GEORGE MASON UNIVERSITY

Modeling Risk of Strategic Deterrence Failure

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MODELING RISK OF STRATEGIC DETERRENCE FAILURE

Project Report for
Strategic Multilayer Assessment (SMA):
Information in Joint Operations (IIJO)

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Abstract

George Mason University (GMU) worked with Strategic Multilayer Assessment (SMA) Subject Matter Experts (SMEs) to model risk of strategic deterrence failure, identify potential indicators and factors the U.S. and its partners can influence, and explain this risk to members of Congress and other organizations in a position to influence strategies to protect against a catastrophic strategic deterrence failure. The model examines strategic deterrence risk using an adversary restraint-centric course of action (COA) selection approach that decomposes into two primary causes of deterrence failure: (1) Adversary perceived need to act (adversely to U.S. interests) and (2) adversary perceived advantage after executing the COA and experiencing a likely U.S. response. The strength of this approach is that by understanding the adversary's perceived need to act due to a scenario, the U.S. and its partners can take steps to influence selection of a COA that meets the adversary's need to act but does not undermine U.S. vital interests or national survival. Recognizing that the U.S. may have limited control of the scenario, the report further decomposes the risk factors to suggest Adversary COA selection Causal Factors that the U.S. can influence as a means to deter critically unacceptable actions from a U.S. perspective. It also describes an approach to identify indications and warnings of an impending situation that could lead an adversary to contemplate courses of action posing threats to U.S. vital interests or national survival.

1. Introduction

USSTRATCOM asked the Joint Staff's Strategic Multilayer Assessment (SMA) office to initiate a reach back study to address a series of questions relating to the implications of the growing number and expanded capabilities of U.S. nuclear adversaries, many of whom have integrated nuclear weapons into operational concepts for future warfare. Russia, China, and North Korea have also devoted significant resources to modernizing their strategic forces, including developing theater-range, nuclear-capable delivery systems in violation of international agreements. These capabilities provide national leaders with options to threaten regional states and put U.S. and Allied targets at risk in ways that can confound U.S. deterrent options.

George Mason University focused on the following questions:

- How should we model the risks to future U.S. strategic deterrence?
- What are the indicators of potential failure of strategic deterrence?
- How can these risks be best explained to the U.S. Congress and the think tanks that inform their perceptions of the problems?

Although not focus areas, the study effort also offered some insights to the following questions:

- What will be the key effects of emerging technologies (e.g., hypersonic weapons, artificial intelligence, machine learning, autonomous platforms, the revolution in sensing capabilities) on the deterrence effectiveness of U.S. strategic forces in the future? Specifically, how might these technologies alter U.S. and competitor nuclear strategies?
- What political, economic, social, or other environmental factors, both internal and external to U.S. nuclear competitors, might increase their costs of restraint and lead to crisis and/or conflict?

Report Overview

This report addresses these questions beginning with a discussion of strategic deterrence risk in the context of adversary courses of action (COAs) that must be deterred to protect vital interests and national survival. The research then explores the question: Why would an adversary abandon strategic restraint to pursue a course of action that it knows will be unacceptable to the U.S. and its partners? The report then proposes a model to examine strategic deterrence risk using an adversary restraint-centric COA selection approach. The report then further decomposes the risk factors to suggest adversary COA selection causal factors that the U.S. can influence as a means to deter actions that are critically unacceptable from a U.S. perspective. The report concludes by applying the restraint-centric risk of deterrence failure model to answer the focus questions outlined above.

2. Background

Strategic Deterrence Risk

Strategic Deterrence Risk is defined for purposes of this report *as the inability to prevent adversary aggression or coercion courses of action (COAs) that threaten vital interests of the U.S. and/or national survival.*

Courses of Action to be Deterred

We first need to understand what courses of action we seek to deter, which begins with identification of U.S. vital interests and elements of national survival. These were used to identify potential vital and existential threats, threats of coercion with respect to U.S. ability to respond to attacks, and threats due to an adversary's unfavorable Cost-Benefit of Restraint decision calculus. These threats were then used to abstract a list of adversary courses of action to deter.

