, we assumed these actions, once taken, are successful for a period of time.

Important for the scoring of the game, is the information used to create the event and escalation cards. Using nuclear strikes as an example, this included fallout probability, number of weapons used, weapon yield, and radiation potential. In the example of a unit or exquisite asset being hit (such as through a cyberattack), we knew generally how many other units or assets would be available to mitigate or replace the lost assets from the damage.[38] This is similar to information used by the U.S. government when considering targets and estimated requirement for use of force.[39] Information on these factors is used to inform the scoring profiles we considered for each action.

Strategic Implications

Estimating how an escalatory action might affect a conflict beyond physical damage is rarely straightforward. Across the multiple domains in a conflict, there is a variety of potential interpretations decisionmakers could glean from an adversary's action. Even the targets themselves can serve multiple purposes and can affect the integrity of domains beyond just their primary function. For example, a main operating base is critical for supporting throughput capacity, providing secure communication capabilities, storing valuable military equipment, and housing thousands of U.S. military members and civilians. A kinetic (or, in some cases, nonkinetic) strike can put all or only some of these elements at risk; but all military domains

[38] See the discussion on action cards in the main body of this report.

[39] U.S. General Accounting Office, "Strategic Weapons: Nuclear Weapons Targeting Process," GAO/NSIAD-91-319FS, September 1991.

connected to the target will be required to consider how the action affects their interests. Their individual interpretations of how the action affects their respective domains and how seriously they perceive the action will ultimately inform how the national command leadership, as a whole, will respond.

The escalation models from the 1980s handled the question of how an agent (or player) would respond to escalatory events by developing rule sets associated with particular NCA temperaments and possible decision trees to look ahead to likely responses to escalatory events based on those characteristics. Descriptive characterizations for each NCA personality was stripped down to fundamentals through the creation of an attribute list. This list contains a set of dimensions along which a general orientation toward political-military decisionmaking was categorized. Within each attribute are multiple values used to construct how each attribute is defined. The main goal of this method was to provide a plausive, coherent, and consistent basis for the many and varied decisions an NCA might choose. The attributes devised were internal constraints on strategic orientation; warfighting style; flexibility; and perceptions the agent has of other agents' temperament and policy.[40]

We built off the idea of categorical attributes and a multidomain decisionmaking approach to develop our own attribute list for how a player might respond to an escalation action by an adversary. In the absence of automated modeling tools, we use a structured questioning method that we apply to each escalatory or event action and determine its escalation potential based on the severity of the responses to each question within the domain category.

This method was inspired by assessments used in the medical field to diagnose mental health issues. Mental health is known to be difficult to diagnose because of "limited availability of objective biological tests and variable diagnostic guidelines, alongside intercultural differences in the mental health experience and complex social and psychological confounders."[41] Parallel difficulties are found when attempting to assess the potential impact of military events or actions. Although warfare generally consists of events that have some known absolute effect, the considerations for acceptable damage might change rapidly in a conflict and in specific geopolitical environments. Political and military leaders might perceive these actions very differently depending on their personal and cultural expectations, as well as their particular relationship to the event and decisionmakers in the conflict. This creates serious difficulties in classifying and predicting how each action could be received.

For mental health care, the gold standard would be a "diagnostic, definitive assessment of a person's mental health status [that] comes from rigorous psychiatric interview by trained clinicians, in most countries, a psychiatrist or clinical psychologist. These diagnostic interviews

---

[40] Kahan, James P., William L. Schwabe, and Paul K. Davis, *Characterizing the Temperaments of Red and Blue Agents: Models of Soviet and U.S. Decisionmakers*, RAND Corporation, N-2350-NA, 1985.

