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SUMMARY

1. PURPOSE: To provide security and policy review of the attached documents prior to public release.

2. BACKGROUND: Volume 19 Spring and Fall issues of Airman Scholar Journal, an e-publication of the department of Military and Strategic Studies, is ready for public release and is currently available internally-to-USAFA on the DFMI Sharepoint site. Cadet scholars enrolled in MSS 415S "Joint Operations Strategy in Global Contexts" during Spring 2013 wrote research papers on topics of deterrence, nuclear proliferation, and regional studies of China and the Middle East. Several Military and Strategic Studies majors are also included among the published papers--author names and majors are included in short bios on bottom-right first page of each article.

Article Titles: Spring 2013) "Responsible Power: Space Deterrence in a Labrynthine World," "Racism: A Stumbling Block to Deterrence," "A Trading Decisions Scheme: A Novel Solution to the Prisoner's Dilemma and Application to Nuclear Proliferation," "Killing Them Softly? Putting the Brakes on North Korean Nuclear Proliferation," "Nuclear Patience: Charting a New Course for the Iranian Nuclear Crisis," "Saddam and the Bomb: An Unusual Case of Counterproliferation Success," and a book review of "Prodigal Soldiers." Fall 2013) "Chinese Strategic Culture: US Policy Implications," "China During the Cold War: A Billion People on a Lonely Island," "Feeding Paper Tigers: Unintended Consequences of American Missile Defense in the Pacific," "Lessons from the Khobar Towers: A Case Study in American Casualty Aversion," "Turkey's Civil-Military Dilemma and EU Ascension," and a book review of "Dying to Win."

All titles are original cadet work and photos used within the articles to enhance reader interest are all properly documented.

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B. Talbot

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Professor and Chief, Research Branch
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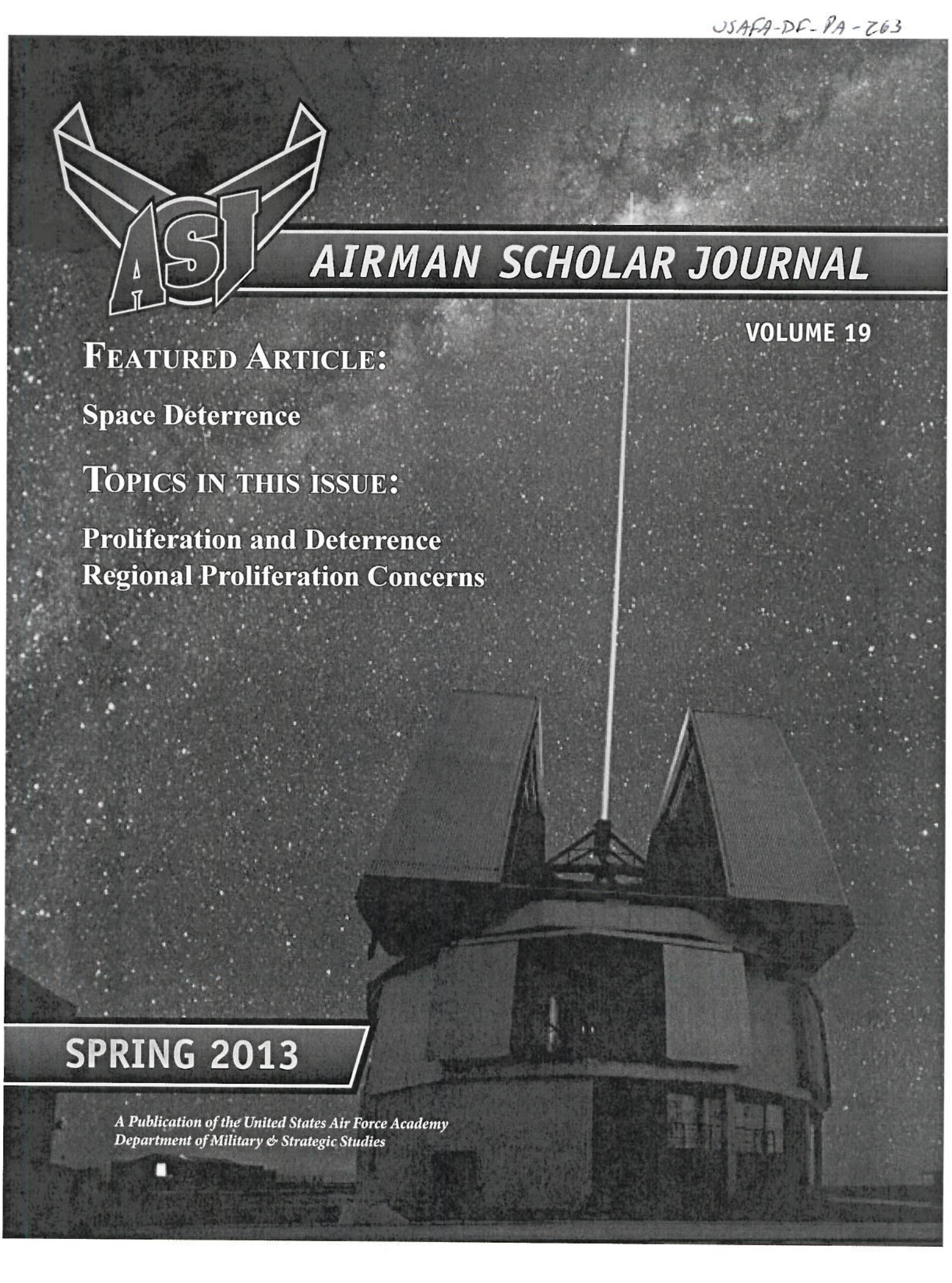
VOLUME 19

FEATURED ARTICLE:

Space Deterrence

TOPICS IN THIS ISSUE:

Proliferation and Deterrence
Regional Proliferation Concerns



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The opinions in *Airman Scholar Journal* do not represent any official policies of the Dean of Faculty, US Air Force Academy, US Air Force or US Government. They are presented to stimulate discussion on current military issues and domestic and international affairs.

From The Editor

Our feature article focuses upon the complex issue of Space Deterrence. Written by two cadet scholars bringing together engineering and foreign area studies insights, Zachary Crippen and Andrew Hilton focus upon the complexities of the modern day world as influencers in determining what space deterrence should look like, requiring a new model beyond Cold War thinking. Following their important insight is Cadet Scholar Elisha Henry's winning essay submitted to the STRATCOM Strategic Deterrence Essay Contest (she placed second overall from entrants across all Air Force domains). Elisha reminds Americans of our own past and how racist tendencies of a foregone era are a reminder of our need to understand other cultures--and not underestimate them due to our own percieved cultural superiority. Next, Cadet scholars Ian Gibson and Zack Adams discuss an insightful Trading Decisions Scheme based upon economic theory and how it might prevent future proliferation in states seeking nuclear energy capability as cover for a secret weapons program. From there, we move to three regional proliferation studies, evaluating states labeled by former President Bush as the 'Axis of Evil,' a term that Elisha's thesis would likely caution against. This issue closes with a book review of Prodigal Soldiers, an MSS-relevant study of US military transformation in the Vietnam to Gulf War era.

ASJs mission is to feature topical and regionally-focused articles of interest to the military academic community. Both military and civilian academic faculty and staff are encouraged to submit articles for publication and nominate outstanding cadet papers. We also encourage reviews of military-relevant topics. Send all submissions in word format (with Chicago-style endnotes) to ASJeditor@usafa.edu

On the cover: Demonstration of the laser adaptive optical system at the European Southern Observatory (ESO) in Chile; photo courtesy of ESO.

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Responsible Power

Space Deterrence in a Labyrinthine World

ZACHARY CRIPPEN AND ANDREW HILTON

"We must learn to bear the responsibilities of power in America without imagining either that the exercise of our power will be perfectly just or that we would be a better nation if we disavowed our responsibilities for the sake of being pure. It is foolish to hope that America could bear its present responsibilities in the world without regard to national self-interest. It is equally foolish to deny that national self-interest may always become so narrow as to corrupt the virtue of what we are doing." -Reinhold Niebuhr[1]

The space age began in a time of ideological, economic, and political rivalry between two superpowers. Motivated by a desire to defeat the statist leviathan of the Soviet Union, the United States embarked on one of the most ambitious technological programs in the history of the world. The culmination of that program with Neil Armstrong's July 1969 walk on the moon was an international icon of technological prowess and a symbol of ideological victory over communism. The Apollo program, which Stephen Johnson has called the United States' most prestigious entry in the propaganda war with the Soviet Union, cost an estimated nineteen billion dollars, galvanizing the efforts of 300,000 workers and 200 universities in 80 countries.[2] Since then, the space arena has attracted the gaze of many other governments, eager to share in the prestige and power that space proficiency and superiority provide.

Outer space represents an area of critical strategic importance for several reasons. First, space represents the ultimate high ground in issues of military engagement. Although the space arena is not weaponized with offensive or defensive technologies, it remains a potent strategic territory with the potential to accommodate critical strike or deterrence capabilities. Second, space represents an avenue for unlimited ISR (Intelligence, Surveillance, and Reconnaissance) operations. Unlike airspace and ground territory, space does not belong to any single sovereign entity, and therefore its use cannot be dictated accordingly. Third, space offers the possibility of unprecedented and unlimited natural resources, including solar power and mineral mining. Fourth, but perhaps most importantly, space is man's final frontier. As such, space represents an unprecedented opportunity for international cooperation. But history suggests that where the potential for cooperation between rival powers exists alongside the possibility to co-opt that potential for ill, the latter has too often occurred. The United States has long leveraged a strong majority of hard power in space, but others are quickly emerging as possible contestants for that leadership position. The next quarter-century will be pivotal in determining the bounds of space interaction, including contestation and partition between sovereign entities. This future requires bold approaches to strategic thinking, especially in the realms of cooperation and deterrence.

A New Paradigm

We are fortunate that we have arrived in the present day with the benefit of hindsight. The threat of nuclear war that clouded much of the postwar 20th century indirectly produced a plethora of literature on the concept of deterrence. The scholarship of Lawrence Freedman, Bernard Brodie, Thomas Schelling, and Robert Jervis has done much to illuminate the complexities of the Cold War and the

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global threat of nuclear weapons. In this respect, contemporary scholars of deterrence have the benefit of standing on the shoulder of giants, to use the language of Isaac Newton. Unfortunately, the vantage point afforded us by such giants is not an accurate picture of the world today. The scholars of the bipolar world, while not ignorant of the possibility for increased international cooperation and economic interconnectedness in the future, were writing for a different age. Cultural dispersion and global media have brought the people of the world closer together, economic interdependence makes the greatest nations of the world mutually reliant on each other for their prosperity and vitality, and technology has made all of this possible. In short, the contemporary world requires us to look upon the literature of yesterday with an eye open to new possibilities and applications that our new paradigm requires.

the United States can alter the architecture of its space-based assets, retooling its resources and dispersing its capabilities in a way that makes aggression both more costly and less rewarding for potential challengers.

Our aim is not to expound upon the effects of globalization—an overused word that does little to shape debates of strategic theory. Instead, we hope to construct a clear and practical picture of what space deterrence should look like, synthesizing new and old ideas into a coherent framework with implications for the United States' national security posture. In this essay, we seek to answer several questions. We propose a clear definition of terms and concepts: What is deterrence? How is it achieved? Furthermore, our project outlines the difficulties of adapting deterrence concepts to meet the evolving technology of the space arena. We embark on this adaptation boldly but imperfectly, acknowledging that strategic thinking requires generalization and the sacrifice of specificity for the benefit of theory. We argue against the monopolization of space power, favoring increased US-led international cooperation but not yielding our unrivaled technological, positional, and normative influence.

In articulating a way ahead for the United States, we adopt and explain a rationalist framework for deterrence theory, exploring simple game theory concepts to illustrate the complexities of deterrence. Second, we explore how the space arena affects traditional cost/benefit structures, examining how we can achieve deterrence in a non-terrestrial arena. Third, we provide a brief picture of the current international structure of space governance and suggest ways for the United States to remain in its position of global leadership, gaining in institutional leverage what it cedes in material power. Fourth, we articulate the potential ways—in technical detail—in which the United States can alter the architecture of its space-based assets, retooling its resources and dispersing its capabilities in a way that makes aggression both more costly and less rewarding for potential challengers. Ultimately, successful space deterrence will necessitate the exercise of responsible power. It will mean that the United States needs to lead a move towards an international structure of space that eschews a global commons view but establishes rules for the advancement of space technology, while at the same time remaining out of reach—both in development and prowess—of potential challengers to that order. This essay explores how each can be done.

What is Deterrence?

The most concise and conceptually clear definition of deterrence that we have found in our research comes from the 1988 National Security Strategy of the United States: Deterrence works by persuading potential adversaries that the costs of their aggression will exceed any probable gains.[3] Logically proceeding from this definition, there are three conceivable ways to achieve deterrence. The first is by increasing the costs of aggression for adversaries, the second is to decrease the expected gains of adversaries, and the third is to do both simultaneously. This view of deterrence proceeds from a transactional view of conflict: Thomas Schelling writes that most conflict situations are *essentially bargaining* [emphasis original] situations in which the actions of one participant are dependent to a large degree on the actions of one or more other actors.[4] A perfect account of deterrence assumes the rational nature of states, implying that state decisions are made, and activities pursued, in the interest of expected payoffs.

Unfortunately, the neatness of pure rationality is not matched in the real world. Instead, behavior is based on bounded ratio-

nality, which incorporates the importance of perceptions into an analytical framework. This term, first used by Herbert Simon in the 1950s, is used to designate rational choice that takes into account the cognitive limitations of the decision maker.[5] Authors Gerd Gigerenzer and Reinhard Selten use the St. Petersburg Paradox[6] to illustrate the effects of bounded rationality: outcomes that are so at odds with the dictates of good sense will not be pursued, even if the probably of the outcome makes it mathematically rational to do so.[7] One possible solution to the paradox involves an explanation of expected utility instead of expected value, the former being the primary determinant of social behavior. The purpose of this discussion, of course, is not to revive what is largely a debate for social theorists, but rather to illustrate the limited extent to which pure rationality can illumine our predictions of social behavior. Even so, while it might be useful to theorize about extricating rationality from policymaking in part or in whole, the empirical nature of policymaking demands rationalist assumptions. We proceed to outline a policy of space deterrence using a rationalist approach, acknowledging its possible shortcomings but working within its constraints to develop a coherent national security strategy for space deterrence.

As we state in the beginning of this section, deterrence involves the manipulation of an adversary's potential costs and benefits from a certain course of action. A purely rational actor will not pursue an action whose costs outweigh its benefits. As such, the deterrer seeks to pursue policies that decrease benefits and/or increase costs for would-be aggressors. Cost can refer to either the resource costs of pursuing an action or punitive measures taken after the fact by the deterrer against the aggressor. For example, cost in a space deterrence context can include both research and development expenses for an anti-satellite program and possible consequent terrestrial retaliation for its deployment. Benefits, on the other hand, we understand to have the singular meaning of advantages[8] received by the aggressor as a result of its pursuit of a certain course of action. To keep our language conceptually clear, we will also assume that negative benefits equal positive costs, and vice versa.[9] Either can be the direct or indirect result of the aggressive action.

We have already pointed out that rationality cannot perfectly encapsulate the complexities of cognition and psychology. A second—and for our purposes, more crucial—limitation of rationality is that its predictive capacity is based largely on the extent to which uncertainty is introduced into the problem. Actors may have opportunities to maximize their gains, but will not take those opportunities because of their opponents' unwillingness to cooperate. The Prisoners' Dilemma is a good illustration of the effects of communication and trust on behavior.[10] At first glance, it would appear that the rational course of action would be for each actor facing the "dilemma" to pursue a strategy of cooperation. Instead, we find that the dominant strategy is to defect.[11] Absent a guarantee of mutual cooperation, which is the case when there is a lack of trust (particularly common between nation-states) or an iterative framework, actors will end up effectively reducing each other's possible benefits and forfeiting their own--always acting to minimize risk. We have chosen to highlight the prisoners' dilemma as an example of the difficulty of cooperation, even when predicated upon rational assumptions. We do not claim that prisoners' dilemma is the best singular framework for assessing deterrence. Long form models can be more accurate, and even the simple stag hunt example of Rousseau can be helpful.[12] The point is that deterrence theory is often not intuitive, and its successful use demands nuance, both in development and application. In the following paragraphs we explore the character of deterrence in the space arena, bearing in mind the difficulties posed by examples such as the one outlined above.

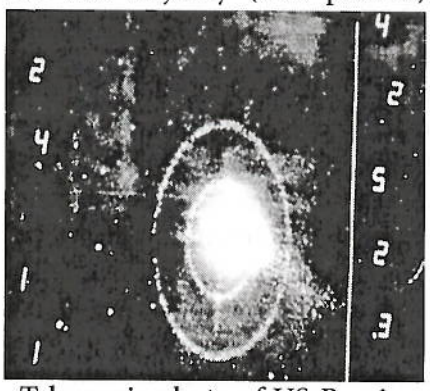


Deterrence in Space

Deterrence in space is rendered especially difficult for three distinct reasons. First, as Forrest Morgan has pointed out, space inherently favors the challenger.[13] The dominant power in space is more likely to base its terrestrial capabilities on its space dominance. For example, the United States is reliant on a host of satellite-based technologies (navigation, positioning, communication, and observation) for its effectiveness on the battlefield.

A successful satellite denial action by a challenger, even if limited in scope, could have exponential effects on the ground. If a potential military challenger is less reliant on space technology than the power being challenged, it would likely be the challenger that would emerge from space conflict with the advantage, even if that space conflict led to tit-for-tat retaliation.[14] This is especially the case because of the crowded nature of space: it is becoming increasingly congested, contested, and competitive.[15] As of April 2013, the United States Department of Defense was tracking 39,156 orbital objects, of which less than 4,000 were active payloads.[16] The numbers are also rising rapidly: in the three-day window between 24 April and 26 April 2013, three separate launches put nine objects into eight different orbits.[17] The increasing number of orbital objects poses severe hazards for functioning satellites, and any conflict in space will multiply that hazard.

The 2009 collision of a Russian Cosmos satellite and US Iridium satellite created 1500 pieces of debris; the Chinese ASAT test of 2007 created 3000 pieces,[18] counting only those large enough to be tracked. It has been estimated that the vast majority (99.3 percent) of space debris is too small to be tracked,[19] an issue that has severe implications for orbiting payloads. The problem is multiplicative: more collisions yield more debris, which yield more collisions, etc. For this reason, any action in space that increases the amount of space debris favors the actor(s) with the least to lose. For example, a ten percent mutual loss of functioning payloads for both the United States and China would eliminate 112 US satellites but only 14 Chinese satellites.[20] This problem is not one with a ready solution, but the inherently global and common nature of space demands institutional and technical solutions.



Telescopic photo of US-Russian Sattelite collision in 2009

Second, space deterrence is difficult because the international space regime has inappropriately leveled the field for space development. International institutions in their current form have created an environment stagnant for technical innovation, diminishing payoffs for governments to develop deterrent technologies, even if those technologies would serve only peaceful purposes. Everett Dolman's formulation is especially poignant: the OST and the existing socialized space regime discouraged productive competition among space capable states . . . space development is trapped in LEO [low earth orbit] parochialism.[21] While counterfactual history is extraordinarily speculative, it is useful to question whether or not the United States would have put Neil Armstrong on the moon if it was not engaged in an intense geopolitical competition with the Soviet Union. Our most ambitious space projects were born before the 1967 OST.[22] We do not, of course, mean to suggest that the international space regime should be abolished. Instead, it needs to be reshaped in order to allow for enterprising nations to reap the benefits of their endeavors, especially because of the proliferation of commercial actors in space. We explore this theme more in the next section.

Third, space deterrence is difficult because it demands innovative approaches to research and development that are not being employed today. Our national abilities have been redirected from the space arena: since 1965, with the brief exception near the end of the Cold War, the budget of NASA has been steadily shrinking as a percentage of GDP.[23] Deterrence requires technical mastery of the arena in which we are trying to deter. Redundancy of our space-based systems would diminish the benefits of any perceived aggressor, ensuring that our reliance is spread across a number of different assets. Satellite fractionation, which we discuss at length in the following pages, could be one significant way to achieve this. Ultimately, successful deterrence will require that we aggressively pursue the technological prowess needed to make aggression difficult and fruitless.

Deterrence through the International Space Regime

Space governance is complicated. Its history spans just over half a century, beginning with the establishment of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) in 1959. It has evolved today to include a variety of multilateral and bilateral agreements between states, and these agreements are undergirded by the increasing

private sector use of space. The 1967 Outer Space Treaty (OST)[24] provides a basic structure for space governance, establishing principles of peaceful use and exploration of space for the benefit and in the interests of all countries. (Article I), designating the arena as fully subject to the confines of international law (Art III), pledging at least limited mutual cooperation for astronaut assistance (Art V) and treaty enforcement (Art VI), and promising to conduct all space activities guided by the principle of cooperation and mutual assistance. (Art IX). Although the OST is the most obvious example of multilateralism in space, it is far from the only one: others include the Rescue Agreement of 1968, the Liability Convention of 1972, the Registration Convention of 1976, and the Moon Agreement of 1984.[25]

Unfortunately, existing international agreements regarding space have a history of problems and loopholes. First, universality is rarely present.[26] COPUOS was so fraught with political wrangling that it wasn't able to successfully convene for the first two years of its existence.[27] The OST was strongly opposed to the 1976 Bogotá Declaration in which several developing equatorial countries claimed sovereignty over the geostationary orbit, 22,000 miles above the earth's equator.[28] The dispute has since been resolved, but is indicative of a wider divide over issues of space governance, as some treaties lack the signatures of even ten percent of the world's nations. Most importantly, existing space law lacks sufficient enforcement mechanisms for violators. The iconic OST fails to specify a single punitive measure for potential violators, and in fact allows for unilateral withdrawal from the treaty as long as one year's prior notice is given. The resulting international framework is a half-hearted attempt at norm construction, with insufficient coercive power over nations of ill will (consider China's 2007 ASAT test and associated debris) but with enough behavioral influence on the leadership of law-abiding, representative democracies.[29]

A revised international space regime must clearly articulate the peaceful uses of outer space and encourage its development, while prohibiting antisatellite operations and the development of space-based weapons.

We reject the realist notion that multilateralism holds no promise and that conflict is inevitable, but we assert that an institution devoid of material power only serves to constrain the wrong actors. As such, the United States' leadership in the international arena should have two components. First, the United States should lead initiatives to increase costs for violators of international space law. A revision of the Outer Space Treaty, to include definitive punitive measures (launch bans, economic sanctions, etc.) would be an excellent start. Such a revision should be led by the United States and other major actors—particularly Russia and China—to improve the universality of the regime. It is reasonable, after all, to think that the active participation of Russia and China in such an arrangement would also facilitate the participation of Japan, South Korea, the Commonwealth of Independent States, India, Iran, and the European Union.

Of course, a redesign of existing space law should be accompanied by the United States' aggressive pursuit of continued technological superiority. For this to take place, the United States needs to also attempt sweeping institutional reform that will allow for the non-global use of extraterrestrial bodies. Such a move could be made under the auspices of boosting private enterprise, and such a reason would not be disingenuous. The untapped potential of resources in space and of private actors who are currently designing technologies to harness those resources (asteroid mining, for example) means that the private use of space will, in all likelihood, eventually be adopted. The effect of space law should be to level the strategic playing field of space and ensure the rules are fair; the regime in its current form is restrictive to technical development that would allow for promising, practical deterrent solutions.