Vital interests and Elements of National Survival

Interviews conducted during the course of this SMA study made it clear that even these subject matter experts did not have a common understanding of which types of attacks would pose an existential threat to U.S. vital interests or threaten national survival. The approach ultimately used to model risk of strategic deterrence failure is not dependent on the specific threat, but, for context, a PMESII (Political, Military, Economic, Social, Infrastructure, Information) construct yielded this representative list of vital interests:

- The United States Government (USG) as a political system.
- Capabilities of the U.S. military to prevent, defend, and respond in kind to adversary attacks.
- U.S. economic, international trade, and financial systems.
- The U.S. social system (for example, beliefs, sentiments, goals, norms, and status of the people) that together constitute a coherent whole and gives the United States its identity.
- Critical infrastructure for safety, security, health.
- The National Information Systems that inform and protect the people of the U.S.

Elements of National Survival were identified as:

- The US government
- U.S. defense establishment
- U.S. internal security apparatus
- The U.S. economy
- Food, water, shelter
- USG Strategic Decision systems: Indications and Warning (I&W), National Leader Command Capability (NLCC), Nuclear Command and Control (NC2), Continuity of Operations and Government (COOP/COG)

Threats to Vital Interests

From these lists, the threats to vital interests were identified as:

- Attacks on the U.S. population
- Attacks against U.S. government operations
- Attacks against the U.S. economy and financial systems
- Attacks impeding international trade with the U.S.
- Attacks against U.S. safety, security, health systems
- Attacks against U.S. government strategic information and decision support systems
- Attacks against social systems (such as insurrections against the government)

Threats to Survival

Threats to survival were identified as:

- Strategic attacks on the U.S. government
- Attacks to disable U.S. defenses
- Actions to disable U.S. internal security capabilities
- Attacks against National Leader command capabilities
- Attacks against critical infrastructure (food, water, shelter, health, safety)
- Attacks against the U.S. economy that undermine its political-economic system

Coercion Threats

An additional category of threats labeled "coercion threats" were identified with two categories:

- Actions to alter U.S. cost/benefit calculus to respond to military aggression (examples: no effective non-escalatory response or no effective defense)
- Actions to alter U.S. cost/benefit calculus to respond to economic aggression

Threats Due to Unfavorable Adversary Benefit/Cost of Restraint Calculus

A final threat category is the result of adversary perceptions (or misperceptions) that lead them to perceive an unfavorable cost versus benefit of restraint with respect to actions against the U.S.

- Internal threat to the adversary government
- Perceived threat from ally or partner of U.S.
- Perceived existential (3rd party) threat to adversary
- Natural disaster posing perceived existential threat to adversary

Abstracted Adversary Courses of Action to Deter

The purpose of understanding the potential threats to U.S. vital interests and national survival is to abstract a set of adversary courses of action that the U.S. must be capable of deterring,

- Military Coercion: Actions to alter U.S. cost/benefit calculus to respond to military aggression (examples: no effective non-escalatory response or no effective defense)
  - Conventional hypersonic weapon
  - Nuclear EMP weapon
  - Low-yield nuclear weapon employment
  - Tactical employment of nuclear weapon
  - Satellite degradation attack (PNT, Comm, I&W)
  - Critical Infrastructure Cyber Attack
- Economic Coercion: Actions to alter U.S. cost/benefit calculus in response to adversary economic aggression against the U.S. and partners
- Adversary Attacks to Distract Adversary Population (from source of unrest):
  - Political: Nationalistic attack on U.S. in response to an internal political threat to adversary government
  - Economic: Nationalistic attack on U.S. in response to a naturally occurring or other economic threat to adversary
- Perceived U.S. Existential Threat to Adversary: Pre-emptive response to perceived existential threat from the U.S. or an ally or partner of U.S. believed to be acting on behalf of the U.S.
- Perceived 3rd Party Existential Threat to Adversary: Pre-emptive response to perceived existential (3rd party) threat to adversary