[41] Jacob King, "Measuring Mental Health Outcomes in Built Environment Research: Choosing the Right Screening Assessment Tools," Centre for Urban Design and Mental Health, February 2018.

may take up to a couple of hours to complete and involve multiple layers of questioning and testing for wide-ranging symptoms of mental health."[42] Similarly, we imagine that, to properly score each action in the war game, we could convene a panel of subject-matter experts, specific to each particular action, and have them rigorously assess implications of each action over several sessions. However, the resource-intensiveness of this process, for the war game and for mental health care, makes using this method difficult or, in some cases, impossible to administer on a larger scale.

To address this issue, the medical field has developed simplified screening tools, such as patient self-assessment tools.[43] Although these tests might not be able to definitively confirm a mental health disorder, they can efficiently assess specific aspects of mental health symptoms in a person and, in some cases, the severity of the disease with a high rate of accuracy.[44] The patient health questionnaire, used to diagnose depression, is an example of this type of tool. It is a multipurpose questionnaire that uses the Diagnostic and Statistical Manual of Mental Disorders-IV depression diagnostic criteria and other major depressive symptom questions to calculate both the presence and the frequency of symptoms. Based on the overall scoring and on whether specific categories met, a diagnosis of mild, moderate, moderately severe, and severe depression is determined. The patient is responsible for completing the questionnaire, and it can be administered over time to track development of symptoms.[45] We used this type of tool as a blueprint for our approach to scoring escalation.

Escalation Questionnaire

Using a similar format for our wargame, we constructed five conflict domain categories or attributes to diagnose the severity of the escalation or event card. The domain categories are based on the temperamental domains associated with the NCA cards and subject-matter expert inputs on the types of concerns planners consider. Each category has several descriptive questions that help discern exactly how the escalatory action affects the domain category. The categories and related questions are as follows:

---

[42] King, 2018.

[43] Katie M. Smith, Perry F. Renshaw, and John Bilello, "The Diagnosis of Depression: Current and Emerging Methods," *Comprehensive Psychiatry*, Vol. 54, No. 1, 2013. Another potential parallel are assessments for determining the lethality of a self-harm action. See, for example, Nilamadhab Kar, Arun Mohanram, Manoj K. Mohanty, and Binaya K. Bastia, "Scale for Assessment of Lethality of Suicide Attempt," *Indian Journal of Psychiatry*, Vol. 56, No. 4, 2014.

[44] Claude A. Mellins, Shuaib Kauchali, Danielle F. Nestadt, Dan Bai, Angela Aidala, Nonhlahla Myeza, Murray H. Craib, Jane Kvalsvig, Cheng-Shiun Leu, Justin Knox, Stephen Arpadi, Meera Chhagan, and Leslie L. Davidson, "Validation of the Client Diagnostic Questionnaire to Assess Mental Health in South African Caregivers of Children," *Clinical Psychology and Psychotherapy*, Vol. 24, No. 1, January/February 2017.

[45] Pfizer, "The Patient Health Questionnaire (PHQ-9)—Overview," 1999.

1. *Reversability elements* indicate how permanent and fatal the attack is and if it represents a change to the previous dynamic of the conflict.
    a. Is the damage permanent (i.e., was a key asset depleted by over 30 percent or does the target lack a readily available mitigation option)?
    b. Is the estimated duration of damages longer than three months to get to 80 percent mitigation?
    c. Does the attack expand the area of the overall war?
    d. Does the attack reduce the area of control for the opposing player?
    e. Does the strike cause additional interests to become involved with the conflict?
2. Military strategy elements indicate how the attack impacts the strategy and military capabilities of the agent.
    a. Does the attack require modification to the strategic plan?
    b. Does the attack directly degrade the capabilities needed to meet stated war plan objectives?
    c. Is there damage to assets that enable critical strike capabilities?
    d. Is there damage to assets that enable critical defensive capabilities?
    e. Is there damage to assets that enable logistics and maintenance capabilities?
    f. Were nuclear mission capabilities targeted in the attack?
    g. Were there extensive damages exquisite capabilities?
3. Leadership/political elements indicate how the attack affects and is interpreted by the political and leadership level.
    a. Were civilian populations intentionally targeted and put at risk?
    b. Did the attack damage any cultural or symbolic institutions (including symbolic ideals, projected strengths, and values, which could be threatened through targeted attacks)?
    c. Were there damages sustained by homeland services or civilian populations?
    d. Were there damages sustained by military services or populations?
    e. Were there damages sustained by intrinsic (i.e., those in the sphere of influence) military services or populations?
    f. Would response to the attack be considered setting a precedence for future conflicts?
4. Communication elements indicate how the attack affects the communication capabilities and ability to operate on the battlefield (i.e., intelligence, surveillance, and reconnaissance; secure communications).
    a. Is there damage to the communication lines that enable critical space capabilities?
    b. Is there damage to the communication lines that enable critical cyber capabilities?
    c. Does the strike to the communication lines create an environment where secure and clear communications are degraded, risking misinterpretations or delayed ability to talk to one's allies?
5. Industrial/economic elements indicate how the attack affects the military industrial base's capabilities and capacity to sustain the war effort.
    a. Did the strike target capabilities meant to sustain and support the throughput of the military force?

