

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE (DD-MM-YYYY)		2. REPORT TYPE	3. DATES COVERED (From - To)		
4. TITLE AND SUBTITLE			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION / AVAILABILITY STATEMENT					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (include area code)

United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, VA 22134-5068

MASTER OF MILITARY STUDIES

Title: Challenging the Existing Military Readiness Model: "Ready for What?"

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

AUTHOR: Major Jeremy M. Hirsch, United States Air Force

AY 17-18

Mentor and Oral Defense Committee Member: Jonathan F. Phillips, Ph.D.
Approved: [Signature]
Date: 7 March 2018

Oral Defense Committee Member: Lynn Tesser, Ph.D.
Approved: [Signature]
Date: 7 March 2018

Executive Summary

Title: Challenging the Existing Military Readiness Model: “Ready for What?”

Author: Major Jeremy Hirsch, United States Air Force

Thesis: Since the end of the Cold War, America’s reliance on the liberal international system to maintain security has resulted in the obsolescence of traditional military readiness methods, necessitating a new approach that will keep pace with the rapidly evolving threat environment.

Discussion: At the end of the Cold War, the United States emerged as the sole global superpower. While numerous international relations theorists attempted to predict how the future face of conflict would look, America began pushing the liberal world order initially devised after World War II. According to this structure, liberal international institutions such as the United Nations would provide a forum to work through issues peacefully and promote economic development. Richard Betts defines military readiness as a function of capability and time. Military readiness means not that a nation has a large standing force, but rather that it has the ability to mobilize the appropriate force in time for a conflict. The post-Cold War military draw down fits with Richard Betts’ readiness tradition narrative in that America trends toward military drawdown post conflict. A new readiness tradition has developed, however, whereby engagement with other nations in international institutions can not only help avert conflict, but can also buy time to achieve military readiness in the event a conflict cannot be avoided. Following this assumption, the resources which were devoted to military readiness during the Cold War could safely be diverted to the other instruments of power. Applying Betts’ definition of readiness, however, exposes serious gaps in America’s existing strategy. While military drawdown fits the strategic narrative, the military training and readiness reporting processes have stagnated. The existing military readiness structure fails to objectively measure tactical readiness and provides little actionable information to operational level decision makers. Recently, the Air Force Chief of Staff was asked by Congress if he felt the Air Force was ready. His response of “ready for what?” reflected the current readiness process shortfalls. The Air Force has devised an approach to adapt to the new environment. The Threat Matrix Framework developed during the 2017 Weapons and Tactics Conference offers a new methodology to modernize the readiness process in order to objectively target gaps and to inform risk versus cost decisions.

Conclusion: As the existing international order based on liberal institutions has induced uncertainty in military readiness, the readiness reporting process in its current form has proven deficient. The Threat Matrix Framework offers a new methodology to the Joint community which applies a holistic approach to readiness. Once a complete readiness picture is achieved, the military will be qualified to answer, “ready for what?”

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

QUOTATION FROM, ABSTRACTION FROM, OR REPRODUCTION OF ALL OR ANY PART OF THIS DOCUMENT IS PERMITTED PROVIDED PROPER ACKNOWLEDGEMENT IS MADE.

Table of Contents

DISCLAIMER	i
TABLE OF CONTENTS	ii
INTRODUCTION	1
LIBERAL INTERNATIONAL THEORY AND POST-COLD WAR ASSUMPTIONS	2
STRATEGIC MILITARY READINESS: OUTDATED LEGACY MINDSET	6
A NEW STRATEGIC MILITARY READINESS TRADITION EMERGES	12
OPERATIONAL LEVEL READINESS REPORTING PROCESS SHORTFALLS	14
RECOMMENDED READINESS REFORM: THE THREAT MATRIX FRAMEWORK	19
CONCLUSION	25
BIBLIOGRAPHY	26

I. Introduction

In his 2016 confirmation hearing, then Air Force Chief of Staff nominee, General Goldfein, was asked if the Air Force was ready to provide air power in support of America's national security objectives. He responded with a simple question, "ready for what?"¹ He explained that the Air Force was ready to continue its current pace in the war on terrorism, but maintaining a high level of readiness in existing overseas commitments came at a serious cost to the readiness of stateside units and the ability to flex military power to future conflicts.² Recently, in his effort to guide America's military instrument of power, General Dunford, Chairman of the Joint Chiefs of Staff, articulated the four-plus-one threat framework, highlighting the major perceived threats to the United States' national security: China, Russia, Iran, North Korea, and Terrorism or violent extremist organizations.³ Linking this framework to national security strategy should drive resources across the four instruments of power which include diplomacy, information, military, and economics (DIME), in order to ensure that America's foreign policy objectives are achieved. Since the end of the Cold War, America's commitments to liberal international institutions such as the United Nations (UN) and the expansion of the North Atlantic Treaty Organization (NATO) have dominated foreign policy. Consequently, reliance on the liberal international system has resulted in the obsolescence of