Conclusion

The U.S. could easily face existential threats due to misperceptions or scenarios over which it has little or no control. For this reason, there is value in adopting a strategy that encourages the adversary to exercise restraint because it is in their own best interest. Restraint doesn't imply no action on the adversary's part, rather, it means that the actions taken are restrained in a way that do not threaten U.S. vital interests or survival, but create effects that still achieve the adversary's internal political objectives.
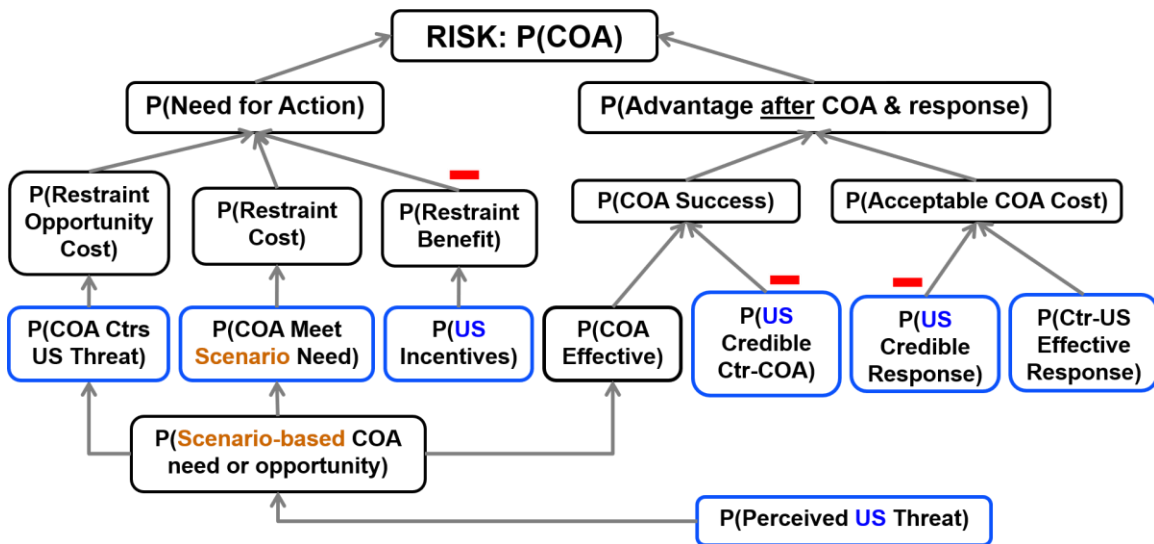
3. Restraint-centric Deterrence Model

Focus on Restraint

Rather than focusing primarily on an adversary's cost-benefit decision calculus of the course of action against the U.S. under consideration, the model developed for this study decomposes the strategic risk of an adversary acting against U.S. vital and survival interests into two restraint-centric causal factors: The probability that the adversary will perceive the need to act, and the probability that the adversary will assess that it will have an advantage relative to the U.S. as a result of executing the COA under consideration, even after the U.S. responds. A visual representation of the model can be found at Fig. 1.

Note: ▬ Means that the causal factor acts to counter the probability of the effect

Figure 1. Restraint-Centric Risk of Strategic Deterrence Failure Model

The probability that the adversary perceives the need for action is further decomposed into three factors. The first is the probability that the adversary perceives that restraint would impose an unacceptable lost opportunity cost. Another key factor is the perceived cost of restraint reflecting that if the COA is not executed, the need for action will not be met. Offsetting this cost is the adversary's perception of the benefits that will result from eschewing actions against the U.S. Two of the key contributing influence factors, the probability that the COA will counter a perceived U.S. threat, and the probability that the COA being evaluated will meet the need of the scenario, are scenario dependent. The perception of gaining benefit from restraint is heavily dependent on U.S. policies and strategies relative to the adversary, which are identified in the model as the probability of U.S. incentives.

The probability that the adversary perceives that it will have a significant advantage over the U.S. after it executes the COA under evaluation, and after the U.S. responds, is decomposed into two key causal factors: The probability that the COA will meet the

desired objectives successfully and the probability that the perceived adversary cost from the U.S. response to the COA will be acceptable. The probability that the COA will be successful further decomposes into the adversary perceptions of the probability that the COA can be executed successfully, and the probability that the U.S. does not have an effective defense or other capability to counter the effectiveness of the adversary COA. The adversary's perception of the cost of a U.S. response to the COA decomposes into the perceived probability that the U.S. will execute an effective response to the adversary COA and the adversary's perception that it can defend against or otherwise counter the U.S. response.