b. Does the attack damage infrastructure or locations critical to war planning operations?
c. Does the attack affect the production capability of the military industrial base?
d. Are the relative costs and efforts of the reconstitution efforts required considered substantial?

Each descriptive question is framed as a yes or no question. If the answer is yes, then the respondent determines the extent to which that element might be affected by the action in question. We used a Likert-scale anchor for *impact* to rate the responses and to attach a quantitative value to the assessment.[46] These values were captured in a spreadsheet used for tracking the answers. Questions were asked by a single team member who used their experience analyzing and modeling military effects. For the prototype of the game, this was sufficient, but future iterations should consider using multiple coders to avoid bias. The scale is as follows:

- 1 point: none, no impact on element
- 2 points: minor impact on element
- 3 points: slight impact on element
- 4 points: moderate impact on element
- 5 points: very serious impact on element
- 6 points: extremely serious impact on element

This questionnaire was used to assess each event and escalation card and assign respective damage and benefit points. As noted earlier in the paper, for ease of game play we abstracted the impact of escalation and event cards to simplified categories, which in this case are low, medium, and high. When filling out the questionnaires, it should be scored through the perspective of the player who sustained damage, and they should assume whatever action that was taken was successful. When thinking of how serious to score the impact, the assessor should broadly consider the following ranges:

- 1–2 points: minor or no impact
- 3–4 points: moderate impact
- 5–6 points: serious impact

Some cards have specific descriptions that make the potential area of damage, capabilities at risk, and threat to populations easier to determine and grade on a scale. In other card types, descriptions are less clear because the location, timing, and potential collateral effects are not known. In the cases of more-vague actions (where more information would be useful in determining impact), the assessor should place a 3 to reflect the potential impact that might occur.[47]

---

[46] Wade M. Vagias, "Likert-Type Scale Response Anchors," Clemson International Institute for Tourism and Research Development, Department of Parks, Recreation and Tourism Management, Clemson University, 2006.

[47] This is also meant to reflect that decisionmakers might not have complete clarity after an escalation action and might have to assume some domains could be potentially vulnerable from the action, even if that might not be the case.

Once the questionnaire is complete, points are summed by each category type. In order to determine how affected each category is by the action, the total scores for category are assessed by where the score falls (for example, the bottom, middle, or top third) in terms of the total number of possible points. This is translated into different levels of impact. For example, in the reversibility category, if the total score across all questions falls between 5 to 12 points, it should be ranked as low impact.[48] If the score falls between 13 to 20 points, it should be ranked as medium impact. If the score falls between 21 and 30 points, it should be ranked as high impact. The minimum and maximum scores for each category vary depending on the number of questions. The resulting assessments for each category are then compiled across multi-domains and used to inform how to assess the level of damage and benefits for each action. Table A.1 shows what the final assessment looks like for several event cards and how a conditional-colored scoring system can help highlight scoring information.[49]

