Extended Deterrence and Strategic Stability in East Asia: AY19 Strategic Deterrence Research Papers (Vol I)

Edited by:
Dr. Paige P. Cone
Dr. James Platte
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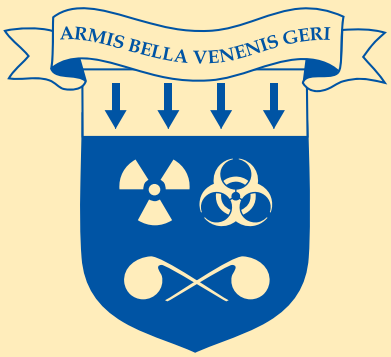

United States Air Force
Center for Strategic Deterrence Studies
Maxwell Air Force Base, Alabama

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Dr. James E. Platte

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USAF Center for Strategic Deterrence Studies
125 Chennault Circle
Maxwell Air Force Base, Alabama 36112

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Preface

During the Academic Year 2019, the U.S. Air Force Center for Strategic Deterrence Studies (CSDS) provided a Deterrence Research Task Force (DRTF) elective for Air War College and Air Command and Staff College students. Of the students, 17 (11 from the Air War College and six from the Air Command and Staff College) with broad and diverse backgrounds participated in this course. They engaged in critical thinking about the nature of strategic deterrence and the role of nuclear weapons under strategic deterrence policy. The class took two field trips. For one trip, the students visited Washington, D.C. to engage with staff in the Office of the Secretary of Defense, Joint Staff, Air Staff, Office of Science and Technology Policy, Defense Intelligence Agency, National Defense University, and the National Nuclear Security Administration. The other field trip was to Lawrence Livermore National Laboratory in California to discuss the technical aspects of nuclear weapons.

Dr. James E. Platte, Dr. Paige Cone, and Dr. Lew Steinhoff were the instructors of this elective and faculty advisors for student research. The research questions for this year's DRTF came from United States Air Force Global Strike Command and the Deputy Chief of Staff for Nuclear Integration and Strategic Stability (HAF/A10) and were divided into two broad themes. First, how can the United States effectively posture in East Asia for a strategic competition with China? Second, how can the United States prepare for a conflict that potentially escalates to an adversary using a low-yield nuclear weapon?

From those two research themes, the staff selected the best student research papers and placed them into three volumes for publication. Volume I is *Extended Deterrence and Strategic Stability in East Asia*. Volume II is *Non-U.S. Deterrence Strategies: What Must the United States Be Prepared For?* Finally, the third collection of student papers was released as a monograph titled *Assessing the Influence of Hypersonic Weapons on Deterrence*.

CHAPTER 1

Introduction

In recent years, the United States government recognized that the international area has returned to an era of great power competition. East Asia is on the front lines of that competition with China as the main competitor to American power in the region. China has long sought to reestablish its status as the preeminent power in East Asia and now has the national capability necessary to engage the United States in this long-term strategic competition. The 2018 *National Defense Strategy* (NDS) declared that China is attempting to "coerce neighboring countries to reorder the Indo-Pacific region to their advantage" and "seeks Indo-Pacific regional hegemony in the near-term and displacement of the United States to achieve global preeminence in the future."[1]

While positioning itself for strategic competition with China, the United States faces other significant challenges in East Asia, particularly from North Korean nuclear, ballistic missile, and weapons of mass destruction programs. The NDS stated that North Korea is "seeking a mixture of nuclear, biological, chemical, conventional, and unconventional weapons and a growing ballistic missile capability to gain coercive influence over South Korea, Japan, and the United States."[2] In 2017, North Korea demonstrated major progress in these programs by successfully testing intercontinental-range ballistic missiles and its most powerful nuclear device yet, which flared tensions on the Korean Peninsula. This transitioned to a flurry of diplomatic activity in 2018 with North Korean leader Kim Jong-un holding summits with the leaders of China, South Korea, and the United States.

The heightened threats posed by China and North Korea also present significant challenges for U.S. extended deterrence commitments to allies in the region, especially Japan and South Korea. Tokyo and Seoul have bolstered their domestic defense capabilities, but still rely on U.S. forward deployed forces, the nuclear umbrella, and other strategic assets for their security. The extended deterrence challenges are arguably more difficult than deterring Chinese or North Korean attacks on United States territory as China and North Korea both work to decouple the United States from its East Asian allies. As seen with the current diplomatic engagement with North Korea, the United States must remain mindful of how to balance military might with the other instruments of national power, while being respectful of allies' concerns and desires.

With this context in mind, several students from the Academic Year 2019 Deterrence Research Task Force (AY19 DRTF) addressed issues related to extended deterrence and strategic stability in East Asia. This effort begins in Chapter 2 with Col. Jordan E. Murphy's examination of implementing a nuclear-sharing agreement with South Korea. Using NATO's nuclear-sharing model as a blueprint, Colonel Murphy outlines what the United States and South Korea would have to do to put a nuclear-sharing plan into practice on the Korean Peninsula. He then analyzes what would be the political effects of such a plan and finds that it

would do more to assure South Korea than to deter North Korea, but importantly, South Korean society must support such a plan to realize those assurance effects.

In Chapter 3, Lt. Col. Elizabeth T. Benedict analyzes how South Koreans view ballistic missile defenses as a component of deterrence against a North Korean attack. The United States and South Korea have worked to bolster their individual and allied missile defense capabilities to counter North Korean ballistic missile development, with the U.S. military notably deploying a Terminal High Altitude Area Defense (THAAD) system to South Korea in 2017. Colonel Benedict found that South Koreans view missile defense systems as vital to their deterrence strategy toward North Korea, and enhancing allied missile defenses, along with maintaining U.S. Forces Korea (USFK), will produce an assurant effect in South Korea. However, if there were a reduction in USFK presence, then an Iron Dome concept operated by South Korea would help maintain South Korean assurance and confidence. Her results provide a framework for how the allies can make decisions on missile defenses in South Korea in the future.

Turning to assuring Japan, Maj. Jonathan P. Gibson examines the impact of U.S. Air Force (USAF) posture in the Indo-Pacific on Japan in Chapter 4. Major Gibson used an analytical model to look at the assurant effect of USAF posturing in response to different situations and found that overall USAF posture levels have no discernable impacts on levels of Japanese assurance. He concludes that incremental increases or decreases of USAF posture would not have an observable effect on Japanese assurance, but specifically tailoring forward-deployed capabilities to address Japan's particular security concerns of ballistic missile attacks and gray-zone maritime coercion could improve positive assurance.

In Chapter 5, Mr. Erwin T. Hoo looks at the assurant value of the nuclear security enterprise (NSE) overseen by the National Nuclear Security Administration (NNSA). Mr. Hoo evaluates the people, processes, and facilities of the NSE and their impacts on assuring Japan in the current and future security environment. He finds that the lack of a U.S. capability to produce, process, or manufacture certain strategic materials for modernizing nuclear weapons could harm the credibility of U.S. extended deterrence for Japan. He urges the United States to complete NSE modernization to be flexible to compete against near peers and rogue states in the current security environment, and recommends that the United States continue to engage allies in dialogue to assure allies.

In Chapter 6, Major William W. Smathers, United States Army, moves to looking at the strategic competition with China and explores how artificial intelligence (AI) will affect the United States-China strategic deterrence relationship. Considering employing AI in the military, Major Smathers finds that the advantage gained by new capabilities may be short lived, and the instability created by these advantages can be overcome. Yet, the capability imbalance can cause instability and increases the likelihood of conflict between the United States and China. He argues that American leaders must increase their awareness about the unforeseen impacts caused by the gain of military advantage, seek a broad coalition to "win" the AI arms race, plus consider and prepare for the impact of an AI arms treaty. Finally, Chapter 7 concludes this volume with some final thoughts and recommendations for further research.

Notes

1. Department of Defense, *2018 National Defense Strategy of the United States of America* (Washington, D.C.: Department of Defense, 2018), https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf, p. 2.

2. Department of Defense, *2018 National Defense Strategy of the United States of America* (Washington, D.C.: Department of Defense, 2018), https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf, p. 2.

CHAPTER 2

Assuring the Republic of Korea Through Nuclear Sharing: A Blueprint for An Asian Ally

Colonel Jordan E. Murphy, U.S. Air Force

In September 2018, it appeared as though the Korean War might finally be over. Not just an armistice (as signed in 1953), but a true cessation of hostilities between North Korea (the Democratic People's Republic of Korea or DPRK) and South Korea (the Republic of Korea or ROK). South Korean President Moon Jae-in's historic visit and summit with Chairman Kim Jong-un creates an idealistic image for the Korean people. The potential of reunification between the two nations has never seemed closer. As both sides begin destroying guard shacks and dismantling defensive positions along the Demilitarized Zone (DMZ), a war between them seems like it could be light years away. Meanwhile, in Washington, President Donald Trump can claim credit for a separate, but equally historic accord with Chairman Kim. Their joint agreement the previous June to cease some joint American military exercises with the Republic of Korea Armed Forces in exchange for the dismantlement of North Korea's nuclear program seems to have taken hold. The visible destruction of the nuclear test area at Punggye-ri gives Chairman Kim credibility that he will keep his word.

However, can Chairman Kim keep his word and end his nuclear development? Evidence points towards North Korea's nuclear desires dating to 1949. Previous talks including the 1992 Joint Denuclearization of the Korean Peninsula and 1994 Agreed Framework did not end Pyongyang's nuclear thirst. While the last American nuclear weapon left the Korean Peninsula in 1991, three successive leaders in North Korea have failed to keep their end of the bargain of nonproliferation. The South Korean people and the Seoul government have every reason to be wary that this thaw in relations is likely to be only a temporary one. Despite President Trump's claims of success, the intelligence community is not in complete agreement that North Korea will denuclearize. Recent comments from the Director of National Intelligence Dan Coats express the sentiment that the North Koreans see nuclear development as essential to their national survival and are unlikely to cease nuclear activity, even though they are seeking better relations with the West.[1]

So, barring a verifiable cessation of North Korean nuclear development, how can the U.S. government best assure its South Korean ally? Is it enough just to deter North Korean aggression, or does the United States need to increase credibility with South Korea as well? Is it harder to deter the North Koreans or reassure the South Koreans? This study tackles these questions and proposes a course of action to ensure American credibility to the South.

Additionally, this paper reviews the importance of deterrent signaling and assurant promises and how they interrelate. Finally, it examines a concept already employed elsewhere in the world with great success. Part of that success has resulted in the nonproliferation of nuclear weapons in several European countries. The United States has shared nuclear weapons to several countries in Europe for more than 50 years, employing them by those nations' air forces. Demonstrating a similar commitment to the South Koreans and showing faith in their armed forces of trust with nuclear employment could achieve the goals of nonproliferation and credibility.

A return of American nuclear weapons to the Korean Peninsula might appear as a shocking idea. However, their presence not only deters North Korea from aggressive behavior, but their presence could also help assure South Korea of the United States' commitment to its extended deterrence posture. The process by which the United States goes about conducting that weapon beddown is essential to ensuring that the weapons have their desired, assurant effect. American personnel stationed with those weapons also need careful selection and training to send the correct message to Seoul. This study will explore those options in depth to create a blueprint for ensuring continued South Korean sovereignty.

At first glance, there appears greater importance of assuring an ally versus deterring an adversary. Several authors write on these points as well as the need for credibility between allies and possible ways to achieve that credibility. There is also a historical legacy of American nuclear weapons on the Korean Peninsula as well and the positioning of American nonstrategic nuclear weapons (NSNW) elsewhere. Those weapons serve a crucial role as part of the nation's extended deterrence posture. Additionally, the United States strategic deterrent is already in place, but that deterrent alone does not completely assure the South Korean ally. Current South Korean opinions towards nuclear weapons appear positive. Employing those weapons with the Republic of Korea Air Force (ROKAF) in conjunction with U.S. Air Force personnel could create an excellent model for success moving forward.

Research Methodology

First, this case study emphasizes the previously mentioned importance of assuring an ally versus deterring an adversary. Second, the research also examines several additional terms and their importance. While some researchers use terms such as low-yield or tactical nuclear weapons, this paper will stick with the NSNW terminology as the role of nuclear weapons on the conventional battlefield has reduced significantly since the 1980s. In turn, it also acknowledges that nuclear weapons have a monumental strategic effect, regardless of yield or type of

employment aircraft. The research also examines what it means for the ROK to be "under the American nuclear umbrella." Using the case example from Europe, it evaluates how a shift to shared weapons enhances the palatability of the Nuclear Non-Proliferation Treaty (NPT) to the DPRK and reassures the United States commitment to the ROK. Finally, the study evaluated to its best ability possible the current public perceptions of the U.S. commitment to the South Korean people and government, as well as the perception of nuclear weapons in South Korea and how those factors might affect this proposal.

Central to this research is the question: *"How would the reintroduction of American nuclear weapons into South Korea affect deterrence dynamics on the peninsula (or in the region)?"* Measuring the amount of assurance by bedding down U.S. weapons is difficult to quantify. Polling data reflects South Korean attitudes towards nuclear weapons. However, that data is ambiguous if it reflects organically designed and built Korean weapons or if it reflects American weapons loaned to the ROK military forces. Central to this research is the hypothesis that: *Given a greater need to reassure the ROK, developing a physical weapon beddown plan and concept of shared employment for U.S. nuclear weapons on the Korean Peninsula has a greater assurant effect than deterrent effect given continued DPRK aggression.*

"Burden sharing" and weapon sharing are also sometimes synonymous. What potential burdens might the ROK government accept to partake in this nuclear program? This question spurs several others regarding the internal commitment from the South Korean government that this research addresses in detail. For example, a potential pitfall for reintroducing American weapons to the peninsula is that it creates a target for DPRK weapons. Mobile nuclear assets would be more survivable, but there is not a template to use for bedding those down in the country. There is also an increased physical security cost involved by having nuclear weapons exposed away from a military installation. An additional burden for the ROK government to accept might be increased tensions with China. The research touches very briefly on potential impacts in that instance, especially if China shifts away from an assured response posture to something more ambiguous.

While the burden on the ROK as far as prestige and perception is somewhat abstract, the actual financial and personnel cost burden is well established. Since the United States has deployed weapons with its North Atlantic Treaty Organization (NATO) allies since the 1960s, the structures of those organizations are well defined. This case study proposes a mirror construct at the operational level to the munitions support squadrons in Europe. To achieve mission-ready status, the ROK would have to invest in a significant amount of training and physical infrastructure. The case study examines the correct number of operational units, weapons, potential weapon types and personnel qualifications necessary to start attaining mission-ready status.

Starting by reviewing literature from Thomas Schelling, Andrew O'Neil, Brad Roberts in addition to other scholarly sources, this case study includes a review of several in-depth articles on Asian deterrence. O'Neil's writing covers several points. These include that extended conventional deterrence is as effective as nuclear deterrence, further reinforcing the argument that the assurant effect of

shared weapons is greater than the deterrent effect. He also covers potential stabilizing factors of nuclear weapons, a consideration the ROK government needs to consider as part of a deployment construct.[2]

Finally, this case study discusses two additional significant factors required to employ effectively a shared-weapons model in the ROK. First, the U.S. Air Force personnel leading these operations possess a key role in enabling the initial stand-up of this operation. What additional training do they require and what would be some of the essential qualifications needed to ensure their success? Second, this case study proposes that all American military personnel tasked to support this model obtain culture and language training before their assignment. While this is not the norm for personnel deployed to the shared-weapon sites in Europe, initial research indicates that understanding Asian culture and language enhances job site effectiveness.[3] An Air Force munitions unit employing shared weapons with a ROKAF fighter wing will need to have a thorough understanding of Korean language and culture to minimize delays in obtaining mission readiness.

Deterrence vs. Assurance

Deterrence Dynamics

Reintroducing American nuclear weapons on the Korean Peninsula has the potential for significant implications in multiple facets of policy and procedure. Some of these facets include credibility, assurance and commitment. Regarding the subject of commitment specifically, Schelling states, "(Commitment) is to incur a political involvement, to get a nation's honor, obligation and diplomatic reputation committed to a response."[4]

Several other authors write about the difficulty of assuring an ally and the greater challenge in achieving this effect versus deterring the adversary. Rod Lyon reviews the topic thoroughly when putting the thought into mathematical terms. The deterrence equation requires that an actor have a nuclear capability and that the capability multiplied by the will to use the nuclear capability in an act of war as perceived by the adversary.[5] Assuring an ally is more difficult, however. To provide this assurance, an ally needs to be credible in its signaling and subsequent actions.

Again, Schelling informs us about the importance of clearly defining commitments to allies to ensure that those commitments are credible. A loosely defined promise to defend shows a distinctly less visible commitment than making a promise into which an ally cannot escape.[6] Schelling goes on to discuss closing loopholes as demonstrations of that credibility. In the current construct of extended strategic deterrence, an ally could doubt the credibility of the United States' steadfast resolve. While intercontinental ballistic missiles (ICBM), submarine launched ballistic missiles (SLBM) and long-range bomber patrols demonstrate some commitment, the ROK military forces do not participate in those operations. Additionally, while those strategic options are likely to continue deterring the DPRK, the greater requirement is to show the commitment to the ROK that the United States will defend South Korea in the case of increased DPRK aggression.

Importance of Assurance and the Healey Theorem

Former British Defense Minister Denis Healey postulated in the late 1960s that "five percent credibility … to deter (an adversary), but 95 percent credibility to reassure (an ally)." Brad Roberts further cites this thought when discussing the challenge of American extended deterrence credibility worldwide.[7] Under the most recent U.S. administrations, a declining trend in the interest of extended deterrence magnifies the challenge.[8] From the perspective of the European allies, the United States has continued to show that credibility despite the challenge. Even though the tactical nuclear threat has subsided since the end of the Cold War, the United States has upheld its nuclear commitment to NATO and continued combined force training and operations with NATO allies. This paper will review those operational concepts in a later section.

Further emphasizing this point, O'Neil investigates the claim that the "effects of extended nuclear deterrence have been exaggerated."[9] While he acknowledges claims that the nuclear umbrella is unreliable in deterring adversaries (in this case the DPRK), he identifies evidence that U.S. extended deterrence does play a role in shaping their decisions. He points to the fact that the DPRK has issued "no first use" and other declarations indicating restraint, arguing that such statements would not make sense for a state that saw U.S. extended deterrence as ineffective.[10]

O'Neil also discusses the argument that extended nuclear deterrence is redundant to the global strategic deterrent with the ending of the Cold War. This lends further credence to the idea that assurance and not deterrence is the greater challenge. He notes that in 2010, both the United States and ROK governments "agreed to institutionalize an Extended Deterrence Policy Committee," to enhance the coordinated effort.[11] Finally, he discusses the compelling example that nuclear weapons make a state more likely – not less likely – to exercise restraint in a crisis. He postulates that a nuclear weapon stockpile deters decision makers from provoking a nuclear adversary.[12]

These arguments should not dismiss the deterrent value completely. It is highly relevant that, included with the deterrent value, there is a nonproliferation value (beyond just creating an assurant) enabled by placing weapons on allied territory. Specifically, the ROK has developed the capability to develop domestic nuclear weapons since the 1970s. However, they have not done so and ceased their organic development completely as of 1979. After potential troop withdrawals from the peninsula in the mid-1970s, both the ROK and the United States signed a joint communiqué in 1978 formally enshrining their inclusion under the nuclear umbrella.[13] Despite further formal (written) assurances, the recent rhetoric from ROK leaders indicates that they believe the continuing relevance of the 1978 declaration 40 years later.

Both Thomas Schelling and Terence Roehrig further discuss the challenge of demonstrating effective extended deterrence beyond a nation's sovereign borders. Do the South Koreans believe that the United States would go to nuclear war for interests outside "plausible statehood?"[14] If there is not an existential threat to the United States, then the ROK needs assurance that the United States will

respond to apply full resources to deter aggression from the DPRK successfully. Roehrig theorizes that the previous iteration of U.S. nuclear weapons on the Korean Peninsula deterred the DPRK from moving southward. However, he contends that those weapons served a tactical (battlefield) purpose. The ROK government and military did not have a voice in the decision to withdraw them in 1991. The withdrawal was a unilateral decision on the American side in the hopes that the DPRK would "(relinquish) its nuclear ambitions and comply with (IAEA) inspection requirements."[15] Regardless of the decision authority, the DPRK did not reciprocate on its end of the bargain as intended.

David Yost explains the American commitment to Europe and NATO and discusses the roles for U.S. nuclear weapons and their effects. Specifically, he points to the continued presence of American weapons in Europe as part of its commitment to Article 5 of the Washington Treaty and the reliability of the United States to defend its allies there.[16] By including the nuclear host nations in the planning process, the weapons serve both deterrent and assurant effects. First, they reinforce the concept of expeditiously resolving security crises by restoring deterrence and preventing a larger conventional war. Second, they inform adversaries that NATO maintains all options to retaliate.[17] Additionally, the presence of the weapons assures these allies because they maintain the aircraft needed for delivery and have the opportunity to show "solidarity and share risks and responsibilities."[18] Finally, Yost argues that maintaining both a conventional and nuclear capability in Europe is the "core element" of American strategy in Europe.[19] It is reasonable, therefore, to argue that displaying a similar level of commitment to the ROK would create a similar effect on our Korean ally and to our overall strategy on the peninsula.

European Perceptions of American Nuclear Weapons and Proliferation Considerations

European polling data on the placement of U.S. nuclear weapons on their soil shows mixed results. While dated (2007), a Simons Foundation survey asked 1,000 respondents in several European countries (as well as elsewhere) about nuclear weapon attitudes and opinions on nuclear sharing.[20] Specifically, they asked several NATO members about the NATO nuclear-sharing concept and if it was a violation of the Non-Proliferation Treaty. Germane to the discussion, 56 percent of Germans and 57 percent of Italians polled said it was a violation. However, 16.5 percent in Italy and 19.2 percent in Germany of those polled were not sure if the sharing concept was a violation or not.

However, favorability towards nuclear sharing in Italy and Germany is somewhat higher. Independent of the Non-Proliferation Treaty question, 30.3 percent of Italians (out of 1,000 surveyed) and 23.6 percent of Germans (out of 1,000) agreed that nuclear sharing under NATO was in their best interest as a sovereign nation. In addition, 18.4 percent of Italians and 16.4 percent of Germans were not sure of their opinion on the question.

In 2014, Dan Reiter attempted to address the reassurance question by examining states that had offers of nuclear security commitments and comparing

them against states that didn't have nuclear security commitments.[21] In this study, he notes that 342 cases of nations to which nuclear weapons had been deployed, none of those nations pursued their own nuclear weapons programs (or acquired them). However, in 5,562 cases in which governments did not have nuclear weapons deployed on their soil, eight of those cases resulted in nations acquiring nuclear weapons. Hence, it is feasible to argue that in those 342 cases, those nations felt assured by having American weapons on their soil and hence chose not to proliferate.

The significant point Reiter iterates is that in each of these nations that hosted U.S. weapons, it disincentivized them from acquiring their nuclear weapon stockpile. By not acquiring a stockpile, the inaction potentially signals assurance. Although the ROK has not resumed its nuclear development (despite the discussions of nuclear desire in the National Assembly), Reiter emphasizes that U.S. conventional forces, alliance agreements and their inclusion under the strategic nuclear umbrella may not be enough to continue to assure the South Koreans sufficiently in the future.

Returning Weapons to the Korean Peninsula

Reassuring the ROK

To follow the Healey Theorem's logic, we revisit the hypothesis: *Given a greater need to reassure the ROK, developing a physical weapon beddown plan and concept of shared employment for U.S. nuclear weapons on the Korean Peninsula has a greater assurant effect than deterrent effect given continued DPRK aggression.*

Shared Weapons

The concept of nuclear weapon sharing is not new. In the early 1960s, the United States established the initial nuclear weapons sharing agreements with several NATO-member countries. This concept served a dual purpose. First, it enhanced the already present U.S. weapons in place, which U.S. aircraft would employ. Second, it enabled those nations to partake in the upcoming NPT. Six of the nonnuclear weapon states that are party to the NPT have weapon-sharing agreements with the United States. These include Belgium, Greece, Germany, Italy, The Netherlands and Turkey.[22]

A series of bilateral agreements are in place with each of these countries as well as the overall NATO employment under the organization's Nuclear Planning Group (NPG). To enable the translation of this concept to the ROK, the United States would have to establish a new series of bilateral agreements and a similar planning organization with the ROK government. Operationally, the concept would employ a stockpile of U.S. weapons at a ROKAF installation by which they are and flown by ROKAF aircraft. Weapon maintenance, custody and use control remain in the hands of the U.S. owning organization until the U.S. president releases those

weapons for use. If that release occurs, the U.S. custodian transfers weapon custody to the employing aircrew for flight.