The model was purposely designed to highlight opportunities for the U.S. to influence the adversary's decision calculus across a wide range of scenarios, and also to provide a framework for the identification of indications and warnings of developing situations where the adversary might see the need or opportunity to act in a manner that would create an adverse impact on U.S. vital interests or survival. Although not in the scope of this strategic multilayer assessment (SMA) reachback study, the utility of this model for other purposes could be evaluated in the future through the use of tabletop exercises or simulations.

4. Deterrence Causal Factors US Can Influence

Key influence factors where the U.S. can exercise some control are identified by blue boxes in the Risk of Strategic Deterrence Failure model (Fig. 1). As the earlier background analysis makes clear, there are a number of scenarios that could lead an adversary to contemplate an action with seriously adverse consequences against the U.S. Since the U.S. has no control over many of the scenarios, and only limited control (in cases where adversary is responding to a perceived threat or misperceived action on the part of the U.S.), it makes sense that the U.S. should focus on those influence factors it can control. These factors are discussed below.

P(Perceived U.S. Threat): This factor addresses the adversary's perception that the U.S. poses an existential threat that needs to be countered (through actions detrimental to U.S. vital interests). Politically, economically, and socially, U.S. adversaries see the U.S. strategically as a threat to their own systems, but not one that poses an existential threat to them. U.S. adversaries will compete aggressively, particularly to win over unaligned actors, but are unlikely to attack U.S. vital interests unless they perceive a threat to their own.

P(COA counters US threat): U.S. adversaries look for weaknesses they can exploit, and can be expected to consider actions detrimental to U.S. interests when opportunities present themselves. Obviously, the first step is to avoid presenting opportunities that can arise because the U.S. loses focus in an area of interest to the adversary. This is addressed as Dynamic Force Employment (DFE) in the Joint Concept for Globally Integrated Operations. Secondly, the U.S. must preserve a broad range of highly effective capabilities to counter the expanding capabilities of U.S. adversaries designed to quickly and/or easily achieve their objectives before the U.S. can respond.

P(COA meets scenario need): While it may be impossible to prevent any adversary action counter to U.S. interests, there is much more latitude to influence an adversary's COA selection to achieve their needs with the least impact on the U.S. or its partners. Since the scenario needs are likely driven by domestic demands for the adversary to act, U.S. actions to allay domestic concerns and avoid stoking their anger against the U.S. can open up COA opportunity space for the adversary.

P(Credible US restraint incentives): Although U.S. routinely operates in competitive relationships with its adversaries, it still maintains cooperative relationships in many areas that an adversary might want to preserve. The U.S. should be prepared to highlight the wide range of PMESII activities that would be negatively affected when an adversary executes a COA that would risk creating adverse effects counter to U.S. vital interests.

P(US Credible Ctr-COA/Defense): Typically termed "deny benefits" in traditional deterrence terminology, this influence factor requires the adversary to perceive that the U.S. possesses the capabilities to defend against or otherwise counter the effects of the COA the adversary is assessing for execution. This argues for strong defenses against attacks that would enable the adversary to employ coercive strategies limiting the options available to U.S. decisionmakers.

P(US Credible COA Response): The adversary must perceive that the US is ready and capable of responding proportionally to a range of adversary COA options in ways that cannot be effectively countered. A U.S. adversary may not perceive a U.S. strategic nuclear response credible in cases where it has options to employ a non-nuclear strategic weapon, a non-strategic nuclear weapon, or any type of weapon that does not clearly align with a U.S. capability to respond proportionally. It is situations like these that provide adversaries opportunities for coercion in their dealings with the U.S. Some examples were identified earlier: Conventional hypersonic weapons, nuclear EMP weapons, low-yield nuclear weapons, "tactical" or "Non-Strategic" nuclear weapons, satellite (PNT, Comm, I&W) degradation weapons, and cyber weapons designed for attacks against critical infrastructure or economic systems. This is not an all-inclusive list. If the U.S. does not possess a credible defense or response capability to an adversary's strategic weapons both from a proportional capability perspective and the adversary's belief in the U.S. willingness to respond to an attack (particularly if the attack is not directly against the U.S.), the adversary may feel confident that it can execute the COA at little of no cost. This is why lower yield nuclear and non-nuclear strategic weapons, particularly those that can be employed from locations outside the U.S. have become so important to U.S. deterrence strategy.