¹ David Goldfein, "Air Force Chief of Staff Confirmation hearing," interview by Senate Armed Services Committee, *American History C-SPAN3*, June 16, 2016, <https://www.c-span.org/video/?411254-1/senate-armed-services-committee-considers-air-force-chief-staff-nomination>.

² Ibid.

³ Joseph Dunford, "Joint Chiefs Chairman Dunford on the '4+1 Framework' and Meeting Transnational Threats," interview by Michael O'Hanlon, *Brookings's Institute* (February 2017), <https://www.brookings.edu/blog/brookings-now/2017/02/24/joint-chiefs-chairman-dunford-transnational-threats/>.

traditional military readiness methods, necessitating a new approach that will keep pace with the rapidly evolving threat environment.

This essay will begin by building a strategic understanding of military readiness through the lens of the post-Cold War liberal world order and then explain how the military must embrace new approaches to readiness that are more appropriate for this context. The discussion will include an analysis of liberal international theory and its assumptions, including a review of the 1990's "now what?" literature. This will lay the foundation for the assertion that America's devotion to the liberal world order has not come at the expense of military readiness, but has replaced the traditional understanding of readiness. It is important to note that this essay does not intend to highlight all factors influencing military readiness, simply to offer a theory to the wide body of existing literature. However, the existing readiness reporting process continues to be largely subjective.

The national budget links operational and tactical military readiness with strategic readiness. If the United States Government intends to prioritize other elements of the DIME for national security in place of traditional military readiness, the military services must use the readiness reporting process to ensure efficient use of every dollar provided. In order to most effectively prioritize those limited resources, an objective methodology is required to identify capability gaps. To answer the thesis, this paper offers a solution to reform the readiness reporting process by evolving intelligence and operations community processes so that requirements may be objectively evaluated. This will provide more accurate assessments in order to advise senior leaders where they accept risk.

II. Liberal International Theory and Post-Cold War Assumptions

According to international relations (IR) theorist Michael Doyle, “the basic postulate of liberal international theory holds that states have the right to be free from foreign intervention. Since morally autonomous citizens hold rights to liberty, the states that democratically represent them have the right to exercise political independence. Mutual respect for these rights then becomes the touchstone of international liberal theory.”⁴ Jack Snyder, another leading IR theorist, further details that the “spread of democracy, global economic ties, and international organizations will strengthen peace.”⁵ In line with this definition, liberalism stresses that international institutions provide a forum to discuss and respect the rights of other nations, encouraging a web of mutually advantageous economic and political commitments, thereby reducing, but not eliminating, the probability of war between nations.⁶ In contrast with the realist theory’s anarchic worldview, the logical conclusion of the liberal theory in a resource constrained environment is for a country to focus those resources towards the diplomatic and economic instruments of power in order to promote interdependence with other nations. Theoretically, this would reduce the probability of war by making the cost economically and politically prohibitive to rational state actors.

Naturally, the attention dedicated to each instrument of power ebbs and flows depending on the political climate. Inter-war eras in the United States historically trend towards military

⁴ Michael Doyle, “Kant, Liberal Legacies, and Foreign Affairs,” in *International Politics: Enduring Concepts and Contemporary Issues*, ed. Robert J. Art and Robert Jervis, 8th ed. (Pearson Education Inc., 2007), 85.

⁵ Jack Snyder, “One World Rival Theories,” *Foreign Affairs Magazine*, no 145 (December 2004): 59.

⁶ Michael Doyle, “Kant, Liberal Legacies, and Foreign Affairs,” in *International Politics: Enduring Concepts and Contemporary Issues*, ed. Robert J. Art and Robert Jervis, 8th ed. (Pearson Education Inc., 2007), 85.

drawdown.⁷ The end of Operation Iraqi Freedom (OIF) in 2003 signaled the most recent break from war between nation states, effectively ushering in an inter-war period between large powers. America has historically been wary of maintaining a standing military in times of peace. After both the Revolutionary War and the Civil War, the military was slashed in favor of focusing on divisive internal issues. After World War I, despite President Wilson's attempt to drive a liberal agenda in Europe and the Pacific, America again focused inward with a return to isolationism. After World War II, while America assumed a larger role on the international stage as a super power nation pushing a liberal agenda, the Cold War drove a continued focus on the military instrument of power.