Table A.1. Final Scoring Overview

	Max Score: 30	Max Score: 42	Max Score: 36	Max Score: 18	Max Score: 24
Event Card	**Reversibility**	**Military Strategy**	**Leadership/ Political**	**Communications**	**Industrial/ Economic**
Red advances	20	17	21	4	14
Red air strikes	17	22	20	9	14
Red headquarters destroyed	18	29	18	15	13
Collapse of Red's front line	21	29	24	5	11
Red theater target hit by nuclear detonation	22	31	26	10	15

Finally, after assessing the multi-domain results, damage points and benefits are awarded to Red and Blue. The motivation behind keeping the scores disaggregated, as opposed to only looking at a grand total, is that multiple domains must sustain serious levels of damage in order to assess how points should be taken away or gained. If some domains are less damaged than others, this will at times offset scoring. Scoring is based on the following rule set:

[48] Note, the scores are never 0 points for any question in order to reflect that, in wartime, each of these critical domains will have to be aware of the action to some degree; even if it does not affect them, it will contribute to their perception in the conflict.

[49] Were the table color-coded, green would indicate the lower third (i.e., minor impact), yellow would indicate the middle third (i.e., moderate impact), and red would indicate the top third (i.e., serious impact).

- For assessing damages (–1, –3, or –5 points)
  - Score –1 is assigned if
    - all categories are green
    - two or more green categories in a row of all yellow categories
    - no categories reach red level
  - Score –3 assigned if
    - all categories are yellow
    - one green category; all other categories are yellow
    - one green category and one red category; all other categories are yellow
    - one red category and all yellow categories
    - three green categories and two red categories
  - Score –5 assigned if
    - all categories are red
    - there are two or more red categories
- For assessing benefits (1, 3, or 5 points)
  - Score 1 assigned if
    - all categories are green
    - all categories are yellow (logic being that in order to gain points, the player must seriously damage (red) at least one category)
    - two or more green categories in a row of all yellow categories
    - no categories reach red level
  - Score 3 assigned if
    - one green category; all other categories are yellow
    - one green category and one red category; all other categories are yellow
    - one red category and all yellow categories
    - one red category; two yellow categories; and two green categories
  - Score 5 is assigned if:
    - All categories are green
    - There are two or more green categories
- Score of 0 points is given if the action taken by a player is not directly related to the actions of an opposing player (i.e., strategic pause)

Appendix B. Limited Nuclear Option Deep Dive

To create the LNO cards, we methodologically built them from the ground up. Once a sufficiently large number of individual cards were created, they were assembled into packages based on the overall effect to be achieved by the aggregation. The first few steps happened in order; however, the last two steps of the process depended on one another and were decided on based off of steps 1–4.

This process took the following six major steps:

1. articulate objective/goal/intent of strike
2. decide if objective/goal/intent best fits Red team or Blue team *modus operandi*, or both
3. choose a feasible target
4. decide what kind of weapon makes sense for target
5. decide on a realistic number to target
6. determine realistic damage expectancy based on target/number of target/weapon

The next sections will walk through these steps in turn, demonstrating in detail how card creation worked through an exemplar card (in this case the creation of the nuclear demonstration (open ocean) card.

Articulate Objective/Goal/Intent

This step was relatively straightforward because there are any number of potential battlefield effects a commander could be trying to achieve. Staging areas can be struck to disrupt enemy mobilization and supply. Satellites can be attacked to deny enemy communications. A weapons test could be used in any number of locations to signal resolve. A large list of potential goals and objectives were generated via brainstorming and analyzed sequentially. For the prototype game, the set of goals was generated using the subject-matter expertise of the team and covers a variety of potential missions commonly considered amongst nuclear planners.

Example objective: Conduct nuclear demonstration over open ocean.