Framing the international space regime to allow for technological development is not fatalistic. Competition need not mean antagonism. A revised international space regime must clearly articulate the peaceful uses of outer space and encourage its development, while prohibiting antisatellite operations and the development of space-based weapons. When coupled with strong punitive measures for offenders, an international space regime that does not have chilling effects on innovation

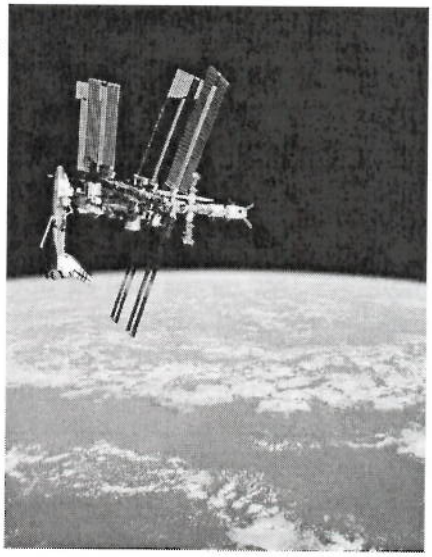
is the most conducive to peace. In the following pages, we embark on an exploration of innovations that could come about as a result of a reinvigorated international space regime, thus rendering spacecraft more secure from potential adversaries.

Spacecraft Design

Technology in space has become a major component of our military capability on land, in the sea, and in the air. Military communications, guidance, and weaponry that utilize space assets have become pivotal to successful military operations. Adversaries looking to level the playing field in those domains will certainly gain from a decisive attack on our space assets. In this section we detail the traditional systems engineering process employed in the United States, which in its current form produces capable but highly vulnerable spacecraft. Space systems are vulnerable because individual satellites are easy to attack, impossible to replace or repair in orbit, and failing or damaged parts can have catastrophic impacts on their respective systems. Often, a single satellite carries multiple payloads, each performing a variety of missions. The traditional design process makes space assets like these easy to target because a successful attack on one key component can render the entire spacecraft ineffective.

As we have previously discussed, American dependence on space for its military superiority could also make it difficult for the United States to respond conventionally against an opponent attacking us in space, as our retaliation against terrestrial targets would likely be construed as disproportional.

Current satellites are designed using a requirements-driven approach in which requirements are defined and then the system is designed to meet those requirements while minimizing cost.[30] The satellite system is broken down into smaller bus subsystems and then again into components. Each subsystem is designed separately to meet its own requirements and then integrated with the rest of the system as the program develops. Space systems are generally made up of six subsystems: attitude determination and control (ADCS), telemetry, tracking, and command (TTC), command and data handling (CDH), electrical power (EPS), thermal control, and structures. In addition to the subsystems, the payloads or experiments on board also carry separate requirements. The systems engineering process is often referred to as iterative because each subsystem has constraints dictated by decisions made on another part of the spacecraft. For example, a decision to use solar arrays on multiple sides of the spacecraft for the electrical power subsystem can take away space for cooling radiators used in the thermal subsystem. The consequent higher internal temperatures will likely result in a lower efficiency rating for the battery charge regulators in the electrical power subsystem, decreasing the amount of converted solar energy. The result is a constant feedback loop that requires the optimization of all subsystems and components. Quite obviously, the complexity of the integrated system makes the failure of one component on a subsystem a potentially catastrophic event for the whole spacecraft.



International Space Station

In the context of deterrence, the integrated nature of satellites both reduces the cost and increases the benefits of attacking our assets—quite the opposite of a successful deterrence strategy.

Once a spacecraft is launched, it cannot be fixed by a mechanic in the way an airplane or a car can be repaired after it comes off the assembly line. For this reason, a great deal of money and time is allocated toward testing every aspect of the satellite before it is launched. Such a rigorous testing and qualification program is required to ensure that the satellite doesn't fail on orbit. All components are tested individually before being integrated and tested at the subsystem level. Finally, the verified subsystems are integrated and tested at the systemic level. Each level includes multiple iterations of functional and environmental testing.[31] In addition to the high costs associated with space programs, the testing campaign also has significant impact on the scheduling of the program that the systems engineer, program manager, and politician all need to consider. To the potential adver-

sary, this method of design means that we are not capable of quickly replacing our current space assets. Large, complex space missions typically require 10 to 15 years to develop, whereas relatively simple missions require as few as 12 to 18 months.[32] This means that in one strike, a potential adversary could limit our operational effectiveness for 10 to 15 years. In addition to strong restraints embedded in institutions, the US should transition to a spacecraft architecture and design process that is consistent with the peaceful purposes that should guide international cooperation (i.e. does not weaponize space), but strengthens the resiliency and durability of space-based assets for the purpose of maintaining stability and deterring aggression.

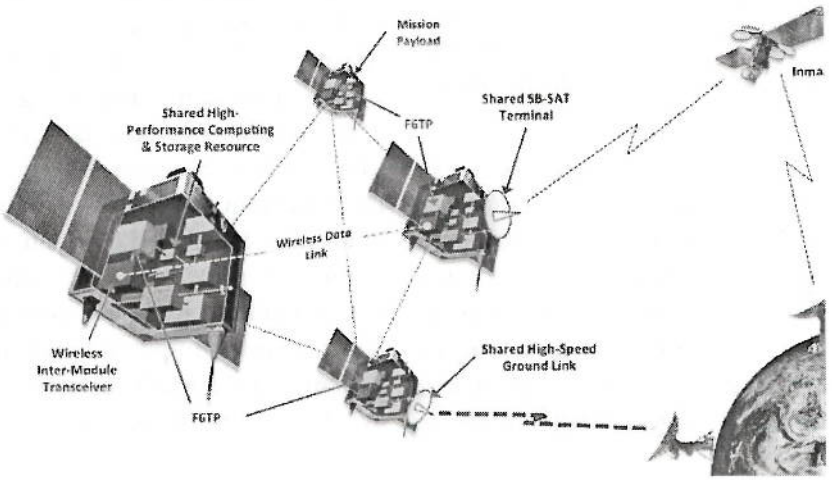
Improving Deterrence through Spacecraft Architecture

Despite their incredible technical and performance capabilities, modern spacecraft lack robustness and flexibility. Robustness refers to a system's ability to continue performing its intended function despite the introduction of an internal or external stimulus. Flexibility is the ability of a system to change on demand at any time during its lifecycle.[33] Robustness and flexibility are important traits to consider when evaluating the deterrent capability of space systems. Improving these qualities will enable the United States to decrease the perceived benefit gained from an attack and increase the United States' capacity for retaliation, even in a degraded environment. This would have the effect of altering both sides of the cost/benefit equation in favor of the deterrer.

By de-integrating the spacecraft, we can remove much of the complexities involved in current design. In essence, the result would be to transform a large, expensive, attractive target and split it into multiple smaller, cheaper, less attractive targets that would function as an emergent system to achieve the same overall mission. Modular approaches to software have already demonstrated advantages over traditional software architectures in flexibility and robustness by breaking code into standalone modules that are adaptable to any mission.[34] Breaking the bus subsystems and payloads into standalone modules with standard interfacing would offer many of the same benefits in the hardware domain that have already been demonstrated in the software realm. Defense Advanced Research Projects Agency (DARPA) scientists Shah and Brown have used the word fractionation to describe the process of physically decomposing a spacecraft into a distributed network of wirelessly connected modules.[35]

Fractionation would give systems engineers the flexibility to break up spacecraft modules in different ways to accomplish a given set of mission needs. For example, an electrical power subsystem could be segregated into its own module while power was wirelessly beamed to other modules using lasers, millimeter radio waves, or specially tuned induction.[36] Decoupling the subsystems would enable an EPS module to be designed with a sole focus on its independent optimization, irrespective of the limiting requirements of an entire payload. Even the propulsion system could be separated out into a module that held fuel and was responsible for the navigation of the entire cluster. The propulsion module would control all other satellites in the cluster using electromagnetic formation flight (EMFF) technology. EMFF technology uses electromagnetic forces and torques created by induced magnetic fields generated from individual spacecraft to control each vehicle relative to one another. The Space Systems Laboratory at the Massachusetts Institute of Technology has already demonstrated EMFF capability in the laboratory using a ground test-bed[37] and will begin demonstrating this capability in orbit in June 2013 with the University of Maryland's RINGS project

DARPA conception of F6 Fractionated Satellite Modules



on the International Space Station (ISS).[38] DARPA has been working to demonstrate working fractionation since 2010.

By reducing the strategic impact of an attack on a United States satellite, a fractionated system will simultaneously increase an adversary's cost and reduce the possible benefit as a result of the attack.

Fractionated systems would prove to be less vulnerable to failure resulting from an attack. Over time, fractionated architecture would have a significant impact on the system's survivability, vastly improving robustness. System risk is assessed by weighing the probability of a failure event occurring against the consequence of that failure on the overall system. Non-fractionated sattelites, like the current generation of monolithic (one structure) spacecraft, comprise a one-strike-and-you're-out design.[39] The only real option to mitigating risk in this architecture is to invest time and energy into reducing the probability of failure through the intensive testing program described above—a process that can drain both time and money. With fractionated spacecraft, however, risk management is easier because most failures within a module will not cause overall system failure. An analysis conducted by Owen Brown for the Aerospace Corporation Risk Management Symposium found that the variability of total lifecycle cost for a highly modular (fractionated) system is nearly half that of a large monolithic spacecraft.[40]

Repair and upgrade of failed or outdated hardware would be easier with a system using this building block approach. As systems are updated individually by module replacement, the older version can remain nearby as a spare. Having a relatively cheap and fast replacement capability will reduce a potential adversary's benefit from attacking space assets. The potential impact of an attack on a space-based asset would be marginal, as the affected module(s) could be repaired on orbit by maneuvering a replacement into the formation. Even if the replacement required ground production and launch, the time required to get a replacement module into orbit would be significantly reduced, because fractionated architectures would enable faster and cheaper module production of spacecraft. Ideally, standardized modules that would combine to make a fractionated architecture would enable assembly-line production that could reduce the frequency of testing, leaving its post-production purpose to be quality control rather than functionality.

In addition to increasing the robustness of US space assets, fractionated architecture will help deter space aggression by enlisting additional actors to join the space domain. A communal network of less expensive and economically viable space modules could enable international sharing between nations, commercial businesses, research, and educational institutions. DARPA's Paul Eremenko has compared System F6's impact on the space industry to the Internet impact on the computer industry.[41] It is an apt comparison, as DARPA has developed a layer of software that will act as a universal translator between modules with different software packages and integrate them seamlessly into the network. Multiple nations can now mount commercial and scientific payloads as separate modules onto a shared launch vehicle and integrate them using a shared network of bus modules. The reduced cost could enable nations that previously couldn't get over large start-up costs to finally become participants in the space arena, which would result in a stronger space regime to deter potential aggressors.

Attacking a shared space network would impact multiple nations and commercial partners instead of just one. The transition to fractionated architecture offers many advantages to the United States with respect to deterrence in the space domain. By reducing the strategic impact of an attack on a United States satellite, a fractionated system will simultaneously increase an adversary's cost and reduce the possible benefit as a result of the attack. The cost will be increased from the segmentation of the target (making it harder to hit) and the incorporation of more space-faring nations and private actors into a space regime. The benefit offered to the enemy will be reduced due to the increased robustness and flexibility that fractionation enables. The best choice a potential adversary could make would be to play the game fairly.

Conclusion

In our analysis, we explored the nature of deterrence in space. Assuming a rationalist

model, we examined the different conditions that make space a unique strategic arena. First, space disfavors first strike stability, making it easier for the actor committing the first strike to achieve decisive victory. Second, the international space regime is inadequate to the task of space regulation. It is a hollow shell that claims normative influence but has none. Third, our current technologies are not amenable to space deterrence, lacking the robustness and flexibility needed to prevent adversaries from gaining decisive advantages through an attack against space-based assets. In the preceding pages, we have attempted to establish a two-pronged approach to space deterrence, simultaneously reducing an adversary's benefits and increasing an adversary's costs through shaping the international space regime and fostering international cooperation, while innovating to keep our spacecraft out of reach of aggressors.

The international space regime is woefully unprepared for aggression in space. Its response to the 2007 Chinese ASAT test was barely perceptible, and was hardly the exception to the rule. The history of international space governance is a troubled one, raising serious questions about the prospects for its future success. But with the leadership of the United States, there is promise for constructing a multilateral framework of space cooperation. Such a framework will need to do two things. First, it will need to make strong promises of punitive measures to be exacted against actors who offend the peaceful uses of outer space outlined in the Outer Space Treaty. Contrary to the existing treaties that constitute merely a notion of corporate goodwill, a new regime will need to have teeth for enforcement. Second, any revision of international space governance needs to provide an environment ripe for technological innovation and multilateral partnerships, ensuring that well-meaning nations can cooperate to keep their space-based assets safe from adversaries. To that end, we have also called for increased technological innovation in the United States, specifically targeting the systems engineering processes that dictate the creation of new spacecraft. We have discussed the excessive costs and time taken through current development processes, and outlined methods for reducing both. Second, we have argued for the design of fractionated space architecture, reducing the benefits of adversaries by building redundancy and flexibility directly into our spacecraft

As the preceding pages articulate, the United States' approach to deterrence must be dualistic. It must simultaneously affect any potential adversaries' costs and benefits. To do so, we will need to exercise responsible power by leading—not dictating—the continued dialogue on international governance of space, and by ensuring that our own technological superiority remains unrivaled. United States leadership in the arena of international institutions must be towards an end that will benefit all nations participating in the regime, and our pursuit of continued technological dominance must render the costs of adversarial action too great for any challengers. We are hopeful and optimistic that the United States will respond to these challenges with the vigilant leadership and unmatched prowess that have distinguished it in history thus far.

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1 Reinhold Niebuhr, cited in Paul J. Bolt, Damon V. Coletta, and Collins G. Shackelford Jr., *American Defense Policy*, John Hopkins University Press, 2005.

2 Stephen B. Johnson, *The Secret of Apollo: Systems Management in American and European Space Programs*, John Hopkins University Press, 2002, 5.

3 The White House, "National Security Strategy of the United States," 1988, 13 <http://nssarchive.us/NSSR/1988.pdf>.

4 Thomas C. Schelling, *The Strategy of Conflict*, Harvard University Press, 1980, 5.

5 Simon Herbert Alexander, *Models of Bounded Rationality: Empirically Grounded Economic Reason*, MIT Press (MA), 1982.

6 In the St. Petersburg Paradox, a casino offers a game of chance in which a fair coin is flipped. The pot starts at one dollar but doubles every time the coin is flipped and lands heads. The player receives all the money as soon as the coin lands tails. Mathematically, the expected payoff is: (1*1/2+2*1/2+4*1/2 . . .) = ∞, so players should be willing to bet an infinite amount of money, in accordance with their expected payoff. Strictly speaking, such behavior would be rational. In reality, the player hesitates to put more than five dollars down because of bounded rationality. See Gerd Gigerenzer and Reinhard Selten, *Bounded Rationality: The Adaptive Toolbox*, The MIT Press, 2002, 2-3.

7 Ibid, 2.

8 Our use of the word advantages here is synonymous with benefits. It does not imply superiority or ascendancy. An actor does not need to have gained a strategic, operational, or tactical superiority over an opponent to have gained a benefit.

9 To use an example: Iran's pursuit of nuclear technology has entailed the international community's application of severe economic sanctions in

recent years. This is a received and indirect condition, and quite clearly a cost for Iran. It could also be viewed as a negative benefit, but the distinction is unnecessary. We eliminate the language of negatives for the sake of conceptual clarity.

10 Let us clarify the Prisoner's Dilemma with the following common example: two actors are faced with two possible choices in this (non) cooperative game: each can either cooperate, or defect. If both cooperate, each will receive the highest payoff If both defect, each receives much less. But if one defects while the other cooperates, the defecting actor will both maximize its own gain and minimize that of its opponent. Note that the payoff for both actors is less when both defect than it is when both cooperate. Still, the lack of trust in what the other actor will do drives decisionmaking of both actors toward non-cooperation. See Merrill M. Flood, "Some Experimental Games," US Air Force Project RAND Working Paper, 20 June 1952.

11 This point of equilibrium is more specifically known as the Nash Equilibrium, named for its discoverer. See John Nash, *Non-Cooperative Games*, University of Princeton (Dissertation), May 1950.

12 In the stag hunt, Rousseau discusses the concept of a group of hunters who go off in search of a deer. In the two-player game, both players can cooperate to catch the deer, or each player can act on his own (defect) to catch a hare for himself. The example differs from the prisoners' dilemma because there are two Nash Equilibria; i.e. if Actor A nows that Actor B is cooperating, he will choose to cooperate (equilibrium); if Actor A knows that Actor B is defecting, he will also defect (equilibrium). See Jean-Jacques Rousseau, *A Discourse on Inequality*, Penuin, 2003.

13 F. E. Morgan, *Deterrence and First-Strike Stability in Space: A Preliminary Assessment*, The RAND Corporation, 2010, 23.

14 Ibid, 27.

15 Department of Defense and Director of National Intelligence, "National Security Space Strategy" (Unclassified Summary), January 2011.

16 Ibid.

17 Ibid, 2.

18 Robert D. Lawrence, "Addressing the Problem of Orbital Space Debris: Combining International Regulatory and Liability Regimes," 15 B.C. Int'l & Comp. L. Rev. 51 (1992), 54.

19 This is chiefly because potential collisions cannot be foreseen. A small piece of metal traveling in geostationary orbit (at a speed of approximately 3,000 m/s) can be of devastating consequence to a satellite.

20 Data collected from www.space-track.org.

21 Everett C. Dolman, Astro*politik: Classical Geopolitics in the Space Age*, Routledge, 2001, 137.

22 Ibid.

23 Charles Lutes and Peter Hays, eds., *Toward a Theory of Space Power*, National Defense University Press, 2011, Ch. 10.

24 The OST is officially known as the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, a title that both lacks brevity and lends itself to a poor acronym. For obvious reasons, we use its colloquial name here.

25 All documents are freely available on the website of the United Nations Office for Outer Space Affairs <http://www.oosa.unvienna.org/oosa/en/SpaceLaw/treaties.html>.

26 Li Daoyu, "Safeguarding Space Security: Prevention of an Arms Race in Outer Space," Conference Report, 21–22 March 2005, United Nations Institute for Disarmament Research (UNIDIR), 44-45.

27 Dolman, 127.

28 Officially known as the Declaration of the First Meeting of Equatorial Countries. Signatories included Brazil, Colombia, Ecuador, Indonesia, Kenya, Uganda, Congo, and Zaire.

29 Dolman, 135.

30 Wiley Larson, and Jason Wertz, *Space Mission Analysis and Design*, Microcosm Press, 2005, 73.

31 Functional tests are used to verify that the component, subsystem, or system is functioning properly. Environmental tests are used to verify that the component, subsystem, or system can survive the vibration and shock environments from the launch vehicle, as well as operate in the thermal-vacuum environment that will be expected on orbit. Test flow generally follows functional vibration post-vibe functional shock post-shock functional thermal-vacuum chamber testing.

32 Larson and Wertz, 7.

33 Naresh Shah and Owen Brown, "Fractionated Satellites: Changing the Future of Risk and Opportunity for Space Systems," *High Frontier Journal* 5, no. 1 (November 2008), 29.

34 Advanced Solutions Inc. (ASI) has developed Modular flight software that can be adapted to a wide variety of C&DH hardware architectures and mission requirements. Each module is a standalone piece of code that can be integrated with other modules depending on the requirements. Modular Command and Data Handling (MCDH) has been flown on the Space Systems Research Center's FalconSAT-5 spacecraft.

35 Shah and Brown, 32.

36 Daniel Kwon and David Miller, "Electromagnetic Formation Flight of Satellite Arrays," (Master's Thesis), 2005.

37 Ibid.

38 Raymond Sedwick, "Resonant Inductive Near-Field Generation System (RINGS)," University of Maryland Energy Research Center, 2012.

39 Shah and Brown, 34.

40 Owen Brown, "Reducing Risk Through a Modular Architecture," Aerospace Corp Risk Management Symposium, 2005.

41 Michael C. Sirak, "Game Changers," *Air Force Magazine*, September 2009.

Racism: A Stumbling Block to Deterrence Strategy

ELISHA HENRY

While the term "deterrence" is usually associated with Cold War nuclear strategy, its underlying principles have a much longer history in conventional armed conflict. Thus, it is important to turn to history for lessons regarding deterrence during conflict to apply to modern security challenges. The example of the Japanese surprise attack on Pearl Harbor in 1941 reveals that racism can impose a potential blind spot upon strategic deterrence. This historical lesson is applicable today due to the possible influence that racism is having on American deterrence policy toward the North Korean nuclear program, an international security threat of increasing concern. While the United States has come a long way in combating racism since World War II, it can never be too careful in ensuring that racial prejudices do not handicap its understanding of its deterrent capabilities.

Important Definitions: Deterrence and Racism

Before proceeding to the historical analysis, it is first important to define key terms essential to this argument. In his book, Deterrence, author Lawrence Freedman defines deterrence as "the idea that demonstrations of military strength might lead adversaries to restrain themselves . . ."[1] This concept has prevailed throughout centuries of military conflict. The Roman legions, for example, held to the motto of "si vis pacem, para belum (if you wish for peace, prepare for war)."[2] Giulio Douhet, Sir Hugh Trenchard, and other airpower theorist pioneers of the 1920s and 1930s likewise advocated for colossal bomber squadrons to deter the aggression of other nations.[3] Thus, the idea of deterrence most certainly had an influence on strategic US military doctrine in the years leading up to World War II.

The second key term requiring definition is "racism." According to the Oxford dictionary, racism is "prejudice, discrimination, or antagonism directed against someone of a different race based on the belief that one's own race is superior."[4] The United States unfortunately holds a long history of racism, including racism toward those of Asian ancestry. American racism toward the Filipinos is a prime example. Americans have been quoted as referring to the Filipinos as "our little brown brothers."[5] Under the principles of Social Darwinism, the Filipinos were an inferior race and were treated accordingly.[6] In 1900, Major General Elwell S. Otis declared, "As biologically inferior and treacherous savages, the Filipinos did not rate conventional modes of warfare."[7] The Filipinos were by no means the only Asians suffering the consequences of American racism. It is well known that Chinese immigrants also suffered racial discrimination. Racial tensions with the Japanese, however, were particularly acute and would play an important role in ensuring American surprise at the Japanese attack on Pearl Harbor.

Historical Lesson: Pearl Harbor, Racism, and Faulty Deterrence

As already indicated, history provides evidence that racism caused the United States to become overconfident in its deterrent capability toward the threat of the Japanese Empire. This guaranteed the United States would be surprised on December 7, 1941 when the Japanese attacked at Pearl Harbor. To establish this conclusion, it is necessary first to substantiate the

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history of American racism against the Japanese and follow with a discussion of the nature of the Japanese culture and its response to American discrimination. This progression is important because these factors culminated into the failure of deterrence to prevent the surprise attack at Pearl Harbor.