In the European model, there are four types of bilateral nuclear agreements. Three of these four apply if the ROK implements this model. These are the Atomic Stockpile Agreement, the Atomic Cooperation Agreement, the Service-Level Agreement and a "Third Party" stockpile agreement. The Atomic Stockpile Agreement is the top-level document between the United States government and the hosting nation, which informs the introduction of nuclear weapons as well as details the cost/burden-sharing process. The Atomic Cooperation Agreement is administrative in nature and enables an exchange of nuclear weapon information "for mutual defense purposes." The Service-Level Agreement is technical and details the responsibilities of the host nation and the U.S. unit. The "Third Party" agreement would only apply in a multilateral setting. Hence, it does not seem applicable for a Korean scenario.[23]

Approximately 60 F-15K aircraft equip the ROKAF.[24] The F-15K is the Korean variant of the F-15E Strike Eagle with some variances to the avionics package for the Korean market. Relevant to the topic, the F-15Ks do not have the nuclear weapon coding equipment required to enable the weapon to "unlock" codes. Daegu Air Base in the central part of South Korea hosts these aircraft. The base has several hardened aircraft shelters as well that at least partially facilitate security cover to allow covert weapon loading. Just because the ROKAF owns the aircraft, however, should not indicate that it is an easy process to begin from nothing in nuclear certifying the unit.

Upon initiation of the nuclear-sharing agreements, the combined force would need to select a base to house the American/ROKAF unit. While Daegu AB has hardened aircraft shelters, there are presently not any types of nuclear weapon storage facilities on the installation. Given current nuclear security requirements, preventing unauthorized access through either weapons vaults or a different type of underground storage is essential. There are several benefits in structuring the beddown for the ROKAF like the present munitions support squadrons already operating as part of United States Air Forces in Europe. Establishing a munitions support squadron (MUNSS) co-located with the ROKAF F-15Ks could occur once the agreements and treaties were in place.

The present munitions support squadron structure is a U.S. Air Force (USAF) unit that directly supports a nuclear strike mission with an allied nation's flying squadron.[25] The squadron consists of approximately 150 personnel in the security forces, maintenance, mission support, communications, command post and personnel career fields. The sole reason the squadron exists is to provide proper custody for the weapons assigned. The role of the security force personnel is to provide close-in weapon security and ensures that American ownership of these weapons until their release to the weapon-sharing nation as authorized by the U.S. president. They interact with a much larger host-nation security force (in this case, a sizable number of ROKAF security personnel) to ensure that improper access opportunities to weapons never occur.

These American airmen require a small mission support section to handle routine personnel matters (i.e. processing new personnel into the unit) and to

manage the various routine administrative functions of a USAF unit. Additionally, as with almost all USAF organizations outside the United States, this support function will need to provide the various U.S.-unique needs, which their ROKAF hosts do not handle. Finally, in times of emergency, these support personnel always provide a back-up close-in weapon security role to ensure U.S. positive weapon control.

The role for the maintenance personnel is to complete routine (internal) maintenance on the weapons themselves. As with close-in security, the host nation never performs this task. Once deployed to the peninsula, the weapons still require routine limited-life component changes, coding updates and inventory tasks performed by maintenance personnel. In these squadrons, there are also communication equipment maintenance personnel assigned to ensure that the equipment used to transmit coding and emergency action messages between U.S. command authorities and the MUNSS is always functioning properly.

Additionally, the MUNSS maintains a command post. There are two command posts operating with this type of unit as proposed for the ROKAF. First, the American command post handles U.S. emergency action messages and other communications traffic (using the equipment described above) to ensure 100 percent positive control of any operational weapon task (i.e. generation to an allied aircraft). Also, the ROKAF would establish and maintain a separate command post to validate South Korean government authority to generate its aircraft for the nuclear mission. Notionally in times of crises, the bilateral governance of the United States and ROK issues a joint message to initiate nuclear mission generation of the host-nation aircraft.

When each command post receives its separate message, both the ROK flying wing command staff and the MUNSS command staff would activate a joint operation center to initiate the aircraft generation process. To ensure security (and continued American weapon custody until authorized for release by the president of the United States), the command posts process multiple coded messages during this generation activity. Dual sets of early messages authorize the opening of the weapon storage (enabling access). Additional sets of dual messages authorize uploading weapons on the aircraft as well as transmitting target data and flight information to the operating aircrews. Crucially, throughout the process, use of control codes prevents unauthorized use of the weapon. The enablement process is the last step in aircraft generation while the aircrews are sitting in the aircraft.

The final step in the dual command post process involves releasing the weapons for military use. This is the unique code only authorized by the president of the United States and transmitted through the appropriate command authorities. Secure communications equipment transmits all of these messages to prevent tampering and unauthorized access. Other components to prevent unauthorized access reside in this process as well. However, discussing those goes beyond the scope of this case study.

While NATO has employed a similar weapon-sharing concept at several locations since the 1960s, copycatting the concept to the Korean Peninsula should capture several lessons learned from the European experience. First, the American forces assigned to the European MUNSS arrive without formal culture or language

training to work with their host-nation counterparts. While NATO has standardized the English language, communication challenges still exist between the American forces and their European hosts. The significant Korean culture differences likely exacerbate this problem on the Korean Peninsula. The ROKAF is presently not under any mandate to speak English (except when required, as in air traffic control). A bilateral treaty initiating this concept diminishes the argument to standardize English without the multilateral facet as in the NATO construct. Additionally, Korean culture training enhances the effectiveness of U.S. forces significantly.

In a study of cultural competency gaps, Chihoko Itami observed that those students who only learned the English language, but did not engage in multi-modal training (i.e. imagery or American culture) had less of an ability to sustain their interaction with native English speakers. The study compared native Japanese speakers who had learned a basic level of English in their school studies and the mannerisms of students who were native English speakers. While Korean and Japanese are different languages, the larger idea that the two Asian cultures are very different from American culture and mannerisms still holds sway. It also seems logical that the inverse of the Asian culture learning the American culture should be true. Namely, that American forces assigned to an Asian unit also need to understand the culture as well as the language to understand the nonverbal and to communicate effectively. This importance of understanding the culture increases in magnitude if a short timeline implemented this concept, as mistakes caused by cultural gaps cannot always evaporate quickly.

Effects of Returning Weapons to the Korean Peninsula

There is reasonable evidence even without a weapon-sharing arrangement that the South Koreans feel assured of coverage under the U.S. nuclear umbrella. South Korea began pursuing nuclear weapons in the late 1960s and continued the effort until 1979.[26] This work increased throughout the 1970s as Presidents Richard Nixon, Gerald Ford and Jimmy Carter's efforts to downsize the U.S. military commitment on the Korean Peninsula resulted in increased anxiety in the ROK government. One can speculate that President Ronald Reagan's increased security guarantee to the South Koreans resulted in the cessation of their nuclear program and efforts do not appear to have restarted since then. Once the fear of abandonment subsided, the South Koreans no longer saw the need to proliferate.

Historical evidence is inconclusive regarding the effectiveness of foreign nuclear weapons on an ally's soil.[27] The signaling of nuclear support and security guarantee appears to be at least as important as the actual positioning of the weapons. The signal of commitment itself does appear to result in a reduction in violent conflict. However, according to Todd Sechser and Mathew Fuhrmann (2014), states hosting nuclear weapons do not, "enjoy a diminished risk of militarized disputes."[28]

In 2011, voices for ROK "nuclear sovereignty" grew in the South Korean National Assembly. As a result, the United States and ROK jointly launched the Extended Deterrence Policy Committee (EDPC). In June 2017, President Trump and President Moon Jae-in replaced the EDPC with an Extended Deterrence

Strategy and Consultation Group (EDSCG) to meet regularly. This group's primary role is to reiterate the firm commitment by the United States to defend South Korea with the full spectrum of military options. The bilateral agreements structured the EDSCG like NATO's Nuclear Planning Group with the diplomatic and defense authorities on nuclear deterrence issues jointly participating to discuss issues and propose solutions. Between the June meeting and a follow-up meeting in January 2018, the group reaffirmed the U.S. commitment to deter North Korea and resolve ongoing nuclear issues.[29]

Within the South Korean government, several politicians have advocated recently for receiving a deployment of U.S. nuclear weapons. Members of both the Liberty Party Korea and the People's Party (the second and third largest political parties in the ROK) have called for weapons to manage the North Korean threat and for use as a "bargaining chip."[30] Chung Mong-joon, in particular, argued in 2011 that the U.S. nuclear umbrella continued to be unsuccessful in forcing the North Koreans to give up their nuclear program. He further argued that having U.S. nonstrategic nuclear weapons increased South Korean autonomy. At the same session, other conservative politicians argued that the weapon deployment would serve as a substitute for an organic nuclear weapons program in their country. It is necessary to caveat these statements that both political parties oppose each other and both are minority parties in the ROK National Assembly, opposing the ruling Democratic Party. Without additional corroboration, the support from one or the other party may merely be one of the ways the two parties are attempting to highlight their differences and to create a headline to oppose the policies of the ruling party in the ROK National Assembly.

Even the concept of NATO-like nuclear sharing by the ROK military arose during other sessions of the ROK National Assembly. In September 2017, members in both the People's Party and the Liberal Party jointly called for nuclear sharing to create bargaining power to oppose the DPRK. The joint statement called for the ROK foreign minister to allow South Korean forces to participate in U.S. nuclear weapon operations like NATO members and for the ROK foreign minister to consider tactical nuclear weapons deployment.[31]

In its annual opinion poll, Gallup Korea (not affiliated with the U.S.-based Gallup, Inc.) has surveyed South Korean attitudes towards nuclear weapons on their home soil going back several years. Attitudes remain positive, with a 64-percent favorable rating in 2013, a 54-percent favorable rating in 2016 and a 60-percent favorable rating in 2017. Notably, all these polls predate the recent discussions between Chairman Kim and President Moon. It is not clear if the recent developments towards disarming the DPRK and ROK border will have an impact on those opinions. The poll also did not break down the data between government members and regular citizens.[32]

The primary intent of the U.S. defense posture in and around the ROK is to deter North Korean aggression towards South Korea and towards other allies in the region. The joint U.S.-ROK Combined Forces Command operates with the following as its mission statement: *"(Our) role is to deter, or defeat if necessary, outside aggression against the ROK."*[33] The currently deployed and exercised strategic nuclear forces may be enough to deter this aggression, but may not be

enough to assure the Seoul government. If not, then the ROK might want to resume its own weapons development program to ensure the balance of power.

Because of the opaqueness of the North Korean society and the lack of available polling data, it is difficult to ascertain with any certainty how North Korean society would react if their southern neighbors had nuclear weapons. Based on historical trends, the North Korean propaganda machine would not mention them at all or they would finger blame through state-run media towards the United States. Chairman Kim's previous activities towards military actions that he sees as a threat might give some clue as to how he might react.

Previous North Korean reaction demonstrating opposition to exercises such as Ulchi-Freedom Guardian includes nuclear and missile tests directed towards the Guam and Japan. Significantly, his reactions do not appear to point towards South Korea. Hence, ensuring effective transmission of the strategic message that the ROK military is employing these weapons is essential in ensuring they have the desired deterrent effect. Chairman Kim appears to follow a largely Stalinist-style of governance. Based on historical Soviet reaction to shared weapons in Europe, he might escalate the rhetoric through threats and tests. However, it seems unlikely that he would kinetically strike anywhere without an offensive military action directly pointed towards his country. In that sense, the weapon beddown has a zero-sum effect towards deterring his actions. The weapons do not deter him any greater or lesser from initiating kinetic military action against the South than without their presence.

Alternatively, the return of weapons to the South might result in an increased desire on the part of Chairman Kim to negotiate with all affected parties towards complete denuclearization. Again, the history in Europe informs this thinking, that basing Pershing II missiles there in the mid-1980s played a prominent role in bringing the Soviets to the negotiating table, which resulted in the signing of the Intermediate-Range Nuclear Forces Treaty (INF) in 1987. Ultimately, a negotiated settlement between both Koreas and the United States might be the best possible effect to result from the weapons return. However, the initial North Korean reaction is difficult to ascertain based upon lack of relevant historical data. By this thought process then, the weapon beddown increased the deterrent effect. This increase leads towards Chairman Kim's desire to de-escalate tensions and negotiate in good faith.

Policy Implications

There are multiple policy implications throughout the U.S. interagency as well as in the ROK government. First, since the 1992 removal of U.S. nuclear weapons from South Korea, the ROK armed forces have assumed a far greater role in leading their military forces. Interagency policy dictates that the Department of State become involved to author documents and policies that mirror the NATO construct to the ROK leadership. Without a multilateral organization such as NATO with which to contend, the amounts of signatories required to those policies are fewer, but still require accomplishment. Additionally, the nuclear command and control structure for use-control is nonexistent within the ROK or its air force. If

the concept copies the European model, those policies require modification, agreement and approval by both the Korean and American governments before ROK implementation.

In addition to the DPRK reaction, the options discussed by this proposal may affect Chinese policy towards the ROK and the United States. Current Chinese policy indicates a regionally focused strategy centered towards assured destruction, second-strike capability. However, while that policy might shift if the United States entered into a shared-weapons agreement with the ROK, this case study will assume the risk of such a policy shift. Finally, this proposal also assumes the risk that the DPRK might consider this beddown provocative and as such would accelerate its weapons development program.

Significantly, to implement this plan on the peninsula would take a whole-of-government approach including the ROK armed forces, support from the ROK National Assembly (all political parties as discussed earlier) and the full endorsement of the ROK president (Moon Jae-in, as of this writing) and the prime minister. Any significant opposition from any of these offices could result in greater damage to the South Korean relationship with the United States and has potential to reduce (not increase) the sense of assurance felt by the former from the latter. If the United States forced this option upon the ROK, it is likely that resistance would be fierce from one (if not all) of these entities, the plan as discussed by this report must appear to the South Korean people as their idea. However, having this plan on the shelf and strategically discussing the possibility of doing it with the ROK government might create an increase in the assurant metrics just by them knowing that the alliance was rock solid. Doing so sends a signal by reinforcing the faith in the ROK armed forces that "We are integrating our strategic forces with you. We trust you with our nuclear weapons."

However, in sum, creating a situation where the South Korean people or government opposes the plan could result in a negative assurant effect. Public support in South Korea needs to be higher than the 2007 European polling data reported in those countries. Implementing this plan without Korean forces could be highly detrimental to both the alliance relationship between the United States and the ROK and the deterrence dynamic with the North Koreans.

Recommendations

To assure the South Korean government and military of inclusion in its nuclear umbrella, the United States should initiate a nuclear weapon beddown plan at Daegu Air Base, ROK. There is adequate reason to believe that the stockpile size placed on the peninsula doesn't need to be very large. Forces designed for a second-strike deterrent or, in this case, assurant effect should not result in an "arms race" between the two Koreas.[34]

The first step in initiating this proposal is to outline a bilateral nuclear-sharing proposal between the United States government and the ROK government — probably between the ROK Ministry of National Defense and the United States Department of Defense. This top-level guidance, signed at the top level, would

outline the reasons behind the beddown plan and establish key governance, organizations, chains of command and authorities for the commander of United States Indo-Pacific Command (USINDOPACOM) and the designated South Korean military representative. Specifically, this document should establish a U.S.-ROK Nuclear Planning Group (NPG-K) of principal members to manage the deployment and employment policies of these weapons while they are in place.

Following its establishment, NPG-K would be responsible for authoring the employment documents and organizing the funding across the joint operation. These documents must include policies and procedures for weapon security, logistics movement and receipt on a South Korean installation, emergency response procedures, emergency evacuation procedures (in case of imminent enemy attack) and weapons employment. The funding established by this organization needs to establish the key facilities at the weapon beddown location that the joint force will utilize. Some of these facility requirements include a battle staff/command staff operations area, purchase of communication systems, secure storage locations and administrative/personnel buildings.

Table 1 below shows three different basing options for nuclear beddown. While the F-15K provides the best weapon-system option, there is potential that the Korean KF-16s could also attain nuclear certification. Both Daegu and Kunsan Air Bases are located farther south from the Demilitarized Zone (DMZ) and provide additional security as a result. Jungwon Air Base is approximately 140 kilometers from the DMZ. Through reviewing overhead satellite imagery, it appears as though there are hardened aircraft shelters (HAS) at all three locations. These shelters provide aircraft and weapon security from both intrusion and enemy attack. Kunsan Air Base provides an added benefit. There is already an American F-16 flying wing on the base, which could provide administrative and aircraft technical support to the shared-weapons organization as needed.

Table 1. Potential Weapons and Aircraft Locations

Facility	Aircraft	Shelters	Number	
Daegu Air Base	F-15K	>30	~60	Primary
Kunsan AB	KF-16C	>30	~20	Alternate 1
Jungwon AB	KF-16C	>25	~60-80	Alternate 2

Part of the construction at each of these locations would have to include weapon storage. Currently, NATO has Weapons Storage and Security Systems of which each weapon storage vault stores B61 gravity nuclear bombs.[35] Remote sites monitor the vaults 24 hours per day, seven days per week at a location elsewhere on the installation to ensure positive control and prevent unauthorized access. These vaults exist inside the shelters, enabling loading of the weapons and configuration for war in a secure environment. Given that a small stockpile size should be sufficient to create the needed assurant effect, each of these installations detailed

could provide sufficient HAS to enable installation of the needed weapon storage vaults and monitoring facilities.

Before weapons beddown, the agreements between the ROK and United States would have to stipulate which type of aircraft would become nuclear capable. The F-15Ks provide the greatest strike capability and weapon load capacity. However, the KF-16Cs also have the potential to become nuclear capable. While the technical details of this nuclear wiring and equipment go beyond the scope of this paper, it would be feasible to install the needed aircraft equipment during a depot maintenance activity or in a specific aircraft modification effort either in the ROK or in the United States.

The United States historically deployed (and continues to deploy) nuclear weapons outside the United States.[36] A small stockpile of weapons, to include weapon trainers, is likely enough to meet the mission need. In this concept, maintenance personnel assigned to the ROKAF load the weapons onto the aircraft and technicians assigned to the USAF maintain the weapons. This creates a training requirement for both the USAF and ROKAF personnel. While the U.S. military personnel would receive their initial skills training before arrival in the ROK, the ROKAF loading personnel require very stringent instruction in weapon upload and preparation for flight. Additionally, the ROKAF security personnel require significant training in nuclear weapon security and emergency response. The previously mentioned cultural skills orientation and indoctrination are necessary to facilitate a smooth transition to nuclear operations in the new nuclear-sharing unit. Also significant, the joint command post personnel in the operations center would require significant training and will need to establish effective coordination procedures between the two nationalities to process emergency action messages correctly upon alerting. Finally, the ROKAF aircrews employing the weapons on their aircraft will require independent certification and training before earning nuclear mission certification.

Conclusion

The United States would not be starting from nothing if it chose to return nuclear weapons to the Korean Peninsula. Emulating the NATO-style of nuclear-sharing with the ROK would prevent creating the image that the United States was "going it alone." Additionally, it has the potential to create a sense of pride and ownership amongst the trained ROKAF personnel conducting joint nuclear operations. While this proposal has explored only three potential locations, there are several other ROKAF locations that could potentially host U.S. nuclear weapons as well. Additionally, the use of weapons storage vaults is only one potential method for storing weapons securely.

There is reasonable assurance that a return of nuclear weapons to their country assuages the South Korean government and its people. First, the current standoff capability of American submarines and bomber overflights shows limited resolve. There is not any ROK government equity in those operations. Second, by completely integrating the South Korean armed forces into the nuclear mission, they would invest a significant cost into the operation. Creating ROK willingness

to expend national resources on nuclear readiness would create a similar effect as producing an independent weapon stockpile separate from the United States. This nonproliferation aspect of weapon sharing is a benefit enjoyed by both sides. Thus far, none of the countries in Europe, which have enjoyed the benefit and shared the burden of nuclear weapons, have created stand-alone nuclear capability. If the United States communicated strategically to the Korean people that the need was their organic idea and not as something forced upon them by an American hegemon, this proposal has potential to obtain the desired results.

The potential reaction from the DPRK or the People's Republic of China (PRC) is unclear. There is a possibility that both nations could consider a move to nuclearize the ROK as a significant escalation. However, in the case of DPRK, moving weapons back to the peninsula creates a possible bargaining chip to entice them to cease nuclear weapon development activities completely. Additionally, this proposal for nuclear weapons at fixed locations in the ROK does create targets for DPRK weaponeers in the event of a renewed conflict. An alternative might be to place more survivable, mobile nuclear assets, away from fixed ROKAF installations. However, there is not a template currently in existence for this type of operation. In addition, there is a significantly increased physical security cost to storing weapons away from a military facility. Exposing nuclear weapons without physical security is not a reasonable proposal.

Finally, it is difficult to measure quantifiably the amount of assurance that the South Korean government and people would sense by weapon sharing. The polling numbers only report ROK favorability towards nuclear weapons, not their sense of assurance of inclusion under the U.S. nuclear umbrella. There is a possibility that drawbacks (i.e. increased tension) and increased cost to the South Korean people would negate the added benefit of weapon sharing, resulting in a net loss of assurance instead of the desired net gain. However, the continued unpredictability of Kim Jong-un and his DPRK leadership is not difficult to assume. Executing a weapon sharing and beddown with the ROK government sends a clear signal to both sides that the United States commitment to the region is ironclad.

Notes

1. Olivia Beavers, "Top intel chiefs contradict Trump on Iran, North Korea nuclear developments," *The Hill* (Jan. 29, 2019, https://thehill.com/policy/national-security/427427-intel-chief-says-north-korea-unlikely-to-give-up-its-nuclear-weapons.

2. Andrew O'Neil, "Extended Nuclear Deterrence in East Asia: Redundant or Resurgent?," *International Affairs,* vol. 87, no. 6 (2011), p. 1,454.

3. Chihoko Itami, "Acquisition of Integrated Language-Culture Competency in a Multi-Cultural Work Place," *Bulletin of the Transilvania University of Braşov,* Series VII: Social Sciences, Law, vol. 6, no. 2 (2013), pps. 291-298.

4. Thomas C. Schelling, *Arms and Influence* (New Haven, Conn.: Yale University Press, 2008), p. 49.

5. Rod Lyon, "The Challenges Confronting United States Extended Nuclear Assurance in Asia," *International Affairs,* vol *89*, no. 4 (July 2013), pps. 929-41.

6. Schelling, *Arms and Influence,* p. 48.

7. Brad Roberts, *The Case for United States Nuclear Weapons in the 21st Century,* (Redwood City, Calif.: Stanford University Press, 2015) pps. 178-179.

8. Ibid., p. 179.

9. O'Neil, "Extended Nuclear Deterrence in East Asia: Redundant or Resurgent?," p. 1,440.

10. Ibid., p. 1,448.

11. Ibid., p. 1,451.

12. Ibid., 1,453.

13. Andrew O'Neil, *Asia, the United States and Extended Nuclear Deterrence: Atomic Umbrellas in the Twenty-First Century* (New York, N.Y.: Routledge Press, 2013), p. 62.

14. Schelling, *Arms and Influence*, p. 60.

15. Ibid., p. 667.

16. David S. Yost, "Assurance and United States Extended Deterrence in NATO," *International Affairs,* vol. 85, no. 4 (2009), p. 768.

17. Ibid., p. 770.

18. Ibid., p. 772.

19. Ibid., p. 775.

20. The Simons Foundation, "*Global Public Opinion on Nuclear Weapons,"* September 2007, p. 7.

21. Dan Reiter, "Security Commitments and Nuclear Proliferation," *Foreign Policy Analysis*, vol. 10 *(2014)*, p. 7.

22. Martin Butscher, Otfried Nassauer, and Stephen Young, "Nuclear Futures: Western European Options for Nuclear Risk Reduction," *British American Security Information Council (BASIC) – Berlin Information-Center for Transatlantic Security Research Report 98.5* (December 1998), p. 34.

23. Hans M. Kristensen, *United States Nuclear Weapons in Europe. A Review of Post-Cold War Policy, Force Levels and War Planning,* (New York, N.Y.: National Resources Defense Council, February 2005), pps. 11-12.

24. "World Air Forces 2018," *FlightGlobal 2017,* RUAG Aviation, p. 29.

25. Kristensen, "*United States Nuclear Weapons in Europe*," p. 11.

26. Philipp C. Bleek and Eric B. Lorber, "Security Guarantees and Allied Nuclear Proliferation," *The Journal of Conflict Resolution,* vol 58, no. 3 (2014), p. 446.

27. Matthew Fuhrmann & Todd Sechser, "Signaling Alliance Commitments: Hand-Tying and Sunk Costs in Extended Nuclear Deterrence," *American Journal of Political Science,* vol. 58, no. 4 (2014), p. 932.

28. Ibid., p. 932.

29. "Outcome of the Second Meeting of ROK-U.S. Extended Deterrence Strategy and Consultation Group," Jan. 18, 2018, www.mofa.go.kr/eng/brd/m_5676/view.do?seq=319650.

30. Takeshi Watanabe, *In South Korea, NATO is a Reference for Tactical Nuclear Weapon Advocates,* January 2018, p. 1.

31. Ibid., p. 4.

32. http://www.gallup.co.kr/gallupdb/reportContent.asp?seqNo=866 &pagePos=1&selectYear=&search=&searchKeyword=.

33. https://www.usfk.mil/About/Combined-Forces-Command.

34. Scott D. Sagan and Kenneth Waltz, *The Spread of Nuclear Weapons: An Enduring Debate* (New York, N.Y.: W.W. Norton, 2012), p. 29.