Is Objective/Goal/Intent Better Fit for the Red Team or Blue Team *Modus Operandi,* or both

Determining whether a given goal for a strike made sense for either Red, Blue, or both depended on the specific characteristics of each goal. Most often, a given end could suit both Red or Blue objectives equally in the course of gameplay, so the process was finished there for both sides. The major determining factor in ruling out inclusion of a goal for either Red or Blue was whether the objective contained a concept or ability that was unique to Red or Blue. This could include a specific nuclear capability, stated willingness to a strike certain target set, or

philosophy of employment. One thing that was also considered was whether the goal to be achieved was inherently offensive or defensive in nature.

Example goal determination: This objective suits both red and blue in gameplay.

Feasible Target

This step took both the most creativity and the most time. The first step was to work on Blue and Red team targeting and then figure out what geographic area would make the most sense for both the objective and overall conflict. After a geographic area determined, the team would come up with a few options per objective; as this game was a prototype, we used the experience of the team to generate feasible targets. After that, we considered the number of population and contents of population (i.e., military force versus large civilian population).

Example target for a Blue attack on Red: Atlantic Ocean.

Decide on the Type of Weapon to be Used

The first choice made was whether the weapon would strike Red or Blue's homeland. If the target was in the homeland, we decided to relegate this objective to the escalation deck. This is because an in-country nuclear strike would not, in almost all cases and with realistic assumptions, be relegated to a theater commander. These types of highly provocative nuclear strikes were deemed to be the sole prerogative of the NCA. The next question asked was, "What kind of weapon makes sense for this target and objective?" This was answered by looking at how the weapon is delivered and what the purpose of the strike is.

Example for Blue attack on Red: This will likely entail a low yield nuclear weapon launched from a Trident submarine.

How Much Damage Should be Imposed on the Target?

This step goes back to the objective of the attack. If the objective is to communicate willingness to use nuclear force but not unleash nuclear war, the damage expectancy would be zero because the target would be open ocean. However, if the goal is to destroy a certain building, the damage expectancy would be much higher. It naturally makes sense that conventional weapons will do less damage than a nuclear weapon; however, the target and end goal are still considered.

Example for Blue attack on Red: Demonstration shot designed to cause no damage; therefore 0.

Number Targeted

The number of a given object targeted also draws back to the objective. If the point of an LNO is to use a nuclear weapon on a specific target, the number targeted changes depending on the weapon and the objective of the attack. Lastly, the number targeted depends largely on the target where a logical decision was made.

Example for Blue attack on Red: The number targeted is 1.

Abbreviations

DoD	U.S. Department of Defense
ICBM	intercontinental ballistic missile
LNO	limited nuclear option
LOC	level of concern
NATO	North Atlantic Treaty Organization
NCA	national command authority
USSR	Union of Soviet Socialist Republics

Bibliography

Behavioral Economics, "Prospect Theory," undated. As of October 5, 2023: https://www.behavioraleconomics.com/resources/mini-encyclopedia-of-be/prospect-theory/

Brodie, Bernard, ed., *The Absolute Weapon: Atomic Power and World Order*, Harcourt, Brace and Co., 1946.

Brodie, Bernard, *Strategy in the Missile Age*, Princeton University Press, 1959.

Burr, W., and J. Kimball, "Nixon's Secret Nuclear Alert: Vietnam War Diplomacy and the Joint Chiefs of Staff Readiness Test, October 1969," *Cold War History*, Vol. 3, No. 2, January 2003.

Colby, Elbridge, Avner Cohen, William McCants, Bradley Morris, and William Rosenau, *The Israeli "Nuclear Alert" of 1973: Deterrence and Signaling in Crisis*, Center for Naval Analysis, April 2013.

Davis, Paul K., *Some Lessons Learned from Building Red Agents in the RAND Strategy Assessment System (RSAS)*, RAND Corporation, N-3003-OSD, 1989. As of October 20, 2020: https://www.rand.org/pubs/notes/N3003.html

Davis, Paul K., Steven C. Bankes, and James P. Kahan, *A New Methodology for Modeling National Command Level Decisionmaking in War Games and Simulations*, RAND Corporation, R-3290-NA, 1986. As of October 26, 2020: https://www.rand.org/pubs/reports/R3290.html

Davis, Paul K., and James A. Winnefeld, *The RAND Strategy Assessment Center: An Overview and Interim Conclusions About Utility and Development Options*, RAND Corporation, R-2945-DNA, 1983. As of October 26, 2020: https://www.rand.org/pubs/reports/R2945.html

Farrell, Joseph, and Matthew Rabin, "Cheap Talk," *Journal of Economic Perspectives*, Vol. 10, No. 3, 1996.