After the Cold War, political scientists attempted to predict what the future would hold for international relations and conflict. Three leading theories in the early 1990's were Francis Fukuyama's end of history, Samuel Huntington's clash of civilizations, and Robert Kaplan's coming anarchy. Fukuyama's thesis, built on Friedrich Hegel's philosophy, posited that the fall of communism marked "the end of history as such: that is, the end point of mankind's ideological evolution and the universalization of Western liberal democracy as the final form of human government."⁸ He stated that nations who chose to adhere to the Western liberal world order would be more concerned with economic development rather than territorial expansion and would therefore be less likely to fight each other.⁹ While not all nations or groups would subscribe to the liberal world order, non-subscribing entities would be too insignificant to threaten the subscribing larger powers economically and would not be able to challenge them in

⁷ Jonathan House, *Toward Combined Arms Warfare: A Survey of 20th Century Tactics, Doctrine, and Organization*, (Ft. Leavenworth: Combat Studies Institute, 1984), 44.

⁸ Francis Fukuyama, "The End of History?" *The National Interest*, (Summer 1989), <https://www.wesjones.com/eoh.htm>.

⁹ Ibid.

a conventional military sense.¹⁰ “There is no struggle or conflict over large issues, and consequently no need for generals or statesmen; what remains is primarily economic activity.”¹¹

Huntington’s clash of civilizations theory, by contrast, explained that future conflict would not occur along ideological nor economic lines as it had in the twentieth century, but along cultural fault lines delineated by civilizations.¹² While Fukuyama’s end of history theory assumed all nations would eventually gravitate towards the western liberal democratic ideology, Huntington argued that although most nations would look to modernize, not all wanted to westernize. As the United States began to advance its own interests as the sole super power, other strong nations could balance or bandwagon along cultural lines to oppose western influence.¹³ This theory has similarities with the balance of power theory and could be used to justify maintaining a larger standing military in order to secure military dominance. Countries such as China and Japan, whose culture is significantly different than western culture, would therefore have to reconcile a desire for economic advancement on the global stage with their existing culture.

Finally, Kaplan’s theory of coming anarchy posited that future conflict would be over resources, not ideology or culture.¹⁴ Using Africa as a case study, he detailed how looming water and food shortages posed the greatest threat to security.¹⁵ While some urban population

¹⁰ Ibid.

¹¹ Ibid.

¹² Samuel Huntington, “The Clash of Civilizations,” *Foreign Affairs*, 72, no. 3 (June 1993): 22

¹³ Ibid, p.41.

¹⁴ Robert Kaplan, “The Coming Anarchy,” *The Atlantic*, (February 1994), <https://www.theatlantic.com/magazine/archive/1994/02/the-coming-anarchy/304670/>.

¹⁵ Ibid.

centers could avoid this problem, the vast majority of people on the planet would be affected by this, inviting conflict to secure those precious resources.¹⁶

Regardless of how accurate any of these theories turned out to be, traces of all three exist in today's international relations environment. After the Cold War, the United States found itself in the unique position as the world's only super power, again able to dictate the world order. It chose to pursue a Wilsonian vision. Describing his hope for the new world order, President George H.W. Bush explained that "we have a vision of a new partnership of nations that transcends the Cold War. A partnership based on consultation, cooperation, and collective action, especially through international and regional organizations."¹⁷ Liberal international institutions such as the UN took center stage according to the United States vision for a new world order. This reflected Fukuyama's theory in that nations who adhered to Western liberal democracy could interact in an open market to further their economies while keeping an open dialogue to avoid conflict. It also reflected Huntington's clash of civilizations in that it was inclusive of all cultures. Finally, Kaplan's coming anarchy theory was woven in through various humanitarian organizations. Per Wilsonian ideals, this world order was designed to reduce the likelihood of conflict and, as a result, has driven resources away from America's military.

III. Strategic Military Readiness: Outdated Legacy Mindset

America's military strives to be ready for a conflict with military peer nations, such as China and Russia, while continuing to fight terrorism, all in a budget constrained environment. As an instrument of power subordinate to civilian political leadership, the military often encounters conflicting guidance in terms of readiness. In order to frame this discussion in terms

¹⁶ Ibid.