35. Kristensen, "*United States Nuclear Weapons in Europe,*" p. 13.

36. Robert S. Norris & Hans M. Kristensen, "Nuclear Notebook: Worldwide Deployments of Nuclear Weapons," *Bulletin of the Atomic Scientists,* 2009, p. 91.

CHAPTER 3

Missile Defense in South Korea

Lieutenant Colonel Elizabeth Benedict, U.S. Air Force

Since World War I, the Korea Peninsula has been separated by territorial claims of the North and South. The North was supported by the Soviet Union and China with a communist ideology while the South was supported by the United States and democratic thinking. Since the end of the Korean War, South Korea, or the Republic of Korea (ROK) has been under constant fear that North Korea, or the Democratic People's Republic of Korea (DPRK), will invade and claim its territory. Seung-Young Kim quoted the director of the South Korean CIA as stating "A North Korean attack may come anytime."[1] The United States has supplied military support stationing troops to provide a deterrence to North Korea. As years have passed and South Korea has grown more self-reliant, many people debate whether there still needs to be a United States military presence. In 2005, U.S. intelligence announced North Korea has the capability to arm a missile with a nuclear device.[2] With the threat of nuclear missiles from North Korea, there is a need for a system to deter North Korea from firing upon South Korea. It is extremely important that South Korea has this deterrence system not only to protect itself, but also to make the population feel safe. Since the threat is with missiles, one way to help support South Korea is to use a reliable, accurate and proven missile defense system.

South Korea's current missile defense system is the Terminal High Altitude Area Defense (THAAD) system. One system that is used today is the Iron Dome by the Israelis. Israel has protected itself from missile threats from Iran, Hezbollah, and Hamas. With help from the United States, Israel adopted this system, which has proven to be very effective at detecting incoming missiles and intersecting them. The South Koreans could potentially replace their THAAD system with an Iron Dome system and realize more confidence in their strategic deterrence posture.

As history evolves, enhancements in technology enable threats to become more dangerous. On the other hand, enhancements in technology can operationalize more capabilities for defense against those threats. When the threat has the capability of causing mass destruction, such as with a nuclear weapon, it is imperative to deter the use of these weapons. Since North Korea has gained this capability, the fear of attack on South Korea is high. There are defense systems available that may help South Korea defend against these attacks and help the population feel more secure.

So, what is the right answer? This study will examine the options – THAAD vs. Iron Dome – and will examine the data, consider current extended deterrence policy of the United States, and consider how upgraded missile defense might change the South Korean nuclear deterrent strategy. This research paper uses a qualitative approach to argue that South Korea desires more independence in its defense capabilities and explores a new or upgraded independent missile defense system as a primary component of that defense capability.

Research Questions

1. *Would an enhanced military defense that included an enhanced missile defense system increase assurance of ability of the ROK to defend itself against the DPRK?*

2. *Would an enhanced missile defense system lead to greater confidence in meeting the security needs of the people of the ROK?*

Hypotheses

1. *An enhanced missile defense with U.S. Forces Korea (USFK) presence will provide assurance and confidence of the ROK against attack from the DPRK.*

2. *An Iron Dome concept with reduced USFK presence will provide assurance to the allies and confidence to the South Korean population.*

Missile Defense in South Korea

Nuclear History in North Korea, South Korea, and the United States

To set up this research, we first look at the documents that give the historical background and the relationships between North Korea, South Korea, and the United States. An article in *International Affairs* by Niv Farago discusses how the South Koreans may look to acquire their own nuclear fuel cycle due to their belief that the American extended deterrence is no longer sufficient.[3] Farago examined the progress of North Korea's quest for nuclear weapons through the Bill Clinton, George H. Bush, and Barack Obama administrations and discussed the attempts at limiting North Korea's success in acquiring them. There was an Agreed Framework in October 1994 between the Clinton administration and Pyongyang on North Korea's nuclear program. North Korea agreed to dismantle the program under the monitoring by the International Atomic Energy Agency (IAEA). In return, the United States agreed to guarantees of no nuclear attacks, to ease its economic embargo, update its reactors, and improve diplomatic relations. However, in 2002 the Agreed Framework fell apart due to North Korea pursuing a uranium enrichment program. According to Farago, since the collapse, the DPRK has advanced its nuclear and ballistic missile programs by conducting more tests and

building a light water nuclear reactor and a uranium enrichment facility.[4] There were multiple attempts to make an agreement that would prevent North Korea from ultimately building a nuclear weapon, such as holding six-party talks that included the United States, North Korea, South Korea, Russia, China, and Japan. There was also the February 2007 agreement to dismantle North Korea's plutonium program. None of these attempts were successful due to the unwillingness of both sides to work together. Instead, it built more mistrust and suspicion between the United States, North Korea, and South Korea. If there is more mistrust and suspicion, North Korea is unpredictable and it is impossible to predict what they will do in the future.

The "strategic patience" policy was initiated during the Obama administration in an attempt at normalizing relations between the United States and North Korea. In his article in *World Affairs*, Leif-Eric Easley discusses "strategic patience" and the relationship between the United States, North Korea, and South Korea. He explains that the Trump administration claims that the "strategic patience" era is over and that this administration is pursuing denuclearization by "maximum pressure and engagement."[5] He states that a high-ranking North Korean defector has claimed the Kim Jong-un regime will not denuclearize because they think the United States will not attack a nuclear state and that China will not cut off trade and assistance if North Korea has nuclear weapons. He mentions former Defense Secretary Jim Mattis' statement "the United States regards the threat from North Korea as a clear and present danger."[6] Easley explains that the United States is not looking to start a preventive war because South Korea would be vulnerable to any retaliation from North Korea. He also provides an example of how unpredictable North Korea is. Moon Jae-in took office in May 2017 in South Korea. The Kim regime called for reduced tensions between North and South Korea. However, North Korea continued to test missiles and sent a surveillance drone into South Korea to take pictures of the THAAD system. Easley states that Kim Jong-un emphasized North Korea is achieving "diversification and advancement" of its nuclear forces, to include miniaturized warheads, multiple delivery systems, multiple missile types with various ranges and payloads, solid or liquid propellant, and improved reentry and guidance capabilities.[7] He also includes Moon's reaction to the provocation in which he stated the missile test represents a "grave threat, not only to the Korean Peninsula but also to international security."[8]

In his article "The Korean Missile Crisis," Scott Sagan discusses why continued extended deterrence for South Korea under the nuclear umbrella with patience until the Kim regime collapses would be the best strategy for North Korea. He explains how the United States is at a disadvantage because intelligence doesn't know the status of North Korea's warheads or the locations of its missiles. He warns that the United States needs to think about possibilities such as Kim ordering his generals to launch all weapons of mass destruction in the event that he is killed in a first strike. He also describes the possibility of an accidental war caused by the mutual fear of surprise attack. This is evident in the statement made by General Jeong Seung-jo, the chairman of the South Korean Joint Chiefs of Staff, "if there is a clear intent that North Korea is about to use a nuclear weapon, we will eliminate it first even at the risk o f a war," and "a preemptive attack against the North trying

to use nuclear weapons does not require consultation with the United States and it is the right of self-defense."[9]

Terence Roehrig discusses the credibility issues with the U.S. nuclear umbrella and the U.S. defense commitment to South Korea in an article in *Political Science Quarterly*. He explains that for more than 60 years, the United States maintained its alliances in East Asia by a commitment to protect South Korea through extended deterrence.[10] To do this, the United States has stationed troops along the Demilitarized Zone (DMZ) and included South Korea under the U.S. nuclear umbrella, which vowed that the United States would use nuclear weapons to deter or defeat an attack on the South. There is no doubt that the United States would help South Korea if North Korea attacks. However, the question is whether the United States would actually use nuclear weapons due to the massive destruction the weapons would cause. Roehrig says that many in South Korea have little confidence in the rationality of Kim Jong-un and think that he is willing to take high risks.[11] If they believe Kim Jong-un is dangerous and the credibility of the U.S. nuclear umbrella is questionable, some form of self-defense would make them feel more secure.

An article by Se Young Jang in the *Journal of Strategic Studies* describes the evolution of U.S. extended deterrence in the Korean Peninsula through the Nixon administration and South Korea's attempt to acquire nuclear weapons in the 1970s. He explains how extended deterrence has been "a main pillar of the security alliance" between the United States and South Korea since the Korean Peninsula was divided into North and South Koreas.[12] There was the Mutual Defense Treaty signed in October 1953 to institutionalize the U.S. commitment to defending South Korea along with stationing troops after the division and deploying tactical nuclear weapons to South Korea in 1958 to deter attacks from North Korea. South Korea is heavily dependent on the United States for military support when it comes to extended deterrence. It became more insecure in the early 1970s when President Park Chung-hee lost confidence in U.S. security commitments due to North Korean provocations escalating from the late 1960s without any retaliations from the United States under President Richard Nixon. This would include an event in 1969 where a North Korean MiG-21 shot down a U.S. Navy EC-121, killing 31 Americans. This caused President Park to question the willingness of the United States to protect South Korea and his attempt at developing nuclear weapons in early 1970s. If South Korea has any doubt of the intentions of U.S. extended deterrence, the responsibility of its own defense should become a high priority. If the South Koreans were willing to develop nuclear weapons for their defense, a missile defense system would be a good alternative without the development of an extremely destructive weapon.

An article in the *Pacific Review* written by Kiyoung Chang and Choongkoo Lee claims that South Korea and the United States should be careful in adopting preemptive or preventive measures against North Korea due to China's reaction and the regional security order. They suggest that "South Korea should prepare for any contingency regarding North Korea's nuclear development and regime instability."[13] They explain that Kim Jong-un has promoted the Byungjin policy, or the parallel pursuit of nuclear weapons and economic development because North

Korea considers these as milestones for victory. If the North Koreans consider these as milestones, they will have nuclear weapons no matter what. The lack of information on North Korean nuclear weapons makes the threat dangerous because Kim Jong-un is unpredictable. If he is unpredictable, South Korea needs to defend itself with any means possible. Chang and Lee explain that any preemptive attack or accelerated collapse of North Korea would be looked upon unfavorably by China and that China would send military support to North Korea. However, to prevent North Korean attacks, South Korea could protect itself with a missile defense system. This system would ensure missiles do not reach South Korea without being an attack on North Korea.

Terminal High Altitude Area Defense (THAAD)

A way to ensure South Korea's protection from attacks by North Korea is to use a missile defense system. One system that is out in the field and is currently deployed in South Korea is the Terminal High Altitude Area Defense (THAAD) system. Leif-Eric Easley gave an explanation of South Korea's decision to deploy THAAD in an article in *World Affairs*. He explains that North Korea's long-range missile test in February 2016 and fourth nuclear test were violations of the United Nations Security Council Resolutions (UNSCR) and the government of the Republic of Korea was pressured to respond.[14] He explains that THAAD could not defend against a bombardment of rockets and artillery, but it could buy time for a counterattack and intercept North Korean missiles with nuclear, biological, or chemical warheads before they reach their targets. He claims that U.S. and South Korean leaders cannot trust North Korea to exercise nuclear restraint because they have threatened to nuke Washington, D.C. and turn Seoul into a "sea of fire."[15] He also claims that the United States and South Korea cannot rely on only extended deterrence or the use of the South Korean military as a deterrence and that THAAD would provide missile launch tracking and an added layer of defense.

Bruce Klingner also talks about THAAD in an article in the *Institute for Security & Development Policy* and why South Korea needs it. He claims North Korea has made it clear that it would never abandon its nuclear arsenal and would maintain its nuclear weapons and be considered a nuclear nation in the DPRK constitution.[16] He describes the THAAD system as being effective to defend military forces, population centers, and critical targets at a higher altitude over a larger area with more reaction time. He says that missile defense is more effective when systems are integrated into a network and he suggests South Korean, U.S., and Japanese sensors should be integrated to enable more accurate interceptions by tracking the missiles through different angles and different points during the flight.

Michael Elleman and Michael Zagurek give a description of the THAAD system in a *38 North Special Report*. They claim adding a THAAD system to missile defense that already includes Patriot systems would substantially enhance South Korea's capacity to minimize damage from a North Korean missile attack.[17] They describe how North Korea possesses an arsenal of short- and medium-range mobile ballistic missiles that are deployed throughout the country and are capable of carrying nuclear, chemical, or biological warheads. North Korea has also

showcased two longer range ballistic missiles in which the status is unknown. Because of these threats, Elleman and Zagurek claim the THAAD system would effectively protect South Korea paired with the already deployed Patriot Advanced Capability-3 systems (PAC-3), which are used for the protection of airfields, ports, critical infrastructure, military command centers, or other important facilities. They explain how the THAAD system intercepts short-, medium-, and intermediate-range ballistic missiles above the atmosphere (above 50 kilometers) providing an upper tier layer of defense while the PAC-3 provides lower tier (lower than 25 kilometers) defense. There are five components to THAAD: interceptor missiles, launch canisters, AN/TPY-2 phased array radar, a fire control unit, and support equipment including power generation and cooling units. It can track targets at a range of 1,000 kilometers as long as the target has a cross section of one meter squared. Elleman and Zagurek say that two THAAD batteries can be deployed to cover all of South Korea working with the Patriot system. They explain that intercepting targets at multiple levels offers higher success rates and improves intercept efficiency, which is based off the probability that an interceptor will destroy a missile or warhead. This is called the "single-shot probability of kill" or SSPK. Missile designers at the U.S. Missile Defense Agency aim for a single interceptor to succeed 80 to 90 percent of the time (SSPK between .8 and .9). Elleman and Zagurek claim that 80 percent is feasible for THAAD. However, even with a high probability of kill, THAAD has some limitations. One THAAD battery has a limited number of ready to launch interceptors. If North Korea decided to launch a large number of missiles, THAAD could not reload fast enough. The AN/TPY-2 radar is also limited in the number of objects it can track. Finally, the radars are pointed north. If North Korea fires from the east, west, or south (possibly from a submarine), South Korea would not be tracking it.

J. J. Suh describes how a THAAD system deployed in South Korea affects Japan, China, and Russia in an article in *The Asia-Pacific Journal*. He explains that THAAD has caused a significant security dilemma among the United States, North Korea, South Korea, Japan, China, and Russia where their security has been affected by an action and reaction chain.[18] He explains how North Korea's weapons targeted at the United States military affect Japan's and South Korea's security causing them to take countermeasures while U.S. weapons targeted at North Korea affects China's and Russia's security causing them to react. Suh claims this security dilemma has intensified an arms race in Korea, Northeast Asia, and the world. This stems from the THAAD system deployed in South Korea, which Russia and China perceive as efforts by the United States to establish global missile defense systems. Michael Swaine explains how the Chinese population is strongly opposed to the deployment of the THAAD system in South Korea in his article in *China Leadership Monitor.*[19] Bruce Harrison's article explains how China believes the THAAD system deployed in South Korea is being used to spy on its military.[20]

The Iron Dome

Peter Dombrowski, Catherine Kelleher and Eric Auner give a description of the Israeli Iron Dome, its effectiveness, and U.S. support of the system.[21] Iron

Dome was designed by Rafael Advanced Defense Systems Ltd., a private Israeli defense firm. Israel and the United States have been in collaboration to develop missile defense and signed a memorandum of understanding in 1986 for Israeli participation in the Strategic Defense Initiative (SDI) former President Ronald Reagan's vision of a global strategic defense capability according to Dombrowski, Kelleher, and Auner. They describe how the Israel Defense Forces (IDF) launched Operation Pillar of Defense in November 2012 responding to rocket attacks from the Gaza Strip. They claim that the system provided a sense of security to the Israelis due to the prevention of damage, injuries, and death. They say the Israelis' confidence in the system was strong enough that they ignored air raid sirens and stayed outdoors to try and capture Iron Dome intercepts in photos.[22] Dombrowski, Kelleher, and Auner give some numbers according to the IDF. There were around 1,500 rockets fired on Israel during the operation, of which around 500 targeted population centers. More than 400 of those were successfully intercepted by Iron Dome.[23]

Because there is a new global missile age emerging that will include more capable short-range rockets, cruise missiles, and intermediate- and long-range ballistic missiles, Dombrowski, Kelleher, and Auner claim that the Iron Dome is one response to this threat that will be a challenge for more advanced militaries.[24] They explain that the technological success of the Iron Dome is that it can detect, track, aim and explode ordinance in a very limited time window along with discriminating between rockets aimed at populated areas versus those aimed at uninhabited areas. They describe each battery includes an ELM-2084 S-band phased-array radar, fire control center and typically three launchers capable of carrying 20 Tamir interceptors, which use proximity-fused explosive warheads to destroy rockets in midair. Each battery costs approximately $50 million while interceptors cost approximately $50,000 each.[25]

Dombrowski, Kelleher, and Auner claim that the Iron Dome's success has caused reports that other states may be interested in purchasing the system due to threats on their borders, to include South Korea. However, they give several reasons why other states may not be willing to purchase it. They say the Iron Dome works best in a threat environment like Israel and its geography, mix of threats to population centers and constrained space. The system is expensive when compared to how much mortars and rockets cost. It is a complex system of systems that need all pieces to work together in order for it to be effective. Finally, Israel may not want to share the technology.[26]

Emily Landau and Azriel Bermant look at the Iron Dome and Israel's Security Concept by providing data on death statistics.[27] During the Second Lebanon War of 2006 when the Iron Dome was not in place, 4,000 Hezbollah rockets hit Israel and 53 Israelis were killed. During the 2014 Israel-Gaza Conflict or Operation Protective Edge, at least 3,360 rockets were fired with two Israelis killed. Also, 30,000 insurance claims for damage were made in 2006 while approximately 2,400 claims were filed in 2014.[28]

Landau and Bermant describe a line of thinking that ties deterrence to missile defense. They give a description from Uzi Rubin, a leading Israeli defense expert and former director of Israel's missile defense organization, who believes

that deterrence against nuclear threats relies on a survivable retaliatory force that requires forces still operational after an initial attack. He claims deterrence is effective even with a partially successful missile shield because it significantly complicates the planning of an adversary.[29]

Landau and Bermant also describe additional benefits in having a missile defense system in relation to the public mood, enhancing stability and de-escalation efforts. Because of the success of the Iron Dome, there has been a positive impact on Israeli national morale and strengthening public resolve in war situations. Landau and Bermant explain that the public mood can provide strategic benefits and give a description of how during Operation Protective Edge, the public's sense of protection gave time for the government to make better decisions and reduce the pressure to move quickly. "Defense systems ensure that they have time, and are not compelled to resort automatically to preemption and retaliation."[30]

Jean-Loup Samaan and Guillaume Lasconjarias discuss the Israeli missile defense experience and NATO in an *Atlantic Council* article.[31] They claim the ballistic missile threat is increasing and missile defense has become a tool for the government to reassure the safety of its citizens and mitigate psychological effects of missile attacks.[32] However, one of the major concerns among European NATO states about Israel's missile defense is the cost and the additional expenditures. Israel has been working with the United States without the fear of losing strategic autonomy, but the NATO allies fear losing their share in alliance decision-making from being too dependent on the United States, which supplies most missile defense technology.[33]

Ian Siperco explains why Israel needs a missile defense system in an article in *Middle East Policy*.[34] He claims that the benefits of having a missile defense system is not limited to just preventing damage and injury. He claims it also robs the enemy's propaganda the opportunity to claim credit for the attack while giving Israeli decision makers the freedom to react strategically instead of emotionally. Siperco says comprehensive missile defense provides an effective second layer of strategic deterrence after the threat of disproportionate retaliation. He also says that if potential aggressors know a missile launch will cause a military response and international sanctions without them achieving any objectives, they may be discouraged from using the weapon.[35]

Yiftah Shapir describes how Israel is the first country to deploy an operational anti-rocket system for protection and how it was a good decision to purchase it.[36] He explains that even though there were demonstrations of the effectiveness of Iron Dome, there were some criticisms. Critics claim the system cannot shoot down rockets or shells with ranges of less than five to seven kilometers and it is not capable of shooting down mortar shells. Because of the system's response time, it will have a hard time with rockets fired on flat trajectories at longer ranges 16 to 18 kilometers. The cost of interception is high with each missile costing about $40,000 to $50,000. Two missiles are fired at one target in some cases. The system has a "saturation point" and can only engage a certain number of targets at the same time. Another criticism Shapir discusses is the fact that Iron Dome does not provide total protection. This raises two questions. How many Iron Dome batteries are needed and is it necessary to protect the civilian population and

not just strategic facilities for survival?[37] Shapir presented some political considerations. The system's contribution to the morale of the civilian population helped with the resilience of the population overall. It proved to them they were being protected. Also, if there is technology available to protect the public from rocket attacks, the political leadership would have a difficult time telling the public they were not purchasing it.[38]

Michael Armstrong analyzed rocket attacks and defenses in Israel during operations Protective Edge, Pillar of Defense, and Cast Lead showing that Israel's rocket concerns were justified.[39] He explains that the interception rate or the percentage of rockets destroyed before they hit defended areas have been claimed as very high for Iron Dome. Writers and critics have argued this point expressing these claims seem unbelievably high and cannot be verified. There was an assessment of the Tamir interceptors in 2014 using videos and photos in which the results were lower than the claims. The arguments to these critiques were that the videos and photos were lower quality and the loss rates were compared across different conflicts that had different numbers of Iron Dome batteries.[40]

Results

This study showed how dangerous North Korea is in terms of its desire for nuclear weapons, its unwillingness for negotiations, and its unpredictability. South Korea has been protected by the United States under extended deterrence and the nuclear umbrella. The United States has supported South Korea by stationing troops there and at one time having deployed tactical nuclear weapons there also. However, there have been North Korean provocations that resulted in no retaliation from the United States, which in turn caused South Korean leadership to question the United States willingness to protect South Korea. Because the United States protection has been questionable at times, South Korea has begun to look at protecting itself by developing its own missile defense system.

The data from this research showed a comparison of the THAAD system and the Iron Dome seen in *Table 1* below. It shows advantages of the THAAD system include: intercepts of short-, medium-, and intermediate-range ballistic missiles, provides upper tier defense, plus detects and tracks targets at about a thousand kilometers. Each battery cost about $800 million. The advantages of Iron Dome include protection from short-range missiles, mortars and rockets, providing a lower tier defense that can detect rockets four to 70 kilometers away and engage targets with interceptors. It costs $50 million per battery. A big disadvantage for the THAAD is that it cannot deal with bombardment because it takes time to reload launch canisters. A disadvantage for the Iron Dome is that the environmental differences between Israel and South Korea may not allow the system to work properly.

Based on the information provided in this study, we can accept the hypothesis that an enhanced missile defense with USFK presence will provide assurance to allies and confidence to the people of South Korea against attack from North Korea. We can also accept the hypothesis that an Iron Dome concept with

reduced USFK presence will provide assurance to the allies and confidence to the South Korean people.

Table 1. Comparison of THAAD vs. Iron Dome

THAAD[41]	**Iron Dome (layered defense)**[42]
Advantages	*Advantages*
5 components: interceptor missiles, launch canisters, AN/TPY-2 phased array radar, fire control unit, support equipment including power generation and cooling units	Batteries include a radar system, a command center, and 3 launchers
Intercepts short, medium, and intermediate range ballistic missiles	Protects from short-range missiles, mortars, and rockets
Intercepts in exoatmosphere (above 50 km)	Lower-tier defense
2 THAAD batteries required to defend all of South Korea	90 percent success rate for intercepts
Kill probability of .8 is feasible	Detects rockets four to 70 km away and engages with interceptors called Tamirs
Can detect and track targets at range of about 1,000 km as long as target has radar-cross section of about one meter squared	System determines when to intercept (anticipated point of impact of incoming rocket to populated area or not)
Single battery holds limited number of ready-to-launch interceptors (48-96)	Complete system cost per battery: $100 million
Can defend against 20 and 50 attacking missiles if two interceptors are assigned to each incoming warhead	United States contribution: 55 percent of components made in United States, FY 2011-FY 2015: $1.3 billion, FY 2016: $41.4 million
Launch canisters can be reloaded within an hour or so	
$800 million per battery[43]	
Disadvantages	*Disadvantages*
Ability to intercept short-range missiles in the ascent phase yet to be demonstrated	Israel may not want to share the technology
Because it provides an upper-tier layer of defense with exoatmospheric intercepts, it needs to work with PAC-3 lower-tier Patriots (endoatmospheric, below 25 km) and Aegis Systems	Environment differences, may not work the same in Korea
Unable to track or see ICBMs from China	

Recommendations

Because of the latest developments in North Korean nuclear capabilities, South Korea should consider capabilities that would help protect itself from North Korean missile attacks. If there continues to be a level of protection provided through USFK, having an independent missile defense system will give a higher level of assurance to U.S. and South Korean allies. The added protection of a missile defense system such as the Iron Dome will increase the confidence and well-being of the South Korean population. It is therefore safe to conclude that assurance and confidence would not be realized if the United States reduced or eliminated entirely the USFK without first replacing THAAD with Iron Dome. Therefore, the United States and South Korea should discuss the possibility of replacing the THAAD system with an Iron Dome missile defense system into South Korea.