American Anti-Japanese Racism

American racism toward the Japanese people originated in the early 1900s, as Japan emerged victorious from the Russo-Japanese War. Western powers began to see Japan as a rival threat to their imperialistic interests in the Far East.[8] Indicative of these sentiments, an American naval attaché to Beijing (Peking) shared his thoughts about the Japanese in 1920. He said that "he liked the Chinese because they knew their place; he despised the Japanese because they wanted to be treated as equals."[9] Such a mentality led many Americans to make Japanese immigrants feel unwelcome. In 1922, the Supreme Court denied Japanese nationals the ability to apply for naturalization. Two years later, the United States closed its doors to Japanese immigration entirely.[10] As previously mentioned, many Americans subscribed to Social Darwinism and saw the racial tension against the Japanese as survival of the fittest, or a struggle for white supremacy.[11]

Perhaps the best reflection of anti-Japanese sentiment in American society in the years leading up to World War II is found in past editions of the *New York Times*. On May 2, 1920, the *Times* reviewed Lothrop Stoddard's then-new book *The Rising Tide of Color*, the thesis of which reflected the growing American concern for the "yellow peril" and the "red, black, and brown menace."[12] One of Stoddard's prevalent messages of that era was the American fear of the expansion of the Japanese race. His warning was of the need to counter the threat of Japanese and other non-white Americans: "within the white world, migration of lower human types like those which have worked such havoc in the United States must be rigorously curtailed."[13] Likewise, one year later, a *New York Times* headline read, "Japanese Race Problem." In this article, US Senator from California, James Phelan argued that, "The negros were and are unassimilable and so are the Japanese . . . here we have a people that cannot be assimilated and make a homogenous population, and it is a real struggle for race supremacy."[14] Senator Phelan's assertion of the desire to protect the racial superiority of American society provides a measurable reflection of the racism of American society during that time period.

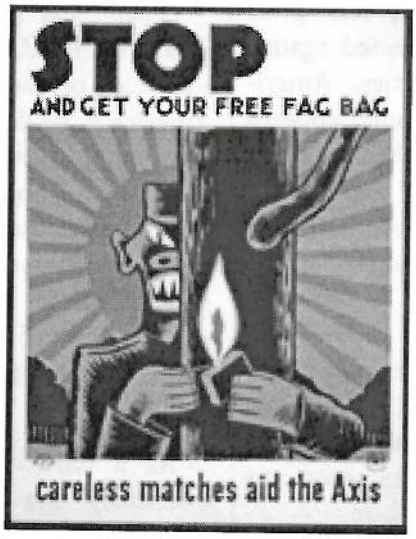


Figure 1[15]

American racism toward the Japanese people also manifested in the propaganda that materialized for American consumption during World War II. The following propaganda posters illustrate the racist sentiments that had been festering in American society for years.

Observe how the propaganda poster in Figure 1 dehumanizes the Japanese foe. The enlarged ears allude to an ape-like creature, signifying that the Japanese race occupies a lower, perhaps subhuman class. The Japanese soldier's teeth are transformed into fangs, relating him to bestiality and savagery. Figure 2, however, takes this interpretation to its fullest extent as it portrays the Japanese as a rat—one of the lowest animals in the food chain. As the following paragraphs demonstrate, the Japanese society was not amused at the barrage of American insults.

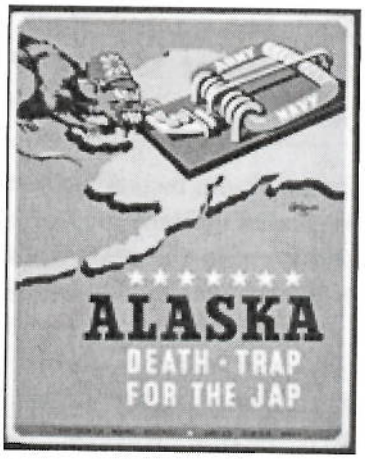


Figure 2[16]

Japanese Culture and Its Response to American Racism

The Japanese culture of the early twentieth century was one of pride, honor, and timeless tradition. It was "a sacred land, ruled by a godlike . . . emperor. Its citizens were the members of a great family

headed by the emperor, and they were expected to serve the state with unquestioning loyalty."[17] Thus, a people who held their land to be sacred and their leader as a god would understandably take great offense to insults directed against either of these entities. American racism, for example, angered Tokyo as early as 1906, when San Francisco segregated its schools against Japanese children.[18] As time progressed, Japanese leaders grew to believe that "submission to 'Anglo-American oppression' would be an 'unbearable humiliation' and would result in 'the most serious threat' to Japan's security."[19] Japan did not want to stoop any further to the West.

Thinking that they were dealing with an inferior opponent, many American military leaders assumed that Japan would not be foolish enough to attack a military might such as the United States.

These cultural factors facilitated the increased militarization of Japanese society in the years leading up to World War II. The military had "the holy mission of expanding Japanese influence abroad . . ."[20] In response to the affront of western racism, Japanese military leaders began to believe that the road to global power was only attainable if Japan overcomes the stifling interference of the Anglo-Saxon powers.[21] The racism of American diplomacy had bruised the honor of the Japanese society writ large. The Japanese people desired to earn the respect of the West once and for all. Pearl Harbor was a direct result of Japan's quest for global power and recognition.

Pearl Harbor: Racism and Faulty Deterrence

Given that American racism greatly offended the honor, dignity, and pride of the Japanese Empire, American leaders should have foreseen that conflict was inevitable. Pearl Harbor, however, turned out to be a complete surprise for the United States. This was because racism caused the United States to be overconfident in its deterrent capability against the Japanese threat.

As a reminder, deterrence is essentially the act of building up one's own forces to discourage another force from attacking. Thinking that they were dealing with an inferior opponent, many American military leaders assumed that Japan would not be foolish enough to attack a military might such as the United States. In War and Empire: the American Way of Life, author Paul Atwood recounts that, "On the eve of war, Chief of Staff General George Marshall observed that the Japanese would be 'stupid' to attack the base."[22] There were several others who overestimated the deterrent capability of the United States military and underestimated Japan's military capabilities and resolve. Joseph Daniels, former US Secretary of the Navy said, "I can hardly believe that it would be possible for any man to be crazy enough to invade this hemisphere."[23] Even more resolutely, Atwood affirms that "in May 1941 Adolf Berle, Assistant Secretary of State, declared that 'a naval invasion of the Western Hemisphere is out of the question.'"[24] Thus, racism blinded these and many other American leaders to the inadequacy of the deterrent against the Japanese. Author Roberta Wohlstetter perhaps sums up this situation most eloquently. She writes, "What these examples illustrate is rather the very human tendency to pay attention to the signals that support current expectations about enemy behavior."[25]

Racism caused Americans to formulate incorrect expectations concerning the behavior of their Japanese counterparts. They did not realize that their military deterrent was inadequate to stem the tide of the Japanese ambition to defeat the West and redeem the country's bruised pride. The United States did not realize that it had proverbially backed Japan into a corner. Both Great Britain and the Netherlands looked to the United States to protect Western interests in Asia, particularly those in Indonesia and Malaya, against Japanese interference.[26] As a result, the United States extended financial aid to support Japan's enemies, stifled exports from the Philippines, froze Japanese assets, and disrupted the majority of trade that had been bound for the Japanese island.[27] Racism blinded Americans as to the consequences of these actions, namely that US policies stripped Japan off all options short of military conflict to secure the raw materials it needed to sustain its empire.[28] Many, although not all, American leaders appear to have assumed that the inferior Japanese race would not be able to do anything about these sanctions. Author Takeo Imuchi provides important insight into the Japanese response to the racist-inspired imperialism of the United States in his book,

Demystifying Pearl Harbor: A New Perspective from Japan. He writes, "The basic aim in war is to win. However, sometimes nations go to war because the fear of defeat is outweighed by the perceived consequences of being intimidated into humiliating submission by a stronger opponent. This happens when the leaders are more concerned with defending the honor of the nation than the lives and fortunes of its citizens."[29] Again, racism is "the prejudice, discrimination, or antagonism directed against someone of a different race based on the belief that one's own race is superior." The United States did not expect an attack from an inferior power and thus misjudged its ability to deter a surprise attack.

As a disclaimer, racism is by no means the only reason for which the United States failed to anticipate the attack at Pearl Harbor, nor is this an attempt to categorize all Americans as racists. The purpose of this analysis, rather, is to provoke thought into how prejudices and biases can affect the judgment of an individual or an entire nation. The success of deterrence rests on one's confidence that one has the necessary power to discourage another force from attacking. This is why overconfidence is so dangerous because it creates vulnerability. If one is overconfident about a deterrent capability, one may eventually be faced with an unpleasant surprise. This scenario can be hypothesized regarding North Korea's nuclear threat.

Historical Lesson Applied to North Korea

The lessons learned from Pearl Harbor can be applied to the current security situation with North Korea to assess whether or not the United States is overestimating its deterrent power against another Asian foe. To accomplish this objective, it is necessary first to examine the evidence for the subtle presence of racism toward North Korea in modern American society. An analysis of North Korean culture and its similarities to Japanese culture will also prove helpful as North Korea is also a proud, militaristic society that is insecure with its place in the globalized world. These factors together conclude the potential for serious consequences in overestimating the US deterrent against the North Korean nuclear threat. This analysis provides important insight as to the possible courses of action for the future.

North Korea is also a proud, militaristic society that is insecure with its place in the globalized world.

Traces of American Racism toward North Korea

In today's day and age, overt examples of racism are far less evident than in the years leading up to Pearl Harbor. As a reminder, racism is "the prejudice, discrimination, or antagonism directed against someone of a different race based on the belief that one's own race is superior." In the modern age, this paper proposes that racism has evolved into a different form. Traces of racism, for example, are evident in the United States' skepticism that North Korea could develop a successful nuclear program. As members of the world's foremost nuclear power, many Americans seem to underestimate or discount North Korea's pursuit of a militarized nuclear capability. They swiftly seem to discredit North Korea's inferior technology and lack of resources. While these sentiments are not overtly racist in and of themselves, they eerily conjure up memories of the same overconfidence that Americans had in its deterrent capabilities against Japan in 1941.

In 2012, Markus Schiller, in conjunction with the RAND Cooperation, published a technical report entitled, Characterizing the North Korean Nuclear Missile Threat. Schiller concluded that the strongest hypothesis was the "Bluff" hypothesis. The "Bluff" hypothesis essentially suggests that North Korea has no intention of using its nuclear missiles for any other purpose but as bargaining chips in foreign politics.[30] In fact, this hypothesis greatly assuages the threat of North Korea's nuclear missile program. Schiller writes, "According to this hypothesis, in its testing, North Korea has launched Soviet/Russian made missiles . . . to maximize the appearance of performance, but may never have tested missiles from its own production—any such indigenous missiles cannot have noteworthy reliability or accuracy."[31]

Andrew Scobell and John M. Sanford agreed with Schiller's conclusions in their report for the Strategic Studies Institute back in 2007. While they cautioned that the United States cannot completely rule out the potential for a North Korean nuclear first strike capability, they also agreed that North Korea's nuclear success is exaggerated. They write, "As impressive as the statistics on North Korean conventional and unconventional

forces are, their actual capabilities are less than the raw data suggest, given the obsolescence of most KPA equipment, shortage of spare parts and fuel, and poor maintenance."[32]

While these researchers undoubtedly arrived at these conclusions after much careful study and analysis of reliable data, it is still dangerous to assume anything about North Korea's intentions or capabilities as this might breed overconfidence and encourage Americans not to take the threat seriously. To make matters worse, popular media gets a hold of this message and misconstrues it with overconfident declarations of American nuclear superiority in the face of inferior North Korean technology, all with the typical flare of American humor. Examine the following images that surface with every popular search engine on the internet today. Notice how each image discredits North Korean nuclear missile technology, all effectively relaying the underlying message that many Americans do not think that North Korea is capable of a nuclear attack against the United States. In other words, Americans see North Korea as primitive and backward—telltale hallmarks of the potential blind spots racism can produce. It is important to remember that this superior to inferior, racist dichotomy was one of the trademarks that led to the Pearl Harbor catastrophe. American leaders must be wary of these pitfalls and not allow the United States to underestimate the very real threat that a belligerent nuclear power poses to the rest of the world, even if it is considered underdeveloped.



Kim Jong Un with toy rocket[33]



Kim Jong Un with fireworks[34]

The Photoshopped images of Kim Jong Un on this page also demonstrate yet another aspect of the enduring influences of American racism. They portray North Korea as an immature child, which is nothing more than a throwback to the American racism against the Japanese as an inferior people. There is a story in a 1998 Stanley Foundation publication entitled, "Emerging from Conflict: Improving US Relations with current and Recent Adversaries," that also reflects this sentiment.

When asked by a skeptic why a country would expect that aggressive actions such as missile launches would lead to increased engagement, one participant replied with the example of a school boy throwing pebbles at a girl in an attempt to both impress her and attract her attention. The North Koreans have also learned that the United States pays close attention to the relationship only when North Korean behavior is viewed as threatening.[35]

In other words, some Americans see North Korea as no more than a child who throws a tantrum to get her way. The danger with this perspective derives from the moment the "child" unexpectedly decides she is going to carry out her threat. The United States needs to be careful in disregarding North Korea's behavior as primitive or child-like just in case North Korea decides to act upon its threat.

North Korean Culture

There are many similarities between the Japanese culture of the 1940s and the North Korean culture of today. The Japanese citizens swore their loyalty to their emperor. In the same way, "North Korea is an isolated and authoritarian one-party state; the political system is based upon an extraordinary cult . . . [idolizing its leader]."[36] Just as the Japanese Empire placed a great deal of emphasis on the military, North Korea has cultivated a militaristic society that holds to the ideology of "military first politics."[37] Finally, North Korea is experiencing the same kinds of insecurities that the Japanese Empire faced in the mid-1900s. It does not trust the West and has attempted to develop a policy of complete independence and self-reliance, or "juché."[38] North Korea views its missile and nuclear development programs as crucial insurance against foreign inter-

vention and vital assurance for continued domestic control over its population.[39] This mentality can be compared to Japan's aggressive, although ultimately unsuccessful, efforts to keep the United States out of its Pacific sphere of influence. Thus, when considering the proper deterrent strategy toward North Korea, American leaders must be cognizant of the motivations and mentality that is driving North Korean nuclear and foreign policy.

The Way Ahead

History has demonstrated that racism can prove to be a fatal blind spot in developing an effective deterrent strategy. The United States must not underestimate North Korea's nuclear potential. In spite of the fact that up until this point, North Korea has only used its nuclear capability as mere bargaining chips on the international spectrum, the United States should not develop the expectation that this is the rule. It must not get caught up in racial stereotypes leading to overconfidence in its nuclear deterrent diplomacy. Rather, the United States needs to follow the advice of former Representative James A. Leach of Iowa, who wisely advised Congress that, "Despite the fact that leaders can be vain or villainous and policies irrational, even evil countries themselves are not intrinsically evil. Negative terms that apply to peoples as opposed to people are almost always counterproductive."[40] The United States must refrain from insulting North Korea if any progress is to be made on the nuclear issue. Moreover, the United States should also heed California Representative Diane E. Watson's recommendation that "we must remember diplomacy when dealing with not only North Korea, but South Korea, China, and the other Asiatic nations, for it is a fundamental belief in this area of the world that you deal with people with respect and dignity. Threatening them is not the way to go."[41] Thus, the United States must be wary of the diplomatic pitfalls of racism in ensuring successful deterrence. The condescension and bullying that accompany racism will only back North Korea into a corner from which there may be no peaceful escape.

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1. Lawrence Freedman, *Deterrence*, (Cambridge, UK: Polity Press, 2004), 7.

2. Ibid.

3. Ibid., 9.

4. "Racism," Oxford Dictionaries (Oxford: Oxford University Press, 2013)<http://oxforddictionaries.com/us/definition/american_english/racism>.

5. Melvin Steinfield, *Cracks in the Melting Pot: Racism and Discrimination in American History, 2d ed.* (New York: Glencoe Press, 1973), 105-6.

6. Ibid., 106.

7. Ibid., 120.

8. Michael L. Krenn, *Race and US Foreign Policy from 1900 through World War II*, 3 (New York: Garland Pub., 1998), 190-4.

9. Sadao Asada, Culture Shock and Japanese-American Relations: Historical Essays, (Columbia: University of Missouri Press, 2007), 33.

10. Herbert Passin and American Assembly, *The United States and Japan, 2nd ed.* (Washington: Columbia Books, 1975), 13.

11. Asada, 36-8.

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The Trading Decisions Scheme

A Novel Solution to the Prisoner's Dilemma with Application to Nuclear Proliferation

ZACHARY ADAMS AND IAN GIBSON

"Our moral imperative is to work with all our powers for that day when the children of the world grow up without the fear of nuclear war."
– Ronald Reagan

While society can certainly claim progress toward achieving Reagan's goal, it is hard, even in the present era, to imagine a world completely free of nuclear weapons. In fact, a recent report by "The Center for Arms Control and Non-Proliferation" estimates that 17,325 nuclear weapons remain in the hands of the world's nuclear power states.[1] While drawing down this stockpile through treaties such as "New START" is no doubt necessary, such an approach focuses only on those weapons which are presently in existence. Perhaps of greater import, we must consider how to prevent other states from crossing the threshold between peaceful nuclear energy prospects and more nefarious attempts at acquiring a nuclear weapon capability. Problematically, it is substantially simpler for nations with nuclear energy technology to build the bomb than those without nuclear technical prowess. Given the political and security advantages a nuclear capability presents in the face of other proliferating countries, a weapons program is often in the national interest. However these state centric incentives contrast with the global advantages of halting proliferation. Until now, scholars and policy makers alike have largely failed at designing effective schemes to solve this Prisoner's Dilemma type challenge. We propose a new mechanism for solving Prisoner's Dilemmas based on a decision trading scheme. Implementing this strategy could be applied to peacefully harness the atom globally without substantially increasing the risk of proliferation.

To best frame this argument, one must first understand the overwhelming benefits of peaceful nuclear energy programs. Nuclear energy is a primary source of electricity throughout the world. In the US alone, 20% of all electricity consumed is generated through nuclear powered plants.[2] Experts predict this number could grow to 25% by 2030.[3] Not only does nuclear energy provide a reliable source of electricity, when compared to petroleum, natural gas, and coal, it is also the most affordable method of doing so. In an age of environmental awareness, nuclear power also stands as one of the cleanest sources of energy. It is referred to as an "emission-free source" of power.[4] Whereas traditional biofuels emit greenhouse gasses as a product of producing power through chemical combustion, nuclear power plants split atoms to power their generators, containing all of the waste. [5] While this contained radioactive waste has caused concern in the past, recent technological developments promise to recycle fuel at the power plant itself, minimizing the hazards of disposal.[6] Nuclear power also serves a strategic purpose. Due to growing volatility among petroleum producing nations, it is increasingly important for countries, both big and small, to create internal avenues for energy production. Nuclear power is a preeminent method for accomplishing this goal.

But if nuclear power is such a valuable tool in energy production, why then is there any concern that other countries implement this technology? It would seem that the

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whole world stands to benefit from an increased spread of nuclear power. While on the surface, this statement contains some degree of truth, it overlooks a crucial detail. Historically, pursuits of peaceful power programs have consistently morphed into full-fledged nuclear weapons programs. Proliferation in Israel and South Africa validates this assertion.

Less than a decade after the creation of the Israeli state in 1948, Ben Gurion, Israel's first prime minister was in pursuit of a nuclear weapon capability.[7] Although Israeli officials have refrained from publically recognizing their weapons program, by 1970 the international community implicitly deemed Israel a nuclear state.[8]



Israel's first nuclear energy facility, located at Nachal-Soreq, was a gateway for eventually developing nuclear weapons.[9] Not only did it serve as a front, masking Israel's weapon's program, it also precipitated the US agreeing to train Israeli students in the area of nuclear-physics.[10] Dimona, Israel's second reactor was originally labeled a "research facility" to further investigate peaceful energy applications. In reality, it was employed to produce plutonium necessary in nuclear weapons production. While much of the Israeli nuclear story has never been revealed, this much is clear: Israel's nuclear pursuits began with the creation of a peaceful nuclear energy program.

South Africa's road to nuclear proliferation is strikingly similar. In 1957, the US signed an agreement with South Africa to provide a Safari 1 nuclear research reactor in addition to uranium enriched sufficiently for use in a power plant with the stipulation that both would be used exclusively for peaceful energy purposes.[11] Additionally 94 students and technicians were allowed to study in US nuclear training centers.[12] Less than a decade later, a second facility, known as the Y-facility was constructed to produce weapon's grade uranium. By the early 1980's South Africa had produced six gun-type nuclear bombs. What, if any, impact did South Africa's peaceful energy program have in this outcome? As Robert Jastor puts it, "These earlier developments – access to Western nuclear technology, and the acquisition of a research reactor – enabled South Africa to take the most important step toward achieving independent nuclear capability."[13] In other words, South Africa's nuclear weapons program was born out of its peaceful energy pursuits.

Israel and South Africa's path to proliferation demonstrate an important point. Historically there has been inextricable links between peaceful nuclear programs and the eventual pursuit of nuclear weapons. Not only can these programs serve as covers for less peaceful activities, in the worst case, they can precipitate and directly aid in the development of a nuclear weapon capability.

While it is important to note that peaceful programs often lay the groundwork for nuclear weapons, it is more vital to appreciate the danger these weapons pose. The hazards inherent to nuclear weapons make proliferation an undesirable and problematic outgrowth of peaceful energy programs.

First nuclear weapons can lead to preventive war. For a country whose adversary is attempting to develop a nuclear weapon, the only reasonable response may be a preventive strike which seeks to remove the opponent's ability to develop nuclear weapons.

Israeli strikes on Iraq are a fitting example. On June 7, 1981 Israeli fighters dropped nearly 32,000 pounds of bombs on Iraq's Osirak nuclear reactor.[14] Intelligence reports suggested that the Iraqis were employing this reactor as part of their nuclear weapons program. Earlier, in 1980, the Iranians carried out a similar preventive strike and destroyed the Tuwaitha Atomic Center housing the Tammuz I nuclear reactor.[15] The case of Iran provides an even more recent application of preventive strikes. In 2009 the Stuxnet

computer virus infiltrated the Natanz nuclear plant in Iran and commanded one-fifth of its operational centrifuges to spin beyond their design limits, causing them to self-destruct.[16]

Critics may argue that the fact that none of these attacks led to an outbreak of war undermines the argument that preventive war can result from nuclear proliferation. However, to accept this argument is to miss the central point. Namely, these attacks did occur in response to nuclear proliferation and are themselves "acts of war." Moreover, one can hardly argue that preventive strikes will never lead to war. The bottom line is that nuclear proliferation raises the probability of preventive attacks which in-turn increases the potential for major conflict.

A second concern of nuclear proliferation is that it increases the liability for nuclear accidents. If proper safeguards both technical and procedural are not established, a nuclear weapon could be launched or detonated inadvertently.

Nuclear weapons accidents are far more common than most would care to admit. The US alone, arguably the safest of nuclear power states, has incurred multiple mishaps which could have been catastrophic. Take for example a situation during the Cuban missile crisis. In response to the heightened Soviet missile activity in Cuba, the US Air Force readied 9 ICBM's with nuclear warheads and placed a dummy warhead on a 10th.[17] Shortly thereafter, Strategic Air Command launched the 10th ICBM as part of a prescheduled test. No one considered the possibility that the Soviets, having learned of the Air Force's nuclear deployment, might misinterpret this test for an actual nuclear attack. Fortunately, they did not.