¹⁷ Henry Kissinger, *Diplomacy*, (New York, New York: Simon and Schuster, 1994), 804.

of military readiness, it is first necessary to define readiness. According to Richard Betts in *Military Readiness: Concepts, Choices, Consequences*, military readiness is a function of potential capability over time. He states that “a country is militarily ready as long as the time needed to convert potential capability into the actual capability needed is not longer than the time between the decision to convert and the onset of war.”¹⁸ He goes on to say “a country proves not to be ready when a gap between its actual and potential capability causes a gap between the supply of capability and the demand for it.”

Betts believes that American military peacetime readiness has adhered to only two traditions throughout its history. The first tradition, which persisted prior to the Cold War, was “rapid demobilization after each war and tardy remobilization for each new war.”¹⁹ There is no clearer example than the interwar years between World War I and World War II. After World War I, the military demobilized as the country returned to a policy of isolationism. Consequently, for World War II, the United States delayed entering the war prior to 1941 then struggled thereafter in part because neither the military nor industry were postured for wartime. In other words, there was a readiness gap due to the difference in the time it took to convert military potential into actual capability for World War II. The second tradition which persisted during the Cold War was “peacetime mobilization: large forces in being, capable of immediate action.”²⁰ Here, the United States maintained a standing force it perceived as large enough to respond quickly to the threats posed by the spread of Communism. Today, however, a third

¹⁸ Richard Betts, *Military Readiness: Concepts, Choices, Consequences*, (Washington, D.C.: The Brookings Institute, 1995), 28.

¹⁹ Richard Betts, *Military Readiness: Concepts, Choices, Consequences*, (Washington, D.C.: The Brookings Institute, 1995), 4.

²⁰ *Ibid*, 4-5.

tradition appears to be emerging whereby discourse through liberal international institutions is leveraged as a readiness tool in place of a large standing force.

The post-Cold War era saw a drastic demobilization which at first glance appeared similar to Betts' first tradition. In 1990, the Defense Manpower Data Center (DMDC) statistics showed the total number of active duty military personnel to be over two million.²¹ As of June 2017, the total was down to about 1.3 million, nearly half of the Cold War numbers.²² The reason for this demobilization, however, differs from both traditions described by Betts. Previous demobilizations in America occurred largely in order to refocus on internal growth either due to a fear of a large standing military, to provide an influx of workers back to the economy and agriculture, or to attempt to regain isolationism. The post-Cold War demobilization has been driven by two different factors. First, with the downfall of the Soviet Union in 1990, no other existing nation could challenge the United States militarily. This argument applies less today than it did at the end of the Cold War as countries like those described by the four-plus-one are on the rise and can challenge the United States militarily. More pertinently, the second factor was that the world order based on liberal international institutions tied countries together through the idea that war could be delayed or prevented through cooperation, thus giving rise to the proposed third tradition.

The UN provides the most readily apparent lens through which to view liberal international institutions' impact on American military readiness. Articles one and two of the UN Charter relate directly to Snyder and Doyle's definitions of the liberal school of international

²¹ Defense Manpower Data Center, *DoD Personnel, Workforce Reports and Publications: Active Duty Military Personnel Strength*, Defense Manpower Data Center, 1991 and 2017, https://www.dmdc.osd.mil/appj/dwp/dwp_reports.jsp.

²² *Ibid.*

relations. Article one states that the purpose of the UN is to collectively work to remove threats to peace through development of relations and cooperation, respect the principles of equal rights among member nations and individuals, and “to be a center for harmonizing the actions of nations” towards those purposes.²³ Article two further delineates that “all members shall settle their disputes by peaceful means” and that they “shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any state.”²⁴ Assuming all member nations adhere to this agreement, the UN provides an outlet for nations to resolve their differences through discourse and diplomacy rather than through war. Since military buildups, regardless of intention, can be viewed as hostile by nations competing economically on the world stage, it is reasonable to expect smaller standing forces in order to convey a less threatening message.

While on the surface it may seem logical that maintaining a smaller standing force reduces military readiness, the proposed third readiness tradition offers a more plausible explanation. If readiness is a function of not only existing capability but also of the time required to realize potential capability, the UN may provide a venue through which to buy time for a buildup even if unable to prevent war. For this to be true, the assumption must be made that the capacity exists in terms of ability to mobilize and train a large influx of personnel quickly in order to realize potential capability in time for an impending war.

In order to achieve readiness as described by Betts, all branches of the US armed forces conduct training according to their assigned mission sets. Each service uses measures of effectiveness related to their respective missions and doctrine, theoretically melded together

²³ “Charter of the United Nations and Statute of the International Court of Justice,” *Chapter I: Purposes and Principles* (1945): 3.

