

## **Understanding Future Conflict Escalation Dynamics with Analytic Gaming**

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### **ABSTRACT**

The approaches of United States (US) competitors to deterrence and crisis management are evolving and have the potential to be highly escalatory. At the same time, advanced technologies are likely to increase the speed and unpredictability of future conflicts.

Modeling and simulation capabilities can provide many potential outcomes to a Blue versus Red scenario using a large data set, but can only model escalatory dynamics using a pre-loaded set of response options. Alternatively, analytic gaming provides a forum where human players respond to a scenario based on their expert knowledge; they develop creative options to advance their “nation’s” interests during a crisis, bounded only by their understanding of foreign military doctrine and capabilities. This approach can reveal circumstances in which crises may have the most potential to escalate, providing indications and warning to analysts.

This paper will address how analytic gaming can be applied to better understand the effects of military doctrine and advanced technologies on crisis escalation; how game design and adjudication techniques ensure that crises intensify based on player inputs and avoid unfair judgments about the reasons for escalation; and how analytic gaming reveals new insights at each step of a scenario, thereby isolating variables for future analysis. It will also discuss a path toward constructing a complementary model of an escalation scenario, informed by analytic game results.

### **ABOUT THE AUTHOR**

**Matthew Lytwyn** is a program manager and senior policy analyst with SAIC. At SAIC, he oversees the application of analytic gaming techniques to answer research questions for clients throughout the US government. He has extensive experience designing, executing, and analyzing games that examined military operations, geopolitical competition, and other national security issues from the near to far term. He has also served as a senior analyst in support of the Defense Science Board. Previously, he worked in the Office of the Secretary of Defense and as a structural engineer in the aerospace industry.

# Understanding Future Conflict Escalation Dynamics with Analytic Gaming

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## INTRODUCTION

During the Cold War, nuclear deterrence was widely studied and theoretical ideas about how conflicts could escalate were well-developed. US national security relied on nuclear deterrence, leading to energetic debates about the role of nuclear weapons, how to control conflict escalation, and to new ideas like Thomas Schelling's competition in risk taking and conceptual frameworks such as Herman Kahn's escalation ladder. During this time period, the national security community relied on wargaming and exercises to identify how crisis scenarios could play out with the Soviet Union. Thomas Schelling, a scholar of nuclear strategy, wrote papers explaining how to apply games and exercises to "think through critical details under hypothetical circumstances" (Schelling, 1987, p. 429).

Today, the US is facing a three-fold problem: (1) deterrence expertise has atrophied since the end of Cold War, resulting in a new generation of analysts with limited background in classical ideas involving deterrence, nuclear weapons, and theories of how conflicts might escalate; (2) the approaches of US competitors to deterrence and crisis management are evolving and have the potential to be highly escalatory (for example, Russia's increasing emphasis on nuclear weapons as a warfighting tool); and (3) advanced technologies are likely to increase the speed and unpredictability of future conflicts (for example, research in multiple countries toward hypersonic weapons).

As a result, the US national security community needs to accomplish two things: (1) quickly educate national security professionals in deterrence and escalation issues and (2) improve its conceptual understanding of how crises and conflicts may develop in the future. This paper seeks to contribute to both paths and will discuss the relevance of analytic gaming to deterrence and escalation issues; discuss the game design process and how analytic gaming can be applied to better understand crisis stability and escalation; propose how to use analytic gaming to educate national security thinkers in these issues; and, finally, propose paths toward constructing a complementary model of an escalation scenario, informed by analytic game results.

## ANALYTIC GAMING AND RELEVANCE TO DETERRENCE AND ESCALATION

Computer-based modeling and simulation capabilities can provide many potential outcomes to a Blue versus Red scenario using a large data set but can only model escalatory dynamics using a pre-loaded set of response options. Alternatively, analytic games provide a forum where human players respond to a scenario based on their expert knowledge and a dynamic environment where analysts can watch the consequences of a simulation play out. Teams develop creative options to advance their interests during a crisis, bounded only by their understanding of foreign military doctrine and capabilities. Although not truly empirical research, analytic games provide a venue for analysts to test theories about how escalation may occur in a given scenario and draw larger lessons that could apply to a range of potential circumstances.