Congress passed the 1954 Atomic Energy Act which actively facilitated the exchange of nuclear know-how, technical information, materials and reactors to developing countries. The intent was to allow countries access to the benefits of peaceful nuclear energy while monitoring to prevent military applications.

A second near accident occurred later in 1962. The commander of North American Defense Command received notification that a missile had been launched from Cuba and was en route to the United States.[18] The commander ordered that the US initiate a launch sequence in response. Fortunately, the missile failed to detonate. After some time, officers realized that the radar operator had inadvertently "inserted a test tape simulating an attack from Cuba into the system, confusing control room officers who thought the simulation was a real attack."[19]

Preventive strikes and accidents are just two among many arguments which purport that nuclear proliferation is undesirable. Increasing the prevalence of nuclear weapons only amplifies these concerns. Herein lies the central dilemma presented within this paper: if nuclear weapons proliferation is undesirable and problematic, how then are countries to reap the benefits of peaceful nuclear power if such programs naturally give rise to nuclear weapons? Is there a method which allows for peaceful nuclear energy acquisition while simultaneously precluding the creation of nuclear weapons? US policy makers once believed there was.

Prior to the 1950's, traditional policy recognized that nuclear technology had the potential to inflict interminable harm and ought to be denied to non-nuclear states.[20] This belief was all but abandoned when Congress passed the 1954 Atomic Energy Act which actively facilitated the exchange of nuclear know-how, technical information, materials and reactors to developing countries.[21] The intent was to allow countries access to the benefits of peaceful nuclear energy while monitoring to prevent military applications. Countries such as Pakistan, Iran, South Africa and Israel have all received nuclear aid in one form or another as a result of the Atomic Energy Act.[22] Incidentally, all of the above countries are or once were nuclear powers with the exception of Iran which is currently seeking a nuclear weapon capability. Few can argue that this program has not increased global access to nuclear information and technology; however, given the condition of the above countries, one would be hard-pressed to find evidence that this program was also effective in retarding weapons proliferation.

Given the apparent shortcomings of previous nuclear policies, what, if anything, can be done to foster access to peaceful nuclear technologies while preventing the

proliferation of nuclear weapons? Centrally, the problem is that the decision to build nuclear weapons, given nuclear knowhow, is a Prisoner's Dilemma.

A prisoners' dilemma arises when, in a non-cooperative game, individual incentives produce an undesirable outcome, despite the possibility of a mutually beneficial one. The classic example of the prisoners' dilemma gives rise to its name. Two prisoners, perhaps Harry and Jane, are arrested on the suspicion of robbery. The police have only enough evidence to convict them of trespassing, which is punishable by six months in jail, but could have enough evidence for a full ten year conviction if one testifies against the other. If they both testify, the evidence will not be as strong and the sentence will be less—perhaps seven years. So, understanding game theory, the police tell Harry that he will walk free if he testifies (defects) against Jane, so long as she remains silent (cooperates).[23]

Now consider Harry's options. No matter what he does, it is much better for Jane to defect. If Jane cooperates and Harry defects, then he will walk away free. On the other hand, if Jane defects, then Harry will receive a shorter sentence by defecting as well. Given these incentives, the rational outcome of the scenario is for both Harry and Jane to defect and thus end up in a worse scenario than if they had made the individually irrational choice (because it requires each to trust the other not to testify) of remaining silent.

Real world Prisoner's Dilemmas arise frequently and in many forms. An arms race between rival countries is a common example. While it might have been in the interest of both the United States and the Soviet Union to quit manufacturing weapons capable of destroying the world many times over, doing so would risk that the other maintained a military advantage, so the race continued at enormous economic cost. Yet examples need not have just two participants. Oil Producing and Exporting Countries (OPEC) are engaged in a Prisoner's Dilemma each day. Decreasing oil production would increase the price of oil and gains in the long term. However, a single defector could make a lion's share of the profits by exporting more than their fair share at the expense of their OPEC comrades. Thus, in part, the price of a gallon of gas persists below five dollars a gallon despite the possibility of rapid increases in the price of "black gold," all as a result of a Prisoner's Dilemma on a worldwide scale.

The world has been unable to halt nuclear weapons programs while peacefully spreading fission energy as a result of the same phenomenon. The Prisoner's Dilemma in the case of nuclear proliferation arises from two sources. First is the relative ease with which a nuclear energy country can build atomic weapons in comparison to a country without that technology. The second arises from the political and security advantages of building the bomb given straightforward development of the technology.

Fortunately the technical challenge required to construct a nuclear weapon is immense. A country must not only have scientific and engineering expertise in nuclear fields, but also must possess sufficient nuclear fission material to construct weapons. The nuclear fuel consists of either highly enriched uranium 235 or plutonium 239. Enriched uranium is tedious and time consuming to produce. The 235 isotope composes only 0.7% of natural uranium ore. Since the isotopes are chemically identical they must be separated, or enriched, by a minute discrepancy in their mass. Correspondingly, sustainable weapons programs require thousands of precisely manufactured centrifuges to isolate the fission capable 235 isotope. Contrarily, plutonium is simpler to manufacture if a nuclear power plant is available for that purpose. Some of the neutrons released during fission in the core of a nuclear power plant are absorbed by uranium 238 to form plutonium 239. Since plutonium is chemically different from uranium, it is straightforward to separate from a nuclear reactor's spent fuel rods.

Obtaining a nuclear deterrent without one's enemies following suit is a potent national security "guarantee." Contrarily failing to proliferate when an enemy possesses the bomb may undermine a nation's international ambitions.

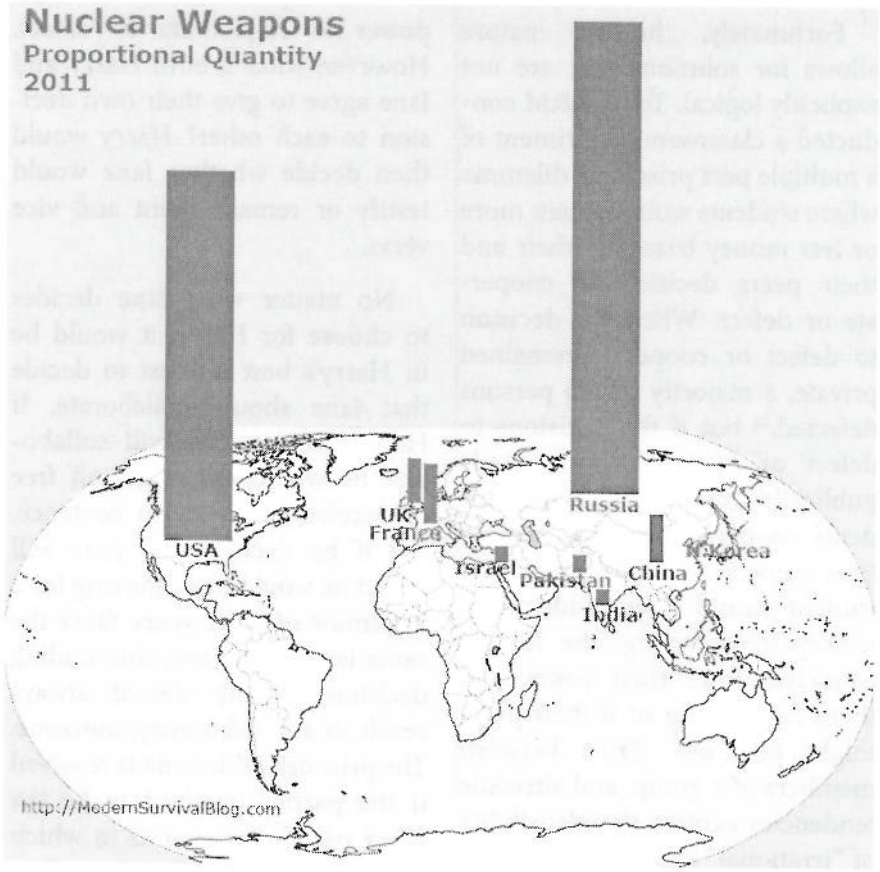
Possessing a nuclear power plant not only provides easier access to fissionable material, but in the process, the nuclear engineering and scientific expertise necessary to develop a nuclear weapon. In other words, a nuclear power plant transforms a "technically" absurd notion of accessing "the bomb"

into an attainable choice.

The problem is that this choice forms a Prisoner's Dilemma. While it may be best for society for nuclear energy countries to decide not to arm, the incentives for each individual nation do not necessarily facilitate this outcome. Obtaining a nuclear deterrent without one's enemies following suit is a potent national security "guarantee." Contrarily failing to proliferate when an enemy possesses the bomb may undermine a nation's international ambitions. Either way it is often more rational for a nation to apply nuclear technology experience to a weapons program, especially where it can deter outside intervention.

No matter what the other country does, it is in each nation's interest to proliferate. Of course, while the simple case of two nations is straightforward to consider, in reality this dilemma is distributed among many countries simultaneously. Thus, how can the Prisoner's Dilemma be resolved?

Scholars have devised many methods to solve Prisoner's Dilemmas, but none with universal application. One such example, "Rational solutions" to the Prisoner's dilemma, alters the incentives of each player so that cooperation is the most profitable outcome. A third party to any Prisoner's Dilemma can add extra punishments for defection or offer extra rewards for cooperation. For instance in the classic Prisoner's Dilemma example, Harry and Jane might threaten each other so that if one defects, the other will ask their friends to take action against the rat. In that scenario being let out of prison immediately via



defection is no longer the rational choice. With respect to the acquisition of nuclear weapons the international community serves as this third party. Sanctions against Iran, North Korea, Iraq, and South Africa's nuclear weapon's programs attempted to make "going nuclear" the unattractive option. However, in each case this third party intervention failed. North Korea and South Africa both obtained nuclear weapons, Saddam Hussein never openly demonstrated a halt of his nuclear program, and Iran is persistently working towards a weapon at present despite tough international sanctions and the Stuxnet cyber attack on the Natanz Uranium enrichment complex. In short, each of the sanction efforts failed because the international community could not leverage a sufficient incentive to make proliferation entirely unattractive. Future attacks, whether cyber or kinetic, will likely end similarly.

Some Prisoner's Dilemmas can alter the incentives without a third party. If the game is repeated—an iterated prisoners' dilemma—then a player can punish another player by defecting in future games and thereby decrease the total payoff for the cheating player. Thus the punishment scheme does not require any outside intervention. The most famous example of a cooperation strategy in iterated games is "Tit-for-Tat." This strategy cooperates or defects based on the other player's choice in the previous game. Unfortunately, acquisition of nuclear weapons is not an iterated game. Once a country obtains a nuclear weapon the Prisoner's Dilemma has ended. Tit-for-Tat or other cooperation strategies are not applicable

Fortunately, human nature allows for solutions that are not explicitly logical. Texas A&M conducted a classroom experiment of a multiple part prisoners' dilemma where students would obtain more or less money based on their and their peers decision to cooperate or defect. When the decision to defect or cooperate remained private, a majority of the persons defected,[24] but if the decisions to defect or cooperate were made publically known, all of the students cooperated even in a one-time game.[25] Although any single student would have made more money by defecting, the fear of ostracism from their peers kept them from doing so if their peers might find out. Trust between members of a group, and altruistic tendencies explain the plausibility of "irrational" solutions to prisoners' dilemmas in other situations. Arguably Japan is an example of where such an "irrational" opposition to nuclear weapons exists. The Japanese population is largely opposed to weapons of mass destruction as a result of the suffering they endured at the end of the Second World War.

Unfortunately irrational solutions to prevent nuclear proliferation are often not feasible. Leaders may not be swayed by discussion of the moral high ground, or be held back by a pacifist population. Thus the Prisoner's Dilemma surrounding nuclear weapons requires an alternative solution.

Although counter intuitive, we suggest that players locked in a Prisoner's Dilemma could achieve cooperation if they simply traded their decision making power. Consider the original example: each player exercises his or her own power to collaborate or defect. However, what if both Harry and Jane agree to give their own decision to each other? Harry would then decide whether Jane would testify or remain silent and vice versa.

No matter what Jane decides to choose for Harry, it would be in Harry's best interest to decide that Jane should collaborate. If Harry decides Jane will collaborate he would either get off free or receive a minimum sentence, but if he decides that Jane will defect he would be in the brig for a minimum of seven years. Since the same is true for Jane, this trading decision scheme should always result in a collaborating outcome. The prisoners' dilemma is resolved if the parties involved make the other party's decision as to which action to take. Further it resolves the dilemma even if there is ample room for any party to cheat and if the game is played only a single time. However, the question must be asked: "What situations actually allow this to happen?"

Imagine that a class is about to take a final exam. The teacher established the test is curved so that the highest mark becomes 100% and then a linear progression from zero to that the highest score will determine the remainder of the grades. For example if the highest score was a 50% and Becca was fortunate enough to obtain a 40% on the original scale, then her score after the curve would be an 80%. The students quickly realize that everyone can obtain a perfect score on the test if each student writes only their name on the test. A zero would then be the highest score and after the curve everyone would score one hundred percent.

Yet, how could all of these students actually execute this plan? All of the students know that if they just answered a few of the questions correctly then they would not only obtain a perfect score on the test, but that they would gain other rewards such as respect from their teacher and higher marks than their peers. Furthermore, it is obvious to every student that every other student has an immense incentive to defect. It would be disastrous for any student to cooperate and not put any correct answers on their test if another student in the class answers some questions correctly.

In this scenario most strategies do not work to resolve the prisoners' dilemma. When the students are taking the test, it is impossible for them to know whether or not any of the other students are defecting. Therefore, students cannot immediately "punish" their peers by trying their hardest on the test instantly after determining someone has defected (since test scores are often kept confidential a defector may never be revealed). Further since this is the final, and the last test in the course, the threat of future defection is not a viable threat.

However, consider the outcome of this scenario if each student decides how hard another student will try on the test. This could be accomplished if the students simply wrote their name on the test, and then switched the test with another student. No student would want another student to score better himself since, with the curve, it would lower his grade. Therefore the safest bet for every student would be to decide that the other student scores a zero percent. In effect, trading the

power to make decisions resolves the Prisoner's Dilemma. The students would cooperate regardless if this is the only test, the number of tests is fixed, or the number of tests is unknown.

Of course the previous example is an idealized situation and the Trading Decisions solution to the Prisoner's Dilemma only applies to a fraction of the situations classified as Prisoners' Dilemmas. There are two conditions that must be met in order for this trading decision scheme to achieve cooperation.

First there must be a way for both parties entirely to give the decision in question to the other party. There can be no way for either party to cheat by withholding some power to influence their own decision. In the testing example the test is a complete unit. It could either be entirely withheld or given to another student. Once the student gives his or her test away, it is impossible for them to influence their own grade. Many real life examples of the prisoners' dilemma violate this condition. Consider nuclear disarmament: If two countries agree to disarm by giving each other the location and ability to disarm their own weapons, a country could easily withhold the location of some of their nuclear arms. Often there is no practical way to give party B the complete power to make party A's decision, and the prisoners' dilemma cannot be resolved.

Additionally, there must not be any incentives that leave the prisoners' dilemma unresolved. In the testing example, there is no incentive for any student to give another student a higher score than the score he will receive on his own test. Indeed, it is safest to give the other student a zero percent. Many production cartels violate this condition and could not trade the power to make their decision to resolve the Prisoners' Dilemma. For instance, OPEC could not use this method to increase their profits. If each OPEC country gave a different OPEC member the decision as to how much oil they export—probably an impossible task in and of itself—then the incentives would still not align to produce an ideal situation for OPEC. The incentive would be for each OPEC member to decide that another OPEC member should export no oil. This would maximize the price of any oil and its own profits.

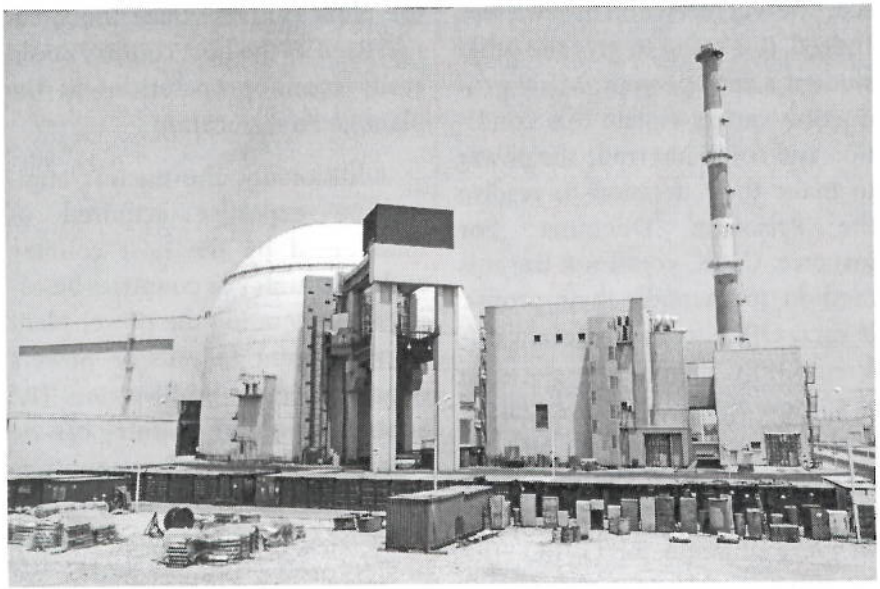
However some real world Prisoner's Dilemmas—importantly the choice to obtain nuclear weapons given a nuclear power plant—satisfy these conditions and can be solved via the Trading Decisions Scheme. Any country could take advantage of nuclear power without an increased risk of proliferation so long as a different unallied country or group of countries constructed and operated their power plant for them. In doing so, a country effectively "trades" its decision to develop nuclear weapons to a partner country or countries.

In this situation the choice of whether or not to proliferate using the nuclear power plant is entirely given to the nation or nations operating the power plant. Access to the spent fuel is secured by another nation and cannot be secretly diverted into a plutonium separation plant as the country operating the plant would control the spent fuel. Further, the nation operating the plant cannot utilize the spent fuel itself as the host country could easily monitor operations at the plant given its location.

Additionally, the nuclear engineering expertise acquired or maintained by the host country and the country or countries building and operating the power plant is transparent to outside powers concerned about proliferation. The experts from each country can be monitored by the other countries since their identities are known. Moreover, countries that already possess nuclear power could be the ones who operate the power plants in other countries. That way the nuclear expertise is held by trustworthy nations.

Fortunately both of the requirements for the Trading Decisions Scheme to work are satisfied in this application. It is possible to entirely grant the operation of a nuclear power plant, and control of the spent fuel rods, to another sovereign entity. Furthermore the incentives align so that the Prisoner's Dilemma is solved. Clearly another non-allied nation or group of nations would not want the country in which they are operating the nuclear power plant to obtain a nuclear warhead. However, each country participating in such a scheme might only engage in it if they can gain some nuclear technical expertise by operating or helping operate power plants in other countries. This nuclear experience could prove vital if a local nuclear disaster occurs or if the scheme breaks down and a weapons program becomes necessary.

While the requirements are in place for the Trading Deci-



Bushehr Nuclear Reactor Complex in Iran. Russia supplies the enriched uranium fuel and removes and recycles the spent fuel rods.

sions Scheme to function on a theoretical basis, it is important to consider how this theory might apply to real-world instances of nuclear proliferation. The historical case of India and Pakistan provides such an example. India tested its first nuclear device in May of 1974.[26] Ultimately Pakistan responded in 1998 by testing six nuclear devices.[27] Recognizing that both countries stand today as nuclear powers, is less important than appreciating why they pursued this capability in the first place. In short, both countries believed that if the other had the capability, they too must acquire the bomb. This sentiment is best conveyed in a remark made by Pakistan's former President Z.A. Bhutto in 1965, "If India builds the bomb, we will eat grass or leaves, even go hungry, but we will get one of our own."[28] More recently, a military official made the following comment: "[Our] Nuclear weapons are aimed solely at India."[29] The upshot of this adversarial relationship, namely that both countries stand today as nuclear powers, demonstrates the Prisoner's Dilemma in action. Could things have gone differently for India and Pakistan? We submit, by applying a Trading Decisions Scheme, both players could have reaped the benefits of nuclear energy while containing the reciprocal threat of nuclear weapons. Under such a scheme India may have never harnessed plutonium from its nuclear energy plant to develop its bomb. As a result, Pakistan may not have established its own nuclear weapons program. By guaranteeing that the opponent would not use their peaceful nuclear plants for the development of nuclear weapons, the underlying motivation for both countries to proliferate would be nullified.

While the case of India and Pakistan may demonstrate how the Trading Decisions Scheme could apply to a real-world proliferation dilemma, the case of Iran's Bushehr power plant provides evidence of how this scheme was applied in a real-life scenario. In 1974, under the Atoms for Peace Program, the United States agreed to build a nuclear power reactor for the American-backed Shah.[30] As the Islamic revolution gained momentum in Iran, the US pulled its support for the program. However in 1992, the Russians agreed to finish construction on the Busehr nuclear power plant with the agreement that they would operate the facility and administer complete control of the separated plutonium waste.[31] A Russian official as recent as last May released a statement confirming that "all operations related to the reactor equipment control and operations were being carried out by Russian specialists."[32] Above all, this agreement shows that the Trading Decisions Scheme can pass the nuclear litmus test and does in fact have real-world application.

The only question that remains is, "Who is next?" What countries are on the brink of proliferation? What countries could benefit from a Trading Decisions Scheme such as this? As global nuclear tensions continue to heighten, answering these questions well could be the key to preventing the spread of nuclear weapons.

The power of the atom both binds us in a game of apocalyptic brinksmanship and offers a solution for limitless, clean, and inexpensive energy. While the distinction between weapons and power plants is clear from an engineering standpoint, it has so far proved politically inseparable. Nuclear energy historically precedes nuclear weapons. Disturbingly, a nuclear power plant mandates that a nation choose whether or not to proliferate. Generally, that choice forms an opaque one-time multi-party Prisoner's Dilemma where third parties have limited

influence. While traditional solutions to solve Prisoner's Dilemmas fail (in this scenario a novel mechanism) the Trading Decisions Scheme provides a realistic means of harnessing the atom in peace. Nations should accept the counter-intuitive.

Note that the Ronald Reagan quote at the beginning of this essay is at the following web address: http://www.thereaganvision.org/quotes/.

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26 "Pakistan Country Profile - Nuclear" The Nuclear Threat Initiative <http://www.nti.org/country-profiles/pakistan/nuclear/>.

27 Ibid.

28 Ibid.

29 Ibid.

30 "Nuclear Power in Iran" World Nuclear Association <http://www.world-nuclear.org/info/Country-Profiles/Countries-G-N/Iran/#.UX8QeqLviSo>.

31 Ibid.

32 Ibid.

33 <http://www.mapsofworld.com/world-top-ten/world-top-ten-countries-by-nuclear-warheads-map.html>.