The results from this study can help decision makers determine if a missile defense system in South Korea would be beneficial. If it is and South Korea still wants U.S. support and protection from North Korea, the South Koreans could decide whether it is worthwhile for the United States to help in acquiring the system and maintaining it. Other issues that need to be looked at are continuing U.S. troop presence in South Korea once an Iron Dome system is in place and how the United States might change foreign policy with regard to the extended deterrence it provides through the nuclear umbrella. Also, if a missile defense system is not a good idea, what would be other alternatives that would help South Korea feel secure from North Korean attacks?

Conclusion

The North Koreans want nuclear weapons and there hasn't been any success at preventing their progress. Because of Kim Jong-un's emphasis on "diversification and advancement" of the nuclear forces, North Korea will always be looking for a better, more advanced nuclear weapon. This paired with its unpredictability makes North Korea a dangerous threat in terms of nuclear attacks, especially with South Korea.

The ultimate way to ensure a nation's security from attacks by other nations is to take responsibility for self-defense and acquire defense systems for protection, resulting in less reliance on the United States for extended deterrence. Because North Korea has nuclear capabilities, it is imperative to protect against that threat. Since South Korea is an easy target, ROK forces need their own protection capabilities, which will cause changes in U.S. deterrence policies.

Notes

1. Seung-Young Kim, "Security, Nationalism and the Pursuit of Nuclear Weapons and Missiles: The South Korean Case, 1970-82," *Diplomacy & Statecraft,* vol. 12, no. 4 (December 2001), p. 55.

2. Chung Min Lee, "A View from Asia: The North Korean Missile Threat and Missile Defense in the Context of South Korea's Changing National Security Debate," *South Korea's Shifting National Security Paradigm* (2005), p. 253.

3. Niv Farago, "Washington's failure to resolve the North Korean nuclear conundrum: examining two decades of United States policy," *International Affairs, vol. 92* (2016), p. 1,144.

4. Ibid., p. 1,127.

5. Leif-Eric Easley, "From Strategic Patience to Strategic Uncertainty: Trump, North Korea, and South Korea's New President," *World Affairs,* Summer 2017, pps. 7-31.

6. Ibid., p. 10.

7. Ibid., p. 21.

8. Ibid., p. 21.

9. Scott D. Sagan, "The Korean Missile Crisis: Why Deterrence Is Still the Best Option," *Foreign Affairs,* November/December 2017, p. 80.

10. Terence Roehrig, "The U.S. Nuclear Umbrella over South Korea: Nuclear Weapons and Extended Deterrence," *Political Science Quarterly,* vol. 132, no. 4 (Winter 2017), pps. 651-684.

11. Ibid., p. 673.

12. Se Young Jang, "The Evolution of United States Extended Deterrence and South Korea's Nuclear Ambitions," *Journal of Strategic Studies,* vol. 39, no. 4 (2016), pps. 502-520.

13. Kiyoung Chang & Choongkoo Lee, "North Korea and the East Asian Security order: competing views on what South Korea ought to do," *The Pacific Review,* vol. 31, no. 2 (2018), pps. 245-255.

14. Leif-Eric Easley, "Kaesong and THAAD: South Korea's Decisions to Counter the North," *World Affairs,* Summer 2016, pps. 21-27.

15. Ibid., p. 23.

16. Bruce Klingner, "Why South Korea Needs THAAD Missile Defense," *Institute for Security & Development Policy*, Policy Brief, no. 175 (April 21, 2015), pps. 1-3.

17. Michael Elleman and Michael J. Zagurek, Jr., "THAAD: What It Can and Can't Do," *A 38 North Special Report* (March 2016), https://www.38North.org.

18. J.J. Suh, "Missile Defense and the Security Dilemma: THAAD, Japan's 'Proactive Peace,' and the Arms Race in Northeast Asia," *The Asia-Pacific Journal*, vol. 15, issue 9, no. 5 (April 27, 2017), pps. 1-9.

19. Michael D. Swaine, "Chinese Views on South Korea's Deployment of THAAD," *China Leadership Monitor*, no. 52, pps. 1-15.

20. Bruce Harrison, "China's Response over THAAD in S. Korea: China Means Business in Economic Challenge Over THAAD," *Chinese American Forum*, vol. XXXII, no. 4 (April-June 2017), p. 10.

21. Peter Dombrowski, Catherine Kelleher and Eric Auner, "Demystifying Iron Dome," *The National Interest (*July/August 2013), pps. 49-59.

22. Ibid., p. 49.

23. Ibid., p. 49.

24. Ibid., p. 50.

25. Ibid., p. 52.

26. Ibid., pps. 55-57.

27. Emily B. Landau and Azriel Bermant, *Iron Dome Protection: Missile Defense in Israel's Security Concept,* pps. 37-42.

28. Ibid., p. 39.

29. Ibid., p. 40.

30. Ibid., p. 41.

31. Jean-Loup Samaan & Guillaume Lasconjarias, "The Israeli Experience in Missile Defense: Lessons for NATO," *Atlantic Council* (August 2013), pps. 1-7.

32. Ibid., p. 3.

33. Ibid., p. 4.

34. Ian Siperco, "Shield of David: The Promise of Israeli National Missile Defense," *Middle East Policy*, vol. XVII, no. 2 (Summer 2010), pps. 127-141.

35. Ibid., p. 136.

36. Yiftah S. Shapir, "Lessons from the Iron Dome," *Military and Strategic Affairs*, vol. 5, no. 1 (May 2013), pps. 81-94.

37. Ibid., pps. 83-86.

38. Ibid., pps. 88-89.

39. Michael J. Armstrong, "The Effectiveness of Rocket Attacks and Defenses in Israel," *Journal of Global Security Studies*, vol. 3, no. 2, pps. 113-132.

40. Ibid., p. 115.

41. Elleman and Zagurek, Jr., "THAAD: What It Can and Can't Do."

42. missilethreat.csis.org/defsys/iron-dome.

43. https://www.foxbusiness.com/markets/lockheed-martins-800m-thaad-missile-defense-system-put-to-the-test.

CHAPTER 4

U.S. Air Force Posture: Impacts to Japanese Assurance in the Indo-PACOM AOR

Major Jonathan P. Gibson, U.S. Air Force

The formal bilateral relationship between the United States and Japan began with the signing of the 1951 security treaty as part of the United States-Japan peace settlement in San Francisco.[1] This original treaty did not commit the United States or Japan to mutual defense, nor did it require Washington to consult Tokyo regarding security arrangements of U.S. forces. The follow-on treaty of mutual cooperation and security, signed in 1960, formalized the U.S. requirement to defend Japan from attack. This treaty also established a Security Consultative Committee to enable discussion between Washington and Tokyo regarding Japanese and Asian regional security matters, as well as any changes in U.S. deployments to Japan or deployment of nuclear weapons.[2]

Article V in the treaty states: *"Each Party recognizes that an armed attack against either Party in the territories under the administration of Japan would be dangerous to its own peace and safety and declares that it would act to meet the common danger in accordance with its constitutional provisions and processes."*[3]

This United States extended deterrence commitment security arrangement served the bilateral alliance well through the Cold War. During this period, Japan felt largely assured within the U.S. nuclear umbrella and left the majority of military details in maintaining the security of Japan to Washington.[4] Following the Cold War, with the United States in the midst of military reductions, the 1997 Defense Guidelines for the Japan-United States Defense Cooperation Agreement shifted portions of security responsibility to Japan, specifically citing the increased requirements for "cooperation in situations in areas surrounding Japan that will have an important influence on Japan's peace and security."[5]

Simultaneous to these shifts within the United States-Japan security alliance, the rise in China, both economically and militarily, has caused concern in Tokyo.[6] In particular, China's increasing assertiveness and use of coercion in the maritime and aerial domains in the East and South China Seas regions is worrisome to Japan. Examples of Chinese coercion include the maritime patrols during the Senkaku Islands Nationalization Crisis in 2012, the establishment of the East China Sea Air Defense Identification Zone in 2013, and the military buildup of the Spratly

Islands that same year.[7] Despite repeated occurrences, the United States has struggled to develop and communicate a comprehensive strategy to deter China's "gray-zone" activities.[8] While the United States extended deterrence guarantees for high side conventional or nuclear conflict have not been in question, the increases in subconventional or low-end conflict, known as gray-zone, have caused Tokyo apprehension and consequently affected levels of assurance felt by Japan.

In Japan's *2013 National Defense Program Guidelines*, a document similar to the *U.S. Quadrennial Defense Review*, Tokyo reveals escalation concerns from Chinese "gray-zone" situations over "territory, sovereignty, and maritime economic interests," which may develop into more serious situations.[9] With "gray-zone" representing a new threshold for potential conflict, Tokyo is uncertain what role the United States will play in deterring confrontations that threaten Japanese interests.[10] Moreover, experts have noted Japanese concern that the United States may not provide defense of Japan in low-scale "gray-zone" contingencies because challenging China's assertiveness may undermine strategic stability within the area of responsibility (AOR.)[11] This concern may prompt Japanese fears of ally abandonment. It is this uncertainty, or the general feeling of assurance, that is difficult to address. Denis Healey, British defense minister from 1964-1970, understood this difficulty. He famously stated: "It takes only five percent credibility of American retaliation to deter the Russians, but 95 percent to reassure the Europeans."[12] Healey's quote is as applicable today to the United States-Japan alliance as it was to Europe during the midst of the Cold War.

Adequately addressing assurance is critical to the success of an extended deterrence alliance. Permanent military basing or military deployments to the region may be one vector to influence Japanese levels of assurance directly. Increased military presence likely affects ally assurance positively by reducing the risk of ally abandonment through the increased perception of a credible and capable security guarantee.

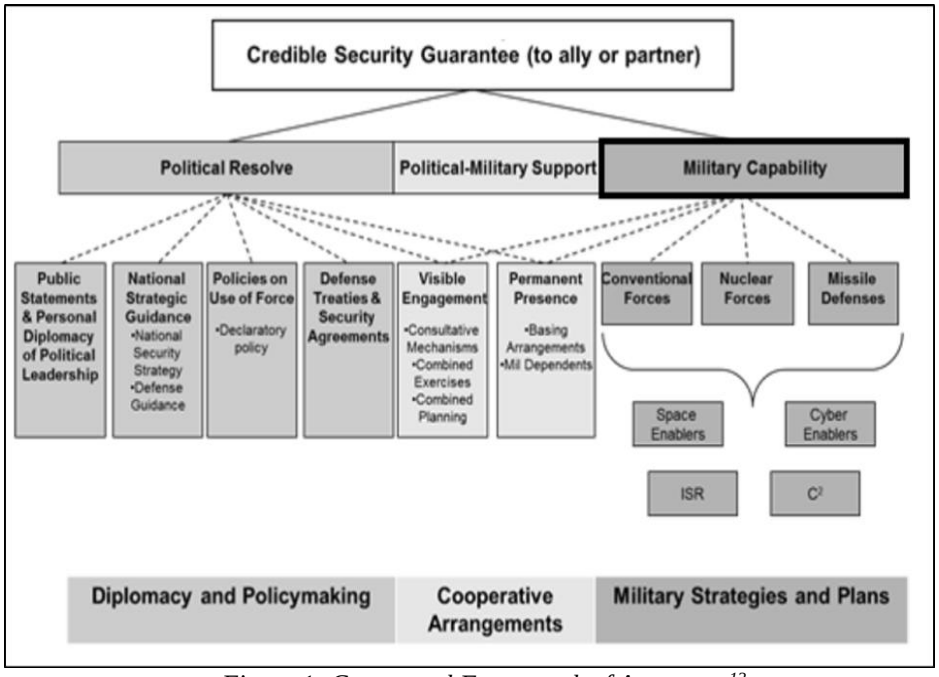


Figure 1: Conceptual Framework of Assurance[13]

Assurance and Abandonment Theory

Extended deterrence seeks to deter a third-party aggressor from intimidating, coercing, or attacking a protégé. The bilateral security agreement between the United States and Japan is an example of extended deterrence. In this particular agreement, Japan (the protégé) must believe in the capability and credibility of the United States (the guarantor) to take action to deter external threats. If Japan does not, Tokyo may take actions or make policies that are counter-productive or subversive to the successful implementation of extended deterrence. This possibility underlines the critical importance of engagement between the security guarantor and the protégé. As a concept, assurance is represented by the means, methods, political resolve, and military capabilities employed by the guarantor to convince the protégé of its commitment.

The U.S. Air Force Institute for National Security Studies created a conceptual framework, listed as *Figure 1*, to illustrate the means and methods normally needed to positively assure a protégé within an extended deterrence commitment. This framework captures the dual requirement of both political resolve and military capability, combined with complementary political-military support, to positively assure a protégé.

The failure to positively assure a protégé creates feelings of abandonment within the alliance. Abandonment is the fear an ally may leave the alliance, not live up to its commitments, or fail to provide support in contingencies where support is expected.[14] In his seminal article, Victor Cha argues abandonment anxiety of an ally is influenced by systemic, domestic, and normative factors that generally determine the ability to which a state can "exit" from an unsatisfactory alliance and "enter" into other security arrangements.[15] From this, Cha asserts that abandonment

fears will be higher for a state with high external threat perceptions, few alternative alliance options, and no internal balancing capabilities.[16]

The United States-Japan bilateral security arrangement solidly fits within Cha's expectations. First, Japan has high threat perceptions of both China and North Korea.[17] Second, Japan has few alternatives other than the United States that can provide sufficient security guarantees. Finally, Japan's ability to balance threats using internal sources is limited because of constitutional restrictions.[18]

Cha asserts five ways a protégé may cope with abandonment fears:

1. *Building up internal capabilities.*
2. *Seeking out new alliances or reinforcing alternate existing ones.*
3. *Bolstering its commitment to the alliance in order to get the ally to reciprocate.*
4. *Appeasing the adversary.*
5. *Bluffing abandonment in order to elicit greater support from the ally."*[19]

Observance of any of these indicators from a protégé infers some degree of abandonment fear, and consequently, decreasing levels of assurance. Conversely, the lack of observance of any of these indicators infer no abandonment fear and consequently, increased or neutral levels of assurance.

Literature Review

The literature on topics of assurance and East Asian deterrence founded the basis for this research. Though Victor Cha's article offered critical foundations for measuring the relative levels of assurance, he does not account for the degree to which any indicator measures abandonment fear.[20] Observance of some of Cha's indicators likely show more abandonment fear than others. For example, appeasing an adversary or seeking out a new alliance seem to indicate a high level of ally abandonment fear. Whereas building up internal capabilities could occur with little government fear of abandonment. To address this omission, a weighted scale should be used when interpreting abandonment indicators.

A historical review by Keith Payne, Thomas Scheber, and Kurt Guthe provide insight and context into how the current defense relationship with Japan has evolved to meet security threats from the Cold War, end of the Cold War period, the Global War on Terrorism, a rising China, and a nuclear-armed North Korea.[21] This historical context enables the identification of trends and likely vectors for increasing assurance and extended deterrence effectiveness.

Literature by Brad Roberts assesses four categories to improve the United States extended deterrence and assurance of Japan: missile defense, conventional

strike, U.S. nuclear tailoring, and strategic stability requirements.[22] Additionally, Roberts references the importance of a coherent and common picture between allies is needed, as deterrence in East Asia becomes more complex and multi-dimensional. Moreover, Roberts assesses the stability requirements in the region, citing increased Japanese fears of increased Chinese conventional strength.

Yugio Satoh analyzes U.S. extended deterrence for Japan by comparing the evolution of policy from both American and Japanese perspectives.[23] Using this comparison, Satoh asserts a general credibility gap regarding U.S. extended deterrence. To address this gap, Satoh asserts further specification is needed regarding U.S. nuclear weapons use in deterring an attack on Japan.

Finally, James Schoff's work recognizes Japan does not have a nuclear-sharing agreement with the United States. The lack of a nuclear-sharing agreement potentially limits Japanese awareness of U.S. nuclear force dispositions and how they support extended deterrence for Japan.[24] Together, this literature highlights the importance of Japanese assurance in executing an effective U.S. extended deterrence strategy.

Research Question

As we seek to further understand assurance theory, what does it mean to assure an ally in the 21st century? Does the United States protégé, Japan, feel adequately assured given the volatility in the Pacific region and continued blurring of what constitutes aggressive military activity? As deterrence strategists, how do we know when Japan feels adequately assured? Recognizing the requirement of positive assurance as part of providing an effected extended deterrence commitment, how can the United States improve Japanese assurance in light of increasing security threats in the region?

Based on the conceptual framework provided in *Figure 1*, a comprehensive improvement in either political resolve or military capability, or some combination of the two, should improve positive feelings of assurance in Tokyo. Logic dictates an increase in any one category or sub-category within the assurance framework would provide corresponding incremental improvements in assurance as a whole.

I propose the following hypotheses:

***H1** – Changes in U.S. Air Force posture levels will produce proportional changes in Japanese assurance.*

***H2** – The presence of U.S. Air Force dual-capable aircraft (DCA) in the Indo-PACOM AOR will have mitigated reduction of Japanese assurance, holding all else constant.*

Research Methodology

To accurately assess Japanese assurance levels, I look specifically at what existing U.S. Air Force (USAF) posture within the Indo-PACOM AOR positively assures Japan of the credibility and capability of the U.S. extended deterrence commitment against a specific threat. In doing so, I assume that other factors that previous scholars have found to affect assurance are held constant, to hone in on the specific effect of the USAF posture. This paper will individually assess Japanese assurance during Chinese aggression and Japan's loss to China following the Second Sino-Japanese War. It (1937-45) will also access how China's current military and economic expansion represent a historical context and current threat to Japan's stability and security in the region that the current United States-Japan extended security guarantee must assure. A qualitative analysis of three Chinese aggression incidents in the Indo-PACOM AOR will be conducted to accomplish this. For each case study, a review of the USAF posture in the AOR will be assessed.[25] This review will sum the number of fighter and bomber squadrons in the AOR, whether permanently established or deployed during the incident, as the independent variable. Permanently established and deployed squadrons will be weighted equally and added together to create a single independent variable.

Additional demarcation of the numbers of DCA squadrons will be noted to test the second hypothesis. Japanese assurance will constitute the dependent variable and will be assessed for each case study. Assurance will be measured by reviewing statements made by the Japanese prime minister or Japanese cabinet officials for inclusion or mention of any abandonment fear indicators. Historical statements will be analyzed using records maintained by the government of Japan. Indicators will be weighted based on the assessed impact on alliance stability as specified in *Table 1*.

Weighted Value	Abandonment Fear Indicator
1	▪ Appeasing the adversary
	▪ Seeking out new alliances or reinforcing alternate existing ones
0.75	▪ Bluffing abandonment to elicit greater support from the ally
0.5	▪ Bolstering commitment to the alliance to get the ally to reciprocate
0.25	▪ Building up internal capabilities
0	▪ Null Value, no abandonment fear indicator found

Table 1: Weighted Abandonment Fear Indicators

Victor Cha does not rank-order or provide weight to his proposed abandonment fear indicators. However, some indicators seem to express greater fear than others. If the protégé has lost confidence in the extended deterrence of the guarantor, we would expect to see direct appeasement of the aggressor or seeking new extended deterrence protections from a different guarantor by the protégé. Whereas bluffing abandonment to elicit greater guarantor support followed by bolstering internal capabilities and commitment indicate abandonment fear to lesser degrees.

The weighted value of indicators will provide an ordinal factor of Japanese assurance for each case study. The higher the factor of weighted indicators in official records will indicate reduced assurance in Japan. The lower the factor of weighted indicators in official records will indicate neutral or positive assurance in Japan. Japanese records will be reviewed for each case study from the date of initiation of Chinese aggression plus three months, to focus results on Japanese assurance as a result of the specific Chinese aggression.

A comparison will then be made between the independent variable (summed number of USAF squadrons, specifically noting the number of DCA squadrons in the Indo-PACOM AOR and the dependent variable (weighted comparison of abandonment fear indicators in Japanese records) to provide correlation data.

Case Study	Incident Date	Assurance Indicator Date Range
Chinese Exercise Strait 961	8-Mar-96	8 March - 8 June 1996
Senkaku Islands Nationalization	11-Sep-12	11 September - 11 December 2012
East China Air Defense Identification Zone Expansion	23-Nov-13	23 November 2013 - 23 February 2014

Table 2: Research Case Studies[26]

Case Studies

Three case studies (see *Table 2*) will be used to assess USAF posture impact on Japanese assurance, the Chinese military exercise titled Strait 961, which simulated a Chinese invasion of Taiwan, the nationalization by Japan of the Senkaku Islands and China's maritime response, and the Chinese establishment of an air defense identification zone (ADIZ) over the preponderance of the East China Sea.

Case Study 1: *Chinese Strait 961 Background* – The Chinese military exercise titled Strait 961 occurred in March 1996. Strait 961 was a Chinese military exercise simulating an invasion of Taiwan.[27] Though this aggressive action was not explicitly directed toward Japan, it constitutes a significant military threat that could affect the feelings of assurance of U.S. extended deterrence commitments. The exercise was conducted during this period to influence the outcome of Taiwan's first popular election for a government leader, and served to underscore China's seriousness over the issue of Taiwanese independence. Additionally, the Strait 961 exercise provided the Chinese military a way to evaluate its effectiveness and capability to operate in a joint environment while training in a realistic setting. Moreover, the exercise consisted of three short-range ballistic missile launches into sea areas near Taiwan, live fire exercises of air and naval assets to achieve air and sea superiority, simulated amphibious landings, troop insertions, artillery firing, and aircraft transport drills. The geographic location of these maneuvers is indicated in *Figure 2*. Overall, Strait 961 was the largest multi-service Chinese

military exercise conducted in the Taiwan Strait area at that time. The exercise had many purposes. Strait 961 tested the current state of Chinese joint operations doctrine while also offering realistic military training. Furthermore, the exercise served to influence the Taiwanese election. The significance of this exercise underscored China's military capability and resolve to directly challenge U.S. extended deterrence commitments and provides an excellent opportunity to assess Japanese assurance.

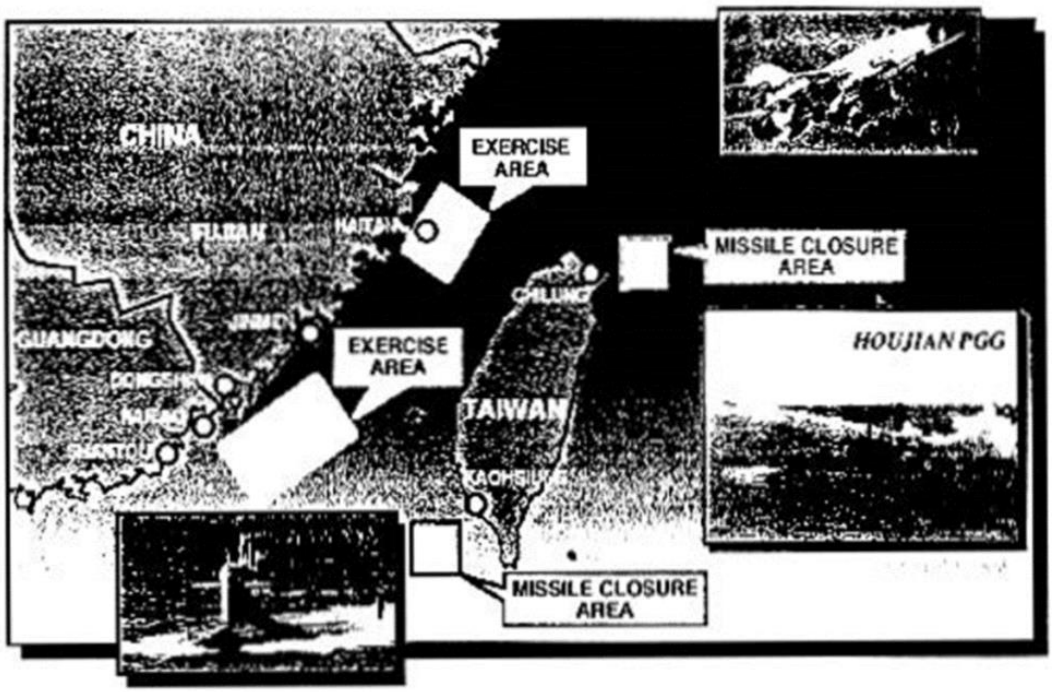


Figure 2: Strait 961 Exercise[28]

Case Study 2: *Senkaku Islands Nationalization Background* – The Senkaku Islands have been contested between China and Japan since Japan's annexation of the landmass in 1895.[29] The islands were privately owned by a Japanese citizen from the 1930s to 2012. Then, in July 2012, the Japanese government stated its intention to purchase the Senkaku Islands from the private owner and finalized the purchase in September. While the dispute had previously been relatively quiet in the background of international politics, this assertion led China to denounce any unilateral action by Japan as illegal and invalid while re-asserting China's indisputable sovereignty over the Senkakus.[30] China immediately decried the announcement and warned that the Chinese government would not idly recognize Japan's infringement of its sovereign territory. China then sent Marine Surveillance patrol vessels to the islands to assert sovereignty. This initial deployment marked the start of a regular Chinese maritime presence near the Senkaku Islands. *Figure 3* shows the Chinese maritime patrols near the Senkaku Islands from 2008-2016.