²⁴ *Ibid.*

through Joint Doctrine, to drive their training environment and to report their readiness up the chain of command. The Marine Corps, for example, focuses much of its training on amphibious warfare and forcible entry operations employed through the Marine Air Ground Task Force construct. The Air Force, by contrast, focuses on supremacy or superiority of the air, space, and cyberspace domains in terms of air-to-air, air-to-ground, and non-kinetic effects employment. Delving into the Air Force's readiness more specifically will provide insight into whether or not the existing readiness methodology truly achieves readiness in the post-Cold War environment.

Assuming the military achieved readiness during the Cold War, can similar principles and methodologies be applied to examine readiness in the post-Cold War environment? Engagements during the Korean and Vietnam wars showed that the Soviet Union's aircraft and air-to-air missile capabilities surpassed that of the United States.²⁵ As a result, in 1977, the Air Force changed its training methodology to better prepare its pilots. Through the recently declassified program CONSTANT PEG, the Air Force acquired thirteen Soviet fighter aircraft in order to exploit the technology to find weaknesses and to allow American fighter pilots to fly and train against actual Soviet aircraft to develop winning tactics and to improve their confidence.²⁶ These aircraft belonged to an aggressor squadron named the Red Eagles. Using Mig-17, Mig-21, and Mig-23 aircraft, the Red Eagles opposed American aircraft and pilots during exercises in Nevada from 1977 to 1988. According to retired General Carlisle, a former member of the Red Eagles, "although it came too late to influence Vietnam, Constant Peg training greatly influenced the success of American Airmen in Desert Storm, who shot down 40 Iraqi fighters," many of

²⁵ US Air Force, CONSTANT PEG, *Official United States Air Force Website* (November 2006): <http://www.af.mil/News/ArticleDisplay/Article/129077/air-force-declassifies-elite-aggressor-program/>.

²⁶ Ibid.

which were those same aircraft.²⁷ With the combined use of realistic training and the use of new technologies such as stealth aircraft, precision guided munitions, and standoff weapons, the United States gained decisive air supremacy over Iraq.²⁸ While the outcome may have been different had Russian pilots been flying rather than Iraqi pilots, the Air Force could be said to have achieved readiness for Desert Storm because it was able to effectively field a superior force in time for the war.

Since then, however, the landscape of air combat has changed significantly. Many countries have developed and fielded anti-access, area denial capabilities. Joint Publication 1-02 defines anti-access (A2) as “action, activity, or capability, usually long-range, designed to prevent an advancing enemy force from entering an operational area.”²⁹ These capabilities are intended to deny an adversary freedom of maneuver across warfighting domains to deter aggression. It also defines area denial (AD) as “action, activity, or capability, usually short-range, designed to limit an enemy force’s freedom of action within an operational area.”³⁰ AD capabilities generally include systems such as coastal defenses, surface-to-air missile systems, advanced fighter aircraft and other short-range weapons, all integrated through some level of automated command and control system. Together, A2 and AD capabilities discourage an adversary from deploying a force to the operational area by prohibitively driving up the risk associated with achieving all-domain dominance.

Recently, the Kaliningrad scenario has been used as an A2AD case study. Kaliningrad is a detached Russian enclave near the Baltics in close proximity to NATO countries. Russia has

²⁷ Ibid.

²⁸ Ibid.

²⁹ Headquarters Joint Staff, *DOD Dictionary of Military and Associated Terms*, Joint Pub 1-02 (Washington, DC: Headquarters Joint Staff, August 2017), 17.

³⁰ Ibid, 18.

traditionally used the Baltic states as a buffer to trade space for time to mobilize its military. Examples of this include invasions by Napoleon and Germany in both World Wars. In order to neutralize NATO's advantages in the areas traditionally used by Russia as a buffer and to complicate its gray zone methods, it has invested in A2 capabilities to discourage or delay NATO from deploying forces. Additionally, it has built up modern conventional AD capabilities, such as long-range air and coastal defenses, to defend the air and sea domains around the Baltics. Nearly all of these modern defensive systems are mobile to complicate NATO targeting techniques and networked for coherent command and control.³¹

Clinging to the old methods of training to gain readiness in a scenario like Kaliningrad has thus become difficult. Realistic training methodologies similar to CONSTANT PEG have been rendered unrealistic as the available training environments struggle to support the scope of the A2 and AD threats in time and space. While emerging opportunities such as networked simulators do exist to help fill the training gap in order to prepare the force for this new environment, development is slow and expensive and realism is difficult to achieve. As such, the Congressional budget process further complicates the readiness challenge. Since the Cold War, budget constraints have limited development of realistic A2AD training opportunities.