RANK	COUNTRY	Estimated Warheads	First Test	Recent Test	Total Test
1	Russia	8500	1949	1990	715
2	United States	7700	1945	1992	1054
3	France	300	1960	1996	210
4	China	250	1964	1996	45
5	United Kingdom	225	1952	1991	45
6	Pakistan	100-120	1998	1998	6
7	India	90-110	1974	1998	6
8	Israel	80	NA	NA	NA
9	North Korea	10	2006	2013	3
10	Iran	NA	NA	NA	NA

Source: Federation of Nuclear Scientists and CIA World Factbook[33]

Killing them Softly?

Putting the Brakes on North Korean Nuclear Proliferation

ZACHARY ESAU

Over the last year, North Korea (DPRK) under Kim Jong Un has increased tension in Northeast Asia by violating numerous United Nations Security Council (UNSC) resolutions banning the testing and development of nuclear weapons and ballistic missile technology. Korean weapons development has been matched by an increase in bellicose rhetoric aimed at South Korea (ROK) and the United States. This paper argues that, at this time, North Korean nuclear posturing since Kim Jong Un's succession represents a continuation of the DPRK's historic policy of using intermittent international cooperation to progress its nuclear program. Additionally, this paper analyzes the international response to North Korea's recent provocations, concluding that the international community has reacted appropriately but will require a greater commitment from China, North Korea's powerful benefactor, to impede and eventually roll-back Pyongyang's illicit weapons program.

North Korea's Nuclear Program Before Kim Jung Un

The North Korean nuclear program began in the 1950s after the Soviet Union agreed to help develop a research reactor at Yongbyon; this effort produced an operational research reactor in 1967. In 1986 North Korea began operating a 5 Megawatt (MWe) nuclear reactor at Yongbyon with the capability of producing approximately 6 kg of plutonium per year. Despite acquiescing to Soviet pressure and signing the Nuclear Nonproliferation Treaty (NPT) in 1985, by late 1986 evidence began to surface of a "serious clandestine effort" to develop nuclear weapons technology.[1] Evidence included efforts to construct two nuclear reactors (with power outputs of 200 MWe and 50 MWe), intelligence detecting high explosive testing, and identification of a plutonium reprocessing plant used to convert spent plutonium fuel rods into a form useable in a nuclear weapon.[2]

Amidst growing concern of North Korea's nuclear weapons program, North and South Korea agreed on 31 December 1991 to ban nuclear weapons from the Korean Peninsula. The agreement, the "Joint Declaration on the Denuclearization of the Korean Peninsula," stipulated that all nuclear technology on the peninsula be used solely for "peaceful purposes" and that neither side would possess a nuclear fuel reprocessing plant. The initial agreement expressed consent for limited inspections; however, it failed to specify a viable inspection procedure.[3] On 30 January 1992, North Korea signed an accord permitting International Atomic Energy Agency (IAEA) inspectors to examine facilities inside of the DPRK. Notably, North Korea indicated that its Yongbyon nuclear facilities could be included in a list of places for eventual inspections. While the DPRK claimed that Yongbyon housed a research reactor, many believed that it was a key facility in a nuclear weapons program and contained a nuclear fuel reprocessing plant. Despite the initial agreement, North Korea cautioned that it might take six months to ratify the accord in its national legislature, prompting many to worry that the DPRK was using the negotiations to buy time for further nuclear development.[4]

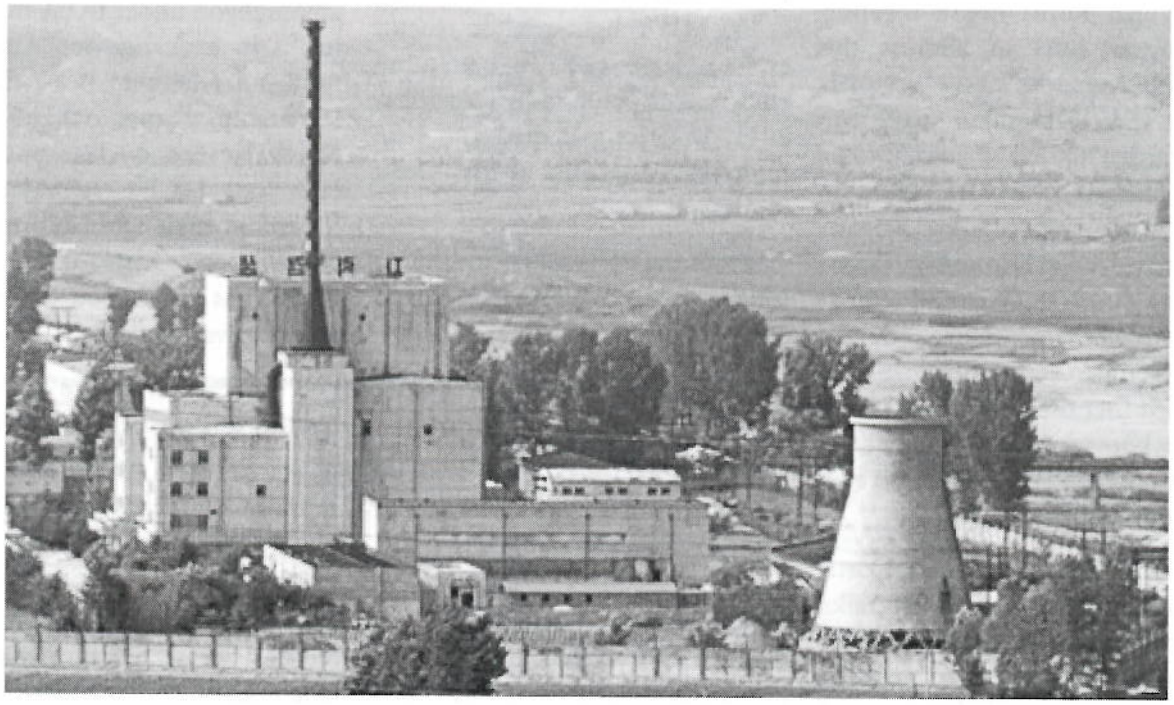
In March 1993, North Korea announced its intent to be the first country to withdraw from the NPT after the United States and the IAEA petitioned for more extensive inspections of DPRK nuclear facilities. In June 1993, amidst substantial international pressure, North Korea decided to "suspend" its treaty withdrawal.[5] In early 1993, North Korea conducted its first successful test of the Nodong 1 midrange missile, which could potentially deliver a chemi-

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cal, biological or nuclear payload.[6] In May 1994, North Korea refused to allow the IAEA to inspect 8,000 fuel rods from its 5 MWe reactor. In response, China cautioned the DPRK that it would not use its UNSC veto authority to halt a first round of US proposed economic sanctions. This led Kim Il Sung to invite former President Jimmy Carter to Pyongyang to negotiate. These efforts and additional negotiations culminated in the Agreed Framework on 21 October 1994.[7]

ity that could threaten American Pacific territories, Japan or South Korea.[8] In exchange for a halt to its nuclear program, the Agreed Framework stipulated that North Korea would receive two 2,000 MWe light water reactors (LWRs) and 500,000 metric tons of heavy oil annually from the United States until the first reactor became operational. Additionally, the United States guaranteed progress towards establishing full diplomatic relations with the DPRK, a pending

ment.[10] Pyongyang's highly enriched uranium (HEU) program dates back to the 1990s and relied upon Pakistani enrichment technology that had been employed at Khan Research Laboratory in the 1980s. It is believed that Pakistan exchanged enrichment technology for North Korean Nodong missiles, which Pakistan later used to develop the Ghauri missile.[11] While the Agreed Framework did not specifically outlaw uranium enrichment, it did call for North



Yongbyon nuclear complex in North Korea

With the Agreed Framework, the Clinton administration aimed to freeze the North Korean nuclear program by preventing further reprocessing of spent plutonium fuel rods, halting construction of the 200 MWe and 50 MWe reactors (the reactors would have the potential to provide enough nuclear material for 30 bombs annually), and precluding Korea from possessing nuclear missile capac-

agreement that the US would not employ nuclear weapons against the DPRK, and elimination of many American imposed economic sanctions.[9]

In 2002, the Agreed Framework collapsed after the United States learned that North Korea had subverted the plutonium focused agreement and had embarked on an alternative route to a nuclear weapon using uranium enrich-

Korea to make progress towards implementing the Joint Declaration on the Denuclearization of the Korean Peninsula that forbade the possession of uranium enrichment facilities.[12] In response, the Bush administration worked with the Korean Peninsula Energy Development Organization (KEDO) to end oil shipments to North Korea in November 2002. North Korea promptly expelled IAEA inspectors, restarted its plutonium based

nuclear reactors, and announced that it would reprocess the 8,000 nuclear fuel rods previously in storage.[13] In January 2003, citing the fuel shipment halt and "charging that the Bush Administration planned a 'pre-emptive nuclear attack,'" North Korea withdrew from the Nuclear Nonproliferation Treaty.

In the wake of the dissolution of the Agreed Framework, delegates from the United States, South Korea, Japan, China, Russia and North Korea began meeting in August 2003 to address the mounting nuclear crisis in North Korea. "In September 2005, the Six Parties issued a Joint Statement on how to achieve verifiable denuclearization of the Korean Peninsula."[14] However, negotiations soon stalled, and North Korea tested its first nuclear device on 9 October 2006. Seismic data revealed that the test yield was less than 1 kiloton, leading many analysts to conclude that the test was only a partial success.[15]

Following its nuclear test, North Korea returned to the six-party talks and in 2007 agreed to a Denuclearization Action Plan that included the disablement and shutdown of some of it "key plutonium production facilities at Yongbyon."[16] Over the next two years, North Korea alternated between bellicose threats and international cooperation. In doing so, the DPRK was able to effectively use a series of promises related to the shutdown of Yongbyon facilities to persuade the United States to resume heavy fuel oil deliveries and remove the DPRK from the American Trading with the Enemy Act (TWEA) and State Sponsors of Terrorism (SST) lists.[17] In April 2009, North Korea halted its deactivation activities at Yongbyon[18] and launched a rocket which violated its ban on long-range missile tests.[19] On 25 May 2009, North Korea announced that it conducted a second underground nuclear test; the second test improved upon the first and achieved an approximate yield of a "few" kilotons.[20] In 2009, North Korea acknowledged the existence of a uranium enrichment program to produce fuel for nuclear power, and in November 2010 North Korea revealed construction on a 100 MWT light-reactor reactor and a new gas centrifuge uranium enrichment plant.[21] In December 2011, Kim Jong Il died and Kim Jong Un was hailed as his "Great Successor."[22]

From the early 1990s until Kim Jong Il's death, North Korea has alternated between apparent international cooperation and vigorous pursuit of nuclear weapons. This discontinuous approach has left a wake of failed international agreements, notably the Joint Declaration on the Denuclearization of the Korean Peninsula, the Agreed Framework, and the six-party talks, and has enabled North Korea to attain nuclear weapons capabilities. Following Kim Jong Un's succession, it is critical to assess whether recent North Korean actions indicate a departure from the DPRK's historic policy of intermittent international cooperation on denuclearization.

Recent Developments

Kim Jong Il, North Korea's "Dear Leader," died on 17 December 2011 and was immediately replaced by "the great successor," his son, Kim Jong Un. Within several weeks, Kim Jong Un became head of the party, state and army. On 29 February 2012, Kim Jong Un undertook his "first major policy move"[23] and "committed North Korea to moratoria on nuclear and long-range missile testing as well as uranium enrichment suspension at Yongbyon under IAEA monitoring"[24] in exchange for American food aid. Despite hope that the leadership change would soften North Korean nuclear posturing, Kim Jong Un has retreated from his initial bout with international cooperation. Instead, the young leader has conducted a series of provocative nuclear actions over the last year, beginning with a failed satellite launch in April 2012 that prompted the collapse of the February 2012 agreement and the suspension of American food aid.[25] North Korea followed the failed April test by placing a 200 pound surveillance satellite into orbit in December 2012. This successful launch indicated that North Korea has cleared some of the hurdles required to develop long-range ballistic missile capabilities. In response to the launch, the United States called upon China to exert greater influence over its ally, threatening that further North

North Korea has alternated between apparent international cooperation and vigorous pursuit of nuclear weapons. This discontinuous approach has left a wake of failed international agreements...

Korean provocation could lead to a greater American military presence in the region.[26] Additionally, the missile test prompted the UNSC to sanction the DPRK for the fifth time since 1993. North Korea threatened the United States and warned South Korea that any attempt to enforce tighter sanctions would prompt "physical countermeasures." Likewise, North Korea declared that it "had no interest in talks on denuclearizing itself and would forge ahead with its missile and weapons development, with the goal of attaining the capability to hit American territory."[27]

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On 12 February 2013, North Korea conducted its long-threatened third nuclear test. The South Korean Ministry of Defense estimates that the weapon attained a yield of between 6 and 7 kilotons. Policymakers worry that this test could be a critical step towards mastering the technology required to make a miniaturized warhead deliverable by ballistic missile.[28] Amidst tightening UN sanctions and routine military drills between South Korea and the United States, the DPRK continued to threaten nuclear attacks against the US and ROK and declared the 1953 armistice that halted the Korean War void.[29] In late March, North Korea cutoff the last military hot line with South Korea and ordered "missile units to be ready to strike the United States and South Korea."[30] In early April, North Korea positioned missiles on its East coast, warned foreign embassies to evacuate their staffs from Pyongyang, removed its workers from the Kaesong industrial park—one of the last remaining symbols of Korean cooperation—and threatened further missile tests and imminent nuclear war.[31] In recent weeks, North Korea has toned down some of its rhetoric and expressed a willingness to negotiate. However, the DPRK has conditioned negotiations on the termination of all joint US and South Korean military exercises and the cessation of the most recent round of United Nations sanctions.[32]

Though the situation remains tense and the future of the Korean nuclear crisis uncertain, recent North Korean actions suggest that Kim Jung Un's succession has done little to alter the DPRK's approach toward nuclear weapons development. Specifically, shortly after assuming power, Kim Jung Un used the promise of greater international cooperation to attain needed American food aid. In short order, North Korea violated these agreements, increased its belligerent rhetoric and tested a third nuclear device. In recent weeks, mounting international pressure has coincided with a more moderate tone out of Pyongyang. The apparent lack of change in the rogue state's approach to nuclear weapons development over the last year and a half is particularly troubling, because, historically, the DPRK's strategy has succeeded; the international community has neither prevented North Korea from attaining nuclear weapons nor mounted a significant challenge to the Kim regime's control.

Motivations for the North Korean Nuclear Program

The North Korean motivation to develop a nuclear capacity is likely aimed at achieving "deterrence [safeguarding national security], international prestige, and coercive diplomacy" rather than attaining a tactical war fighting capability.[33] Correspondingly, Hughes suggests that during the Clinton administration, Pyongyang may have attempted to use its nuclear program to "secure negative security guarantees from the United States and then, during the period of the Bush administration, has been looking to establish a declared nuclear deterrent as a cheap security equalizer against the United States and North Korea's neighbors and the perceived threat of regime change."[34] The DPRK has repeatedly claimed that its nuclear weapons program serves its national security by deterring external threats, most notably in April 2013 when the party congress adopted the "Law on Consolidating Position of Nuclear Weapons State." This statement reaffirmed the alleged deterrent and retaliatory nature of the DPRK's nuclear weapons program.[35]

Hughes asserts that "states may seek nuclear weapons to assert their identity—for domestic or international political consumption—as autonomous nations."[36] Internationally, Denny Roy suggests that the Kim regime has used nuclear weapons to make the outside world "take it

seriously."[37] Furthermore, Pyongyang's nuclear program is certainly aimed at achieving domestic prestige. Accordingly, Hong Yung Lee has argued that "North Korea has credited Kim Jong Il for 'having transformed North Korea into a politically undefeatable and ideologically strong state—an invincible military power in possession of nuclear weapons—that no enemy can touch.'"[38] In this sense, nuclear weapons serve as a means of solidifying a common North Korean identity and reinforcing the legitimacy of the Kim dynasty. Furthermore, Hughes suggests that North Korea's nuclear weapons have enabled it to "extract economic concessions" from the international community, confirming the charge that the DPRK's program aims to utilize "coercive diplomacy." [39] North Korea has often used threatening rhetoric to extort economic concessions, such as in 2008 when it threatened to increase its nuclear capability to protests its position on the US State Sponsor of Terrorism list.[40]

Former American Ambassador to the United Nations Bill Richardson discussed Kim Jong Un's motivations for the most recent incidents of North Korean saber rattling on the 7 April 2013 episode of Meet the Press. Ambassador Richardson asserted that the DPRK's provocative actions are aimed at three audiences: the North Korean generals and the Korean workers party, the North Korean people, and the new South Korean leadership.[41] Efforts to appease the general staff are in recognition of the authority of the generals in controlling the North Korean military, one of the DPRK's most often flexed sources of power.



UN Security Council

Secondly, Ambassador Richardson suggests that Kim Jung Un's recent militancy has been aimed at restoring his legitimacy with the North Korean people after a failed missile test last year. Correspondingly, Roy supports the idea that recent DPRK actions are aimed at bolstering the regime's domestic legitimacy: "if Kim Jong Il gave his country the Bomb, his youngest son, Kim Jong Un, who desperately needs a signature accomplishment, can hope to claim credit for a reliable nuclear missile that could change the game between the DPRK and its adversaries."[42] Lastly, Ambassador Richardson suggests that Kim Jong Un's recent actions have corresponded to leadership changes in South Korea, suggesting that hostile DPRK actions are aimed at testing the response of the new South Korean president.[43]

If North Korean policymakers truly believe that nuclear capability is necessary to safeguard the Kim regime from external threat (which appears likely), then only very substantial, broadly-supported, sustained international pressure (potentially with the threat of military force) has a chance of reversing the DPRK's nuclear program. Recent actions indicate that the DPRK will continue to pursue its successful strategy to further develop nuclear weapons, signifying that the international community must reassess the effectiveness of its current and historic actions to restrain North Korea.

The International Response

The United Nations

North Korea's nuclear program has prompted numerous resolutions and sanctions from the United Nations Security Council over the last two decades. UNSC resolution 825 was passed on 11 May 1993 in response to North Korea's announcement of its intent to withdraw from the NPT. Resolution 825 called upon the "DPRK to reconsider the announcement," to "honour its non-proliferation obligations," and for "all Member States to encourage the DPRK to respond positively to this [UNSC 825] resolution, and encourages them to facilitate a solution."[44] In 2006, the Security Council unanimously adopted resolution 1695

condemning a series of North Korean ballistic missile tests. The resolution further implored the DPRK to avoid actions that could jeopardize the peace and security of the region, to reengage with the six-party talks, to return to the NPT, and to submit to IAEA safeguards.[45] Following North Korea's first nuclear test on 9 October 2006, the Security Council unanimously passed resolution 1718 which reiterated resolution 1695's demands and imposed economic and commercial sanctions against North Korea. Notably, the resolution prohibited the transfer of a wide variety of military equipment, authorized the inspection of North Korean cargo for weapons of mass destruction, and ordered the freeze of foreign financial assets of North Koreans involved in the nuclear program.[46] In response to North Korea's second nuclear test, the UNSC unanimously passed resolution 1874 on 12 June 2009. Resolution 1874 further condemned North Korea's weapons programs, called for its return to the NPT and IAEA safeguards, and increased commercial and economic sanctions, including the expansion of the arms embargo.[47] A year later, the Security Council passed resolution 1928, extending the mandate of a panel of experts charged (created with resolution 1874) with investigating North Korea's nuclear program.[48] Resolution 1985 in June 2011 and resolution 2050 in June 2012 further extended the panel's mandate by an additional year each.[49]

Though the United Nations Security Council has repeatedly reprimanded North Korea for its nuclear and ballistic missiles programs, the North Korean actions since the succession of Kim Jong Un prompted two resolutions in the first three months of 2013 alone. On 22 January 2013, the Security Council adopted resolution 2087 in response to the DPRK's 12 December 2012 satellite launch. The Security Council alleged that this launch utilized ballistic missile technology that violated resolutions 1718 (2006) and 1874 (2009). Additionally, resolution 2087 "reaffirms[ed] its current sanctions measures contained in resolutions 1718 (2006) and 1874 (2009)," demanded that the "DPRK not proceed with any further launches using ballistic missile technology," suspend its missile program, and charged the international community with monitoring North Korea's program and implementing the UN dictates.[50] On 7 March 2013, the UN Security Council unanimously passed resolution 2094, the fifth UNSCR against North Korea for nuclear and ballistic missile programs since 2006, following the DPRK's third nuclear test on 12 February. Resolution 2094 ratcheted up the pressure on North Korea by making some of the existing financial sanctions mandatory, introducing new economic measures aimed at limiting Korean access to hard currency, mandating the interdiction and inspection of all suspicious ships and cargo, and by focusing international efforts on monitoring the activities of North Korean diplomats.[51] Victor Cha and Ellen Kim have indicated that, while resolution 2094 stands out as an increase in severity, it was passed under Chapter 7, Article 41 of the UN Charter, thus limiting its measures to nonmilitary actions. Cha and Kim contend that "a more serious and harsher resolution would have been for the UNSC to invoke Chapter 7, Article 42 under which UN member countries are allowed to use air, sea, or land forces to enforce sanctions."[52]

Though 20 years of United Nation's opposition has not prevented North Korea from developing nuclear weapons, the use of international sanctions has been appropriate given the structural constraints of the Security Council. Over the last two decades, the UNSC has been forced to address the threat to peace and stability posed by North Korea's nuclear weapons program at various stages of development. As with most other actions, the UNSC utilized a gradual approach to the DPRK, ratcheting up sanctions and other punitive measures as the rogue state attained greater and greater weapons capabilities. While this approach may have provided North Korea with the "wiggle room" required to pursue its weapons programs, it is unlikely that drastically stronger measures could have been imposed. As a permanent member of the Security Council, China has veto authority over council resolutions. While China has supported most measures to limit North Korean nuclear developments, China has historically been reticent to impugn its ally (see discussion on the Chinese and North Korean relationship below). Accordingly, as the sanctions have generally made it more difficult for the DPRK to pursue its weapons programs, and it is unlikely that significantly "stronger" UNSC resolutions could have been passed any earlier, this author must conclude that the international community (acting through the UNSC) has generally responded appropriately to North Korea's

nuclear developments. However, if the new round of "harsher" sanctions fail to compel North Korea to abandon its nuclear program, it may be necessary for the UNSC to invoke Chapter 7, Article 42. Notably, such an action would still require Chinese consent.

none of the principle drivers of nuclear programs, national security, prestige... were sufficient to push Japan, South Korea, or Taiwan towards an active nuclear weapons program... the 'common factor influencing and restraining all of the potential drivers for nuclear proliferation [in this region] is the stance of the United States.'

Geopolitics and the Regional Balance

While the United Nations Security Council has responded to North Korean actions in order to maintain regional peace and stability and to limit further nuclear proliferation (within Northeast Asia and beyond), a brief look at the regional balance of power related to North and South Korea, China, Japan, and Taiwan illustrates the potential dangers of the DPRK's weapons program and the importance of further international action. Chiefly, foreign policymakers worry that the proliferation of nuclear material out of Korea could set a dangerous precedent that might embolden other states to seek nuclear material from abroad.