March 1996 Posture (Squadrons)	Nuclear Capability	Not Nuclear Capable				Nuclear Dual Capable ‡			Total
		8				7			15
	Primary Mission	Attack	Air Superiority			Multi Role		Strategic Attack	
		2	6			7		0	
	Aircraft Type	A-10/OA-10	F-15A/B	F-15C/D	F-22	F-15E	F-16C/D	B-52	
		2	1	5	0	1	6	0	
‡ - Nuclear bombers are included as DCA capable									

Figure 3: Chinese Maritime Law Enforcement Patrols near the Senkakus (2008-2016)[31]

Tensions continued to increase between China and Japan, with rapidly increasing numbers of Chinese maritime patrols near the islands. When these patrols were challenged by the Japan Coast Guard, the Chinese vessels would demand Japan withdraw from Chinese sovereign waters. Increasing its military footprint in the area, People's Liberation Army Navy warships passed through Japan's contiguous zone near the Senkaku Islands. Moreover, China increased its military air presence over the disputed islands, prompting the Japanese Air Self Defense Force to scramble aircraft nearly 300 times.[32] In response, Japan deployed half of the entire Japan Coast Guard to the Senkaku area. This substantial commitment threatened to strain Japanese maritime capability elsewhere and Japan sought American assistance. In response, the United States secretary of defense reaffirmed the United States-Japan Security Treaty and its applicability to the Senkaku Islands. The secretary further warned that additional provocations on either side could result in violence and conflict. This case study offers a clear test of the United States extended deterrence commitment and any corresponding impact on Japanese fears of abandonment.

Case Study 3: *East China ADIZ Expansion Background* – In November 2013, China announced the creation of an air defense identification zone (ADIZ) in international airspace over the East China Sea.[33] An ADIZ is a defined area extending beyond a nation's sovereign territory, within which aircraft can be interrogated or intercepted before crossing into national airspace. No international agreements govern the creation of an ADIZ. The creation of an ADIZ does not confer any additional rights to a nation. However, its establishment can be perceived as a claim of jurisdiction within the ADIZ boundary. The proximity of nations in the East and South China Seas creates an array of overlapping ADIZs of different countries. China's new ADIZ overlapped with other counties' established ADIZs and is shown in *Figure 4.*

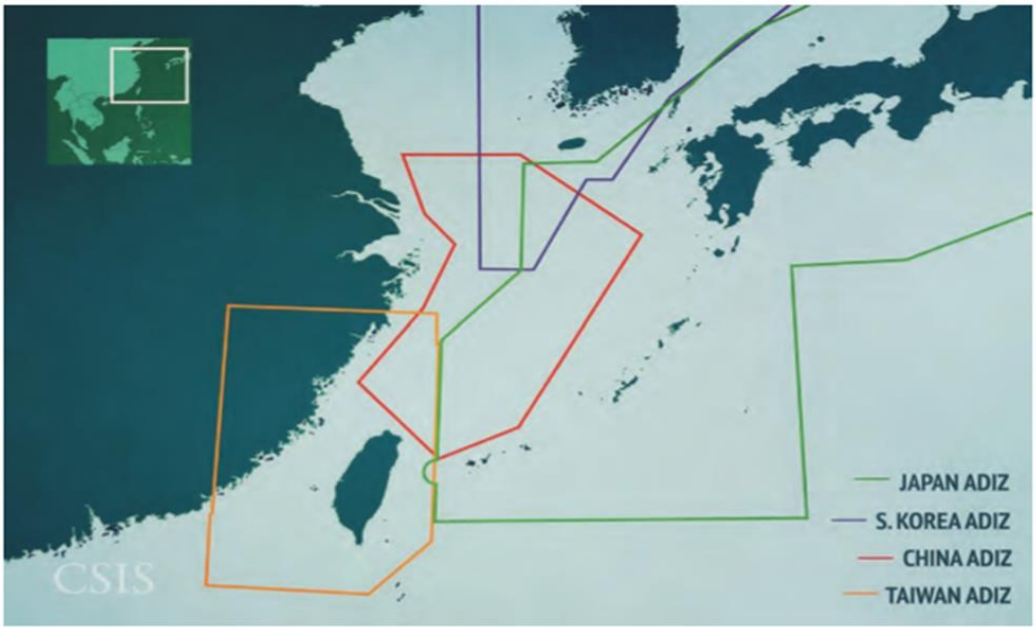


Figure 4: ADIZs in the East China Sea[34]

Moreover, China threatened emergency defensive measures against any noncompliant aircraft that transited its new ADIZ without properly filing of an aircraft flight plan. Both the United States and Japan criticized Beijing's decision to create an ADIZ, perceiving coercive intent behind the maneuver. Following China's ADIZ creation, the United States, Japan, and South Korea deployed military aircraft, which transited the areas to assert freedom of navigation over international airspace. Additionally, China sent a military aircraft patrol through the ADIZ. Japan scrambled fighters to intercept the patrol. Moreover, Japan demanded a rollback of the ADIZ, which China refused. Throughout these occurrences, the United States reaffirmed its Security Treaty obligations to Japan. The creation of the Chinese ADIZ offers a further case study to assess Japanese assurance of U.S. extended deterrence commitments.

Significance of Research

While limited, this research provides information regarding the impact of the USAF posture in the Indo-PACOM AOR on levels of Japanese assurance following Chinese aggression incidents. This information can be used to assess the future impact on Japanese assurance by potential USAF posture changes, such as the number of squadrons or the mix of DCA squadrons in the AOR. This data can additionally contribute to deterrence and assurance dialogue between the United States and Japan by providing assurance implications for the roles, missions, and capabilities of USAF assets in the AOR.[35] Finally, while extended deterrence commitments are unique from state to state, this research broadly applies to USAF posture impacts on ally assurance for states other than Japan or incidents other than Chinese aggression.

The following sub-sections provide individual data for each case study.

U.S. Air Force Posture During Strait 961 – The USAF maintained its highest allocation of fighters within the Indo-PACOM AOR during the Strait 961 exercise, as compared to the next two case studies. During March 1996, the United States Pacific Command (USPACOM) maintained 15 fighter squadrons within the region. This footprint consisted of two A-10/OA-10 squadrons (30 aircraft), one F-15A/B squadron (15 aircraft), five F-15C/D squadrons (90 aircraft), one F-15E squadron (18 aircraft), and six F-16C/D squadrons (138 aircraft). See *Table 3*.

March 1996 Posture (Squadrons)	Nuclear Capability	Not Nuclear Capable				Nuclear Dual Capable 1			Total
		8				7			15
	Primary Mission	Attack	Air Superiority			Multi Role		Strategic Attack	
		2	6			7		0	
	Aircraft Type	A-10/OA-10	F-15A/B	F-15C/D	F-22	F-15E	F-16C/D	B-52	
		2	1	5	0	1	6	0	
1 - Nuclear bombers are included as DCA capable									

Table 3: March 1996 U.S. Air Force Posture in the Indo-PACOM AOR[36]

Abandonment Fear Indicators During Strait 961 – 35 Japanese records from within the specified time frame of March 8 to June 8, 1996, were reviewed. From these records, there were eight statements regarding China, United States-Japan alliance, Japanese security, or the Strait 961 military exercise. One of these eight statements was found to contain abandonment fear indicators.[37]

U.S. Air Force Posture During Senkaku Islands Nationalization – The USAF posture during the Senkaku Islands nationalization was significantly different as compared to during China's Strait 961 exercise. The overall number of fighter squadrons had decreased, while the implementation of USPACOM's continuous bomber presence, a posture established in 2004, provided significant rapid global strike capability.[38]

During September 2012, USPACOM maintained 10 fighter squadrons and one bomber squadron within the region. This footprint consisted of one A-10 squadron (24 aircraft), two F-15C/D squadrons (48 aircraft), two F-22 squadrons (unknown number of aircraft), five F-16C/D squadrons (76 aircraft), and one B-52 squadron (six aircraft). See *Table 4*.

September 2012 Posture (Squadrons)	Nuclear Capability	Not Nuclear Capable				Nuclear Dual Capable 1			Total
		5				6			11
	Primary Mission	Attack	Air Superiority			Multi Role		Strategic Attack	
		1	4			5		1	
	Aircraft Type	A-10/OA-10	F-15A/B	F-15C/D	F-22	F-15E	F-16C/D	B-52	
		1	0	2	2	0	5	1	
1 - Nuclear bombers are included as DCA capable * - During this period, six B-52s were deployed to Andersen AFB, Guam as part of the Continuous Bomber Presence and are counted as a complete squadron.									

Table 4: September 2012 U.S. Air Force Posture in the Indo-PACOM AOR[39]

Abandonment Fear Indicators during Senkaku Islands Nationalization – 181 Japanese records from Sept. 11, 2012, to Dec. 11, 2012, were reviewed. From these records there were 20 statements regarding China, United States-Japan

alliance, Japanese security, or the Senkaku Islands. Five of these 20 statements were found to contain abandonment fear indicators.[40]

U.S. Air Force Posture during Chinese ADIZ Expansion – The USAF posture during the Chinese ADIZ expansion was no different than during the Senkaku Islands nationalization. During November 2013, USPACOM maintained 10 fighter squadrons and one bomber squadron within the region. This footprint consisted of one A-10 squadron (24 aircraft), two F-15C/D squadrons (48 aircraft), two F-22 squadrons (unknown number of aircraft), five F-16C/D squadrons (76 aircraft), and one B-52 squadron (six aircraft). See *Table 5*.

November 2013 Posture (Squadrons)	Nuclear Capability	Not Nuclear Capable				Nuclear Dual Capable †			Total
		5				6			
	Primary Mission	Attack	Air Superiority			Multi Role		Strategic Attack	11
		1	4			5		1	
	Aircraft Type	A-10/OA-10	F-15A/B	F-15C/D	F-22	F-15E	F-16C/D	B-52	
		1	0	2	2	0	5	1	

† - Nuclear bombers are included as DCA capable
* - During this period, six B-52s were deployed to Andersen AFB, Guam as part of the Continuous Bomber Presence and are counted as a complete squadron.

Table 5: November 2013 U.S. Air Force Posture in the Indo-PACOM AOR[41]

Abandonment Fear Indicators during Chinese ADIZ Expansion – 223 Japanese records from within the specified time frame of Nov. 23, 2013, to Feb. 23, 2014, were reviewed. From these records there were 29 statements regarding China, United States-Japan alliance, Japanese security, or the Chinese ADIZ. Two of these 29 statements were found to contain abandonment fear indicators.[42]

Conclusion

The change in total number of USAF squadrons across case studies does not appear to correlate with changes to the maximum, average, or mode value of abandonment fear indicators. Maximum and average abandonment fear value was higher during the Senkaku nationalization, but the same during the Strait 961 military exercise and Chinese ADIZ expansion. Moreover, the change in DCA squadrons across case studies produced mixed results. Maximum and average abandonment fear values were higher during the Senkaku nationalization, but the same during the Strait 961 military exercise and the Chinese ADIZ expansion. *Table 6* compares USAF posture with weighted abandonment fear indicator data.

Case Study	Number of USAF Squadrons	Number of DCA Squadrons	Number of Abandonment Indicators	Abandonment Fear Weighted Value Index		
				Maximum	Average	Mode
Chinese Exercise Strait 961	15	7	1	0.25	0.25	0.25
Senkaku Islands Nationalization	11	6	5	0.5	0.35	0.25
East China Sea Air Defense Identification Zone Expansion	11	6	2	0.25	0.25	0.25

Table 6: Case Study Data Comparison

It can be noted the lowest number of abandonment fear indicators occurred during the Strait 961 military exercise, which corresponded with the highest USAF squadron posture. However, significantly fewer Japanese records were reviewed for this case study as compared to the other case studies.[43] As a result, correlating a decrease in abandonment indicators to an increase in the number of U.S. Air Force squadrons is statistically difficult.

This data would seem to confirm that, in general, overall USAF posture levels have no discernable impacts on levels of Japanese assurance, negating *Hypothesis H1*. Additionally, due to the similar number of dual-capable aircraft within the USAF posture across case studies, it is difficult to determine if the presence of USAF dual-capable aircraft in the region corresponds to any impact on Japanese assurance levels, following aggressive Chinese actions. This data is therefore unable to confirm or negate *Hypothesis H2*. Focusing on the negation of *H1* suggests a reduction in total USAF posture in the Indo-PACOM AOR would not have a significant impact on Japanese assurance. With no direct correlation observed between USAF posture and abandonment fear indicators, we can assume that further incremental increases or decreases in USAF posture would not have an observable effect on Japanese assurance. However, it is logical that any significant and abrupt posture increases or reductions would have discernable effect on the assurance of any protégé.

Finally, this research assessed the effect on assurance based on the number of USAF squadrons and the number of nuclear dual-capable squadrons. The lack of correlation between the USAF posture in the region and Japanese assurance suggests different factors, other than the total number of USAF squadrons, may contribute to changes in assurance. Instead, specific military capabilities, tailored to counter protégé perceived threats, may have more impact on protégé assurance. For Japan, tailoring USAF capabilities to address its particular security concerns of ballistic missile attacks and gray-zone maritime coercion, could improve positive assurance. This idea of tailoring capabilities to threats is in line with previous suggestions by Brad Roberts for the United States to emphasize missile defense and conventional strike capabilities to assure Japan.[44]

Future research should include a broader range of case studies to provide additional data sets to assess abandonment fear indicators. Specifically, case studies tied to North Korean aggressive acts, such as missile launches, could be included to increase available data. Moreover, statements by Japanese officials indicate the presence of U.S. naval assets, specifically aircraft carriers, may affect their calculus of the strategic balance within the AOR.[45] Future research should also determine if any correlation between naval force assets and abandonment fear indicators exist.

Additionally, specific U.S. military capabilities should be assessed on their impact on assurance. For example, the deployment of missile defense, early warning, and intelligence, surveillance and reconnaissance (ISR) systems may positively contribute to assurance because of their unique capabilities, given the specific security threats faced by Japan at this time. Tailored assurance emphasizing functional capabilities could provide a positive assurance effect, whereas the overall quantity of air assets shows no correlating affect.

Finally, Victor Cha's original abandonment fear indicators should be expanded to include statements of vulnerability. During the 1996 Chinese Strait 961 military exercise, Japanese officials specifically cited Japan's vulnerability in the region as constraining their potential actions and dialogue with China.[46] Japanese officials further contrasted their own vulnerability against the relative lack of vulnerability of their U.S. security guarantor. Such statements of vulnerability demonstrate a loss of assurance and should be considered an abandonment fear indicator in future research.

Notes

1. Governments of the United States of America and Japan, "Treaty of Mutual Cooperation and Security between Japan and the United States of America," Jan. 19, 1960, available at www.cia.gov/library/readingroom/docs/CIA-RDP07-00469R000100950001-2.pdf.

2. Ibid.

3. Ibid.

4. Keith Payne, Thomas Scheber, and Kurt Guthe, *U.S. Extended Deterrence and Assurance for Allies in Northeast Asia* (Fairfax, Va.: National Institute Press, 2010), p. 24.

5. U.S.-Japan Security Consultative Committee, "Completion of the Review of the Guidelines for U.S.-Japan Defense Cooperation," Sept. 23, 1997.

6. Payne, Scheber, and Guthe, *U.S. Extended Deterrence and Assurance for Allies in Northeast Asia*, p. 27.

7. Michael Green, et al., "Countering Coercion in Maritime Asia: The Theory and Practice of Gray Zone Deterrence," (Washington, D.C.: Center for Strategic International Studies, May 2017).

8. Green, et al., p. 7.

9. Japanese Ministry of Defense, "National Defense Program Guidelines for FY 14 and Beyond," Dec. 17, 2013, p. 2.

10. Michael Markey, *Extended Deterrence and Japan: How Much Is Enough?* (Center for Global Security Research, February 2016), p. 2.

11. Brad Roberts, *Extended Deterrence and Strategic Stability in Northeast Asia* (National Institute for Defense Studies, 2013), p. 32.

12. Denis Healey, *The Time of My Life* (London: Michael Joseph, 1989), p. 243, from Justin Andersen and Jeffrey Larsen, "Extended Deterrence and Allied Assurance: Key Concepts and Current Challenges for U.S. Policy," INSS Occasional Paper 69 (Institute for National Security Studies, 2013), p. 77.

13. Andersen and Larsen, p. 8.

14. Victor Cha, "Abandonment, Entrapment, and Neoclassical Realism in Asia: The United States, Japan, and Korea," *International Studies Quarterly*, no. 44 (2000), p. 265.

15. Cha, p. 265.

16. Cha, p. 265.

17. Japan has cited great concern over Chinese air and maritime activities and their combined effect on regional and global stability. They have also cited North Korea's nuclear and ballistic missile program as a grave and serious threat to Japan's security. See Japanese Ministry of Defense, "National Defense Program Guidelines for FY 14 and Beyond," Dec. 17, 2013, pps. 2-4.

18. Article Nine of Japan's constitution renounces the Japanese sovereign right to use force or wage war. See "The Constitution of Japan," May 3, 1947.

19. Cha, "Abandonment, Entrapment, and Neoclassical Realism in Asia: The United States, Japan, and Korea," p. 266.

20. Victor Cha, "Abandonment, Entrapment, and Neoclassical Realism in Asia: The United States, Japan, and Korea," *International Studies Quarterly*, no. 44 (2000).

21. Keith Payne, Thomas Scheber, and Kurt Guthe, *U.S. Extended Deterrence and Assurance for Allies in Northeast Asia* (Fairfax, Va.: National Institute Press, 2010).

22. Brad Roberts, *Extended Deterrence and Strategic Stability in Northeast Asia* (National Institute for Defense Studies, 2013).

23. Yukio Satoh, "U.S. Extended Deterrence and Japan's Security," *Livermore Papers on Global Security* no. 2 (October 2017).

24. James Schoff, *Realigning Priorities, The U.S.- Japan Alliance and the Future of Extended Deterrence* (Cambridge, Mass.: Institute for Foreign Policy Analysis, 2009).

25. Data was compiled for comparison among three sources of the publication. *The Military Balance* quantitatively provided numerical counts of aircraft squadrons and inventory assigned by combatant command. Moreover, information regarding historic nuclear bomber deployments to the region was collected from an interview with the Pacific Air Forces (PACAF) Commander's Action Group via telephone.

26. Case studies were pulled from the following sources. Jeffrey Richelson, *China and the United States: From Hostility to Engagement, 1960-1998*, the *National Security Archive Electronic Briefing Book 19* (Washington, D.C., 1999), Green et al., *Countering Coercion in Maritime Asia: The Theory and Practice of Gray Zone Deterrence* (Washington, D.C.: Center for Strategic International Studies, May 2017), 124–47, Green et al., pps. 148-68.

27. Office of Naval Intelligence, "Chinese Exercise Strait 961: 8-25 March 1996," 1996.

28. Ibid., p. 1.

29. Michael Green, et al., *Countering Coercion in Maritime Asia: The Theory and Practice of Gray Zone Deterrence* (Washington, D.C.: Center for Strategic International Studies, May 2017), p. 125.

30. Ibid., pps. 131-32.

31. Ibid., 142, Source from Japanese Ministry of Foreign Affairs, "Trends in Chinese Government and Other Vessels," October 2016.

32. Ibid., p. 143.

33. Ibid., p. 148.

34. Ibid., p. 148.

35. The importance of deterrence and assurance dialogue between the United States and Japan, which incorporates more detailed analysis about potential threats, common objectives, and implication for roles, missions, and capabilities was recommend by James Schoff. See *Realigning Priorities, The U.S.- Japan Alliance and the Future of Extended Deterrence* (Cambridge, Mass.: Institute for Foreign Policy Analysis, 2009), p. 79.

36. *International Institute for Strategic Studies, The Military Balance 1996-1997* (London: Oxford University Press, 1996), p. 29.

37. The following Japanese record contained abandonment fear indicators regarding the Strait 961 military exercise, Hiroshi Hashimoto, "Press Conference by the Press Secretary," (May 14, 1996). Of note, the Joint Security Declaration issued by Japan and the United States on April 17, 1996, could be assessed as the abandonment indicator of bolstering commitment to the alliance to solicit reciprocity. However, this joint statement was issued following 18 months of diplomatic work between Washington and Tokyo and the Joint Declaration is assessed as not resultant from the Strait 961 military exercise and therefore scored as a null value. See Patrick M. Cronin, *The U.S.-Japan Alliance Redefined* (Institute for National Strategic Studies, May 1996), pps. 1-2.

38. Andersen Air Force Base Office of Public Affairs, "Continuous Bomber Presence Mission," Government, Andersen Air Force Base (blog), accessed Jan. 17, 2019, www.andersen.af.mil/CBP.

39. International Institute for Strategic Studies, *The Military Balance 2013* (London: The Routledge Taylor & Francis Group, 2013), pps. 79-84.

40. The following Japanese records contained abandonment fear indicators regarding the Senkaku Islands nationalization: Yoshihiko Noda, "Address by Prime Minister Yoshihiko Noda at the 2012 Fleet Review of the Japan Self-Defense Forces," (Oct. 14, 2012); Yoshihiko Noda, "Policy Speech by Prime Minister Yoshihiko Noda to the 181st Session of the Diet," (Oct. 29, 2012); Osamu Fujimura, "Press Conference by the Chief Cabinet Secretary," (Sept. 14, 2012); Osamu Fujimura, "Press Conference by the Chief Cabinet Secretary," (Nov. 5, 2012); Osamu Fujimura, "Press Conference by the Chief Cabinet Secretary," (Nov. 7, 2012).

41. International Institute for Strategic Studies, *The Military Balance 2014* (London: Taylor & Francis Group, 2014), pps. 50-55.

42. The following Japanese records contained abandonment fear indicators regarding the Chinese air defense identification zone (ADIZ) expansion: Shinzo Abe, "Second Gathering with Prime Minister Shinzo Abe," hosted by Japan Akademeia, Speech by Prime Minister," (Dec. 19, 2013); Shinzo Abe, "Policy Speech by Prime Minister Shinzo Abe to the 186th Session of the Diet," (Jan, 24, 2014).

43. Japanese Chief Cabinet Secretary archive data does not exist on the official Japanese website prior to 2011. As a result, significantly fewer records were reviewed for the Strait 961 case study. Only 35 records were reviewed for the Strait 961 military exercise case study as compared to 181 and 223 for the Senkaku nationalization and Chinese ADIZ expansion case studies respectively.

44. Roberts, *Extended Deterrence and Strategic Stability in Northeast Asia.*

45. Hiroshi Hashimoto, "Press Conference by the Press Secretary," (March 12, 1996), www.mofa.go.jp/announce/press/1996/3/312.html#18.

46. Ibid.

CHAPTER 5

Nuclear Security Enterprise Modernization and Its Impact on Ally Assurance

Mr. Erwin T. Hoo
Department of Energy
National Nuclear Security Administration

Historical precedents in Cold War Asia provide ample evidence of the proliferation-related consequences of real or perceived American indifference to the region. In the past, perceptions of declining American credibility and of weaknesses in the nuclear umbrella have spurred concerted efforts by allies to break out.
– Toshi Yoshihara, 2009

The United States no longer has the capability or capacity to produce, process or manufacture some of the strategic materials necessary for modernizing the nuclear weapons stockpile. The National Nuclear Security Administration (NNSA) is currently undergoing an infrastructure modernization program that ranges from new facilities and processes to restarting processes in old outdated facilities in an effort to address this deficiency.[1] The implications of this deficiency potentially impacts the credibility of the U.S. extended nuclear deterrence, and consequently erodes assurance of allies.[2] The United States must modernize the Nuclear Security Enterprise (NSE)[3] and its nuclear stockpile to give allies the greater assurance in the U.S. extended nuclear deterrence.

The physical production of nuclear weapons relies upon three important areas: people, processes and facilities.[4] During the Cold War, all three of these areas were vigorously exercised through the research, development, testing and production of weapons introduced into the nuclear arsenal.[5] However, toward the end of the Cold War, a "peace dividend" resulted in shrinking defense budgets, a shift from production to the reduction of the nuclear weapon stockpile, and a limited demand for new weapons, all of which contributed to the atrophy of these three key areas.[6]

The first important area, personnel, as previously mentioned, during the Cold War developed their technical knowledge and experience in the design and manufacture of nuclear weapons through the regular process of producing new

weapons and weapon types.[7] However, toward the end of the Cold War, the demand to exercise these skills was greatly reduced and left the current NSE with the challenge of developing the necessary skills and experience in the younger workforce as the current wave of experienced personnel retire.[8]

The second important area are the processes developed during the production of nuclear weapons. These processes included the specialized production processes for the strategic materials, the acquisition process, known as the joint nuclear weapons life-cycle, and nuclear weapons testing. All of these processes have either been suspended because of the loss of demand,[9] modified to accommodate the international agreements or the current requirements for managing the nuclear weapons stockpile.[10]

The final area of importance deals with the equipment and facilities that comprise the physical NSE, where the strategic materials are fabricated into weapon components. Concerns over the loss of capability, facility deterioration and safety, have been raised since the late 1980s.[11] While some actions had been taken, revitalization of the overall enterprise was never fully implemented. The 2018 Nuclear Posture Review (NPR) reiterates that all previous NPRs highlighted the need to maintain a modern nuclear weapons infrastructure, and that the United States has failed to follow through on this obligation. The result of this neglect is the current urgent requirement to recapitalize on an infrastructure that lacks the ability to produce certain strategic materials and components needed for nuclear weapons.[12]

This study accomplishes three things:

1. *Understand and describe the past and current operational condition of the NSE with respect to the people, processes and facilities/materials.*

2. *Describe and evaluate the NNSA efforts to build the desired effective, responsive and resilient infrastructure necessary for the future NSE.*[13]

3. *Considers whether the current condition of NSE and the ability to respond to the changing security environments is impacting Japan's assurance of the U.S. extended nuclear deterrence.*

Research Question

The United States must modernize the NSE and its nuclear stockpile to give allies the greater assurance in the United States extended nuclear deterrence. Given the known limitations of the current NSE and the lengthy time required to establish a modern and responsive enterprise, how will these factors affect the United States ability to assure its allies of a credible extended nuclear deterrence?