This paper defines analytic gaming as: *an analytic, qualitative methodology where teams react to a situation, scenario, and/or the actions of other teams from the perspective of an actor they are tasked to represent, thereby providing a Control/Adjudication team with the basis to advance the game further.*

A game is a structured analytic research method. The analyst identifies a question that can be answered by a game, and then designs a game structure and scenario to investigate the question. Once the game begins, the players provide the basis for the further development of the scenario (within the bounds the game controllers allow). Debates within teams and the interactions between teams create a dynamic environment where players consider multiple courses of action, stretch their own initial assumptions, and eventually hone in on a solution to advance their team's interests.

Games designed to test escalation differ from other games, such as crisis response or geopolitical competition games carried out at the strategic level. In a crisis response game, the goal may be to design a game that places opposing interests in conflict, but does not necessarily seek to explore how a crisis may become more severe. The analyst may be more interested in identifying how countries would work together to seek common ground. Similarly, a geopolitical game may focus on larger questions of how a regional balance of power shifts over several years and actively avoids introducing military conflict. If the diplomatic management phase of a crisis is well-explored by previous research or other games, it may be unnecessary to begin at a lower level of tensions. In escalation gaming, the analyst is seeking to test how one side reacts to the other's use of capabilities or methods of operating, making it acceptable and analytically sound to begin the game at a higher rung on the escalatory ladder.

Games uncover hidden dynamics as a scenario evolves, thereby widening the analysts' aperture into how a crisis could develop. Analytic games also impose penalties (albeit in a fictitious scenario). By pitting teams representing specific countries or actors against one another, teams are forced to identify tradeoffs and live with the consequences of their decisions for the remainder of the game. For the game sponsor, understanding how and why teams make these tradeoffs and decisions is highly valuable, since those decisions can help isolate the reasons for escalation.

Games can also help the analyst challenge assumptions about how countries could choose to pursue their objectives in the presence of asymmetric interests. For example, a standard research investigation could reveal that Country A is less committed to defending a specific interest than Country B is in challenging that interest. The researcher may therefore conclude that Country A is less likely to match Country B in moving up an escalatory ladder during a crisis, but lacks insight into how a specific crisis environment could change Country A's calculus. The competitive nature of games places teams in an environment where they must grapple with the consequences of actions they take to pursue their interests. Although Country A may initially begin the game intending to de-escalate the crisis and seeking to avoid challenging Country B directly (for fear of being unable to match Country B's commitment to escalation), the unfolding situation could place Country A in a position where it decides it can no longer back down (such as for reasons of international prestige, perceptions of its commitments to allies, or because Country B inadvertently triggered a core interest of Country A as the scenario unfolded). It is these types of insights that analytic gaming can highlight more easily and plainly than other research methods.

## GAME DESIGN

Analytic games that test future escalation dynamics begin with three key design issues: (1) designing a game to analyze the impact of new approaches to crisis management and escalation control; (2) designing a game to ensure that future military capabilities are tested; and (3) capturing how these new approaches and capabilities impacted perceptions and misperceptions between the countries in the game. Team selection and adjudication are also discussed in this section for their key contribution to successful games.

### Designing to Test Doctrine

As noted above, the US is witnessing a number of developments in foreign military doctrine on escalation control. For example, Alison Kaufman and Daniel Hartnett argue "understanding how other countries think about the dynamics of conflict and escalation is particularly relevant with regard to the People's Republic of China (PRC), where strategic and military thinking are currently undergoing rapid evolution and adjustment" (Kaufman and Hartnett, 2016). Designing a game to test the impact of this rapid evolution requires a scenario that affects the core interests of the teams involved. Escalation games should be designed to place teams in a state of tension with one another at the start. Limited time and limited budgets usually preclude the use of several moves just to advance teams to a state of conflict. As the analyst designs a game, teams should be incentivized to develop military options which could be escalatory. The initial scenario should provide a plausible history of events leading to the state of tension, and present a situation that is critical enough that players are persuaded that they must plan for all contingencies, including military responses. This requires prior analysis of the interests of the actors, their national security concerns, their declaratory policy, and whether the game's scenario would actively engage the future doctrine the analyst wishes to test.