Many foreign policy thinkers have long held that the unbridled pursuit and maintenance of nuclear weapons by North Korea could lead to a "nuclear cascade" throughout much of Northeast Asia. "This 'nuclear cascade' might begin with Japan reconsidering its nuclear option, closely followed by South Korea reacting to the change of stance by both North Korea and Japan."[53] Furthermore, the nuclearization of Japan and the Korean Peninsula could prompt China to upgrade its nuclear capabilities and doctrine which could then trigger Taiwan to reassess its nuclear weapons options.[54] In 2007 Christopher Hughes analyzed the likelihood that any of the states surrounding North Korea would reconsider their nuclear stance in relation to advances in North Korean nuclear technology. He concluded that none of the principle drivers of nuclear programs, national security, prestige, identity and norms, domestic political economy, or technological capability, were sufficient to push Japan, South Korea, or Taiwan towards an active nuclear weapons program at that time.[55] However, Hughes determined that the "common factor influencing and restraining all of the potential drivers for nuclear proliferation [in this region] is the stance of the United States."[56]

Hughes contends that national security is typically the primary driver of nuclear proliferation; states seek nuclear weapons to address security dilemmas arising from an existential threat and to restore the balance of power. Correspondingly, national security dilemmas are related to alliance dilemmas as motivations for nuclear proliferation. States may fear the alliance dilemmas of "abandonment" or "entrapment." Abandonment occurs when a state doubts the reliability of the security guarantee provided by an ally and entrapment when a state fears being implicated in the aggressive policies of an ally.[57] To address these potential problems and dissuade Northeast Asian states from proliferating, Hughes recommends that the United States upgrade its alliances and reassert its nuclear guarantees while minimizing military doctrine involving preemption.[58] He argues that the United States must confront the security dilemma by helping to upgrade the conventional capabilities of its Northeast Asian allies; with greater conventional capabilities, American allies in the region will be able to confront North Korean threats without resorting to a nuclear equalizer. Additionally, the United States must maintain a sizeable troop presence in the region and reaffirm its commitment to providing a nuclear umbrella for Japan and South Korea to combat feelings of "abandonment." Furthermore, by emphasizing deterrence over pre-emption, the United States can alleviate potential feelings of "entrapment," whereby allies are persuaded to seek nuclear weapons in order to escape the security umbrella provided by an overeager United States.[59]

The previous discussion on the nuclear balance in Northeast Asia has assumed that greater proliferation would have a destabilizing effect on the region; however, Denny Roy from the East-West

Center has argued that: though the world is generally more stable with fewer nuclear weapons states, the introduction of nuclear weapons into South Korea could have a "constructive influence on international security."[60] Roy suggests that South Korea should cite "extraordinary events" that threaten national security and respond to North Korean threats by withdrawing from the NPT. South Korea should then launch a program that will parallel North Korean weapon developments while maintaining a commitment to the mutual denuclearization of the Korean Peninsula. Simultaneously, the United States should modify its nonproliferation policy to tolerate proliferation to peaceful countries facing threats from a nuclear armed rogue state.[61] Roy argues that this approach would deter North Korean aggression and demonstrate that their nuclear policy will only worsen their security vis-à-vis South Korea. Additionally, a South Korean nuclear capacity would "close the credibility gap in the US-ROK alliance," severing South Korea's reliance on America's nuclear umbrella.[62] Moreover, Roy contends that this move would "signal to Beijing that the cost of failing to discipline their client state [North Korea] is rising dramatically," prompting the Chinese to put greater pressure on North Korea to relinquish its nuclear arsenal.[63]

Roy agrees that regional nuclear proliferation throughout Northeast Asia could have a destabilizing effect. However, he asserts that by emphasizing the transient and expedient nature of the South Korean program, the United States and the ROK could prevent Japan from acquiring a weapon.[64] It is this author's assessment that Roy's proposal dangerously assumes that other states in Northeast Asia can be convinced to acquiesce to South Korea's rise as a nuclear power without pursuing their own programs. While this may be the case, it seems far from certain and has the potential to compound the already extensive challenge of maintaining a regional balance of power in Northeast Asia. Lastly, as the threshold for "extraordinary events" is not clearly defined, international acceptance of South Korea's withdrawal from the NPT could embolden other nations, such as Iran, to do the same. The threat of regional destabilization as a result of nuclear proliferation in Northeast Asia underscores the need for the global community to effectively thwart the DPRK's nuclear ambitions.

China and North Korea

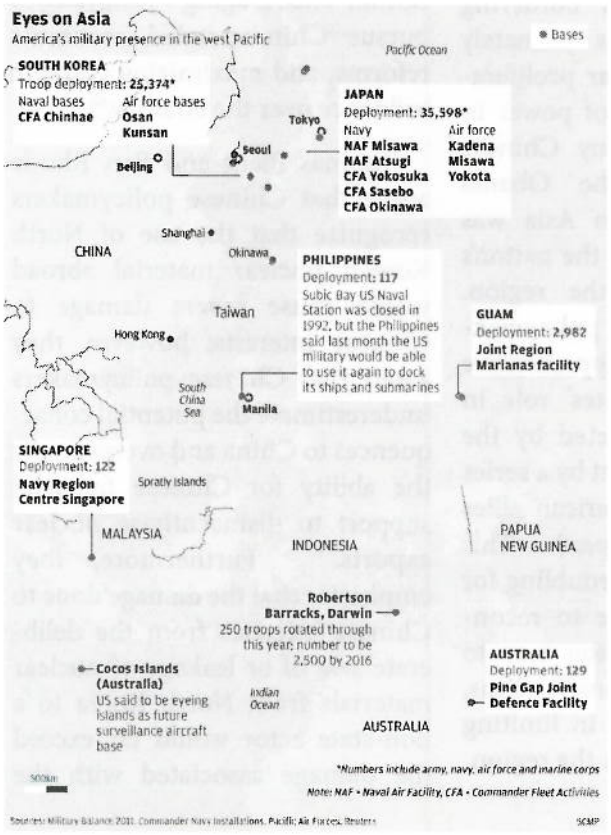
As a global power bordering North Korea, China is intimately concerned with nuclear proliferation and the balance of power in Northeast Asia. Many Chinese policymakers feel the Obama administration's tilt to Asia was directed at containing the nation's rising influence in the region. Accordingly, Chinese policymakers who are already apprehensive about the United States' role in the region are disquieted by the thought of encirclement by a series of nuclear-armed American allies (South Korea and Japan). This could be particularly troubling for China, if Taiwan were to reconsider its 1960s decision not to pursue nuclear weapons.[65] Thus, China has an interest in limiting nuclear proliferation in the region.

Chinese concerns over limiting regional proliferation are counterbalanced by China's traditional interest in maintaining a stable communist North Korea. China worries that the collapse of North Korea could lead to a flood of refugees entering northern China and to a reunified Korean Peninsula.[66] A unified Korean Peninsula controlled by Seoul and allied with the United States is deeply alarming for China. This anxiety is compounded by the prospect of American troops stationed at China's Korean border. Ultimately, Beijing harbors a deep seeded fear of "territorial vulnerability" stemming from "memories of Japan's invasion of China via the Korean Peninsula."[67] Currently, North Korea serves as a Chinese client state; China provides necessary trade and investment with the hope of promoting regime stability, "reduce[ing] any incentive to extort aid through military provocation," encouraging Pyongyang to pursue Chinese-styled economic reforms, and maximizing Chinese influence over the country.[68]

Thomas Plant and Ben Rhode argue that Chinese policymakers recognize that the use of North Korean nuclear material abroad would cause severe damage to Chinese interests; however, they assert that Chinese policymakers underestimate the potential consequences to China and overestimate the ability for Chinese financial support to disincentivize nuclear exports.[69] Furthermore, they emphasize that the damage done to Chinese interests from the deliberate sale of or leakage of nuclear materials from North Korea to a non-state actor would far exceed the damage associated with the

collapse of the Kim regime.[70] In the case of the use of North Korean nuclear material abroad, it is likely that the victimized state would find itself compelled to retaliate against the DPRK, leading to a potentially devastating war in Asia. China would likely suffer from refugee flows, economic dislocation and the possibility of an unintentional war with the United States on the Korean Peninsula.[71]

Despite China's interest in limiting North Korean nuclear ambitions, some Chinese policymakers argue that Chinese leverage over its Korean ally is greatly exaggerated. Contrarily, Plant and Rhode maintain that China has constituted approximately 20-30% of North Korea's foreign trade for the last decade and more than 50% since 2011. Additionally, North Korea is dependent on China for most of its imported oil needs (potentially almost 100%).[72]



Over the last two decades, China has generally opposed North Korea's nuclear program by reluctantly supporting the UNSC resolutions aimed at inhibiting the DPRK's programs. Over the last several months, "China has been discomfited by the behavior of the North's leader, Kim Jong Un, but it has refrained from making pronouncements that would signal what, if anything, it planned to do to rein in North Korea."[73] Thankfully, China has reluctantly supported the most recent rounds of UN sanctions. China must recognize and accept that it has substantial interests in limiting North Korean proliferation. Accordingly, this author agrees with American foreign policy leaders, such as Senator John McCain, who have urged China to use its substantial economic leverage to pressure North Korea to accept a more conciliatory approach.[74]

American Interests

During its first term, the Obama administration highlighted American interests in Northeast Asia by announcing a diplomatic and military pivot toward Asia. Suzanne DiMaggio, vice president of Global Policy Programs at the Asia Society asserts that "the US sees the pivot toward Asia as a way to counterbalance China's growing influence in the region."[75] Kurt Campbell, Assistance Secretary of State for East Asian and Pacific Affairs stated that "it is clear that America's success in the 21st century is tied to the success of the dynamic Asia-Pacific region."[76] Accordingly, Campbell reinforced the importance of the trilateral coordination between the United States, Japan and the Republic of Korea in maintaining "peace and stability" in Northeast Asia and in responding to North Korea's "destabilizing policies and provocations."[77]

More tangibly, the United States maintains a significant military presence that is potentially vulnerable to North Korean military attacks, including forces in Japan, Guam, and South Korea. While it is unlikely that North Korean nuclear weapons have the capability to hit American bases in Guam, Hawaii or the mainland, it is estimated that North Korea has the ability to devastate Seoul with conventional artillery and possibly overrun South Korea, threatening the 30,000 American personnel stationed in the South.[78] While there is little question that the United States and South Korea would be able to counter a DPRK invasion, in the first days, it is likely that there would be heavy American and South Korean loses.[79] Amitai Etzioni contends that "Kim Jong Un has [the United States] over a barrel." If he were to initiate an attack, the United States would be "left with very few and very tough options: either using nuclear arms or engaging in a large-scale conventional war, drawing on our worn-out army in a faraway country—all this just as our [the American] economy requires retrenching."[80]

In addition to damaging nonproliferation efforts in Northeast

Asia, a failure of the United States and the international community to appropriately respond to North Korea could inflict irreparable damage to the NPT. Lee argues that "Pyongyang wants to be recognized as a de facto nuclear power so that it can bargain with Washington on equal terms. But legitimizing North Korea's nuclear capability would mean the end to the international non-proliferation treaty. This, in turn, would be tantamount to admitting that the protracted US-North Korean talks, including all agreements reached since 1994, have been essentially futile."[81] Representative Tom Cotton illuminated this issue when speaking to the House of Representatives on 15 February 2013, following North Korea's third nuclear test. Cotton argued that the current problem related to containing nuclear North Korea is a bellwether of the challenges that will be faced if Iran is allowed to obtain nuclear weapons.[82] Moreover, by failing to stop North Korea's nuclear weapons program, countries such as Iran may be emboldened to pursue their own weapons programs without fear of international repercussions.

In addition to encouraging other states to pursue nuclear weapons, North Korea's willingness to sell whatever to whomever will pay for it, including conventional weapons, counterfeit pharmaceuticals, narcotics, counterfeit currency, and ballistic missiles, worries American policymakers who fear that North Korea will assist other states or non-state actors in attaining nuclear weapons technology. In fact, North Korea has a history of proliferation; Pyongyang sold slightly enriched uranium hexafluoride to Libya and reactor technology to Syria.[83] However, "on neither occasion was Pyongyang directly punished or held accountable for its actions. North Korean decision-makers thus recognize that their nuclear expertise and technologies can be used as trade goods."[84] While Plant and Rhode note that North Korea's history of nuclear proliferation indicates that the DPRK would be unlikely to export nuclear technology directly to non-state actors or terrorist groups (due to the greater likelihood of international repercussions and the inability for most groups to access the sufficient level of funds),[85] they maintain that the international community should still be worried about potential nuclear transfer to terrorist groups. Firstly, as North Korea's nuclear stockpile increases, Plant and Rhode caution that it may become easier for unauthorized actors within the government to sell nuclear material to non-state actors. Secondly, terrorist groups, such as Hezbollah working through Iran, could obtain nuclear materials indirectly through another state's purchase of DPRK technology.[86]

The United States is chiefly concerned with North Korea's nuclear program because North Korean actions pose a threat to regional stability and peace, the DPRK has directly threatened American assets, and a failure to restrain North Korea could undermine the NPT, resulting in greater regional and global proliferation. Given the United States' role as a world leader and its substantial interest in limiting Korean proliferation, it is necessary to examine the effectiveness of the American response to the DPRK's most recent provocations.

the United States military responded to DPRK threats of nuclear attack on Guam, Hawaii and the US mainland by announcing the deployment of the Terminal High Altitude Area Defense System (THAAD) ballistic missile defense shield to Guam.

The American Response

Historically, the United States has opposed the North Korean nuclear weapons program using a mixture of negotiations, economic sanctions and international pressure. Following North Korea's most recent nuclear test, the United States proceeded with its annual joint military exercises with South Korea, known as "Foal Eagle," in March 2013. American commanders in Korea have described the drills as "designed to improve the alliance's readiness to defend the Republic of Korea."[87] Contrarily, North Korea alleged that the operations aimed at preparing for an invasion of the DPRK. Over the course of the two month long exercises, North Korea nullified the 1953 Korean War truce, shut down its military hotlines to South Korea, ordered its missile forces to the ready, threatened to restart the Yongbyon reactors and closed the Kaesong industrial complex.[88] In addition to utilizing over 10,000 American troops, the United States flew 2 B-2 and 2 B-52 nuclear capable bombers over South Korea during the exercises, "underscoring Washington's commitment to defend its ally amid rising

tensions with North Korea."[89]

Secretary of Defense Chuck Hagel announced on 15 March 2013 that the United States would increase the number of ground-based ballistic-missile interceptors positioned along America's Pacific Coast from 33 from 44 by 2017.[90] Subsequently, on 3 April 2013 the United States military responded to DPRK threats of nuclear attack on Guam, Hawaii and the US mainland by announcing the deployment of the Terminal High Altitude Area Defense System (THAAD) ballistic missile defense shield to Guam. In addition to the THAAD truck-mounted missile interceptors, the United States positioned the destroyer USS John McCain (with ballistic missile intercept capability) off the Korean Peninsula.[91] The Pentagon indicated the deployment would "strengthen our [the United States'] regional defense posture against the North Korean regional ballistic missile threat".[92] Similarly, on 3 May the US Navy confirmed that the Nimitz Strike Group, led by the USS Nimitz aircraft carrier, joined the US 7th fleet off the coast of the Korean Peninsula to participate in a series of exercises with the ROK Navy.[93]

In mid-April Secretary of State John Kerry traveled throughout Asia, meeting with South Korean, Chinese and Japanese leaders. Secretary Kerry confirmed the United States' security commitment to its Asian allies and urged Chinese leaders to increase pressure on North Korea to denuclearize. Meanwhile, President Obama canceled several planned military exercises to diffuse tension in the region. Secretary Kerry continued to call on North Korea to cease further ballistic missile tests and pressed the DPRK to commit to denuclearization and return to the negotiating table.[94] The United States has advised North Korea to avoid any actions that could provoke a devastating miscalculation in the hopes of safeguarding the interests of all parties in the region.[95]

American actions in response to North Korea's recent provocations have been largely appropriate. First, it is important that the United States reaffirmed its commitment to its regional allies and increased its military assets in the region (notably anti-ballistic missile defense assets). This will help to restrain American allies from pursing their own nuclear programs. Second, the United States has continually reaffirmed its commitment to negotiations. This is essential to help provide North Korea with a potential avenue to diffuse tension while also serving as a prerequisite to more drastic actions; only after the United States has exhausted its diplomatic options will it have enough international credibility to develop broad-based international support for military action. Lastly and most importantly, the United States has appropriately urged China to put great pressure on North Korea to abandon its weapons program. Etzioni agrees, arguing that the best avenue for the United States to limit proliferation in Northeast Asia is to pressure China toward exploiting its leverage over North Korea to "defang" its nuclear program. He suggests that this could be accomplished by guaranteeing China that the US would not move troops beyond the demilitarized zone if North Korea were to implode.[96] This author is skeptical that the United States would make such a guarantee. Rather, it would likely be more fruitful for the United States to stress the damage to Chinese interests that could result from North Korean proliferation activities.

Conclusion

North Korea's most recent nuclear posturing suggests that the DPRK under Kim Jong Un will continue the country's successful policy of alternating between international cooperation and nuclear provocation to further its nuclear program. North Korea's nuclear ambitions appear to be driven by a desire to elevate its international status, attain a nuclear deterrent to protect from external regime change and to solidify domestic support. Because the regime has linked its survival to nuclear weapons, it is likely that drastic means will be required to reverse the DPRK's nuclear program.

In an attempt to preserve international norms and protect peace and security, the UNSC has issued a series of resolutions condemning North Korean nuclear weapons development since 1993. While ineffectual, this policy was appropriate given the constraints imposed by Chinese membership on the Security Council. Regionally, it is necessary to restrain North Korea's nuclear weapons program to prevent the proliferation of nuclear weapons throughout Northeast Asia and to maintain regional stability. As North Korea's benefactor and neighbor, China must recognize that nuclear proliferation by the DPRK would likely have a greater impact on Chinese interests than the feared collapse of

the Kim regime.

As a Pacific power with far-reaching economic and military interests in Asia, the United States has been intimately involved with the current North Korean nuclear crisis. The United States worries that North Korean actions could undermine international nonproliferation norms and make it more difficult to restrain other "rogue" states, such as Iran, from attaining nuclear weapons. To counter recent North Korean threats, the United States has appropriately worked to reassure its allies of American security guarantees, has increased its military presence in the regions, and has pushed for further negotiations with the DPRK. However, due to China's membership on the Security Council and close economic relationship with North Korea, China is likely the key to resolving the North Korean nuclear crisis. Accordingly, the United States must continue to pressure the Chinese to use their leverage with North Korea to work towards eventual denuclearization of the Korean Peninsula.

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Nuclear Patience

Charting A New Course for the Iranian Nuclear Crisis

KEVIN BEAUCHEMIN REUBEN LUOMA-OVERSTREET

Don't worry, about a thing,
'cause every little thing,
gonna be alright.
-Bob Marley

In the world of crisis management, waiting is always the least fashionable option. Crises lead to panic, and panic leads to a demand for immediate action, which often results in misjudgment and lasting failure. The United States' desire for a quick solution to the Iranian nuclear crisis has unwittingly resulted in divergent strategies which have failed to produce the desired end state. The West is desperately in need of a single, coherent, and sustainable policy for engaging Tehran on the nuclear issue. We propose a policy of "Nuclear Patience." This strategy is comprised of a single, defined red line, tiered economic sanctions, a credible military option, and a willingness to forego the active pursuit of regime change. We believe this policy provides the international community with the most potent option for eliminating Iran's nuclear ambitions.

The Role of Red Lines

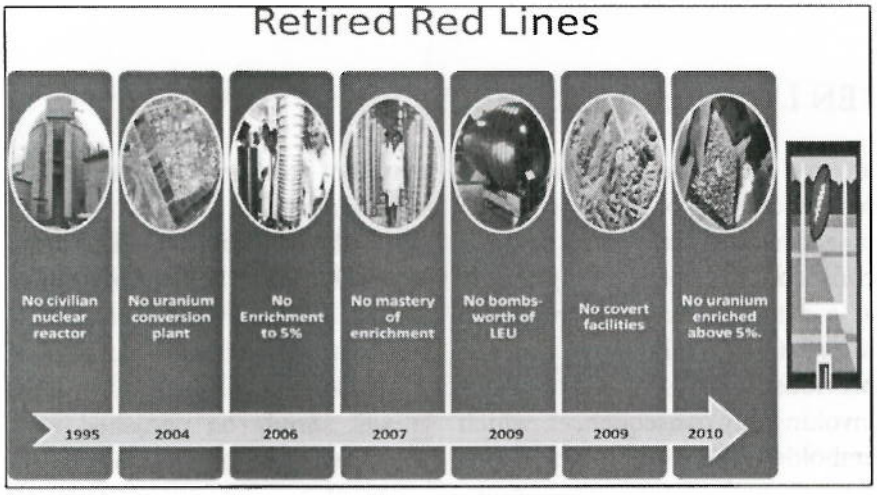
Red lines play an integral role in any strategy for deterring Iranian nuclear development. In order for any red line to be effective it must be well defined, based upon a clear objective, and have clear negative consequences strong enough to act as a deterrent. Iran has managed to cross practically every red line previously set by the West without invoking any consequences, which emboldens the country when confronted with future ultimatums. Other complicating factors include how the regime in Tehran views US actions towards red lines set in other countries, most recently North Korea and Syria. In order to develop our own red line strategy, we first look to the western precedent set over the last two decades.

Although analysts have found it fashionable in recent years to proclaim that President Obama has set a true red line, Tehran does not share this belief.[1] Simply put, no red line will be effective unless the Iranian government has a convincing reason to believe the United States will enforce it. Iran is not short on supporting evidence for its belief that American-set red lines lack legitimacy. The most practical example Tehran can look to is the red line the Bush administration set for North Korea in the early 2000s which barred the DPRK from conducting any nuclear testing.[2] The Koreans defied that red line in 2006 by conducting a test and were hit with another round of economic and diplomatic sanctions.[3] The same occurred after North Korea's nuclear tests in 2009 and 2013. Looking to the North Korean example, the West has functionally told Iran that if it crosses future nuclear red lines it will simply be punished with increased sanctions which the government may be willing to absorb if it means acquiring and testing a functional weapon.

Another problem with the current strategy for setting red lines has been the exceedingly liberal use of the term 'red line' in recent diplomacy. In 2012, President Obama stepped up to the microphone and proclaimed with regard to Bashar al-Assad's regime in Syria that "a red line for us is if we start seeing a whole bunch of chemical weapons moving around or being utilized" and that Assad would be "held accountable by the international community" if chemical weapons were used.[4] Given the recent allegations of chemical warfare in Syria, the American administration has been put in a tough position. The situation in Syria is complicated, with each side

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blaming the other for the use of chemical weapons, and the international community is currently bogged down in an attempt to determine the truth of the matter. Tehran is watching the situation very carefully, and will likely base future judgments regarding its own red lines upon the response to any finding in Syria. The western response in Syria will strongly influence Iranian perception as to whether current red lines carry legitimacy, or if they have further devolved into mere rhetorical bluster.



Retired Red Lines, Source: Allison, 2012.

Add these examples to Iran's own experience with western red lines, and it is easy to see why they tend to ignore such pronouncements. In a presentation for the Aspen Strategy Group in August 2012, Graham Allison outlined a series of what he called "Retired Red Lines." These retired red lines constitute former technical thresholds which the West deemed Iran must not cross.[5] They are retired, of course, because each was achieved by the Iranian nuclear program at some point in the past. In each case the violation of a red line was met with either a new round of economic sanctions or a stern warning and a new red line further down the technological road. With that in mind, it is easy to understand why Mahmoud Ahmadinejad would chide the United States with words like these, "We say to you today that you are in a position of weakness. Your hands are empty, and you can no longer promote your interests from a position of strength."[6] From the Iranian perspective, Washington is unwilling to follow through on its red lines, rendering them practically useless.