P(Counter/Defense against US Response): If the adversary perceives that it has the capability to counter or defend against the US response to the COA it is assessing, then the adversary may believe that there is no significant cost to execute the course of action being evaluated. The U.S. can influence this perception through force modernization, capability demonstrations, and readiness exercises. The key is to prevent the adversary from becoming confident that it can mount an effective defense. This is the reason that there has been significant emphasis on force modernization over the years.

Identifying Potential Triggers

While the U.S. cannot control how a scenario will unfold, it can identify potential triggers leading to situations where an adversary would be likely to consider employing COAs that could jeopardize U.S. vital interests or national survival. Figure 2 illustrates an approach that can help identify indications and warnings of potential strategic deterrence failure where there is still time and options for the U.S. to mitigate the tensions that could trigger and adverse course of action.

If alternative actor actions (behaviors) can be identified that support the adversary's objectives but are more favorable to U.S. interests, one of these alternatives may offer a potential avenue to successfully influence the adversary's decision calculus toward a more favorable behavior.

It is also important to analyze adversary perceptions of the need to act based on their perceptions of the U.S. government's decision calculus. Does the adversary see a need for preemptive action to counter a perceived threat from the U.S. or a U.S. partner? How does the adversary perceive the U.S. government's likelihood to exercise restraint in the face of domestic pressure for action that the adversary would find unfavorable? A complicating factor is that an adversary's perception may often be different from the reality which the

U.S. government and its partners intended. On the other hand, identifying the discrepancies between the adversary's apparent perceptions and actual facts provides a useful foundation for designing a U.S. plan to favorably influence the competitor's decision calculus. It can also highlight areas for deliberations with partners whose actions may be causing undesirable effects on the competitor's perceived need for action.
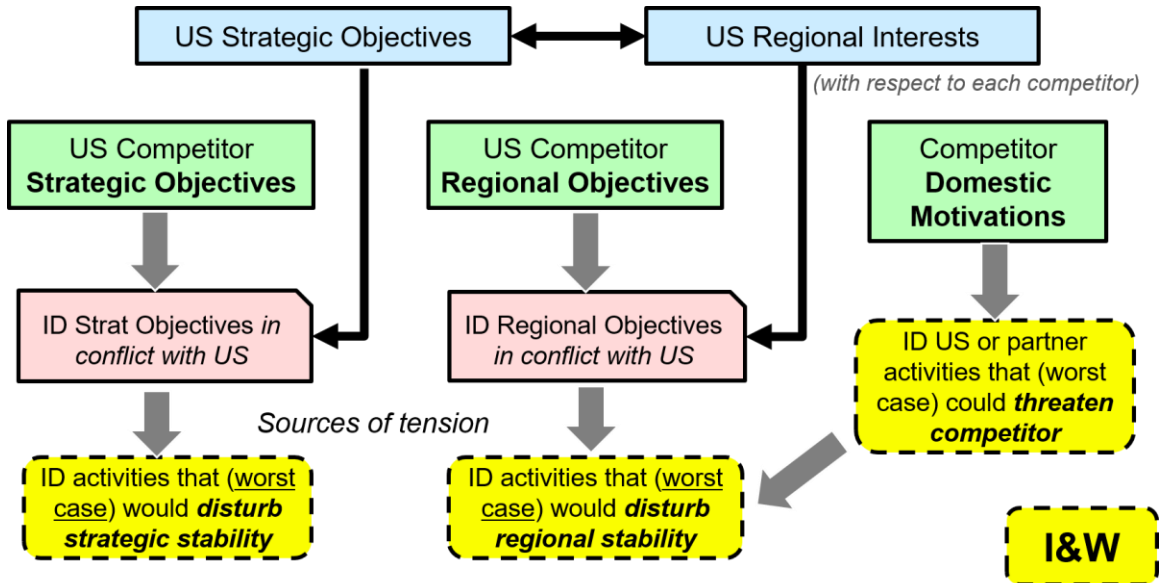

Figure 2. Indications and Warnings of Potential Deterrence Failure Triggers

5. Responses to Study Questions

How should we model the risks to future U.S. strategic deterrence?