## **Designing to Test Capabilities**

While escalation can occur for many reasons, this paper's focus is integrating emerging military capabilities into the teams' calculus. Thus, the second important design consideration for escalation games is ensuring that teams make use of emerging military capabilities. These could include new cyber weapons, robotic swarms, or some other tool that the analyst seeks to examine in detail. The game should feature teams that are likely to trigger the use of these advanced capabilities. Presenting a major power with a challenge from a much less militarily powerful country will fail to reveal how two technologically advanced countries could manage or lose control over a military confrontation. Once again, the scenario design should capture the attention of the teams involved for its effect on their country's core interests. The scenario should make players representing the game's actors realize that the time has come for them to use their most advanced systems.

Common to both design issues of doctrine and capabilities are two key factors: time and people. First, the game needs to start far enough in the future for the countries in the game to have implemented the doctrine the game is testing, as well as for each country to have acquired the advanced capabilities the game wants to explore. Second, and critically, teams must be composed of subject matter experts who understand the military doctrine of the country they are tasked to represent as well as experts who understand the capabilities and employment concepts to be tested by the game. Without credible players, the analyst will be less able to defend the insights revealed by the game.

## **Analyzing Perceptions**

Arguably, the most important outcome of a game focused on escalation is revealing where the opposing sides misunderstood one another's signals. Joe Williams and Adam Lowther note that US Strategic Command's Deterrence and Escalation Game and Review (DEGRE) commonly reveals that "teams fail to effectively convey a desired message (signal) that is both received and understood" (Williams and Lowther, 2017). Games often demonstrate just how quickly trust erodes in a crisis between countries. They also lead participants to take stock at the conclusion of the game, amazed at how teams were unable to communicate effectively.

Teams should be tasked to consider both the potential impact of their own actions (and how they are perceived by the opposing team), as well as provide actions contingent on certain triggers by the opposing team. Teams should note the intent of their actions, such as whether an air strike and subsequent stand down of operations was intended to signal resolve and willingness to de-escalate. The opposing team should be asked how it perceived these actions (once they have been adjudicated). This provides important data for the analyst following the game. Driving teams to consider the impact of their plans also encourages them to think more critically about their initial instincts for reacting to a crisis.

## **Team Selection**

The selection of teams is a key design factor that depends on the overall approach to answering the game's research question. Typically, a game will include at least two teams representing the countries of interest in the scenario. Additional teams should be added only after careful consideration of how they could enable or obstruct the exploration of a crisis. For example, the analyst may wish to include close allies or a bloc of countries (e.g. NATO) in order to explore how they could intensify or check a crisis. But, since escalation games seek to place teams into a competitive environment with one another at the start, additional teams beyond a Red and Blue team may unnecessarily muddy the analytic waters. By including only a Blue team and a Red team (with all other actors represented by the Control team as needed) teams can be instructed to make educated assumptions about how their allies are behaving in the crisis and move on to planning their actions without getting bogged down in diplomatic consultation. In seeking to test escalation, one assumes that countries have moved on from diplomatic consultations to a certain extent, thereby removing some need to include all the primary interlocutors as teams. This is not to say that teams should be discouraged from identifying off-ramps where they may exist, only that the diplomatic resolution of a crisis is not the main intention in this type of game.

## **Importance of Adjudication**

During the actual execution of a game, the Control/Adjudication team provides critical oversight to maintain a game's analytic integrity and to ensure that the game's objectives are properly explored. The move – adjudication –

move process enables a game to progress beyond the initial scenario, but ensures that crises only intensify based on team inputs. The Control/Adjudication teams acts as the “gatekeeper” against analytic biases in the move assessment process and should aim to adjudicate only information provided by the teams (as opposed to scenario “injects” which can distract players and make post-game analysis more difficult). Adjudication also helps the analyst avoid incorrect judgments about the reasons for escalation, since these break points isolate specific actions and plans that intensified or de-escalated a crisis. After the Control/Adjudication team completes its assessment of each team’s actions, it provides the results back to the teams in the form of a situation update and tasks them to continue their planning.