A Line in the Sand

With these factors in mind, we propose a new red line strategy. Rather than defining intermediate red lines which the USG and international community have been reluctant to provide with teeth, we believe in setting a single red line which will serve as the final ultimatum. Iran shall not develop a nuclear weapon, regardless of any formal declaration of its existence or test thereof. This includes the development of the individual components necessary for the construction of a weapon. If Iran does develop a nuclear weapon then it will face invasion, destruction of any nuclear capability, and its government will be answerable to the United Nations and International Court of Criminal Justice for violating its obligation under the Nuclear Non-Proliferation treaty. When the United States invaded Iraq in 2003, Iran halted development of its nuclear weapons program out of fear that it might be invaded next.[7] Putting invasion by an international coalition on the table as the final response to Iran crossing the nuclear threshold, will deter Tehran through the only method which has proved effective in the past.

The goal of setting this red line is to convince Iran that it will be safer without a nuclear weapon than with one. Looking to Libya as an example, Khamenei believes that the fate of Iran without a bomb is particularly grim.[8] The United States must make it clear that regime change is not a goal, assuming Iran refrains from building a nuclear weapon. In so doing, the West gives Tehran the option of choosing not to develop weapons without fearing an invasion. Iran already has the knowledge and technical infrastructure to enrich uranium, and that fact is not going to change. Reserving an invasion or kinetic action for weapons construction while utilizing a system of economic sanctions proportionate to enrichment violations allows the West to make a clear distinction between the two activities and provide Iran a way out. As Robert Litwak has stated, uncertainty in our own system of red lines has led to ambiguity on behalf of the Iranian regime.[9] Our red line plan attempts to eliminate that

ambiguity

Why the West CanWait

Ultimately, history has shown that western estimates of Iranian progress along the nuclear timeline have been consistently exaggerated. Like the boy who cried wolf, the West cannot afford to continue overestimating Iranian nuclear capabilities. This consistent alarmism has cost the United States dearly in terms of global cooperation and credibility on the Iranian issue. China and Russia have begun to turn away from American leadership on the Iranian issue by backing off on sanctions due to this loss of faith in the West. The United States and Israel have continuously overestimated Tehran's nuclear program for the last twenty years; since Israel first estimated in 1992 that Iran would achieve a nuclear bomb by 1999, American and Israeli estimates have been revised multiple times, always placing Iran a short time away from nuclear weapons.[10] There are political, institutional, and social reasons as to why the United States has trended towards threat construction, but the US must recognize and counteract these considerations in order to maintain any sort of international coalition on the Iranian issue.

The Republican Party in the US has long benefitted from the perception that it takes a tough stance on foreign military threats. Given this platform, it benefits the Republicans to play up the international threat posed by Iran in an American society which demands tough action against foreign threats.[11] The American political system also forces the Democrats to hype up the Iranian issue and take a tougher political stance in order not to appear weak. There is no easy way out of this vicious political circle unless politicians are willing and able to reach across the aisle and take bipartisan action to downplay the threat. Furthermore, there are powerful bureaucratic and institutional interests which play up the threat posed by Iran and ultimately emphasize military solutions to the problem. The State Department budget pales in comparison to the military and intelligence budgets and a powerful infrastructure made up of contractors, lobbies, and think tanks is intertwined into the national security bureaucracy of the United States.[12] These institutions naturally benefit from playing up military solutions to the Iranian problem and emphasizing the gravity of the problem. Additionally, the emphasis on the military aspects of the Iranian question serves to radicalize the Iranian government, which sees an ever-escalating discourse of hard power from the United States. Finally, this increased military emphasis also entrenches warnings about the violent effects of attempting to rebalance foreign policy.[13]

The United States must realize these institutional biases towards the militarization of the Iranian problem and attempt to refocus its calculations away from an exaggerative discourse. The ultimate method for analyzing the Iranian nuclear timeline must account for the socio-political state of Iran and attempt to calibrate for western biases. This is why we suggest that a single, tangible redline clearly delineated at obtaining a nuclear weapon is a crucial part of nuclear patience. Estimates and speculations may be skewed by these biases, but our proposal offers an empirical method of determining whether that red line has been crossed. The United States must ultimately rely on tangible evidence rather than political bluster and institutional recommendations to decide whether action should be taken against Iran.

Recently revised Israeli estimates now put an Iranian bomb between two and three years out.

Israel was recently embarrassed in the light of new intelligence estimates on Iran's timeline to the bomb. During the recent Israeli elections, Netanyahu played up the immediacy and danger of the Iranian bomb, warning that "D-Day might come as early as 2013."[14] Recently revised Israeli estimates now put an Iranian bomb between two and three years out. This intelligence failure is far from an isolated occurrence, and American intelligence agencies have similarly overestimated Iranian capabilities. One of the largest reasons for these miscalculations is a consistent failure to account for the realities of Iranian society and politics.[15]

The West must revise its models of Iranian proliferation to account for the organizational aspects unique to Iranian government and society.[16] Iraq provides an interesting case study for the setbacks a nuclear program often suffers in a society rife with a variety of political agendas and heavy top-down management. When Saddam's son-in-law, Kamel al-Majid, took over the Iraqi nuclear program, he forced scientists to compete against

each other, resulting in work duplication rather than healthy competition.[17] When Kamel became frustrated with the lack of progress on the program he mothballed entire portions and restarted them.[18] The case of Libya also provides an example of a government structure similar to Iran's. History has shown that Libya was not able to develop nuclear weapons despite extensive help from the A.Q. Khan Network and thirty years of effort due to these organizational constraints.[19]

Jacques Hymans argued in a May 2012 article in *Foreign Affairs* that nuclear research relies heavily on "intense commitment, creative thinking, and a shared spirit of cooperation."[20] The United States and Israel must consider the setbacks and delays caused by the lack of a productive scientific environment for their models of the Iranian nuclear timeframe. A year after Netanyahu's dire predictions about Iran, Israel has been forced to revise its nuclear estimates once more; it seems certain that the West has failed to account for critical political and social factors in Iranian government and society. Simply put, American and Israeli estimates have been based on theoretical timelines influenced by alarmist political, institutional, and social factors which fail to account for the realities of Iranian society. The longer the West continues along this alarmist path, the more it will lose international support and credibility on the Iranian issue. The West must recognize these important considerations and ensure it does not cry wolf any more.

The military establishment justifies its heavy focus on the Iranian nuclear threat by arguing that the potential effects of an Iranian nuclear bomb would be devastating for the world as a whole. While we agree that it would not be good if Iran were to obtain a nuclear bomb, we contend that the United States is in a powerful position to take military action if it becomes necessary. The US has a massive presence around Iran, with at least 40,000 troops in the Persian Gulf and thousands more in Afghanistan and Central Asia.[21] These numbers are already greater than the troops used to deter the DPRK and would provide a strong base for an attack on Iran.

Dramatic increases in intelligence-gathering technology practically assure that the US would have sufficient notice before Iran obtained a nuclear weapon. Additionally, the best estimates indicate that Iran would have to rely on currently declared facilities under IAEA auspices to develop the enriched uranium needed for a nuclear weapon and it is highly unlikely that Iran could have hidden enrichment facilities from the outside world for so long. Even if they could hide these facilities, they would still be plagued by the technical difficulties observed at the Natanz and Qom sites.[22] Moreover, in the event that Iran developed nuclear weapons, the United States could almost certainly count on regional support from other countries that do not want to see Iran become a nuclear power. Ultimately, the United States can count on sufficient time and resources to counteract Iran if it decides to cross the nuclear threshold.

Finally, there is no reason to believe that Iran will go ahead with its attempt to build nuclear weapons if the United States engages with them in a measured and patient manner. There is nothing to show that Ayatollah Ali Khamenei has made the final decision to develop nuclear weapons.[23] Additionally, the United States has demonstrated a willingness to engage in military action through recent events such as the surge in Afghanistan, the air campaign in Libya, and the strike on Bin Laden.[24] These events would act as deterrents to Iran, and would at least force caution on its path to a nuclear weapon.

Sanctions: A Strategy of Patience

Economic sanctions have been one of the most effective diplomatic measures with regard to punishing Iran for proceeding along the developmental path to a nuclear bomb. The evidence that sanctions are having some success is, ostensibly at least, the fact that Iran has been willing to talk about its nuclear program with the P5-plus-1 council. For a fifteen month period after January 2011, Iran refused to even consider discussing its program until the P5-plus-1 affirmed Tehran's right to enrich uranium. Then in March of 2012, after damaging new rounds of sanctions were enacted, Iran put its nuclear program back on the table for discussion at a series of talks in Istanbul.[25] It has been argued that sanctions will not bring a resolution to the conflict, but if they can cause a change in the dynamic of Iran's negotiating strategy they are worth a deeper look.

Economic sanctions imposed against the Islamic Republic by the United States are not new. Sanctions against Iran have been a

popular diplomatic weapon in the West since the late 1970s and have been imposed for various reasons throughout the Islamic Revolution, Iranian Hostage Crisis, Iran-Iraq War, the Global War on Terror, and, most recently, in an attempt to deter Iranian nuclear development.[26] Since 2003, the European Union, United Nations, and United States have made decrees limiting Iran's ability to engage in the international marketplace.[27] The majority of these sanctions have focused on petrochemical exports, foreign investment in construction and industrial development, individuals with alleged human rights violations, trade of technology (especially dual-use components), transfer of funds through world banking organizations, and access to the marketplace for organizations associated with terrorists.[28]

While the ultimate effect of these sanctions on diplomacy has been debated, the role they have played in Iran's economic downturn is certain. In 2012, Iran's economy contracted by 1.1% of GDP and encountered deflation of roughly 21%; it also ran a budget deficit of about 6% of GDP. Most notably, perhaps, Iran's oil production has declined by nearly one-million barrels per day over the past decade.[29] While the rising price of oil has helped keep Iran's economy afloat in spite of ongoing sanctions, Iran is incapable of boosting its production without more foreign investment and its economy has begun to stagnate.[30]

But what does it all mean? For the most part sanctions are affecting the quality of life for the average Iranian. It is believed that economic downturn helped fuel the street riots in 2009, and gasoline shortages led to rations which infuriated the masses in 2007. While Iran is flush with crude oil, its limited domestic refining capability requires it to import as much as forty-percent of its gasoline supply.[31] In our opinion, the best route for economic sanctions would be to target Iran's ability to import foreign gasoline. *The Economist* recently reported that Iranian oil traders are managing to dodge economic sanctions—with difficulties that result in a loss of about thirty-percent of their revenue—by falsifying documents or transferring crude to tankers affiliated with other countries. Additionally, the few banks that find it worthwhile to deal with Iranian oil traders are able to charge roughly five-percent on each transaction, as opposed to the normal rate of a few fractions of a percent.[32] If Iranians are willing to take such costly routes to continue trading, so be it. The economic results are still obvious, and by targeting gasoline imports the international community can impose real hardships on the Iranian people and the regime. In the past, a common argument amongst the Iranian population has been that a nuclear program is simply not worthwhile economically and the regime is to blame for the downturn as a result of its continued pursuit of nuclear weapons.[33] If gasoline prices and rationing increase, then the people may become angry enough to demand the money be redirected to refining capability, or that the nuclear program be abandoned to relieve sanctions. By dividing the people and the regime, sanctions may help accomplish the goal of disbanding the program.

The most viable objection to the use of economic sanctions is that the current strategy "offers no viable endgame for dealing with Iran's current leadership. The impression that the sanctions are permanent—indeed, the [new] law does not specify any conditions that Tehran might satisfy in order to lift the siege on its central bank—conforms to the Iranian hard-liners' darkest delusions about Washington's intentions."[34] But that can be rectified. Rather than engaging in the traditional model which rewards Iran with reduced sanctions every time it comes to the negotiating table—a method which encourages half-hearted gestures on Tehran's part—we should provide a simple statement outlining levels of sanctions for various levels of uranium enrichment. If Iran continues to enrich to medium or high levels, the sanctions tighten; if the regime converts its medium-enriched uranium back below 5 percent, sanctions are reduced, and so forth. Providing a tiered system which relies on reductions in enrichment, while still acknowledging Iran's technical capability to enrich, will provide Iran with an exit strategy and a way to appease its population without appearing weak. In the words of former Secretary of Defense, Robert Gates, "If there is enough economic pressure placed on Iran, diplomacy can provide them with an open door through which they can walk if they choose to change their policies."[35]

It is true that economic sanctions alone will not fully deter weapons development if Iran believes the current economic downturn is worth the perceived security of possessing a nuclear bomb. But

we have already attempted to eliminate that perceived security increase through our red line strategy. While economic sanctions take time to work, it appears that they are beginning to have tangible effects. By boosting sanctions on gasoline imports, we can further intensify those effects. The fact is that utilizing sanctions effectively will take time and patience. But based on the most recent Israeli estimates that Iran will not have the bomb for another two years or more, time appears to be on our side.[36]

Maintaining a Credible Military Option

As we have already mentioned, in order for a red line to be effective the United States must maintain a credible military option. Considering we have already established the one scenario that would elicit a full-scale military invention, namely Iran's construction of a nuclear weapon, maintaining a credible military option simply means ensuring that the terms of that red line can be enforced. As a general rule, it is best to reserve military action until no other option is available. In our strategy, that situation only exists once Iran possesses all the components for rapid construction of a nuclear weapon. By maintaining the readiness of the Fifth Fleet, continuing joint military exercises in the Persian Gulf, and demonstrating a military capability of keeping the Strait of Hormuz open, the international community will have guaranteed the option to use force in the future.

Our strategy does not allow for an overt attack on Iran's nuclear facilities under any other circumstances. It has been suggested that an attack on Iran would bolster nationalist sentiment among the population and unify the people and government in an anti-American frenzy.[37] Additionally, any limited strike would only delay, not destroy, Iran's nuclear program and would likely exacerbate the regime's belief that it will not be territorially secure until it has a bomb.[38] Finally, a limited, overt attack may bolster international sentiment for Iran and delegitimize the current economic sanctions, thereby jeopardizing their effectiveness. Unilateral American, or Israeli, action will not be an effective solution in the long run.

In April 2012, Colin Kahl insightfully noted that escalation and spillover are among the negative effects of a military strike on Iran. Any attack on Iran would likely lead to an escalation of proxy attacks by Hezbollah, the Quds Force, and elements of the Revolutionary Guard. Such actions would spill over into other countries in the region and could potentially result in rising conflict throughout the region.[39] Thus the paradox is that in order to maintain the utility of a credible military option, it cannot be used; that is, until it is absolutely necessary.

The major issue with maintaining a credible military option is, once again, the precedent set with respect to North Korea. The United States set red lines for North Korea which it crossed without any military consequences. Perhaps the only way of overcoming this obstacle is (to reiterate our earlier point) for the US to clearly outline the one condition under which military power will be exercised and demonstrate the capability and willingness to do so. Another option would be to act militarily in North Korea, thereby reasserting American military credibility and perhaps scaring Iran as the US did after invading Iraq in 2003. The consequences of such an action are broad however, and outside the scope of this analysis.

Maintaining a credible military option ultimately applies real pressure on the regime and plays to their worst fear-an invasion which would remove the current regime from power. Again, maintaining the option does not mean using it. Our standpoint remains that time is on the West's side, and the best option is to be patient with regards to military action. Maintain the option, but reserve it for the extreme case.

A Kennedyesque Solution Through Compromise and a Credible Threat

Policymakers continue to draw on the lessons learned from the Cuban Missile Crisis to deal with nuclear issues today. Unfortunately for the future of diplomacy, the most common perception surrounding the Cuban Missile Crisis tends to romanticize the issue into Dean Rusk's portrayal of a macho stare-down decided by the question, "who blinked first?" In reality, Kennedy resolved the conflict in a much more diplomatic way. Although there was certainly a threat to wage war with the Soviet Union, Kennedy gave the Soviets a crucial concession in terms of American missiles in Turkey.[40] The ultimate lesson that policymakers should take from the Cuban Missile Crisis is that successful conflict resolution relies on finding an acceptable compro-

mise between parties rather than playing hard-ball.[41]

However, carrots alone do not always work; adding a stick to emphasize the carrot helps push the other side towards your end of the compromise. In relation to the Cuban Missile Crisis, Graham Allison argues that the compromise of withdrawing American missiles from Turkey alone would not have been enough to get the Soviet Union to withdraw from Cuba. The threat of American military force played a more crucial role in pushing the Soviet Union to accept American terms.[42]

The current problem with the Islamic Republic is that Iranian leaders believe that any compromise resulting in a non-nuclear Iran will only threaten Iran in the future. According to Khamenei, "Qaddafi gathered up all his nuclear facilities and gave them to the West. And now, you can see the conditions our nation is living in versus their conditions."[43] Lessons from Iraq and Libya have taught dictators that their regime faces danger without a nuclear program.[44] Thus, the US strategy must be twofold: show the Iranian regime that it would face a much greater danger if it decided to obtain a nuclear weapon, and be willing to compromise on regional goals—to include regime change—in order to credibly assure Iran that the US will not seek its overthrow if and when it gives up its quest for nuclear weapons. It is a delicate balancing act for US foreign policy-if the threat for crossing the nuclear threshold is not great or credible enough, Iran will believe it is worth the risk to obtain a nuclear weapon. On the flip side, if Iranian leaders see an American threat in a world in which Iran does not have access to nuclear weapons, they will believe that nuclear armament is their only feasible option.

As has already been discussed, the United States must find ways to make its military threat credible and important. However, the US must also come to terms with the fact that Iran may have legitimate regional goals. The essence of compromise is that both sides must realize that they have to modify their goals to achieve agreement. The United States must realize that there are ways to contain Iran other than acting as the "global policeman." Countries in the region will check back against Iranian imperialism because they do not want a neighboring Iran with hegemonic power. The US should work to strengthen ties in the region, with both Israel as well as other Arab states. These ties will ensure that Iranian hegemony does not become a reality in the Gulf region. As part of this effort, the United States must be willing to provide these countries military and economic aid in order to empower them to balance against Iran.

This sort of policy will allow the United States to extend tendrils of economic growth and democratic ideals to the Iranian people. In the years since the Cold War, economic ties and increasing democracy have contributed far more to global peace and stability than a large American military.[45] As long as Iran remains isolated by economic sanctions and the threat of military force, the United States cannot increase economic ties and spread democratic ideals to the Iranian people.

As long as Iran faces military opposition to its regime with no opportunity to back out while saving face, its nationalist and imperialist tendencies will only be exacerbated. Economic and diplomatic checks against Iran are a much more subtle way to avoid conflict. These checks are only feasible in a world where the US concedes the legitimacy of Iranian regional interests and is not faced with the imminent threat of a nuclear bomb. Kennedy summed up his experiences from the Cuban Missile Crisis, saying "nuclear powers must avert those confrontations which bring an adversary to a choice of either a humiliating retreat or a nuclear war."[46] As long as Iran faces a military threat without an attractive alternative, the regime cannot back down and still save face, as it would have to admit it had caved to US military pressure. The US must be willing to endure Iranian gloating in the short term to ensure long term peace and stability.

Ultimately, the United States must use soft power to contrast hard power. If there is no clear delineation for the consequences of crossing the nuclear threshold, there is no reason for Iran to avoid the bomb. However, offering a clear and satisfying alternative to Tehran will allow the regime to save face while avoiding the dangers of a nuclear Iran. This approach necessitates an acceptance of the consequences that accompany recognition of Iran as a legitimate state, but they are far better than the alternative of a nuclear Iran.

Appeasing Israel

Israel may pose the biggest threat to a potential US strategy of "nuclear patience." Because

of its proximity to Iran as well as long-standing enmity between the two countries, Israel may be justified in believing it faces an existential threat from a nuclear Iran. Moreover, there is concern that after abandoning a nuclear weapons program Iran may continue to sponsor terrorism and asymmetric attacks against Israel. For the most part, the United States has been able to ignore the occasional Iranian terrorist attack on its interests by retaliating with warnings, sanctions, or by casting doubt on whether Iran is actually to blame for a specific attack.[47] Unfortunately, due to its small size and proximity to Iran, Israel does not have this luxury. Thus, Israel stands to lose the most if a strategy of nuclear patience is unsuccessful.

Israel must be reassured against the occurrence of three different scenarios. The first scenario is one in which Iran does not take the soft power alternative and appears to be nearing a nuclear bomb. In this scenario, Israeli worry would be focused on preempting the Iranian nuclear establishment before it can get any closer to a nuclear bomb. The red line strategy proposed above would play a significant role in bolstering Israeli confidence in this situation. The United States must reassure Israel that it will respond immediately and efficiently as soon as Iran crosses the nuclear threshold. Providing Israel with military materiel to ensure that it could effectively and immediately participate in enforcing this red line would assuage its worries that it must act before Iran gets the bomb.

The second scenario is one in which Iran chooses to abandon its nuclear ambitions but still threatens Israel with a conventional missile force. To prevent Israel from escalating this conflict to the nuclear level, the United States should aid Israel in developing both its defensive forces and conventional weapons systems, with the ultimate goal of deterring or neutralizing an Iranian attack. This aid would come in the forms of technological assistance as well as arms sales to adequately supplement Israel's forces.

The final scenario is perhaps the trickiest, where Iran does not threaten Israel conventionally, but instead uses asymmetric warfare and its connections to Hamas and Hezbollah to attack through proxies. This scenario is problematic due to the dangers inherent in implicating Iran directly in these attacks. If the United States overtly accuses Iran of sponsoring specific acts of terrorism, Iran could be pushed to a situation where it attempts to develop a nuclear deterrent once more. Thus, the United States must find other methods of dealing with this problem. First, the United States should dramatically increase diplomatic ties with Tehran in order to attempt to solve this problem diplomatically. Additionally, the United States should work with other Middle Eastern countries to pressure Hamas and Hezbollah to engage in cease-fires and begin peace talks with Israel. This has been proven to work in past instances where Egypt has negotiated a ceasefire between Israel and Hamas.[48] Finally, the US must support Israeli retaliation against any legitimate terrorist targets. Retaliation by Israel against Hezbollah in southern Lebanon was effective insofar as it avoided direct implication of Iran and halted the Hezbollah offensive. This approach would also drive a wedge between Iran and its proxy terrorist organizations as those groups realize that they will suffer Israeli retaliation without gaining open support from Iran. In the short term, the crisis in Syria may provide the best opportunity to implement this strategy.

our policy of "Nuclear Patience" will provide Iran with the incentive and ability to step away from its nuclear ambitions without sacrificing its pride.

Conclusion

Through these components of a single, defined red line, tiered economic sanctions, a credible military option, and a willingness to forego the active pursuit of regime change, our policy of "Nuclear Patience" will provide Iran with the incentive and ability to step away from its nuclear ambitions without sacrificing its pride. An important part of that methodology will involve placating Israel's desire to strike. This will likely involve allowing, and perhaps even supporting, covert operations aimed towards delaying Iran's weapons development. There are many forces within the Israeli government that still believe an attack is not a good option at the moment, and by playing to those individuals the US can keep Israel from acting rashly.