Hypothesis

Planned capacity and knowledge preservation within a modernized NSE will be limited in responsiveness to potential near-peer challengers.

Allies will gain greater assurance in U.S. extended nuclear deterrence as a result of the modernization of the NSE and nuclear stockpile.

Nuclear Security Enterprise Operations and Modernization

This section provides a summary of the past and present NSE operations status for people, processes and facilities and materials. A discussion on the goals for the future based on real stockpile requirements follows. This section ends with an evaluation of the NSE modernization effort.

Past – Cold War

People

During the Manhattan Project and the ensuing Cold War, U.S. scientists, engineers and craftsmen developed and exercised critical skills through the design and manufacture of nearly one hundred different types of nuclear weapons.[14] The weapons were built, assembled and tested through a large infrastructure of production and processing facilities that spanned the country.

Process

During this period, new weapon designs were developed and weapons with new capabilities were regularly introduced into the arsenal. This continuous buildup also kept the stockpile weapons "fresh," precluding the aging effects on electronic and weapon components exacerbated by radiolytic decomposition. The process for managing the acquisition of nuclear weapons was the joint nuclear weapons life-cycle. It consisted of seven phases that ran from concept, design, development, production, sustainment, then carried the weapon through to retirement and disposal.

Weapon designs and weapons were verified through nuclear weapon testing, initially above ground from 1945 to 1962 and underground nuclear weapon testing (UGT) until 1992, when the United States suspended underground nuclear testing.[15]

Facilities and Materials

Actual weapon production is dependent on the ability to produce and manufacture components from key strategic materials. During this period, these materials were managed at facilities across the country. Plutonium was produced

and purified at the Hanford Site in the state of Washington.[16] Plutonium pits were produced at the Rocky Flats Plant (RFP) in Colorado.[17] Uranium was enriched at the gaseous diffusion plants in Ohio, Kentucky and Tennessee.[18] The Oak Ridge Site in Tennessee also produced the finished enriched uranium and lithium products.[19] Tritium and lithium were produced at the Savannah River Site (SRS) in South Carolina.[20]

Following the collapse of the Soviet Union and the end of the Cold War, the United States determined there was a "peace dividend" to be applied at home. In 1992, tritium production reactors at SRS and plutonium pit production at RFP were shutdown.[21] Plutonium production at the Hanford Site had already been shut down and its mission shifted to clean up.[22] The three gaseous diffusion plants for uranium enrichment had been employed in the production of low enriched uranium (LEU)[23] for the civilian power industry and had not been producing highly enriched uranium (HEU)[24] for weapons since the 1960s. The last of these facilities was shut down in 2013.[25] Similarly, lithium production at Oak Ridge Site was suspended in the 1960s due to the accumulation of a large stockpile of material.[26]

Current and Planned Future State

People

Department of Energy (DOE) documents point out that the NSE requires a workforce with specialized skills and experience. The current NNSA federal and Management and Operating (M&O) workforces exhibit a bimodal age distribution where the workforces are comprised of large numbers in the youngest and oldest ranges and fewest in the mid-age range. This results in a skewed distribution of experience.[27] The concern caused by this situation is the adequate transfer of design and manufacturing skills to the younger workforce as well as their development and retention.

Consequently, the NSE is developing strategies to develop and retain the next generation of workers, through various programs, for example: developmental rotations, and technical certification programs.[28] Additionally, the NNSA is partnering with the Department of Defense (DOD) in implementing a Stockpile Responsiveness Program (SRP).[29] This is intended to "exercise weapons design as (a key) element of deterrence," but separate from the acquisition process. The latest information available, from late 2016, stated funding had not been appropriated.[30]

Process

The nuclear weapons life-cycle was suspended following the termination of the last nuclear weapon production program in 1991. Since that time, all weapons in the stockpile have been sustained in Phase 6, which is the stockpile maintenance and evaluation portion of the life-cycle. The prolonged nature of managing the weapons in the sustainment phase led the Nuclear Weapons Council to develop the Phase 6X process as a supplement to the routine maintenance and evaluation of Phase 6. The Phase 6X process has allowed personnel to exercise portions of the

life-cycle process, but from the more limited perspective of component modernization as opposed to the design, development and production of new weapons or capabilities.[31]

During the Cold War, the science, as well as, the weapon design was confirmed through nuclear testing. However, as time progressed, restrictions through various mechanisms, such as treaties were implemented. The treaties prompted the United States to pursue other avenues such as three-dimensional computer analyses to better understand and model the nuclear explosive process. This laid the groundwork for the Stockpile Stewardship Program (SSP), which was implemented shortly after underground nuclear testing (UGT) was suspended in 1992.[32]

Today, the SSP provides confidence in the nuclear weapon stockpile without UGT by integrating various surveillances, nonnuclear testing and computational modeling.[33] The program consists of system and component level testing in an effort to identify aging issues with sufficient lead time for the NSE to respond with capability and capacity to ensure stockpile reliability.[34]

Despite the 1992 UGT moratorium, the NNSA is also tasked to maintain readiness to resume UGT. This is accomplished by exercising personnel and equipment capabilities but does not include the maintenance of obsolete facilities.[35] Based on a discussion with NA-115 personnel, because of these efforts, the United States would be able to return to UGT on relatively short order, if required to do that.[36]

Facilities and Materials

Facilities status and plans can be described based on their ability to process the required strategic material for nuclear weapon production. Currently the United States has no capability to produce[37] or separate[38] plutonium. Additionally, the NSE can neither enrich uranium, nor purify and fabricate lithium components. In order to meet program needs, the NSE is mainly recycling components.[39]

The NSE modernization efforts attempt to address deficiencies in the material capabilities of the enterprise as described in the 2018 Master Asset Plan (MAP). MAP is a prioritized 25-year infrastructure investment management tool.[40] However, some material strategies are still being developed and shortfalls in certain materials are forecasted. The status of each strategic material is discussed in the following subsections:

Plutonium – Currently, the NSE plutonium component production is limited to developmental pits at Los Alamos National Laboratory (LANL)[41] in New Mexico. The way forward is captured in the Plutonium Sustainment Program, which addresses several facility aspects, including replacement of the analytical facility and plutonium pit production capacity.

Uranium – Uranium is a key strategic material that is required in various levels of enrichment and for many purposes ranging from weapons components, to fuel for naval reactors and commercial reactors used for tritium production.

Currently the NSE has no capability to enrich uranium.[42] The NSE uranium work centers on facilities located at the Y-12 site in Tennessee. The efforts regarding uranium work can be discussed based on three main enrichment levels of HEU, LEU and depleted uranium (DU).[43]

Lithium – Lithium is another strategic material the United States no longer has the ability to produce in the quantity and level of purity required. However, the loss of this capability was not due solely to the "peace dividend," but was due, in part, to processing efficiency. During the 1960s the lithium production line at Y-12 provided a sufficient surplus of material that production was stopped in 1963 and has relied upon the recycling of material from retired weapons since then.[44] The downside of these events is that in order to continue to meet stockpile needs, the lithium work occurs within one of the oldest facilities in the NSE,[45] Building 9204-2, which is a Manhattan Project era facility. The facility is in an advance state of deterioration because of the caustic processes that were performed in the facility.[46]

Tritium – The final strategic material that NNSA is working to address in the NSE modernization is the production of tritium. The modernization requires multiple facets, first, restoration of tritium production and second, the relocation of tritium processes out of the current 60-year old facility and reestablishing them into facilities at SRS.[47] Because of its relatively short half-life, 12.3 years, it is a material that requires constant production and refreshment in the stockpile. The United States stopped producing tritium about two and a half half-lives ago, in 1988 when the last of the SRS reactors was shut down. Since then, the United States and has relied mainly upon recycling from component exchanges and weapon retirements.[48]

Evaluation of Nuclear Security Enterprise Modernization

NNSA is in the process of developing a measurement framework to evaluate whether the NSE successfully meets the goal of "resilient, flexible, and responsive enterprise." The measurement framework is expected to be produced by fiscal year 2019 and intends to appraise the myriad of aspects that the enterprise is comprised of, such as personnel, facilities, equipment, science, engineering, computing, technology, materials, production, manufacturing processes, and business practices. In order to capture the responsiveness aspect, the measures being developed will also evaluate how quickly the NSE is capable of completing activities such as life extension programs and weapons modification.[49]

In the absence of the NNSA evaluation framework, this study applies criteria discussed in the 2018 NPR regarding the NSE. In addition to maintaining the stewardship of the current stockpile, the NPR envisions maintaining "the capability to design, develop and produce nuclear warheads with new or different military capabilities if required in the future, and provide an effective response to technical problems with a warhead or to adverse geopolitical developments that call for force augmentation."[50] The NPR also goes on to define "responsive" as "the capacity to deploy and employ forces as promptly as is necessary to pose credible

threats." In context, this definition is with respect to the "nuclear triad" and not infrastructure.[51] In any case, having "the capacity to deploy … forces promptly" is facilitated by the NSE. Using these queues and the specific criteria spelled out in the NPR, for example, produce at least 80 war reserve pits per year by 2030, the NSE was evaluated.

The summary figure that follows provides a qualitative evaluation of the three main areas of people, process and facilities using a relative comparison over time. Each area is represented by a different color border. The interior color represents a qualitative evaluation of capability (using the NPR description) along a color spectrum where red is least and blue is most capable. The size of the bubble implies the qualitative significance of concerns.

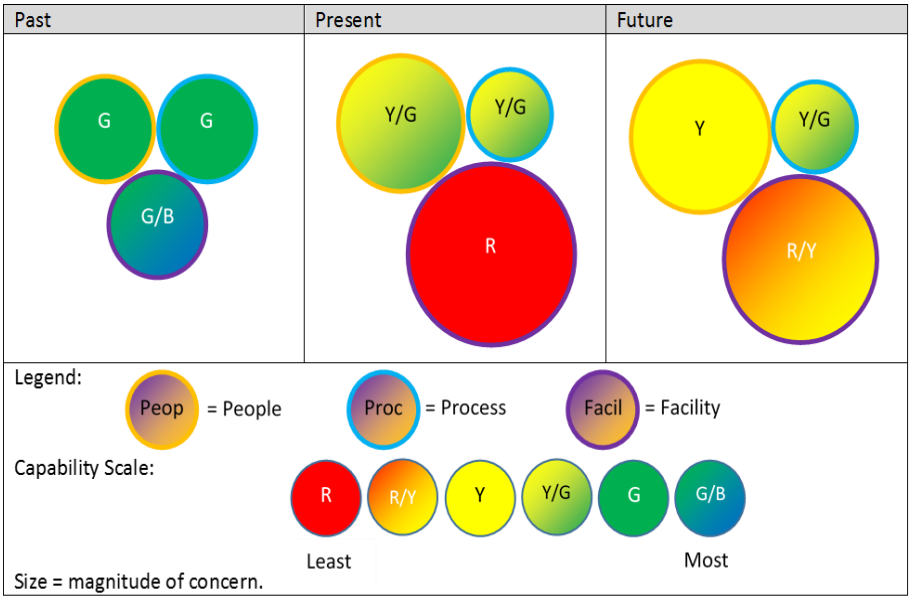


Figure 1. Evaluation of NSE: People, Process, Facilities

The past NSE is evaluated with bubbles of equal sizes, green for people and processes and green-blue for facilities. During the Cold War period, the personnel regularly exercised their skills and processes, continually introducing new weapons and capabilities, and enlarging the stockpile. Facilities is rated green-blue to represent the overcapacity the NSE contained and resulted in surpluses in HEU and lithium, that are still relied upon today.

The present NSE represents changes for the worse in all three areas. The people bubble acknowledges not only the aging out of experienced personnel, but also tenuous nature of the transfer of knowledge to the newer personnel. As of late 2016, the SRP, which is intended to exercise all the aspects of weapon design, had not been funded. The reduced size of process acknowledges use of the 6X process and readiness to resume testing, but also recognizes that the 6X is a limited version of the joint nuclear weapons life-cycle. Finally, the facility bubble indicates the level of disrepair in the NSE and the severe lack of capability to produce a nuclear weapon at this time.

The future state for personnel implies the increased concern related to the aging out of experienced personnel, and the limited effectiveness of the certification programs to transfer knowledge when considering programs like the SRP are not funded. Assuming continued commitment and funding for NSE modernization will restore the capability to produce nuclear weapons in the 2023 timeframe, the facility bubble size (concern) is reduced. However, at this point, uranium enrichment and therefore long-term tritium production are not yet resolved. Therefore, the capability color remains in the less capable range.

The bottom line is the NSE modernization must continue and will improve upon the current condition. Personnel knowledge and experience will continue to be a concern unless they have the opportunity to exercise their skills. Facility modernization will restore enduring capabilities for most of the strategic materials. However, long-term resolution for uranium enrichment and tritium production has not been determined.

Impacts on the Assurance of Allies

Past - Historical and Cultural

In the article by Toshi Yoshihara and James R. Holmes titled "Thinking about the Unthinkable," they highlight how a perceived lack of credibility of the United States commitment to extended nuclear deterrence in East Asia in the early 1970s led to the Republic of Korea (ROK or South Korea) and the Republic of China (ROC or Taiwan) to seek their own nuclear weapons. This perception resulted from the U.S. administration's calls for allies to bear a larger share of their own defense and the withdrawal of U.S. combat troops from their respective nations. Yoshihara and Holmes summarize the events, suggesting that states can give in to nuclear proliferation temptations when faced with a perception of a deteriorating security environment and a reduced confidence in the United States commitment to them.[52]

Similarly, Japan is also susceptible to pursuing nuclear weapons based on external security pressures and perceptions related to the United States commitment to extended nuclear deterrence. The regional environment has been exemplified by the People's Republic of China's (PRC) aggressive naval build up and forays into the East China[53] and South China Seas, actions that threaten Japanese territories, sea lines of communications and her strategic position in the region. The region also saw the Democratic People's Republic of Korea (DPRK or North Korea) detonate multiple nuclear devices since 2006 as well as threaten the ROK, Japan and the United States. Rising defense costs have resulted in a shrinking force structure of U.S. military forces and challenges the staying power of the United States in the region.[54]

However, unlike the ROK and ROC in the 1970s, Japan has a myriad of other factors that impact her willingness to exercise the nuclear option.[55] Three of these factors are discussed further: cultural, diplomatic and the United States-Japan Alliance.

First, the cultural aspect has to do with Japan's experience at the end of World War II, where Japan is the only nation to have experienced the effects from an attack by nuclear weapons. Consequently, the populace is strongly against nuclear weapons. Even after the initial North Korean nuclear test, the overwhelming majority of the population continued to favor that Japan maintain the three nonnuclear principles[56] initially espoused during the midst of the Cold War.[57]

Second, as an offshoot of the public sentiment against nuclear weapons, Japan has adopted an identity as a "peace state." The nation has staked much diplomatic capital in the promotion of nuclear nonproliferation and disarmament. For Japan to change this position and withdraw from the Nuclear Non-Proliferation Treaty (NPT) in order to pursue the nuclear option would refute its diplomatic track record of over 30 years.[58]

Finally, Japan has been able maintain its nonnuclear position despite the East Asian security environment during the Cold War because of the United States commitment to the extension of the nuclear umbrella over Japan. This timeframe included regional wars in Korea and Vietnam, the People's Republic of China's first detonation of a nuclear device in 1964 and North Korea's detonation of a device in 2006. This assurance has been built over time, and documented in the revised United States-Japan Treaty of Mutual Cooperation and Security signed in 1960.[59] From the beginning, Japan has tracked the U.S. commitment for any sign of weakness. For example, following the PRC's detonation of a nuclear device in 1964, Japan directly engage American leadership regarding the United States commitment of nuclear weapons for the protection of Japan. As described by Ota, in a 1965 face to face meeting, Japanese Prime Minister Sato pressed the American President Lyndon B. Johnson for assurance of the U.S. nuclear deterrent. Ota asserts that the president gave his Japanese counterpart the unequivocal assurance of extended nuclear deterrence in defense of Japan.[60]

Current and Future – Less Visible Equals Less Assured

Relating back to the United States removing combat forces from ROK and ROC in the 1970s, along with U.S. leadership demands for increased allied sharing of defense costs, allied governments perceived a weakening of American resolve to them and the region. The removal of nuclear weapons from Asia in 1991, the retirement of submarine launched nuclear cruise missiles, the skyrocketing costs of military equipment and consequential reduction of force numbers lead to questions of U.S. staying power in the East Asian region and contribute to Japan's sensitivity and fears of U.S. abandonment.[61] Piled on top of the reduced visible presence is "the U.S. Departments of Defense and Energy statement in 2008 that the United States 'is now the only nuclear weapons state party to the NPT that does not have the ability to produce a new nuclear warhead,'"[62] exacerbates Japan's concern over the long-term viability because of the state of deterioration of the U.S. nuclear capability.[63]

In the light of a perceived decline in U.S. conventional forces in Asia, as well as the lack of visibility of U.S. nuclear forces, the increased security threats to

Japan, the United States continued to provide assuring statements focusing on increased capability and flexibility of systems. Unfortunately, these statements did not carry the weight they once did because of U.S. actions that surprised the Japanese and were contrary to their expectations of how the United States was providing credible deterrence to potential adversaries. Specifically, the retirement of nuclear-capable tomahawk land attack missiles (TLAM/N),[64] which in the eyes of some U.S. defense planners, left the United States with a Cold War arsenal that may be inappropriate for deterring anything but a large-scale nuclear attack.[65] Consequently, efforts to alleviate concerns and restore credible assurance, the United States and Japan began bilateral consultations starting in 2009, which for the first time granted Japan official discussions and even influence in U.S. nuclear strategy. These discussions on the extended nuclear deterrence have included concerns regarding confidence in warhead reliability, low-yield options and the ability to display these forces as the situation warrants. The assurance measures have been established as the Extended Deterrence Dialogue (EDD) between the United States and Japan. They are held on a biannual basis where one of the meetings includes a visit to a deterrence-related infrastructure site to demonstrate the visible and tangible aspects of the U.S. nuclear umbrella.[66] The most recent EDDs were held in March and October 2018 at Naval Base Kitsap, in the state of Washington[67] and in Tokyo, Japan,[68] respectively.

Evaluation of Ally Assurance

Yoshihara and Holmes discuss factors that would tempt Tokyo to consider the nuclear option. Three prominent factors include the security environment, the perceived U.S. credibility and commitment, and Japan's response to that perception. *Figure 2* below attempts to represent these factors that contribute to an ally's assurance, providing relative comparisons for the past, present and future. Each factor is represented by a different color border. The interior color represents the qualitative level of assurance along a color spectrum where red is least and blue is most assured. The size of the bubble implies the qualitative significance of the factor.

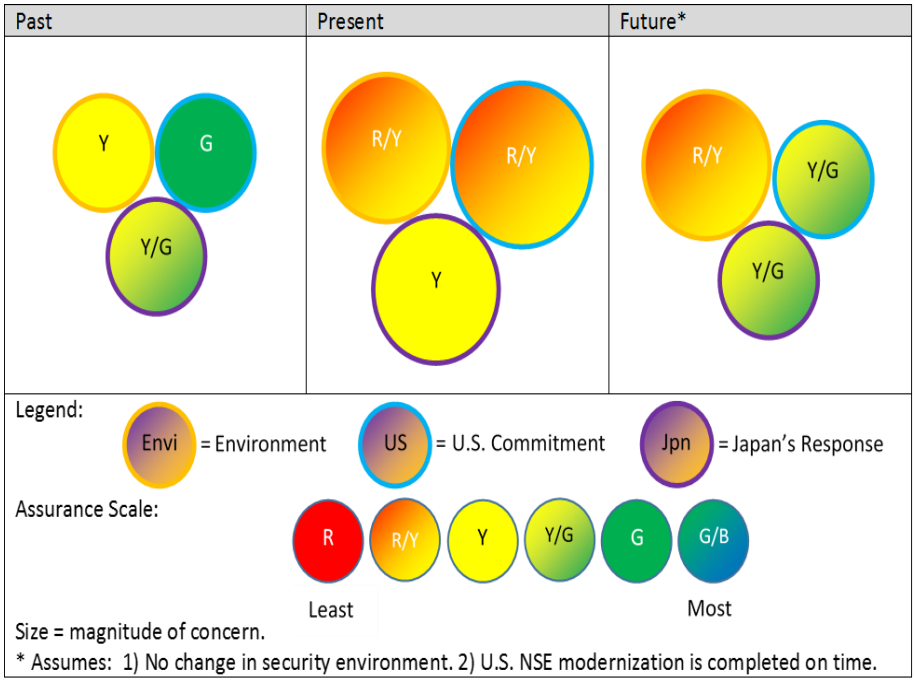


Figure 2. Evaluation of Ally Assurance:
Security Environment, U.S. commitment, Japan's response

The past represents the general Cold War situation where the United States and Soviet Union maintained the balance in a bipolar world. The U.S. assurance of Japan was fairly straightforward, with U.S. nuclear weapons at home as well as on shore and at sea throughout the Asia-Pacific region. Japan played a key ally role by hosting U.S. bases in the area.[69]

The present security environment involves PRC modern forces and North Korean nuclear capability. Japan has raised numerous concerns regarding the U.S. commitment to the region. Concerns range from reduced U.S. conventional and nuclear force structure and presence. The concerns include specific issues such as credibility of an inflexible arsenal to reliability of aging weapons. The United States has been able to reassure Japan by holding the bilateral EDD including site visits.

The future assessment assumes no change in security environment and completion of U.S. NSE modernization, development and deployment of both a low-yield warhead and sea-launched cruise missiles (SLCM) as described in the 2018 NPR. The United States commitment bubble does not move significantly higher, evaluated as "Y/G," because the trends of the reduced size of U.S. conventional forces and regional presence are likely to continue.

Recommendations

Efforts by the United States to modernize the NSE consider the capabilities needed to provide resilient, flexible and responsive infrastructure. The three important aspects of people, processes and facilities have plans established. Regarding the people, the programs to train the newer generation are defined.

However, the programs for exercising the skills are not funded. The facilities and associated strategic materials have plans to restore production capabilities. The main strategic materials that remain indeterminate and could result in shortfalls are uranium and therefore tritium. All of these plans, U.S. deterrence and a credible extended nuclear deterrence, could come to naught if the United States fails, as it has previously, to commit the necessary funds to complete the NSE modernization.

This study suggests that the risk of not modernizing the NSE is too great. It is a risk that includes the loss of a credible nuclear deterrent and the loss of credibility in assuring our allies. It is therefore recommended that research be considered to further evaluate assurance with our Japanese partners with regard to the United States' ability to provide extended deterrence based on current and future condition of the NSE and reliability of the stockpile. It is further recommended that other allies of the United States be looked at for the same reason.

Conclusion

This study sought to answer two hypotheses. The first regarded the NSE modernization effort: *"Planned capacity and knowledge preservation within a modernized NSE will be limited in responsiveness to potential near-peer challengers."* This hypothesis is therefore accepted. The modernization effort encompasses all the right areas of people, processes and facilities. However, the personnel aspect of knowledge and experience will continue to be a concern unless the new generation is able to exercise their skills. While the facility modernization will restore enduring capabilities for most of the strategic materials, the long-term resolution for the key strategic materials of uranium and tritium are not determined.

The second hypothesis concerns ally assurance: *"Allies will gain greater assurance in U.S. extended nuclear deterrence as a result of the modernization of the NSE and nuclear stockpile."* This hypothesis is also accepted. The effects of decreasing numbers of U.S. forces, the apparent reduced flexibility of a less diverse nuclear arsenal and reliability concerns coupled with the loss of the NSE production capabilities have raised concern in Japan over the credibility of the U.S. commitment and extended nuclear deterrence. Efforts to engage Japan in dialogue over these concerns as well as visits to U.S. deterrence-related infrastructure sites have alleviated some of these concerns for now.

Notes

1. "Nuclear Infrastructure Modernization," National Nuclear Security Administration, accessed Nov. 11, 2018, at www.energy.gov/nnsa/nuclear-security.

2. Andrew O'Neil, *Asia, the United States and Extended Nuclear Deterrence* (New York, N.Y.: Routledge, Inc., 2013), p. 26.

3. The National Nuclear Security Administration uses the term "nuclear security enterprise" (NSE). Historically, the enterprise was referred to as the "nuclear weapons complex (NWC)." The *Nuclear Posture Review* (NPR) refers to the NSE as "nuclear weapons infrastructure."