Proper game design should enable successful adjudication. Specifically, the game design should require teams to develop branch plans and indicate triggers for those plans. This ensures that adjudicators have the information needed to determine whether a team’s branch plans have been triggered by the other team. This saves time by advancing the game up the escalatory ladder, but only based on what the teams said they would do. By intentionally separating the game into a series of planning moves, each followed by situation updates drawn from those moves, the analyst can look back at each point in the game and see what actions (triggered by specific plans from the other side) led to an escalation of the situation. Critically, pre-game planning should ensure that trained note-takers capture the drivers behind team decisions to take certain actions.

## **ANALYTIC GAMING AS A TEACHING METHOD**

The US used wargames during the Cold War partly because no one had ever experienced an actual nuclear conflict. Games emerged as a tool to test war plans and identify gaps in US doctrine and capabilities. The US finds itself in a similar situation today: rapid advances in technology are driving new concepts of military operations during a time of increasing instability and military competition between major powers. For example, the use of autonomous robotic swarms is likely to be a feature of future conflicts, but there is no example of their application during a war, particularly in a war where each side possesses such a capability. As Deputy Secretary of Defense Robert Work and General Paul Selva argued, “Wargames provide opportunities to test new ideas and explore the art of the possible. They help us imagine alternative ways of operating and envision new capabilities that might make a difference on future battlefields” (Work and Selva, 2015). Games can provide participants who have a limited understanding of how new technologies or military doctrines could drive or shape a crisis the opportunity to experience them in a simulated environment. Games also illuminate even well-explored problems in new ways; precisely the need of policymakers today. Much US national security brainpower has explored a Taiwan Strait crisis, but US policy needs to study how technological advances or new military doctrine might change what we think we know in the future.

Thomas Schelling observed “people discover facts, ideas, possibilities, capabilities, and arguments that do not in any way depend on the game but nevertheless emerge from it” (Schelling, 1991, p. 23). It is in this way that escalation games can educate a new generation of policymakers and analysts about escalation and crisis management issues. Game designers should push teams to consider how their actions may be perceived by the opposing side. Although a game is not required in order to consider these issues, debates and personal interactions force participants to challenge their own assumptions and a game gives them an environment to test their arguments. After the adjudication period and situation update, teams see how their actions succeeded or failed and then make a new assessment regarding how they should pursue their objectives. Teams often misunderstand the intent of other teams’ actions from the beginning to the end of a game. The value of escalation games is to give players a concrete example of how their doctrine, capabilities, and plans failed deter, compel, or message an adversary in the way they thought it would.