IV. A New Strategic Military Readiness Tradition Emerges

For the majority of the past twenty-five years, and notably for ten straight years from 2007 to 2017, Congress failed to pass a budget, opting instead to pass continuing resolutions (CR). A CR provides funding for the specified period, usually the fiscal year, but "creates

³¹ Stephen Fruhling and Guillaume Lasconjarias, "NATO, A2/AD and the Kaliningrad Challenge," *Survival: Global Politics and Strategy* 58, no. 2 (Apr 2016): 95-116, <https://web-b-eb-scohost-com.lomc.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=11&sid=641df10c-012b-4578-8f75-4fa23a8f95e6%40sessionmgr104>.

uncertainty about both the timing and level of funding that ultimately will be available.”³² While each military service chief submits a budget, Congress effectively prevents the service chiefs from planning more than a year in advance by opting to pass a CR instead of approving a budget. The CR does not account for emerging or future capabilities and requests, forcing each service to prioritize limited funds to achieve immediate objectives. This stifles the military’s ability to implement a coherent long-term modernization plan to tackle A2AD readiness challenges.

In response to the CR dilemma, the Joint Chiefs of Staff have provided a clear, unified message to Congress. As stated by General Goldfein, “continuing resolutions completely undermine a service chief’s ability to plan for the future.”³³ It not only hinders the services, but it also introduces instability with industry because the services cannot purchase weapons or other capabilities more than a year in advance. The Joint Chiefs are begging for stability in the budget process. They continue to submit their annual budget request and urge Congress to approve a budget on time so that, regardless of the amount appropriated, the military can plan for the future.³⁴ This is significant in terms of readiness in that if Soldiers, Sailors, Airmen and Marines do not have the means to effectively train to the A2AD environment posed by four-plus-one scenarios like Kaliningrad, the time it would take to train the force in the transition from potential capacity to realized capacity is inevitably extended. For example, an instructor pilot who has never trained against modern air defense systems cannot be expected to immediately train new pilots on those threats.

³² US Government Accountability Office, *Continuing Resolutions: Uncertainty Limited Management Options and Increased Workload in Selected Agencies* (Washington DC: Government Accountability Office, 2009), 1, <http://www.gao.gov/new.items/d09879.pdf>.

³³ David Goldfein, “Air Force Readiness,” By John Venable. *Heritage Foundation*, April 12, 2017, <https://www.c-span.org>.

³⁴ *Ibid.*

Based on this message from the Joint Chiefs of Staff, it seems that America's civilian leadership continues to play down military readiness. One underlying explanation is that they view the UN, and other liberal international institutions, as a time buffer. To draw a parallel with Russia's newfound reliance on A2AD capabilities, Russia has traditionally relied on the Baltic states as a buffer to trade space for time while it mobilized its military to confront invaders. As that buffer disappeared with the post-Cold War expansion of NATO, they turned to A2AD capabilities to fill that role.³⁵ Similarly, if discourse in the UN can delay the outbreak of hostilities between nation states buying time for a military mobilization, that time could shrink or bridge America's military readiness gap. Therefore, the third readiness tradition has emerged whereby the time bought through discourse in international institutions provides readiness in place of a large standing military force.

While support for liberal international institutions has dominated American international relations since the end of the Cold War, the third readiness tradition explains why it has come at the expense of military readiness. Although the size of the force does not necessarily determine readiness, the existing force must be trained and equipped to quickly turn potential capability into actual capability. As budget constraints continue to hamper the military's ability to implement a modernization plan, the military will struggle to train to the A2AD environment presented by the four-plus-one. As long as the third readiness tradition provides American political leaders with the perception of a safety blanket to justify driving resources to other instruments of power, military readiness will continue to deteriorate.

³⁵ Fruhling, Stephan and Guillaume Lasconjarias. "NATO, A2/AD and the Kaliningrad Challenge." *Survival: Global Politics and Strategy* 58, no. 2 (Apr 2016): 95-116, <https://web-b-eb-scohost-com.lomc.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=11&sid=641df10c-012b-4578-8f75-4fa23a8f95e6%40sessionmgr104>.