Foot, Rosemary J., "Nuclear Coercion and the Ending of the Korean Conflict," *International Security*, Vol. 13, No. 3, 1988–1989.

Glaser, Charles, and Paul K. Davis, *Treatment of Escalation in the RAND Strategy Assessment Center*, RAND Corporation, N-1969-DNA, 1983. As of October 5, 2023: https://www.rand.org/content/dam/rand/pubs/notes/2009/N1969.pdf

Glasstone, Samuel, and Philip J. Dolan, eds., *The Effects of Nuclear Weapons*, U.S. Department of Defense and U.S. Department of Energy, 1977.

International Atomic Energy Agency, "Frequently Asked Chernobyl Questions," webpage, undated. As of May 26, 2023: https://www.iaea.org/newscenter/focus/chernobyl/faqs

Jervis, Robert, "Hypotheses on Misperception," *World Politics*, Vol. 20, No. 3, April 1968.

Kahan, James P., William L. Schwabe, and Paul K. Davis, *Characterizing the Temperaments of Red and Blue Agents: Models of Soviet and U.S. Decisionmakers*, RAND Corporation, N-2350-NA, 1985. As of October 6, 2023: https://www.rand.org/pubs/notes/N2350.html

Kahn, Herman, *On Thermonuclear War*, Princeton University Press, 1961.

Kahn, Herman, *On Escalation: Metaphors and Scenarios*, Routledge, 1965.

Kaplan, Fred, *The Bomb: Presidents, Generals, and the Secret History of Nuclear War*, Simon & Schuster, 2020.

Kar, Nilamadhab, Arun Mohanram, Manoj K. Mohanty, and Binaya K. Bastia, "Scale for Assessment of Lethality of Suicide Attempt," *Indian Journal of Psychiatry*, Vol. 56, No. 4, 2014.

King, Jacob, "Measuring Mental Health Outcomes in Built Environment Research: Choosing the Right Screening Assessment Tools," Centre for Urban Design and Mental Health, February 2018.

Lin-Greenberg, Erik, Reid B. C. Pauly, and Jacquelyn G. Schneider, "Wargaming for International Relations Research," *European Journal of International Relations*, Vol. 28, No. 1, 2021.

McDermott, Rose, "Prospect Theory in Political Science: Gains and Losses from the First Decade," *Political Psychology,* Vol. 25, No. 2, 2004.

Mellins, Claude A., Shuaib Kauchali, Danielle F. Nestadt, Dan Bai, Angela Aidala, Nonhlahla Myeza, Murray H. Craib, Jane Kvalsvig, Cheng-Shiun Leu, Justin Knox, Stephen Arpadi, Meera Chhagan, and Leslie L. Davidson, "Validation of the Client Diagnostic Questionnaire to Assess Mental Health in South African Caregivers of Children," *Clinical Psychology and Psychotherapy*, Vol. 24, No. 1, January/February 2017.

Noga, Heather L., Elizabeth C. L. Walsh, Jenny J. Shaw, Jane Senior, "The Development of a Mental Health Screening Tool and Referral Pathway for Police Custody," *European Journal of Public Health*, Vol. 25, No. 2, April 2015.

Oberholtzer, Jenny, Abby Doll, David Frelinger, Karl Mueller, and Stacie Pettyjohn, "Applying Wargames to Real-World Policies," *Science,* Vol. 363, No. 6434, March 29, 2019.