4. Department of Energy, FY 2019 *Stockpile Stewardship and Management Plan, Report to Congress* (Washington, D.C.: Department of Energy, October 2018), pps. 3-63. In addition to people, processes and facilities the SSMP also acknowledges a resilient, flexible and responsive enterprise will include science, engineering, computing, technology and business practices.

5. George C Allen, Jr., *Complex Transformation: Change in the United States Nuclear Weapons Complex from 1942 to 2015* (Middletown, Del.: TechSource, Inc., 2017), p. 44.

6. Ibid., pps. 48-49, 51-57.

7. Ibid., p. 44.

8. Department of Energy, FY 2018 *Stockpile Stewardship and Management Plan, Report to Congress* (Washington, D.C.: Department of Energy, November 2017), pps. 7-11.

9. Allen, *Complex Transformation*, p. 57.

10 Department of Defense, *Nuclear Matters Handbook 2016* (Washington, D.C.: Office of the Deputy Assistant Secretary of Defense for Nuclear Matters, 2016), pps. 156-157, 214-219.

11. Allen, *Complex Transformation*, p. 48.

12. Office of the Secretary of Defense, *Nuclear Posture Review* (Washington, D.C.: Department of Defense, February 2018), pps. 61-62.

13. 2018 NPR, pages XIV, 60 provide expectation for the desired modernized NSE end state: "Maintain the capability to design, develop and produce nuclear warheads with new or different military capabilities if required in the future, and provide an effective response to technical problems with a warhead or to adverse geopolitical developments that call for force augmentation." FY 2019 *Stockpile Stewardship and Management Plan, Report to Congress*," section 3.32, reports that the NNSA will develop measures for determining success in meeting the goal of a resilient, flexible, and responsive enterprise in FY 19.

14. Allen, *Complex Transformation*, pps. 25-26, 33-34, 39. Doctor Allen reports the number of weapon designs generated by the NWC for each decade was 46 from 1950-1959, 29 from 1960-1969, 11 from 1970-1979, and 8 from 1980-1989.

15. Department of Defense, *Nuclear Matters Handbook 2016*, pps. 208, 212.

16. "Projects and Facilities, Plutonium Finishing Plant," Hanford.gov, accessed Nov. 11, 2018, at www.hanford.gov/page.cfm/PFP

17. “Rocky Flats Site, Fact Sheet,” Department of Energy, Office of Legacy Management, accessed Nov. 11, 2018, at www.lm.doe.gov/Rocky_Flats/Sites.aspx.

18. Allen, *Complex Transformation*, pps. 380, 385, 387.

19. Ibid., p. 387.

20. Mary Beth Reed, et al., *Savannah River Site at Fifty* (Washington, D.C.: U.S. Government Printing Office, 2002), pps. 517-519, www.srs.gov/general/about/50anniv/CONTENTS.pdf.

21. Ibid., p. 535.

22. “Hanford History,” Hanford.gov, accessed Nov. 11, 2018, at www.hanford.gov/page.cfm/HanfordHistory.

23. Low-enriched uranium contains higher concentrations of the fissile uranium-235 isotope than natural uranium, but less than 20 percent.

24. 2018 SSMP definition: heavy enriched uranium is a type of uranium in which the concentration of uranium-235 has been increased to 20 percent or greater, and up to 90 percent.

25. Allen, *Complex Transformation*, p. 230.

26. Ibid., p. 270.

27. Department of Energy, FY 2018 *Stockpile Stewardship and Management Plan*, pps. 7-7 to 7-8.

28. Ibid., pps 7-13.

29. Lisa E. Gordon-Hagerty, Administrator, National Nuclear Security Administration, memorandum for distribution, subject: National Nuclear Security Administration *Nuclear Posture Review* Implementation Guidance, Aug. 24, 2018.

30. Perry Johnson, Ingrid Kolb, “Stockpile Responsiveness Program,” NNSA Enterprise Portal, Dec. 29, 2016, https://nnsaportal.energy.gov/intranet/na-10/DP Strategic Communications/2016 DOE Transition Books/NNSA 2016. Presidential Transition Efforts/Defense Programs - 2016 NNSA Specific Transition Material/NNSA, Topic Paper-Stockpile Responsiveness Program 2016-12-28.

31. Department of Defense, *Nuclear Matters Handbook 2016*, 2016), pps. 155-157.

32. Department of Defense, *Nuclear Matters Handbook 2016*, pps. 205, 208, 210, 212-219. Limited Test Ban Treaty was signed in 1963. It restricted above ground testing. Threshold Test Ban Treaty, which the U.S. voluntarily has observed since 1976, limited the maximum yield of tests. Public Law 102-377, prohibits U.S. underground nuclear testing. The Comprehensive Test Ban Treaty was never ratified by the U.S. and not entered into force.

33. Ibid., pps. 55-56.

34. Ibid., pps. 212-219.

35. Department of Energy, FY 2018 *Stockpile Stewardship and Management Plan*, pps. 3-26.

36. Enrique Wong (NA-115), in discussion with author, Oct. 29, 2018.

37. "Projects and Facilities, N Reactor," Hanford.gov, accessed Nov. 11, 2018, at www.hanford.gov/page.cfm/NReactor.

38. "Projects and Facilities, Plutonium Uranium Extraction Plant," Hanford.gov, accessed Nov. 11, 2018, at www.hanford.gov/page.cfm/purex.

39. Department of Energy, FY 2018 *Stockpile Stewardship and Management Plan*, pps. 2-33, 2-37.

40. Department of Energy, National Nuclear Security Administration – *Governance and Management of the Nuclear Security Enterprise, Report to Congress, Revision F* (Washington, D.C.: Department of Energy, February 2017), pps. 16-18. The NNSA manages infrastructure investments based on a 25-year Master Asset Plan that prioritizes infrastructure investments based on criteria such as the consequence and likelihood of the facility or equipment failure and the difficulty of replacing it. MAP includes lower-cost efforts of less than $20 million to stabilize or improve conditions in facilities where mission-critical activities must continue in aged facilities and ranges through larger budget projects that consist of individual line items.

41. Department of Energy, FY 2018 *Stockpile Stewardship and Management Plan*, pps. 2-30.

42. Department of Energy, FY 2018 *Stockpile Stewardship and Management Plan*, pps. 2-31, 2-33.

43. Department of Energy, FY 2019 *Stockpile Stewardship and Management Plan, Report to Congress*, pps. 3-36. Depleted uranium is a byproduct of the enrichment process that has a lower ratio of uranium-235 to uranium-238 than naturally occurring uranium.

44. Allen, *Complex Transformation*, p. 270.

45. Department of Energy, FY 2018 *Stockpile Stewardship and Management Plan*, pps. 2-37.

46. Department of Energy, *Master Asset Plan 2018* (Washington, D.C.: National Nuclear Security Administration, Office of Safety, Infrastructure and Operations, May 2018), p. 32.

47. "SRS Tritium Facilities," April 2009, pps. 1-4, www.isotopes.gov/outreach/reports/SRNL_tritium_facilities.pdf.

48. U.S. Government Accountability Office, *Nuclear Weapons: National Nuclear Security Administration Needs to Ensure Continued Availability of Tritium for the Weapons Stockpile* (Washington, D.C.: U.S. Government Accountability Office, October 2010), pps. 3-4.

49. Department of Energy, FY 2018 *Stockpile Stewardship and Management Plan*, pps. 3-63.

50. Office of the Secretary of Defense, *Nuclear Posture Review*, p. 60.

51. Office of the Secretary of Defense, *Nuclear Posture Review*, p. 44.

52. Toshi Yoshihara and James R. Holmes, "Thinking about the Unthinkable: Tokyo's Nuclear Option," *Naval War College Review*, vol. 62, no. 3 (2009), p. 66.

53. Mike M. Mochizuki, "Japan Tests the Nuclear Taboo," *The Nonproliferation Review*, vol. 14, no. 2 (2007), p. 313.

54. Yoshihara and Holmes, "Thinking about the Unthinkable," pps. 59-60.

55. Ibid., p. 62.

56. Richard J. Samuels and James L. Schoff, "Japan's Nuclear Hedge: Beyond 'Allergy' and Breakout," *Political Science Quarterly*, vol. 130, no. 3 (September 2015), p. 481. The three nonnuclear principles announced by Prime Minister Eisaku Sato in 1967 are no possessing, manufacturing or introducing of nuclear weapons on Japanese territory. The declaration gained Japan American assurances of the nuclear umbrella in exchange for supporting U.S. nonproliferation goals and signing the Nuclear Non-Proliferation Treaty.

57. Mochizuki, "Japan Tests the Nuclear Taboo," p. 307.

58. Ibid., pps. 306, 308-309.

59. Masakatsu Ota, "Conceptual Twist of Japanese Nuclear Policy: Its Ambivalence and Coherence Under the United States Umbrella," *Journal for Peace and Nuclear Disarmament*, vol. 1, no. 1 (2018), p. 199.

60. Ibid., pps. 201-202.

61. Yoshihara and Holmes, "Thinking about the Unthinkable," p. 60.

62. Quoted in Samuels and Schoff, "Japan's Nuclear Hedge," p. 484.

63. Ibid., p. 484.

64. Ibid., p. 477.

65. Ibid., p. 484.

66. Ibid., pps. 485-487.

67. Under Secretary for Public Diplomacy and Public Affairs, "Extended Deterrence Dialogue Between the United States and Japan," U.S. Department of State, March 14, 2018, www.state.gov/r/pa/prs/ps/2018/03/279240.htm.

68. Under Secretary for Public Diplomacy and Public Affairs, "Extended Deterrence Dialogue Between the United States and Japan," U.S. Department of State, Oct. 29, 2018, www.state.gov/r/pa/prs/ps/2018/10/286964.htm.

69. Samuels and Schoff, "Japan's Nuclear Hedge, p. 477.

CHAPTER 6

Give Goliath a Gun: Artificial Intelligence's Effect on Strategic Deterrence Relationships

Major William W. Smathers, U.S. Army

In the modern world, the United States is a giant. Its values dominate much of the world, but its economic and military might is currently being challenged by nations with oppositional values. The current geopolitical landscape has the United States in a position of power, but Russia and China strive to overtake American power and transform the political landscape to their advantage. Post-Cold War, the United States has assumed a now challenged position as global hegemon. The economic growth of the United States and use of economic institutions and interdependence to build other capitalist nations has proven successful. Economic growth for the United States coincided with the development and integration of advanced military technologies. Precision guided munitions, stealth technology, and remotely piloted aircraft are a few of the advancements that enabled the United States to attain its relative power position. If China seeks to supplant the United States as a regional hegemon or superpower it will require China to militarily challenge the United States and its allies with new and advanced technologies. The first nation that can discover and integrate artificial intelligence (AI) technology into military and strategic decision-making systems will have a significant advantage in the world. The integration of AI as a capability will transition countries like Russia and China into superpowers.

What is AI? AI is the ability of a machine to do things autonomously that, if done by a human, most would regard as requiring intelligence. A machine with AI can complete reasoning puzzles, show judgment, and produce consistent results to problems normally requiring human intelligence.[1] The response of a machine with AI is not preprogrammed, rather, it is the result of an intelligent output by a machine receiving external inputs. AI is important because it allows for rapid intake, processing, and output of large amounts of data. Additionally, the data in a computer can be transmitted about one million times faster than the data in our brains can be transmitted over neurons.[2] Imagine your vehicle starts to sputter, the diagnostic computer system analyzes the fault, orders the part, and directs you to the nearest maintenance location. This type of information is convenient in our personal vehicles, but on the battlefield, it would increase the operational rate and

enhance combat readiness. This example is the tip of the iceberg as it relates to the potential impact of this new technology. The integration of AI technology is important because it has the potential to increase the speed of decision making and replace the human-in-the-loop, because it could have access to and process more information than a biased human can process.

AI exists and impacts most of our lives every day, but its incorporation into war is concerning to ethicists and computer scientists. Recently, employees of Google refused to work on Project Maven, a Silicon Valley-Department of Defense (DOD) venture to apply AI to intelligence, surveillance, and reconnaissance (ISR) platforms.[3] Additionally, the Campaign to Stop Killer Robots movement has added Human Rights Watch and Amnesty International to its list of global members in an effort to ban lethal autonomous weapons systems (LAWS) on moral and ethical grounds.[4] LAWS are the integration of AI and unmanned sensors and weapons. LAWS hold the potential to reshape the battlefield and change the nature of war.[5] While the integration of AI into weapons is at least a few years away, it is important to examine how AI may affect deterrence, strategy, and the conduct of war before the introduction of LAWS on the battlefield.

To understand the potential impact of AI on the political landscape – and the battlefield – we need to look no further than the impact of cyberweapons. The Stuxnet attack conducted against Iranian centrifuges in 2009, assumed to have been executed by the United States and Israel, shows the potential destabilizing effect of the use of a new, and not well understood weapon.[6] In 2009, the United States and Israel used a cyberattack to delay or degrade the Iranian nuclear weapons development program. The ability of one, or a group, of nations to sabotage another state's ambitions without conducting a military strike at the site proved valuable. However, the impact of the cyberweapon, and the potential response from Iran was not fully realized. In the Stuxnet case, Iran calculated a reasonable response to an attack on its sovereignty by executing counterattacks of its own. Allegedly, Iran conducted cyberattacks of its own against government and civilian targets tied with the United States and Israel, and provided further support to terrorist organizations, as a response to Stuxnet.[7]

Ultimately, Iran cannot sustain a tit-for-tat response with the United States and Israel when threatened by military capabilities and pressured by economic sanctions. The initial destabilization caused by using a new military capability for strategic effect resulted in longer term stability and may have contributed in moving Iran toward the Joint Comprehensive Plan of Action (JCPOA). Kim Zetter highlights some of these concerns in *Countdown to Zero Day*, specifically, the race to develop the new capability, failure to understand the consequences of its use, the potential long-term impact, and the arms race it would start. Stuxnet, like nuclear weapons, was rushed through the development and employed out of fear of an adversary gaining an advantage. Furthermore, the development and employment of cyberweapons, and nuclear weapons is cloaked in secrecy that causes public discussion about the capabilities to be misguided or nonexistent.[8] Like Stuxnet, the strategic impact of a new military capability is often misunderstood and causes instability between states. Ultimately, as the capability matures, so does its understanding by policymakers, resulting in long-term stability.

The post-Cold War period was been marked by increased stability between superpowers. That period has ended. The United States has been pulled away from the idealized world it sought and back into a period of instability as Russia and China challenge American hegemony.[9] Instability and the risk of wider conflict has taken many forms during this new period of great competition. We have seen aggressive actions by Russia in Crimea, Donbass, Syria, and London. China has further encroached in the East and South China Seas, taken an aggressive stance in Africa, and pledged Chinese domination. Iran is emboldened by Russian support in Syria and against the United States and Israel. North Korea has continued development of nuclear weapons and delivery systems.[10, 11, 12, 13] Each of these elements contribute to instability and pose challenges to the liberal order envisioned by western, democratic powers. AI has the inherent power to reshape the military capabilities, economic might, and strategic decision making of the first state able to properly harness and integrate it. The power of AI could allow states like Russia and China to surpass U.S. military might and challenge the world order– or, it could allow the United States to maintain its current status and to pursue a global order in its own image. The question to examine then is how will Artificial Intelligence affect United States-China strategic deterrence relationship?

Theory and Literature Review

This study is guided by previous research at the Center for Global Security Research (CGSR) at Lawrence Livermore National Laboratory (LLNL). Recently, CGSR sought to examine the impact emerging disruptive technologies have on strategic decision making and making decisions based on the idea that a new disruptive technology will arrive soon.[14] CGSR's work attempts to frame the idea of strategic latency to provide guidance for policymakers. The research done at CGSR seems especially pertinent in a world waiting for the precipitous advance of AI technologies. When paired with Nick Bostrom or Paul J. Springer's work on AI and robotic warfare, respectively, the implications for military applications and strategic deterrent relationships is worth rigorous study.[15, 16] Bostrom likens the potential impact of AI on humans to many children playing with a bomb. Not all of the children will be convinced to put the bomb down, but all of the children will be impacted when its energy is released upon the world.[17] Paul J. Springer's conclusion further described many of the potential impacts of AI. His concerns include armies of annihilator robots capable of destroying anything in their programming.[18] The concerns of Bostrom, Springer, the Campaign to Stop Killer Robots, and many others, combined with CGSR's conclusions on strategic latency beg further study on the topic before its seemingly eventual battlefield introduction.

The research question to be considered, and the hypotheses to be tested are rooted in the interest of a state to find strategic advantage over another. Strategically important technologies like nuclear weapons, ballistic missiles, and cyber tools have the potential to alter the balance of power between states. Arguably, AI holds the potential to upset the global order, for better or worse. A better understanding of this potentially impactful technology could reduce the likelihood that a change in the balance of power leads to conflict. Policymakers of the past sought to

understand the impact of new technologies by applying the theoretical principles of deterrence theory, for example. Those same theories will be the basis for answering tomorrow's big questions when policymakers consider the employment of strategically impactful developments. States considering the potential impact of AI to be high must consider how the new technology may affect its relationship with other states, whether the new technology gives it an advantage, and will using the new technology lead to conflict. The answer to each of these questions could drive investment strategies, policy decisions, and the pursuit of norm establishment.

To properly understand the potential impact of AI on strategic stability between the United States and China, a common understanding of terms is necessary. AI and LAWS are defined above. Strategic stability means that "no party has an incentive to use nuclear weapons save for vindication of its vital interests in extreme circumstances."[19] The transformative potential of AI requires an examination of strategic latency. Strategic latency is the understanding, implementation, and integration of technology with geopolitical potential, or the quest for a technology with transformative potential for strategic purposes.[20] Russian President Vladimir Putin was recently quoted as saying the discoverer of AI will be the "ruler of the world."[21] China is investing $300 billion into AI research and development.[22] The arms race for AI is already happening between countries and corporations across the globe in an effort to achieve military and economic dominance.[23] The United States Government will invest $13.7 billion during fiscal year 2019, and is collaborating with industry and academia in an attempt to win the ongoing arms race.[24] While the potential impact of AI advancements are not universally agreed upon, most governments, and the largest corporations in the world are in agreement. Each is racing to be first.[25]

Research Question and Hypothesis

The research question considered here is: *How will Artificial Intelligence affect the United States-China strategic deterrence relationship?*

This study will seek to answer that question through two hypotheses.

***H1** – Significant strategic and military advantage is gained by the state able to discover and integrate a new technological discovery first.*

***H2** – The employment of a new technology for strategic advantage causes near-term instability, but long-term stabilization.*

Research and Design

This paper will conduct a qualitative examination of two case studies. The case studies will highlight the introduction of a newly developed technology, its military and diplomatic integration, and its impact on strategic stability between the states involved. The two cases are the dropping of atomic bombs in August 1945 and August 1949, and the Cuban Missile Crisis of October 1962.

In the case of the dropping of the first atomic bomb, the case study will examine how and if the bomb influenced or deterred the Soviet Union between Aug. 6, 1945, and the first Soviet nuclear test on Aug. 29, 1949. The Cuban Missile Crisis case will examine the deterrent effect and strategic stability achieved by the newly developed and integrated medium and intermediate range ballistic missiles between the United States and Soviet Union during the period 1961-1962. The periods of examination were chosen, in the first case, to examine how the strategic deterrence relationship was impacted by inequity of capability, and the second, to examine the effect of strategic latency when equity of capabilities exists. Using longer or shorter periods in each case may skew the results because of contributing factors outside of the scope of this study.

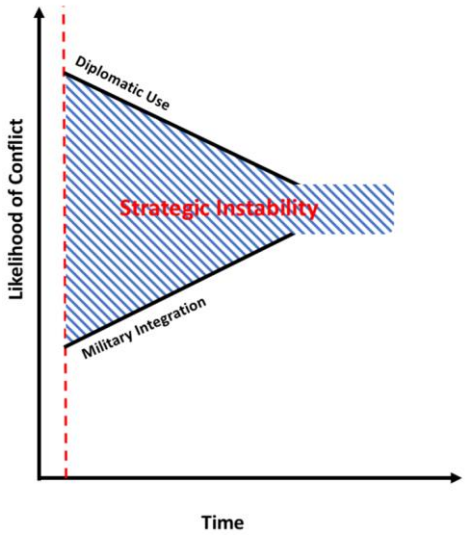
The examination of each case study will inform the potential impact of AI on strategic deterrence relationship and whether the discoverer (or employer) of the capability experiences advantage over potential adversaries. The strategic deterrence relationship between the United States and Soviet Union provides an opportunity to examine relatively recent examples of competition between two great powers and draws parallels to the current strategic competition between the United States and China. A thorough examination of these cases will help the reader understand how two of the most strategically important technologies of the last century impacted the interactions between states. The introduction of the strategic stability continuum graph will be used to paint a picture demonstrating the area for instability as it applies to the introduction of a new technology. We will apply the graph to the 1945-1949, and the 1961-1962 cases, and using the most similar systems design, attempt to depict where AI may impact the continuum.

For comparison, this paper will examine the probability (p) of deterrence stability (y) being maintained by a status quo (SQ) relationship between two states (A, B) over time (t). This uninterrupted relationship between two states is represented as a strategic stability equation: y=pASQ+pBSQ+t. The introduction of a disruptive strategic capability (x) by one state will create some measure of imbalance thereby impacting the deterrence stability between the states and voiding the status quo relationship.

Status quo: y=pASQ+pBSQ+t
Disrupted relationship: y=Ax+BSQ+t
New Status quo: y=Ax+Bx+t

The introduction of nuclear weapons and intermediate range ballistic missiles are represented as (x) in this study. The introduction of (x) by one state created an imbalance that negatively impacted the deterrence stability between the

involved states. The probability of conflict was initially increased by an unknown measure with the integration of the new technology. However, relations between the states normalized and a new status quo was achieved over time. The strategic stability equation, represented graphically below appears as the strategic stability continuum.



The graph shows the following elements. The dashed red line represents the introduction of a new strategically disruptive technology. The status quo relationship between states is represented as the strategic instability that exists between the military integration and diplomatic use of the technology. The likelihood of conflict is represented as the deterrent stability (y) in the equation, and time (t) demonstrates a reduction in instability between the states as the understanding and integration of the technology increase.

The graphic representation of the strategic stability continuum will utilize information from the Doomsday Clock, to measure the likelihood of conflict. Using the Doomsday Clock, generated by the Bulletin of Atomic Scientists, prevents this author from arbitrarily assigning levels of potential conflict and instability.

Case Studies

Case Study 1: *Deterrence between the United States and Soviet Union from 1945 to 1949* – The period from Aug. 6, 1945, to Aug. 29, 1949, when the first Soviet nuclear weapons test was conducted were the formative years of the Cold War, and provides information to be examined about the impact of a revolution in military affairs on the relationship between states. Specifically, did the United States have, or perceive to have, strategic geopolitical advantage because of its military integration of nuclear weapons? Were the Soviets deterred from taking actions because of (perceived) American advantage? Answering these questions about how stability between the superpowers was affected after the use of nuclear

weapons could help us examine the impact AI will have on adversarial relationships.