Ultimately, the success of this policy requires patience on many fronts and from many entities. In the past, faulty estimates of coun-

tries' nuclear capabilities have led to dramatic intelligence failures and embarrassing foreign policy criticisms. A policy of "Nuclear Patience" allows for more thorough analysis of the socio-political factors affecting Iran's nuclear timetable, while maintaining a credible deterrent factor. For this reason, we advance it as the methodology with the greatest potential for successfully mitigating the Iranian nuclear crisis.

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Saddam and the Bomb

An Unusual Case of Counterproliferation Success

DAVID PTACEK

Iraq was a signatory of the Non-Proliferation Treaty (NPT), but there were always strong suspicions that Saddam Hussein's Baathist regime wanted to acquire nuclear weapons. Saddam demonstrated his willingness to use chemical and biological weapons on Iranians during the Iran-Iraq war, so when the French built a nuclear reactor near Baghdad and Iraq began to enrich uranium the world started to worry. Iraq spent billions of dollars to research methods for enriching uranium and building nuclear weapons technology only to have their program set back by the Iranians and the Israelis, and finally dismantled by the Americans. Iraq developed plans for enriching and weaponizing large amounts of uranium, but its program was unable to produce the desired results and Saddam was never permitted to achieve his goal of a nuclear weapon.

Saddam's Motivation

Saddam's motivation to construct an atomic weapon seems to have come from both his hatred of Israel and his desire for prestige and power in the Arab world. During the Six Day war in 1967 Israel took control of previously Arab lands in the Sinai, Gaza Strip, Jerusalem, the West Bank, and the Golan Heights. Saddam believed it was within his power to retrieve these territories. Saddam expressed desires to destroy all of Israel, but he also realized that even if he could stand up to the Israeli state and push some of the borders back to pre-1967 lines, he would "...weaken Israel's geopolitical position and make [himself] a hero throughout the Arab world."[1] Although Saddam had clearly expressed his anti-Zionist and anti-sematic views, it seems his main source of motivation may have been the reputation and prestige that would come to him from the Arab world. When contemplating between a quick war or a drawn out confrontation with Israel, Saddam was quoted saying that "...even more important is the widespread cheering from the masses that will accompany each step we take forward."[2]

Saddam knew that Israel was a formidable opponent and that conventional forces alone would not be able to stand up to a nuclear attack by the Israelis. Saddam needed a bomb. He believed that if Iraq was able to acquire nuclear weapons it could successfully deter a nuclear attack on Arabs. This then would give the Arab nations enough time to overwhelm Israel with conventional forces. Saddam was confident that even a single nuclear weapon in the hands of the Arab armies could deter any nuclear threat from Israel. He said, "The Arab atom will finish you off, but the Israeli atom will not end the Arabs."[3]

Proliferators

The Iraqi nuclear program began with the purchase of a Soviet-made research reactor in the late 1950s and accelerated when Saddam became head of the Iraqi Atomic Energy Committee in 1973. In the 1970s France agreed to build a research reactor and all of the necessary laboratories in Iraq. The reactor was named "Osirak" by the French and was a 40 megawatt light-water reactor built near Baghdad. In addition to the reactor and the laboratories, France also provided approximately 27.5 pounds of 93% U-235 to be used for research.[4]

France was not the only country to significantly aid Iraq on its quest for nuclear weapons. During the late 1970s and into the early 1980s Iraq purchased uranium in various forms from Portugal, Italy, Niger, and Brazil.[5] The IAEA was aware of some, but not all of these uranium transactions. German companies and engineers gave Iraq data on centrifuges and an Austrian company provided calu-

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trons for uranium isotope separation. Both of these countries' contributions aided in Iraq's nuclear and chemical weapons programs.[6] Even the United States played a role in developing the nuclear weapons program in Iraq. Advanced computers were sent to Iraq during the Iran-Iraq war to aid the war effort and the computer transactions were approved by the Commerce Department; but eventually the computers were actually used to advance Iraq's nuclear program.[7]

Osirak Reactor

The Osirak reactor at the Al-Tuwaitha Nuclear Center provided Iraq its best chance at obtaining a nuclear weapon; yet, scientists still disagree about whether or not Iraq could have been producing weapons grade material on a large enough scale to make weapons. Richard Wilson, an inspector of the damaged reactor in December 1982, claimed that "...it would've taken decades, not years..." to produce enough plutonium for a nuclear weapon.[8] Both Iraq and France claimed that the reactor was only used for peaceful purposes, but it may have been possible that Iraq was taking steps towards a weapon in secrecy. Roger Richter, a former IAEA inspector, admitted that the safeguards were not foolproof and that not all of the nuclear facilities at the Al Tuwaitha Nuclear Center were under IAEA's watch.[9] The true threat of the Osirak reactor may never be known, but its perceived danger was very real.

Operation Scorch Sword

Israel and Iran were both extremely concerned about the possibility of an Iraqi nuclear weapon. Israel feared an Arab bomb and knew that Saddam had been supporting the Palestinian Liberation Organization and terrorist acts in Israel. Even though Iraq claimed that any such weapons would only be used against an Israeli enemy, Iran did not trust Iraq with a weapon either.[10] Saddam confirmed Iran's rationale of distrust when, upon observing how disorganized Iran's leadership structure was after the Islamic Revolution, he launched an all-out invasion in September 1980.[11] The Israelis, who had already been attempting to set back the Osirak program, allegedly assassinated Dr. Yahya al-Meshad, the supervisor of the reactor deal, and managed to surreptitiously destroy reactor housings. These developments encouraged Iran to attack the Tuwaitha complex.[12]



Artist rendering of Israeli attack on Osirak, 1981

Only a few days after the Iran-Iraq war began, Iran began preparations for an air attack on Tuwaitha. "...The first ever mission in the history of warfare to be undertaken against a nuclear reactor—even one still being built—was planned under the operation name of scorch sword."[13] Iran sent four F-4 Phantoms on the mission. After refueling the fighters flew to their targets. Two Phantoms attacked a power plant while the other two struck their targets at the Tuwaitha site with twelve Mark 82 500 pound bombs. The F-4s were not fired upon and returned to Iran untouched.

Operation Scorch Sword was widely regarded as a failure in the West because of the minimal amount of damage caused by the bombing, but there were some benefits to be capitalized on as well. 'Only' several million dollars of damage was caused along with a 'slight delay' in the construction of the facility.[14] The real benefits of the operation came in the form of intelligence from frightened French personnel and reconnaissance flights flown over Osirak after the attack. Many of the French and Italian workers at the Osirak site fled after the Iranian bombing. Some of the personnel returned, but others were able to provide the

Israeli secret services much needed intelligence. Iran shared reconnaissance photos with the Israelis and Israel discouraged Iran from re-attacking.[15] Now it was Israel's turn to prevent the creation of an Iraqi nuclear weapon.

Operation Opera

Immediately after the unsatisfying results of Operation Scorch Sword were known, Israel began planning and practicing for its own attack on the Iraqi nuclear program. The initial attack, scheduled for 10 May 1981 was almost a complete failure. The fuses on most of the ordnance to be dropped on the Tuwaitha complex were incorrectly set. Luckily, the mission was called off because of political opposition and a series of events in Lebanon.[16] Once things settled, a new date was set and on 7 June 1981, eight F-16s and six F-15 Eagles were deployed to Etzion air base in the still-occupied Sinai.[17]

The Israeli goal was to exploit a hole in Iraqi radar. They planned to do this by flying through the Saudi desert. All the fighters took off on time, but made a potentially deadly mistake en-route. They accidentally flew through Jordanian airspace. At just 2,100 ft, they flew over tourist filled beaches and King Hussein's private yacht.[18] Although this could have spelled the end for the mission, no negative consequences ensued. The Israeli aircraft flew low and in silence as they made their way through northern Saudi Arabia. The external fuel tanks, which were needed in order to make the long trip into Baghdad and back to Israel, were dropped over the desert.

Once the F-16s arrived over Tuwaitha, all eight aircraft each dropped two Mark 84 2000 pound bombs on the reactor.[19] Only after the reactor was completely destroyed did the Iraqi air defense system finally react. Unguided anti-aircraft artillery fired toward the Israeli aircraft, but none actually threatened them. The departing Israelis met no resistence and the mission was a success. The combination of Operation Scorch Sword and Operation Opera was estimated to have set Iraq's nuclear program back ten years.[20]



Osirak after the Israeli attack

Israeli Justification

After the raid Israel issued a statement saying that it had evidence from "...'sources of unquestioned reliability' that Iraq was producing nuclear bombs at the Osiraq plant, and, for this reason, Israel had initiated a preemptive strike."[21] Invoking Article 51 of the Charter of the United Nations (UN), Israel claimed it had a legitimate right to self-defense. But were they under any real threat? The IAEA was accused of failing to tell the world about events and developments at Tuwaitha. The IAEA stood by their earlier conclusions that Iraq was not making nuclear weapons with the Osirak reactor and that it had been complying with all IAEA guidelines. It was, in fact, Israel who was not a signatory to the Non-Proliferation Treaty (NPT) and who was operating a nuclear facility at Dimona that was not open to UN inspections or complying with IAEA safeguards.[22]

Renewed Motivation

Iraq planned to rebuild the destroyed facilities at Tuwaitha. Talks with France failed and Iraq decided to construct a new heavy water research reactor. This undertaking, named Project 182, would have been similar to the Canadian NRX reactor had it been completed. However, as a result of scarce resources, the project was never finished.[23]

Gulf War and Inspections

After the 1990 invasion of Kuwait, Iraq accelerated its efforts for a nuclear weapon. A "crash program" was started in the summer of that year which was supposed to recover highly enriched uranium from the Osirak reactor fuel. If it were not for the United States intervention in 1991, this program "...could have resulted in the availability by the end of 1991 of a quantity of HEU sufficient to manufacture a single low-yield nuclear device."[24]

In the winter of 1990 President George H.W. Bush used Iraqi pursuit of nuclear weapons as one of his justifications for taking military action against Saddam and Iraq. In National Security Directive 54 he made it clear that use of any weapons of mass destruction against United States or allied forces would justify the removal of Saddam from power.[25] Needless to say, Saddam did not use WMDs on allied forces which attacked in January 1991, and was still in power, and in possession of his weapons stockpiles, at the

end of Operation Desert Storm in March 1991.

The IAEA was in put in charge of finding and removing anything that was left of Saddam's nuclear program. Initially, Iraq denied having any hidden or secret stockpiles of fissile material that could be used to construct a nuclear weapon, but after some pressure from the IAEA, a second declaration was produced that admitted the existence of nuclear material and facilities that were not previously known to the inspection teams.[26] Still much of the biological, chemical, and nuclear weapons programs were hidden from the West until Saddam's son-in-law, Kamel Hussein, defected in 1995.[27] Kamel provided the United States with information on the hidden stockpiles of chemical and biological weapons and the intent of Saddam to keep plans and designs for his weapons programs.

According to IAEA reports in 1997, if the war had not interrupted the Iraqi nuclear weapons program in 1991, it is entirely possible that Iraq may have been able to complete a functional nuclear weapon by the end of 1992.[28] The IAEA found and destroyed uranium enrichment facilities, stockpiles of high explosives, facilities for weapon component construction, and computer simulations of nuclear weapon detonations. In 1998 the IAEA concluded that even though $10 billion was spent in the 1980s on enrichment and weapons programs, 'There were no indications to suggest that Iraq was successful in its attempt to produce nuclear weapons."[29]

Second Gulf War

Iraq had never been very forthcoming with inspectors and because they came so close to completing a nuclear weapon in the early 1990s, the West knew that Iraqi scientists and engineers had the technical know-how to build a weapon. In 1996 the IAEA stated that "the know-how and expertise acquired by Iraqi scientists and engineers could provide an adequate base for reconstituting a nuclear weapons-oriented program."[30] These scientists, along with other intelligence suggesting that Iraq did have weapons of mass destruction, led to the decision by the United States, Great Britain, and other allies to launch Operation Iraqi Freedom in March 2003.

No weapons of mass destruction were found in Iraq after the invasion by the US and coalition forces. The intelligence analysis and the informants were heavily criticized. One of the high profile informants was Rafid Ahmed Alwan al-Janabi, also known as "Curveball." Curveball left Iraq in 1995 and fled to Germany. He claimed to have worked in biological weapons programs under Saddam's regime. His claims were used to justify Iraqi Freedom, but in 2011 he publicly admitted to lying saying, "Believe me, there was no other way to bring about freedom to Iraq. There were no other possibilities."[31] Although the United States had faulty intelligence and no weapons were found, Saddam was removed from power and the world was reassured that Iraq no longer had any nuclear, biological, or chemical weapons capabilities.

Technological Achievements

Iraq's nuclear program had quite a bit of help from foreign countries, but that help could only get the Iraqis so close to producing a bomb. The two largest challenges in producing a weapon in Iraq were not unlike the challenges faced by any other nation seeking nuclear weapons: they needed to produce or acquire a large amount of fissile material and they needed a way to deliver and detonate that critical mass. Iraq attempted to attack their challenges all simultaneously and from a few different angles. Four groups were created to: 1) produce uranium 235 by using diffusion barriers and centrifuges 2) produce uranium 235 by way of chemical and electromagnetic methods 3) computer modeling 4) perform "special tasks," or weaponization.[32]

The IAEA estimated that once Iraq machined its planned steel centrifuges and built its cascades that it could have produced enough enriched uranium for 1.5 bombs per year.

Iraq's attempts at Electromagnetic Isotope Separation (EMIS) took place at Tuwaitha and Tarmiya. By time the Gulf War ended and UN inspections ensued, Iraq had eight 1200 mm separator units with plans to make seventeen more operational. It also had enriched about 1350 grams of uranium to between three and eight percent.[33]

Iraq had other plans for centrifuges, Laser Isotopic Separation (LIS), chemical and ion-exchange separation, and gaseous diffusion,

but they were not able to get very far before the Gulf war. Iraq was successful at obtaining plans centrifuges and the maraging steel needed to make them. The IAEA estimated that once Iraq machined its planned steel ecntrifuges and built its cascades that it could have produced enough enriched uranium for 1.5 bombs per year.[34] The other programs, some still in the design stage, did not receive enough money or time to prove effective.

The "special tasks" group had more success than the others. While Iraq struggled to get the fissile material it needed to produce a bomb, they were successful at creating an implosive shock wave strong enough to start the nuclear explosion. They were also able to produce tritium which could be used to increase the yield of any nuclear weapon through a process of boosting. Inspectors concluded that Iraq could have made a functional, weaponizable bomb if only they had had enough enriched fuel.[35]

Closing

The goal of obtaining a nuclear weapon was never achieved in Iraq. Many other countries contributed materials and technologies that Saddam planned to use to his advantage and quicken the arrival of his nuclear objectives. During the Iran-Iraq war the French made Osirak reactor near Baghdad became a target for the Israelis and the Iranians. Iranian Operation Scorch Sword was the first preemptive strike on a nuclear program in history and although it did not destroy the reactor, the operation provided intelligence that Israel would later use to destroy the complex at Tuwaitha. Israel's air attack set Saddam's program back, but it did not deter him from investing even more in his nuclear weapons program. By 1990, the IAEA estimated that Iraq could have had an operational nuclear weapon by 1992. This was as close as Iraq would get. The Gulf war and the subsequent inspections removed the nuclear weapons capabilities in Iraq. Although Saddam was not very cooperative with inspectors and the Iraqi scientists and engineers still possessed the knowledge required to develop a nuclear weapon, the United States and its allies did not find any weapons of mass destruction when they invaded during Operation Iraqi Freedom in 2003. Saddam was removed from power and the dismantlement of the nuclear weapons program in Iraq was confirmed.

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Book Review

Prodigal Soldiers: How the Generation of Officers Born of Vietnam Revolutionized the American Style of War

REVIEWED BY MARK MELVILLE

James Kitfield's book, *Prodigal Soldiers*, is an entertaining telling of the dramatic transformation of the US military after the debacle of Vietnam through the 70s and 80s to the resounding success of the 1991 Gulf War. This narrative tracks the individual military careers and observations of Army, Navy, Air Force and Marine officers who were key leaders and commanders in the Gulf War. It answers the important question "what changed in the US military between the failures of Vietnam and the success of the Gulf War?" The book begins in the mid-1960s with the young officers early experiences in Vietnam. Each chapter is devoted to a specific person and in fascinating story-telling style describes key events that would later provide the impetus for the military transformation.

The author, Kitfield, divides the book into four parts spanning five to seven year increments starting in 1965 and ending after the 1991 Gulf War. In each part he provides ten chapters with each chapter highlighting one of the several officers and their experiences and observations that will affect the military transformation. For Air Force followers the author uses Chuck Horner, the Joint Force Air Component Commander (JFACC) in the Gulf War, from his first formative experiences in Vietnam as a captain through his career as an instructor pilot at Nellis Air Force Base, his contribution to the development of Red Flag to his eventual command of a fighter wing. There are also chapters on key issues, events and individuals that shape the US and its military forces over the time period. Issues, such as the all-volunteer force, the elimination of the draft, and its near ruin of the military in its first few years of implementation to its eventual success in providing the US an unsurpassed and motivated core of soldiers, sailors, airmen and marines, are discussed by Kitfield in his novel-like style. He brings in major events like Desert One, the ill-fated rescue of the Iranian hostages, and Urgent Fury, the 1983 invasion of Granada, to tell the story of the need for major reform in the military chain of command and the Department of Defense. It is in the chapter on Urgent Fury that we first are introduced to the young two star, Norman Scharzkopf, who would eventually command all US forces in the 1991 Gulf War.

Of special interest to Air Force members, is the chapter on an important individual whose next generational leadership and command style would be a vital element of the transformation. In 1978 General Bill Creech, the namesake of Creech Air Force Base, would take command of the USAF Tactical Air Command (TAC, now ACC or Air Combat Command) and foster a new style and focus of command that would eventually permeate the entire US military. Creech had learned early in his career as an Air Force fighter pilot and commander of an aerial demonstration team in Europe, the value of precision, teamwork and pride. He would take those elements of command and force them into the very fabric of the squadrons and wings in TAC, including the restive wing commander Chuck Horner.

In *Prodigal Soldiers*, Kitfield documents the many innovations that would lead to remarkable transformation of the US Military. He knits together such diverse issues as the all-volunteer force, the Goldwater-Nichols Act in Congress, the impact of the information revolution and a push for better and more realistic training and their impacts on the armed forces. While the US Navy

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General Creech, one of Kitfield's Prodigal Soldiers

would lead the other services with the development of Top Gun air to air combat course, providing realistic training for fighter pilots, the Air Force would expand the idea at Nellis Air Force Base with the establishment of its Red Flag training exercise and high tech training ranges.

Kitfield's thesis meshes nicely with Max Boot's work, *War Made New*. In his later chapters Boot describes the same time frame and comes to similar conclusions.

The US military's edge lies not simply in recruiting high-quality personnel but in its methods for training and organizing them. Initiatives undertaken in earlier decades, such as setting up realistic training centers to simulate combat conditions and forcing the services to work more closely together (the Goldwater-Nichols Act), continue to bear fruit. [1]

Prodigal Soldiers also directly supports the curriculum for a senior level Military & Strategic Studies core course at the Air Force Academy, where the cadets explore various models of innovation and the important lessons from the past dealing with innovation in military forces. The course teaches that," Innovation is more than incorporation of equipment and technical change into doctrine, practices, and tactics. Innovation in tactics and operational concepts can prove as important on the battlefield as changes in equipment."[2] Kitfield also demonstrates, through the life stories of his prodigals, that changes in the US armed forces' organization, doctrine and training were a fundamental part of the transformation.

Criticism of *Prodigal Soldiers* is almost universally positive. However in a review by Gregg Easterbrook in the *Washington Monthly*, Easterbrook complains that Kitfield "dismisses the constructive efforts...of the military reform movement"[3] and gives too much credit to congressional investigations. Easterbrook, who is familiar with one of the examples Kitfield uses in his book, highlights that those acquisition problems had been discovered by the military and were being addressed but had gained the attention of congress. It must be apparent that in writing *Prodigal Soldiers*, Kitfield was supporting a thesis about the catalysts of change that brought the US from the defeat of Vietnam to the success of Desert Storm. One of those key changes was the Goldwater-Nichols Act that reformed the DoD and forced the services to become more reliant on each other and to work together (jointness), a secondary result of the Act was to improve the military acquisitions system. Kitfield uses the example of failed weapon system testing to discuss the need for reform of the DoD, not just in the realm of jointness but also in the area of acquisitions.

A second area of criticism is Kitfields use of attention getting novel like setups for each chapter. In a review by Warren L. Nelson in the *Chicago Tribune* in 1995 He complains that "Kitfield has gone overboard to make his book readable."[4] Strangely many consider this to be was one of the book's strong points, the story-like vignettes of the prodigals in their military careers was praised by Major C.H. Wesely in his review of the book "Kitfield combines old-fashioned story-telling and blunt analysis in this tremendously readable illustration of the importance of moral courage to military failure or success."[5]

To summarize, *Prodigal Soldiers* is an interesting and enjoyable book that provides valuable insights to professional military officers and leaders. Kitfield tells the remarkable story of the dramatic transformation of the US military from the jungles of Vietnam to the deserts of Iraq. The author develops his thesis by following the careers of selected military officers from their experience in Vietnam and the turbulent years that follow to their eventual command of key forces in the 1991 Gulf War. The officers that Kitfield selects, his prodigals, are from all four services and in additional chapters he highlights other officers and leaders that had significant impacts on the transformation of US forces. There is a fascinating account in *Prodigal Soldiers* of the efforts to reform the DoD and require the services to work together during combat operations and training. The back story of what we now call Goldwa-

ter-Nichols, one of several significant improvements made in the US military during the transformative years. For readers that are air power disciples the book has many profound insights into the role of the Air Force, and our leaders in the transformative years. The Air Force's love of, and constant quest for advance technologies is told by Kitfield in his chapters on the development of new digital weapons systems and the air war.

Kitfield's analysis provides an excellent case study in transformation and innovation in the difficult to change US Military bureaucracy. He tells the story of visionary officers and their quest to heal the wounds of the Vietnam era. This book is an insightful study for any future military leader.

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Air Force Chief of Staff's Reading List, 2013

Bert Frandsen, ***Hat in the Ring*** *(2010)*

Beryl Markham, ***West with the Night*** *(1982)*

David E. Hoffman, ***The Dead Hand*** *(2009)*

Daniel Ford, ***Flying Tigers*** *(2007)*

Lee Ellis, ***Leading with Honor: Leadership Lessons from the Hanoi Hilton*** *(2012)*

Gayle Tzemach Lemmon, ***Dressmaker of Khair Khana*** *(2012)*

Anna Simmons, Joe McGraw and Duane Lauchengco, ***The Sovereignty Solution*** *(2011)*

Wolfgang W.E. Samuel, ***I Always Wanted to Fly*** *(2001)*

Chris Dubbs and Emeline Paat-Dahlstrom, ***Realizing Tomorrow: The Path to Private Space Flight*** *(2011)*

Eric Schmitt and Thom Shanker, ***Counterstrike: The Untold Story of America's Secret Campaign Against Al Qaida*** *(2011)*

James Fallows, ***China Airborne*** *(2012)*

Malcom Gladwell, ***Outliers*** *(2008)*

Charles Kupchan, ***No One's World*** *(2012)*

Vijay Vaitheeswaran, ***Need, Speed, and Greed*** *(2012)*

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