This study proposed a restraint-centric model focused on two major causal factors: The probability that the adversary will perceive the need to act, and the probability that the adversary will assess that it will have an advantage relative to the U.S. as a result of executing the COA under consideration, even after a U.S. response. The benefit of this approach is that these causal factors can be decomposed to identify factors that the U.S. can influence. These seven factors were detailed in Chapter 4.

What are the indicators of potential failure of strategic deterrence?

Risk indicators fall into two major categories: Scenario-related triggers and adversary restraint assessment considerations. The restraint assessment indicators are based on the causal factors outlined in the model in Chapter 3:

- The adversary sees a need to act or opportunity to gain advantage by acting against U.S. interests.
- The adversary eschews cooperation opportunities that would be of benefit to both parties.
- The adversary promotes a possible course of action with key national leaders to ensure it will satisfy their demands for action.
- The adversary perceives that the U.S. cannot defend or mitigate the effects of a course of action under consideration.
- The adversary perceives that the U.S. does not have a credible response to a course of action under consideration
- Adversary perceives that it can counter or defend against a U.S. response to the course of action it is considering.

The scenario-related indicators fall into three main categories:

- The adversary indicates that it perceives an existential threat to its vital interests or survival from the U.S. or partner.
- The adversary indicates that it perceives an existential threat to its vital interests or survival from a third-party regional actor.
- The adversary faces an internal existential threat to the government in power's vital interests or survival.

How can these risks be best explained to the U.S. Congress and the think tanks that inform their perceptions of the problems?

Deterrence theory is difficult to understand and even harder to explain because it involves perceptions rather than facts, and focuses on preventing an action or behavior rather than causing an action or behavior to occur. The model in this study attempts to explain deterrence from a restraint perspective, with the potential U.S. response and capability to deny benefits of the course of action treated as just two of the restraint decision influence factors. Reviewing these risk influence factors shifts the risk of strategic deterrence

failure problem from an abstract concept to a specific set of factors which Congress and think tanks can visualize and as a result, more easily comprehend.

Furthermore, the model assumes that the adversary has a range of options from which to develop COAs to address a perceived need to act or opportunity cost should it not act. The U.S. might not be able to prevent any action against the U.S. on the adversary's part, but Congress should be encouraged that its actions can affect the adversary's restraint influence factors in ways that will encourage adversary actions that will have a much lower negative impact on the U.S.

What will be the key effects of emerging technologies (e.g., hypersonic weapons, artificial intelligence, machine learning, autonomous platforms, the revolution in sensing capabilities) on the deterrence effectiveness of U.S. strategic forces in the future? Specifically, how might these technologies alter U.S. and competitor nuclear strategies?

Although not a specific focus, the risk of strategic deterrence failure model suggests that emerging technologies will alter the adversary's perceptions of several key influence factors: First, these technologies individually and collectively are likely to embolden U.S. adversaries that they possess courses of action that will achieve their desired effects successfully with no credible means for the U.S. to counter the activity or defend against them. Secondly, unless the U.S. develops a comparable capability, the adversary may assess that the U.S. has no credible response and therefore the cost of executing the course of action is acceptable. Finally, these new technologies could open up new courses of action to gain strategic advantage relative to the U.S that the adversary might feel the need to exploit if opportunities to employ these capabilities present themselves.

What political, economic, social, or other environmental factors, both internal and external to U.S. nuclear competitors, might increase their costs of restraint and lead to crisis and/or conflict?

Although not a focus of this modeling effort, the model suggests two major factors that would increase the cost of restraint: Missed opportunity costs and costs resulting from an inability to satisfy a perceived need for action. In both cases, the U.S. must watch for any situations that could negatively affect perceptions of key influencers regarding the continued efficacy of leaders in control of the adversary government. This could be triggered by natural disasters, internal strife, third-party actions affecting the economic well being of the country, or any actions that would put the adversary's population at risk politically, militarily, economically, or even socially.

Missed opportunity costs arise from situations where an adversary is presented an opportunity to act against U.S. interests and improve its advantage relative to the U.S., and it is confident that the U.S. will not be able to respond. As an example, if the U.S. deploys forces to one part of the world and the adversary government perceives that the U.S. does not have sufficient capacity to deal a second crisis at the same time, it may see this as an opportunity that it must exploit to avoid internal criticism.

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