Pettyjohn, Stacie, Becca Wasser, and Chris Dougherty, *Dangerous Straits: Wargaming a Future Conflict over Taiwan*, Center for a New American Security, 2022.

Pfizer, "The Patient Health Questionnaire (PHQ-9)—Overview," 1999.

Reddie, Andrew W., and Bethany L. Goldblum, "Evidence of the Unthinkable: Experimental Wargaming at the Nuclear Threshold," *Journal of Peace Research*, 2022.

Sagan, Scott D., "Nuclear Alerts and Crisis Management," *International Security*, Vol. 9, No. 4, Spring 1985.

Sagan, Scott D., and Jeremi Suri, "The Madman Nuclear Alert: Secrecy, Signaling, and Safety in October 1969," *International Security*, Vol. 27, No. 4, Spring 2003.

Schelling, Thomas C., *The Strategy of Conflict*, Harvard University Press, 1960.

Schneider, Jacquelyn, Benjamin Schechter, and Rachael Shaffer, "Cyber Operations and Nuclear Use: A Wargaming Exploration," *Social Science Research Network Electronic Journal*, November 2021.

Shlapak, David A., and Michael Johnson, *Reinforcing Deterrence on NATO's Eastern Flank: Wargaming the Defense of the Baltics*, RAND Corporation, 2016. As of October 6, 2023: https://www.rand.org/pubs/research_reports/RR1253.html

Smith, Katie M., Perry F. Renshaw, and John Bilello, "The Diagnosis of Depression: Current and Emerging Methods," *Comprehensive Psychiatry*, Vol. 54, No. 1, 2013.

Snyder, Glenn Herald, *Deterrence and Defense*, Princeton University Press, 1961.

Tversky, Amos, and Daniel Kahneman, "Advances in Prospect Theory: Cumulative Representation of Uncertainty," *Journal of Risk and Uncertainty,* Vol. 5, No. 4, 1992.

U.S. Congress Economic and Social Consequences of Nuclear Attacks on the United States: A Study Prepared for the Joint Committee on Defense Production, U.S. Government Printing Office, 1979.

U.S. Congress Office of Technology Assessment, *The Effects of Nuclear War*, U.S. Government Printing Office, May 1979.

U.S. General Accounting Office, "Strategic Weapons: Nuclear Weapons Targeting Process," GAO/NSIAD-91-319FS, September 1991.

Vagias, Wade M., "Likert-Type Scale Response Anchors," Clemson International Institute for Tourism and Research Development, Department of Parks, Recreation and Tourism Management, Clemson University, 2006.

Wasser, Becca, and Jennie Matuschak, *Risk and Responsibility: Managing Future Iranian Weapons of Mass Destruction Threats*, Center for a New American Security, 2022.

Wasser, Becca, Jenny Oberholtzer, Stacie L. Pettyjohn, and William Mackenzie, *Gaming Gray Zone Tactics: Design Considerations for a Structured Strategic Game*, RAND Corporation, 2019. As of October 6, 2023: https://www.rand.org/pubs/research_reports/RR2915.html

To assist the U.S. Department of Defense and other stakeholders addressing the subsiding interest in and knowledge of a continued nuclear threat, RAND Corporation game designers and subject-area experts developed *A Strange Game*, named in reference to the 1983 techno-thriller movie, *Wargames*, which presents thermonuclear war as a conflict that no one can win. *A Strange Game*, however, very much concerns the present day and the future in that it gives players an opportunity to explore the problems of near- or longer-term future intra-war deterrence where the taboo against the use of nuclear weapons has broken down.

This report provides the scientific and theoretical background that informed the creation of the *A Strange Game* prototype. This report also offers relevant context that went into game design. Therefore, it should be useful to those considering adopting the game, game masters who will want to conduct fully informed gaming sessions, and players wanting a first-hand account of the diplomatic and military concepts used in the game. The information presented in this report can also assist other game designers as they work toward the development of further games that immerse participants in environments designed to improve decisionmaking before, during, and after conflict.

www.rand.org

RR-A1204-1