The post-World War II period saw a brief period of cooperation among the United States, Great Britain, and the Soviet Union, but by mid-1946 it was apparent that rising tensions were creating competition and raising the potential for conflict. Maksim Litvinov, deputy foreign minister of the Soviet Union, revealed that differing ideologies would lead to inevitable conflict between capitalists and communists, and America could do nothing to assuage the Soviets.[26] Stalin's suspicion of the West certainly started prior to the end of the war, but by late 1945 optimism and cooperation abounded. The United States and the Soviet Union were trading ground across Europe, meeting their negotiated post-war requirements, and honoring commitments to form the United Nations. Stalin's reluctant cooperation with the West was further complicated as the Cambridge Five collected British contingency plans to fight a war with the Soviet Union.[27] Further, Soviet intelligence was able to collect U.S. nuclear war plans in a "September 1945 study by the U.S. Joint Chiefs of Staff."[28]

U.S. Actions

As early as 1946, academics and theorists in the United States feared an atomic war between the United States and the Soviet Union. Arnold Wolfers postulated that the atomic bomb gave the United States a marked increase in military strength, but Soviet diplomats were reluctant to publicly acknowledge a change to the relational status between the nations.[29] Continuing, Wolfers asserts that the Soviet Union is assuredly seeking an atomic weapon to prevent an expanded American monopoly, but that it need not, because American peacefulness and war-weariness should assure the Soviets, and all other nations, that they need not fear the United States position as the sole atomic weapons holder.[30]

Soviet Actions

According to Ambassador Raymond Garthoff, in 1947-48, Stalin calculated that the United States would not have a sufficient stockpile to attack the Soviet Union until 1955 and therefore would not attack the Soviet Union unless provoked. This allowed Stalin to maximize his gains through political maneuvering short of direct conflict.[31] Additionally, Stalin's receipt of exaggerated intelligence reports about Western plans and intentions, paired with actual airspace incursions, insurgency attempts, and other intelligence activities confirmed the adversarial relationship between the great powers.[32] The Soviet policy stance toward the United States, which it now viewed as its primary rival, took a hard turn toward impending conflict by the fall of 1947 when Soviet leadership viewed the Marshall Plan as an attempt at American supremacy over Europe and the globe.[33] Tensions and the prospect for conflict increased greatly in 1948 when Stalin ordered the blockade of West Berlin in Germany. In his memoir, Ambassador Garthoff calls the blockade "the most dramatic episode" of the early Cold War period.[34]

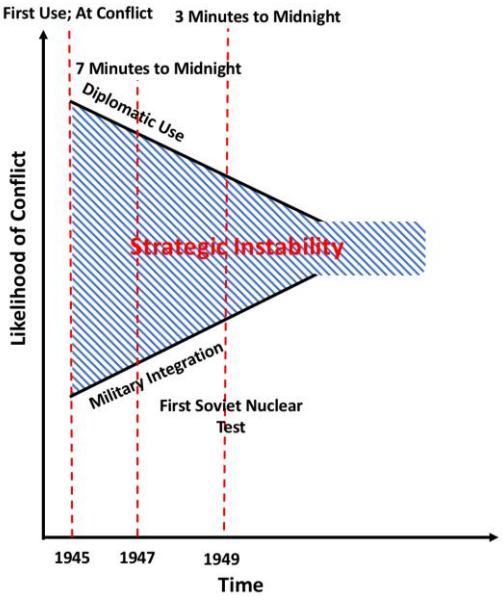
Strategic Stability Continuum

Wolfers understood as early as 1946 that nuclear weapons were not having an impact on the negotiating process or diplomatic relations between the United States and Soviet Union.[35] He contends that the Soviets did not credibly believe that the United States would attack distant countries to achieve political objectives unprovoked, and Americans broadcast their intention not to use the atomic bomb.[36] The American signaling combined with Soviet suspicion because of Soviet intelligence collection, lead to increased tension and strategic instability. During this period of examination, it culminated in the blockade of West Berlin and the testing of the first Soviet atomic weapon. The misuse of nuclear power by American diplomats, aided by Soviet intelligence collection, created instability between the states and increased the likelihood of conflict. This form of strategic latency, not understanding the strategic impact of a new technology, impacted geopolitics for 45 years. Using data from the Doomsday Clock, the graph below demonstrates the area available for miscalculation created by the level of understanding of the new atomic technology from 1945 to 1949.

At the time, the Bulletin of the Atomic Scientists presumed that Soviet acquisition of nuclear weapons would increase the likelihood of nuclear conflict. Upon reflection, relations stabilized between the rival nations as the room for miscalculation narrowed, and fortunately, their fears did not materialize.

Answering the Hypothesis

H1: Significant strategic and military advantage is gained by the state able to discover and integrate a new technological discovery first.



The United States did not gain significant strategic advantage over the Soviet Union because of the use or integration of nuclear weapons. The Soviets did not credibly believe, as was signaled by U.S. diplomats, that the United States would use nuclear weapons to achieve political objectives. Soviet intelligence collection calculated an insufficient stockpile to influence Soviet policymaking. Militarily, nuclear weapons gave the United States a significant advantage, but the advantage was unrealizable considering the national will.

> *H2: The employment of a new technology for strategic advantage causes near-term instability, but long-term stabilization.*

Stability between the United States and Soviet Union slowly deteriorated in late 1945 and 1946. By 1947, each nation perceived the other as an adversary, and accordingly, planned and executed grand strategy to that effect. The culminating point of instability for this period was the blockade of West Berlin, which could have resulted in full-fledged conflict at any point. In 1949, the Soviet Union tested its first nuclear weapon, bringing parity to the world powers and stabilizing relations. The stability achieved by the Soviet test was short lived as the Korean War, the Space Race, and ballistic missiles each sought to upset the balance and foment conflict.

Case Study 2: *Cuban Missile Crisis Overview* – The history of the Cuban Missile Crisis of October 1962 began with the deployment of medium range ballistic missiles (MRBM) to Turkey in 1959.[37] The nuclear-armed Jupiter missiles were the first salvo in an escalatory climb that would see the Bay of Pigs Invasion, the construction of the Berlin Wall, Soviet arms sales to Cuba, Soviet nuclear missile deployment to Cuba, and ultimately, the October Crisis that brought the world to the brink of nuclear war.[38] The Cuban Missile Crisis provides us with a great case study about the unforeseen strategic impact caused by the employment of a new military capability. The strategic latency, in this case the misunderstanding of the strategic impact of a new capability, was miscalculated by both the United States and Soviet Union from 1959 to 1962. The path from development to integration of MRBM lasted only three years.[39] This short timeline precluded theorists and strategists from calculating the strategic cost of deploying missiles to Turkey or the potential response from the adversary. Ultimately, nuclear war was averted between the two superpowers, and the stage was set for the 1963 Limited Test Ban Treaty. Long-term stability was achieved despite, as Soviet Premier Nikita Khrushchev told U.S. President John F. Kennedy on Oct. 30, 1963, "military conflict that might have resulted in a world thermonuclear war."[40]

In 1956 the U.S. Army and Navy started to develop the Jupiter medium range ballistic missile. During research and development, the authority to develop the missile was transferred to the United States Air Force. By 1959, the United States and Turkey had agreed to deploy 15 of the missiles within Turkey. During the period of 1945 to 1959, nuclear weapons, aircraft, and missile technology were all developing rapidly. The strategic environment between the United States (and Western Europe), Cuba, the Soviet Union (and Eastern Europe), and China was

contentious as the Truman Doctrine of containment were put to the test during the Korean War. The contentious political environment, paired with rapidly developing, devastating technologies increased instability between the great powers. U.S. policymakers should have expected and planned for a Soviet response to the deployment of MRBM to Turkey. By deploying missiles in Turkey, the United States was creating more vulnerabilities for the Soviet Union and shortening the decision to delivery time of the weapon. The United States should not expect rational leaders of sovereign foreign nations to ignore an existential security threat within range of their capitals.

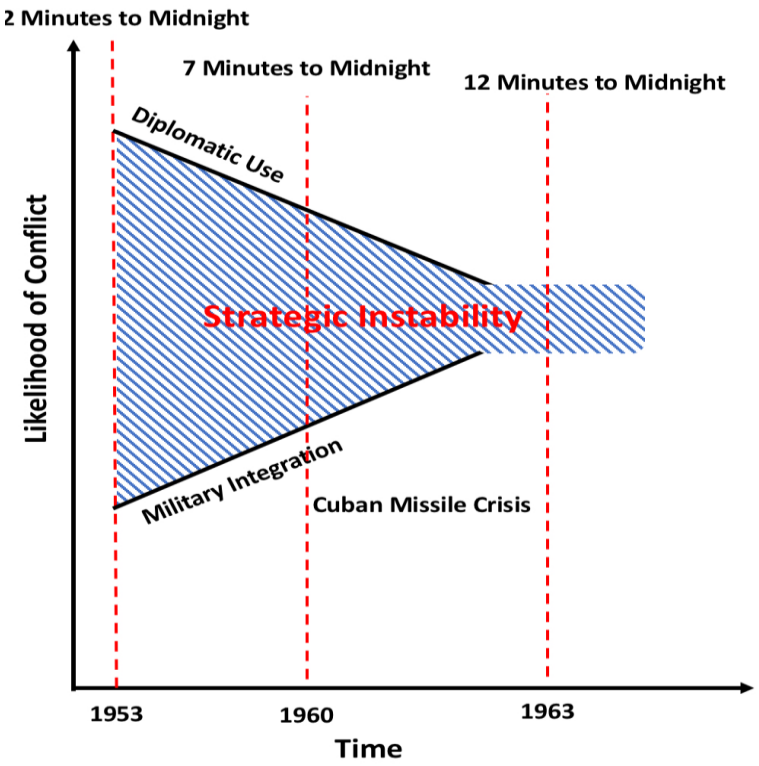
Instead of being deterred by the American deployment of missiles to Turkey, the Soviet Union should be expected to create a similar vulnerability for the United States. Deploying missiles within range of Washington, D.C. would reestablish mutual vulnerability and equalize the speed of decision-to-delivery between the nations. The Soviet deployment is reasonable and rational when viewed as a way of gaining equity with the risk posed to Moscow and its allies. Further, it allowed the Soviets to improve their negotiating position in future discussions. The Soviet R-12 and R-14 rockets were introduced into military service in 1958 and 1959, respectively.[41] We again see the rush to develop, and deploy, military technology without fully understanding its strategic implications.

The space for miscalculation and error during the Cuban Missile Crisis was very narrow. According to James Nathan, several different situations existed that could have escalated the crisis even further.[42] For example, he outlines the "flexibility" exercised by the Navy during the quarantine operations, the authority of "Soviet field commanders … to launch up to six short range nuclear missiles," or that American fighter aircraft, armed with nuclear weapons, flew approximately 100 miles into Soviet airspace to escort a U-2 being intercepted by Soviet MiGs.[43]

Strategic Stability Continuum

If we consider that strategic instability increases the likelihood of conflict, and that strategic instability exists between the military use of a technology, and policymakers understanding of the technology, then in the case of MRBM and the Cuban Missile Crisis, we see the likelihood of conflict decrease as understanding of the capabilities strategic impact rises. The graph below uses the Doomsday Clock position to chart the level of strategic instability and likelihood of conflict from 1953 to 1963.

The following graph shows that conflict is possible at any point along the continuum of strategic stability, but that the political, military, and technological environment stabilized over the period 1953 to 1963. In this case, stability was maximized with the Limited Test Ban Treaty in 1963. Kennedy and Khrushchev each could have initiated conflict at any point during the timeline. However, the strategic understanding of available military capabilities increased, resulting in a period of relaxed tensions between the superpowers.



Answering the Hypothesis

H1: Significant strategic and military advantage is gained by the state able to discover and integrate a new technological discovery first.

The Soviet and American development and integration of MRBMs was near simultaneously, so the strategic and military advantage created by the capability went to the United States first, because it developed a plan with Turkey to deploy the missiles. The advantage was short lived because the Soviets quickly responded with a strategic deployment of their own. The circumstances of the Cuban Missile Crisis seem to indicate that even over a short period, the United States did have an advantage, but the Soviet Union was not deterred from responding to ensure the maintenance of its own security situation.

H2: The employment of a new technology for strategic advantage causes near-term instability, but long-term stabilization.

As the strategic stability continuum shows above, the deployment of MRBM to Turkey and Cuba created increased instability between the nations and increased the immediate likelihood of conflict. When the United States deployed missiles to Turkey, it perceived an increased security benefit from the deployment. The response from the Soviet Union increased Moscow's perceived security situation and improved its negotiating position. In the end, the level of instability

and likelihood of conflict were decreased. This resulted in long-term stability, starting with the Limited Test Ban Treaty.

Combined Results

As the chart below shows, the advantage of a new capability may be short lived, and the instability created by the technology is able to be overcome. Each of these cases resulted in long-term stability as a result of the increased level of understanding by policymakers. It is important to remember that conflict was not inevitable or impossible in either case. The actions of individuals resulted in the avoidance of conflict and may be the most important lesson to consider.

Case Study	*Equation* (y=pASQ+pBSQ+t)	*Hypothesis 1* (strategic and military advantage)	*Hypothesis 2* (near term instability and long-term stabilization)
United States-Soviet Relations: 1945-1949	y=United Statesx+SUnited StatesQ+t	False	True
Cuban Missile Crisis: 1962	y=United Statesx+SUx+t	True	True

Understanding these cases allows us to further examine the potential impact of AI on the strategic deterrence between the United States and China. Based on the results of this study, the discoverer of a new technology does not necessarily achieve a strategic or military advantage. It appears actions have a greater impact on the gains. Further, the understanding of the impact of nuclear weapons, and what the United States was willing to do with them, gave advantage to the Soviet Union in *Case Study 1*. This should serve as an example of the potential for AI. AI may or may not provide immediate advantage, but an understanding of its strategic potential allows policymakers to either bolster or hedge against its impact. Regarding *Hypothesis 2*, it appears as though long-term stability resulted from the temporary upset in the status quo. However, AI may lead us into conflict if state leaders do not influence the situation in the same way these case studies were influenced.

Policy Implications

The United States may seek to enact policy measures with the objective of overcoming the instability and uncertainty associated with an unknown technological development to achieve meaningful military and economic advancement in order to promote global stability based in Western (United States) values. If the potential for conflict is increased as a new strategically disruptive

technology is introduced, then seeking to reduce the likelihood of conflict should be an early objective. Increased understanding of the potential impacts of AI will reduce the strategic latency associated with the new technology and its implementers. President Donald Trump's recent executive order, and the Department of Defense AI strategy seek to increase the understanding, research, development, and advantage for the United States in the AI arms race.[44, 45] Winning the AI arms race is necessary for the United States to secure its interests and maintain Western values while averting potential conflict with adversarial states. To achieve this end, U.S. policymakers should explore every possible avenue of studying, investing, and integrating AI technology for strategic decision making, military, and other applications. The United States should pursue a consortium of nations, research institutions, and corporations, dedicated to Western values like human rights and capitalist economies, to jointly invest and conduct research and development into AI.[46] The consortium would serve to create diversified thought on the subject, and upon discovery provide equal benefit to the economy and military apparatus of participating nations. NATO, EU, NAFTA, India, South Korea, Japan, Singapore, and Australia (at least) could be offered membership to the consortium. The multinational development effort surrounding the F-35 fighter could be a good starting point for the development of the consortium.

In addition to the R&D effort, the United States should formulate policy that places export control measures, like nuclear weapons/dual use technologies, on elements of the AI technology in an effort to prevent narrowing of the gap by adversaries. Much thought has been expended in the cyber domain about the application or use of export control of cyber tools. This research will serve as the foundation for AI export control measures.[47]

Another area for examination is the integration of AI into strategic decision-making processes. As AI is integrated, and trusted to make small decisions, the decisions it is entrusted with making will increase in magnitude over time. Justifiably so, since AI will have the ability to see, understand, process, and make unbiased decisions at a rate far surpassing human abilities. Ultimately, we as a society in a democracy, must decide the level of decision we are comfortable with AI making. Lastly, the rapid growth and destructive power of nuclear weapons from 1945 through the 1970s should serve as a warning for the potential impact of AI. The United States should start planning now for the AI arms treaty that will be required. If and when AI is integrated into military capability, its destructive power will reshape the battlefield. The United States should set conditions today that will limit the battlefield impact of AI and America's adversaries in the future. Each of these policy implications presents its own challenges and obstacles for theorists and strategists to examine. However, if a rising China threatens Western values, then the United States should urgently pursue AI capability to establish global norms under which the AI can operate.

Conclusion

Deterrence succeeds or fails based on the calculations made by the leaders of states and their understanding of the current level of strategic stability and their satisfaction with their relative power. When a state sees an opportunity for advancement of its position based on new militarily significant developments (i.e. new technology) the level of instability is increased, the desire to increase relative power is increased, and the likelihood of deterrence failing rises. This trend was demonstrated in each of the case studies presented, and we should expect the trend to continue with the development of AI. While the advantage gained by a state is unclear, it should be clearly understood that the potential for conflict between competitive states is ever present and presents sufficient reason to study the impact of strategically disruptive technologies on the deterrence relationship between states. AI has boundless potential for military and decision-making systems. Work aimed at understanding AI's impact, shaping the norms for its use, and guiding states toward stability are integral to influencing tomorrow's national security.

Notes

1. Darrell M. West, "What is artificial intelligence?" (Washington, D.C.: The Brookings Institution, Oct. 4, 2018), www.brookings.edu/research/what-is-artificial-intelligence.

2. Frits van Paasschen, "The Human Brain vs. Computers," *Medium*, Jan. 16, 2017, https://medium.com/thrive-global/the-human-brain-vs-computers-5880cb156541.

3. Daisuke Wakabayashi and Scott Shane, "Google Will Not Renew Pentagon Contract That Upset Employees," *New York Times*, June 1, 2018, www.nytimes.com/2018/06/01/technology/google-pentagon-project-maven.html.

4. "The Threat of Fully Autonomous Weapons," Campaign to Stop Killer Robots, accessed Jan. 16, 2019, at www.stopkillerrobots.org.

5. Aaron Mehta, "AI makes Mattis question 'fundamental' beliefs about war," *C4ISRNET*, Feb. 17, 2018, www.c4isrnet.com/intel-geoint/2018/02/17/ai-makes-mattis-question-fundamental-beliefs-about-war.

6. Kim Zetter, *Countdown to Zero Day: STUXNET and the Launch of the World's First Digital Weapon* (New York, N.Y.: Crown, 2014), p. 16.

7. Ashish Kumar Sen, "Iran's Growing Cyber Capabilities in a Post-Stuxnet Era," Atlantic Council, April 10, 2015, www.atlanticcouncil.org/blogs/new-atlanticist/iran-s-growing-cyber-capabilities-in-a-post-stuxnet-era.

8. Zetter, *Countdown to Zero Day*, p. 375.

9. Department of Defense, *Summary of the 2018 National Defense Strategy of The United States of America*, (Washington, D.C.: Department of Defense, 2018), p. 1, https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf.

10. Eerik-Niles Kross, "Putin's war of smoke and mirrors," *Politico*, Feb. 17, 2017, www.politico.eu/article/vladimir-putin-war-smoke-and-mirrors-russia-occupation-crimea-ukraine.

11. Task and Purpose, "China's Masterplan After it Dominates the South China Sea," *The National Interest*, Jan. 12, 2019, https://nationalinterest.org/blog/buzz/chinas-masterplan-after-it-dominates-south-china-sea-41347.

12. "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy," Arms Control Association, January 2019, www.armscontrol.org/factsheets/dprkchron.

13. Mohammad Ayatollahi Tabaar, "Iran's Russian Turn," *Foreign Affairs*, Nov. 12, 2015, www.foreignaffairs.com/articles/iran/2015-11-12/irans-russian-turn.

14. Zachary Davis et al., *Strategic Latency and World Power: How Technology is Changing Our Concepts of Security (*Livermore, Calif.: Lawrence Livermore National Laboratory, 2014).

15. Nick Bostrom, *SUPERINTELLIGENCE: Paths, Dangers, Strategies* (Oxford, Oxford University, 2014).

16. Paul J. Springer, *Outsourcing War to Machines: The Military Robotics Revolution* (Santa Barbara, Calif.: Praeger, 2018).

17. Bostrom, *SUPERINTELLIGENCE*, p. 259.

18. Springer, *Outsourcing War to Machines*, p. 202.

19. Eldridge Colby, "Defining Strategic Stability: Reconciling Stability and Deterrence," in *Strategic Stability: Contending Interpretations*, (Carlisle, Pa.: Strategic Studies Institute and U.S. Army War College Press, 2013), p. 55.

20. Zachary Davis et al. *Strategic Latency and World Power,* p. ii.

21. Gregory C. Allen, "Putin and Musk are right: Whoever masters AI will run the world," *CNN*, Sept. 5, 2017, www-m.cnn.com/2017/09/05/opinions/russia-weaponize-ai-opinion-allen/index.html?r=httpspercent3Apercent2Fpercent2Fwww.google.compercent2F.

22. Vikram Barhat, "China is determined to steal A.I. crown from United States and nothing, not even a trade war, will stop it," *CNBC*, May 4, 2018, www.cnbc.com/2018/05/04/china-aims-to-steal-us-a-i-crown-and-not-even-trade-war-will-stop-it.html.

23. Michael Auslin, "Can the Pentagon Win the AI Arms Race?" *Foreign Affairs*, Oct. 19, 2018, www.foreignaffairs.com/articles/united-states/2018-10-19/can-pentagon-win-ai-arms-race.

24. "DOD Releases Fiscal Year 2019 Budget Proposal," Department of Defense, Feb. 12, 2018, https://dod.defense.gov/News/News-Releases/News-Release-View/Article/1438798/dod-releases-fiscal-year-2019-budget-proposal.

25. Branko Blagojevic, "AI, Optimists vs Pessimists and Why the Singularity Isn't Near," *Medium*, Oct. 8, 2018, https://medium.com/ml-everything/ai-optimists-vs-pessimists-and-why-the-singularity-isnt-near-5d3a614dbd45.

26. Raymond Garthoff, *Soviet Leaders and Intelligence: Assessing the American Adversary During the Cold War* (Washington, D.C., Georgetown University, 2015), p. 4.

27. Ibid., p. 6.

28. Ibid., p. 6.

29. Frederick S. Dunn, Bernard Brodie, Arnold Wolfers, Percy E. Corbett, and William T.R. Fox, *The Absolute Weapon: Atomic Power and World Order* (New York, N.Y. Harcourt, Brace and Company, 1946), p. 111.

30. Ibid., p. 113.

31. Garthoff, *Soviet Leaders and Intelligence*, pps. 7-8.

32. Ibid., p. 8.

33. Ibid., p. 10.

34. Raymond Garthoff, *A Journey through the Cold War: A Memoir of Containment and Coexistence* (Washington, D.C., Brookings Institute, 2001), p. 6.

35. Dunn, et al., *The Absolute Weapon*, p. 114.

36. Ibid., pps. 114-115.

37. James Nathan, *Anatomy of the Cuban Missile Crisis* (Westport, Conn.: Greenwood Press Inc., 2001), p. xx.

38. Ibid., pps. xix-xxix.

39. "Rocket Engine, Liquid Fuel, Cutaway, LR-79-NA-9 (Thor)," Smithsonian Institute, Date Accessed, Jan. 16, 2019, https://airandspace.si.edu/collection-objects/rocket-engine-liquid-fuel-cutaway-lr-79-na-9-thor.

40. Thomas Fensch, *The Kennedy-Khrushchev Letters* (The Woodlands, Texas: New Century Books, 2001), p. 348.

41. "R-14/SS-5 SKEAN," Federation of American Scientist, accessed Jan. 16, 2019, at https://fas.org/nuke/guide/russia/theater/r-14.htm.

42. Nathan, *Anatomy of the Cuban Missile Crisis*, pps. 106-111.

43. Ibid., pps. 106-111.

44. President Donald Trump, "Executive Order on Maintaining American Leadership in Artificial Intelligence," (Washington, D.C.: White House, 2019), www.whitehouse.gov/presidential-actions/executive-order-maintaining-american-leadership-artificial-intelligence.

45. Department of Defense, *Summary of the 2018 Department of Defense Artificial Intelligence Strategy: Harnessing AI to Advance Our Security and Prosperity* (Washington, D.C.: Department of Defense, 2018) https://media.defense.gov/2019/Feb/12/2002088963/-1/-1/1/Summary-Of-Dod-Ai-Strategy.PDF.

46. Ibid.

47. Tom Cross, "New Changes to Wassenaar Arrangement Export Controls Will Benefit Cybersecurity," *Forbes*, Jan. 16, 2018, www.forbes.com/sites/forbestechcouncil/2018/01/16/new-changes-to-wassenaar-arrangement-export-controls-will-benefit-cybersecurity/#6ec1a9b55ed6.

CHAPTER 7

Conclusion

The papers presented in this volume all demonstrate the importance of East Asia to U.S. national security strategy, but they also show the challenges that the United States faces in designing and implementing effective deterrence and assurance strategies for the region. Four of the five papers here address issues related to assuring allies and maintaining credible extended deterrence guarantees. While the threats to the United States posed by China and North Korea are significant, maintaining credible extended deterrence for U.S. allies in East Asia is more challenging than deterring Chinese or North Korea attacks on the United States homeland. Then, as shown in the last paper, emerging disruptive technologies will present new opportunities and challenges for the United States for both central deterrence and extended deterrence.

The findings of the four papers related to the United States alliances with Japan and South Korea all can help inform policy makers on allies' perceptions and intentions, and they show the need to continue deepening dialogue with U.S. allies. As the threats from China and North Korea grow, Tokyo and Seoul likely will demand signs of strengthened U.S. commitment to their defense. These demands could include requests to deploy more strategic assets, such as ballistic missile defense systems and nuclear weapons, to the region to bolster deterrence. While Washington may initially balk at such demands, the United States must be willing and able to discuss regional strategic deterrence capabilities with Japan and South Korea. Related to showing a willingness to discuss strategic deterrence with allies, the strongest sign of commitment to extended deterrence that Washington can send to its allies is maintaining a robust presence in the region and coordinating any regional posture changes with Japan and South Korea. As threats from China and North Korea grow, Seoul and Tokyo will look to the United States to remain committed to maintaining regional order, or they could feel forced to bolster their own deterrence capabilities.

Along with engaging allies on extended deterrence, the United States also must seek dialogue with allies and adversaries on emerging technologies, such as artificial intelligence, to maintain strategic stability and avoid miscalculations. Working with allies and partners on artificial intelligence also can give the United States an advantage in this era of great power competition and can build consensus on norms and practices regarding artificial intelligence.

The United States and its allies in East Asia must work together to move beyond old strategies and deal with the realities of the region today, taking into account both technological and political developments. They must focus on deterring North Korean use of nuclear weapons, not deterring development of nuclear weapons. They must recognize China as a peer competitor with the United States. In addition, they must incorporate advances in technology into strategic planning. The papers in this volume help move policy discourse in those directions.

USAF Center for Strategic Deterrence Studies
Maxwell Air Force Base, Alabama

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