V. Operational-Level Readiness Reporting Process Shortfalls

Despite these strategic challenges, America's military must still train to be as ready as possible. Understanding how to train to achieve readiness should begin with the intelligence community (IC) analysis to inform operations, and should culminate in a readiness reporting process designed to inform senior leader decisions. The goal of the readiness reporting process should be to enable leadership to properly prioritize the limited resources available for training. The IC is responsible for analyzing enemy threats and tailoring that analysis to the requirements of their service or organization. Based on competing priorities, these disparate organizational analytic requirements have resulted in a fragmented depiction of the threat environment, complicating training prioritization. These problems, when combined with a subjective readiness reporting process, have institutionalized generic reporting, masking true readiness assessments. In order to drive readiness reporting back toward its intended purpose, the IC should transition to a universal language to define the threat environment based on a repeatable, unbiased methodology to inform training prioritization and readiness reporting.

While defining enemy threats globally can be a paralyzing analytic challenge, the CJCS's four-plus-one strategic framework effectively scopes the problem from the standpoint of air defense. Most countries, including Iran and North Korea, rely on weapons purchased from the three primary military weapons exporters which are Russia, China, and the United States. Each country integrates these weapons differently based on their culture, capabilities, and doctrine. Iran's air defense network presents a representative illustration. Iran currently operates surface-to-air missile systems from the United States, China, and Russia, as well as several indigenously produced systems. Additionally, it operates fighter aircraft purchased from both the United States and Russia. While none of these weapons systems were meant to integrate from a

hardware or software perspective, Iran has meshed them together to defend their airspace through upgrades and command and control procedures. Therefore, any universal methodology to define the threat environment must not only be able to handle the high-end A2AD environments posed by countries such as Russia and China, but must also be flexible enough to account for less advanced but complex A2AD environments such as Iran, North Korea, or even terrorist groups.

Within the IC, analysts have used two methodologies which attempt to describe the air defense threat environment based on levels. The first, used by organizations such as the National Air and Space Intelligence Center, bins specific threat systems into levels according to the year they attained initial operating capability. In application, a scale from level one to level five, for example, can be derived where level one represents legacy weapons systems and level five represents the most recently fielded systems. According to this scale, the SA-2, one of the first radar-guided surface-to-air missile (SAM) systems fielded by Russia in the 1950's,³⁶ could be binned into level one whereas a newer SAM system, such as the SA-21 fielded by Russia in the 2000's, would be binned into level four or five.

This type of scale is simple to understand and can be easily applied to threats across domains and warfighting functions. However, it falls short in two areas. First, technology does not always follow a linear development or implementation timeline, making it difficult to accurately place upgrades to existing systems. Additionally, it becomes unwieldy as new systems are fielded because the breaks in levels do not necessarily correspond to friendly counter-tactics. For example, if a new system were fielded which could be defeated using existing counter-tactics, it would presumably be binned into a higher threat level even though it

³⁶ Janes online handbook, <https://janes-ihs-com.lomc.idm.oclc.org/Janes/Display/jlad0227-jaad>

had similar characteristics to older systems. Second, the analysis is stove piped to weapon systems and does not account for the overall threat environment to include country-specific doctrine, tactics, techniques and procedures (TTP), or integration with other systems. Therefore, this methodology is too broad to capture a holistic picture of various threat environments and ineffective at properly driving training resources.

The second methodology attempts to bin threats based on their technological advancement. This model could again bin threats into five levels. Using fighter aircraft as an example this time, an aircraft with no air-to-air radar and no radar-guided missiles, such as the Mig-15, could be binned into level one whereas an aircraft with an active electronically scanned array (AESA) radar and active radar-guided missiles could be binned into level four or five. Although this methodology is more flexible to non-linear technology development cycles, it also fails to account for the threat environment nuances posed by doctrine, TTP, and integration.

In the Air Force, the problem of capturing readiness is compounded by the existing readiness reporting process. Readiness reporting involves three separate-but-aligned commander assessments: Resource readiness, Capability Readiness, and Unit Type Code Readiness.³⁷ This process is a commander's tool to present the state of his unit's readiness up the chain of command. "Resource readiness provides an objective assessment of a unit's status, based on the full mission set it was organized for."³⁸ Commanders measure their possessed resources, such as manning and equipment, against what they are authorized in order to provide a realistic indication of the unit's readiness.³⁹ By contrast, "capability readiness reflects the unit's ability to accomplish the designed mission by assigning the METs (Mission Essential Tasks), while also

³⁷ AFI10-201, Force Readiness Reporting, March 2016, 7.

³⁸ Ibid, 9.