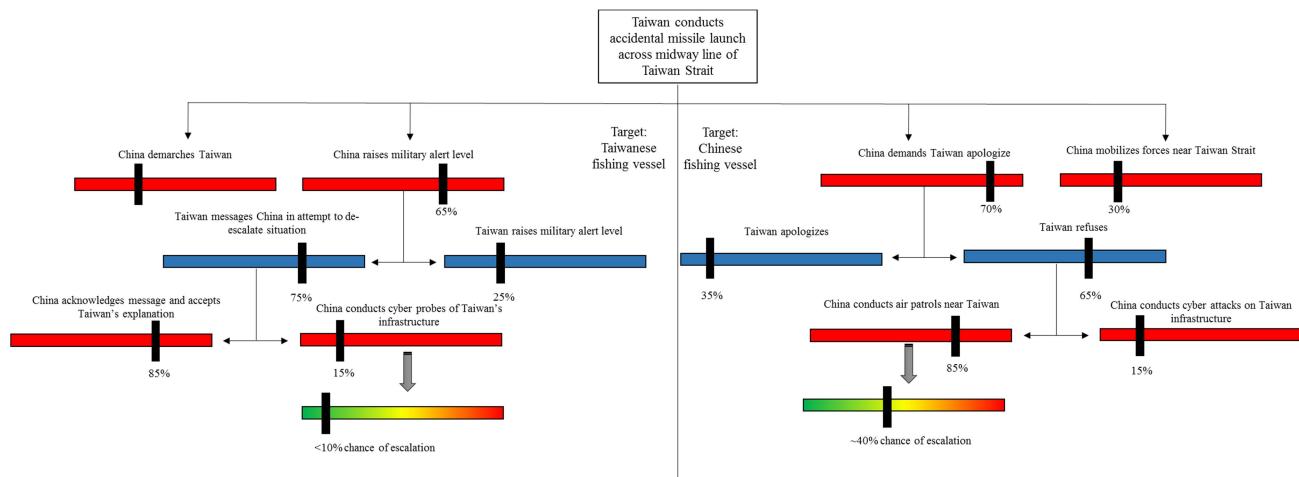
## **TOWARD A COMPLEMENTARY MODEL**

Analytic gaming is a qualitative methodology. It relies on human judgments and interactions in order to evaluate a situation and make decisions. As a result, the outputs of games resist easy translation into mathematical models since it is inherently risky to assign statistical likelihoods to human decision makers. Nevertheless, a model could complement an analytic game in two ways. First, it can highlight the key decision points that drive a crisis toward intensification and enable analysts to drill further into these key areas in future studies. Second, the ability to visualize an unfolding crisis can contribute to the educational priorities discussed above, as national security professionals can use a model to visually understand the action-reaction dynamics of a crisis.

Figure 1 illustrates an approach to post-game modeling. This example scenario is based on a real-world incident in July 2016, in which a Taiwanese naval vessel accidentally fired a missile toward China during an inspection, hitting a Taiwanese fishing boat. The missile did not cross the midway line between China and Taiwan, and the incident ended peacefully. However, one could easily imagine scenarios in which the missile hit a different target, crossed into Chinese waters, or resulted in a stronger Chinese response.

### Creating the Model

This paper proposes a four step process for integrating gaming with modeling and simulation capabilities. First, an analytic game is conducted (e.g. into the dynamics of a crisis involving an accidental missile launch in the Taiwan Strait) to gather data on what actions and reactions could occur between China and Taiwan. Second, the analyst determines what crisis end states are most important to policymakers; these are the end states on which the analyst will focus the model, in order to determine how likely such an outcome may be and to better understand the intermediate steps to these points. Third, data from the game and from subsequent consultations with subject matter experts is used to determine what intermediate steps could occur between the outbreak of the crisis and the end state. Fourth, subject matters experts are consulted to gather their inputs on the likelihood of each of these intermediate actions occurring. These experts would assign likelihoods to these actions based on the assumption that the previous action in the chain had already occurred. These statistical likelihoods would be collected from a variety of different experts with varying viewpoints and then averaged to arrive at an overall likelihood. Once this process of data collection is complete, the analyst can look at any part in the chain of events and determine how likely the crisis is to progress to that point, based on expert assumptions and inputs.



**Figure 1. Notional Escalation Model**

In Figure 1, two possible targets are shown to illustrate varying paths toward escalation or de-escalation (not all potential branches of the scenario are played out to their conclusions for the purpose of clarity). On the left side of Figure 1, Taiwan's missile hits a Taiwanese fishing vessel (as in the real-world example). In this example, China raises its military alert level, prompting Taiwan to message China in an attempt to de-escalate the situation. Although refraining from taking strong military actions, China conducts some cyber probes into Taiwan's critical infrastructure to message China's displeasure and remind Taiwan of China's capability to retaliate. Given the statistical likelihood of each side taking these decisions in sequence, the model gives less than 10% chance that the crisis could progress to this point (based on the product of the statistical chance of each action occurring).

On the right side of Figure 1, the missile strikes a Chinese fishing vessel. China demands an immediate apology from Taiwan. Taiwan, initially unsure of the ship commander's reason for the missile launch, refuses. China, seeing a need for a strong, swift response conducts military aircraft patrols near Taiwanese waters. The model assigns about 40% chance to the crisis reaching this point.

## CONCLUSION

Games and models are two sides of the same coin. Games use subject matter experts to illuminate the ways countries may interact with one another in a crisis and to identify new escalatory dynamics the analyst may have been unable to understand via standard research methods. The modeling approach discussed above provides a means of further analysis after a game is conducted and can enable visual illustration of the consequences of decisions teams made in a game.

As this paper has shown, additional application of these two methodologies can enable a more robust and nuanced understanding of the future challenges facing the US in responding to and managing conflicts.

## ACKNOWLEDGEMENTS

The author wishes to thank Maureen Smith and Hannah Johnson of SAIC for their review of this paper and Mrs. Smith for her thoughts on the application of gaming to crisis escalation and its value as a training tool. Thanks also to Eric Wertheim and Nelly Swonger of SAIC for their thoughts and assistance in devising a follow-on model for use in post-game analysis and visualization.

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