³⁹ Ibid, 9.

considering the unit's ability to provide the level-of-capability it is organized for."⁴⁰

"Commanders will combine mission assessments with the results of training events and their resource readiness to support their Capability Readiness Assessment."⁴¹ The commander's assessments are input into the DoD's readiness system of record, the Defense Readiness Reporting System (DRRS).⁴² In theory, the capability readiness assessment should tie resources and capabilities together to describe the unit's overall state of readiness.⁴³ Operational level leadership should use this readiness data to identify gaps in readiness and to drive resources to target those gaps.

In the Air Force intelligence and aviation communities, the readiness reporting process begins at the Squadron level. Certified trainers in a Squadron develop a training plan using Major Command (MAJCOM) approved mission essential tasks (MET) tied to assigned named operations or Operational Plans (OPLAN) to achieve readiness at the tactical level.⁴⁴ Each individual in the Squadron is evaluated against the METs periodically. To be considered combat mission ready (CMR), an individual must show the requisite level of proficiency for all required METs within the reporting period. While building training plans to fulfill individual METs appears objective, subjectivity creeps in even at this level. METs are typically broad in that they do not specify where or how the training should occur, nor do they specify a required threat replication proficiency. An example of a MET for a fighter pilot could be to demonstrate proficiency in the defensive counter-air (DCA) mission. It would not typically specify against what enemy aircraft nor would it specify the tactics the red force would be required to replicate.

⁴⁰ Ibid, 10.

⁴¹ Ibid, 63.

⁴² AFI10-201, Force Readiness Reporting, March 2016, 63.

⁴³ Ibid, 10.

⁴⁴ Ibid, 9.

Further detail regarding threat replication criteria is delineated in the less formal platform Air Force Tactics, Techniques and Procedures 3-1 (AFTTP 3-1) volumes, however they too miss the mark. Traditionally, aircrew train to show proficiency against a baseline threat identified in their platform's AFTTP 3-1. The baseline threats are designed to inform the METs and to baseline a community's proficiency. While a small percentage of CMR pilots in a given fighter community may be proficient against a fifth-generation fighter threat, for example, all CMR pilots would be proficient against a fourth-generation fighter threat. The baseline threat is therefore determined according to each platform's assigned missions and capability and published in that AFTTP 3-1 document.

The AFTTP 3-1 series of publications are PDF documents which are updated every two years by subject matter experts from that platform's operators and from the IC. As the enemy threat evolves over time, so too should the baseline threat in order to mirror the most likely threat scenario. While this process was able to keep pace with changes to the threat environment during the Cold War, it has lost relevance for two reasons. The first is related to the financial restrictions and flight hours limitations as a result of sequestration. Historically, any change to the baseline threat would be closely followed by the acquisition of a capability to replicate that threat in training. Financial limitations have stifled Squadrons' ability to acquire and maintain systems to replicate more advanced threats in normal training scenarios. Additionally, opportunities for realistic training such as CONSTANT PEG have dwindled and atrophied. If a threat cannot be replicated, community SMEs have no incentive to advance the baseline threat. This trend may shift with the budget passed in February 2018 lifting sequestration and ending the CR spiral. The second reason is that the two year AFTTP 3-1 update cycle is too slow to keep pace with the changing threat environments posed by the four-plus-one. Therefore, the AFTTP

3-1 baseline threat methodology does not effectively inform the associated METs per the existing readiness reporting process.

While broad MET criteria entrust a commander with flexibility to assess his unit's readiness without undue oversight, it hinders the readiness process in that reporting is largely subjective. Referring back to the enemy fighter example, one unit may have trained against legacy enemy fighters while other units may have trained against a more modern threat. While both of these units would clearly be ready for different environments, they both show up simply as ready through the reporting process. Although different units can and should be expected to require readiness for different threats depending on their assigned resources and tasked mission sets, the lack of a universal language to define the threat environment writ large confuses the overall readiness picture. Without a common understanding of the holistic threat environment, the existing readiness reporting process will continue to provide mediocre data to inform senior leader decisions.

VI. Recommended Readiness Reform: The Threat Matrix Framework

A third methodology being developed by the Air Force, called the Threat Matrix Framework (TMF), evolves the IC's depiction of the threat environment and merges it with a recommendation for a revamped training and readiness reporting process. This new methodology was conceived at the annual Air Force Weapons and Tactics Conference (WEPTAC) in January 2017 in response to the CSAF's question "ready for what?" During this two week conference led by Air Combat Command, the first week was devoted to Mission Area Working Groups (MAWG). Each group tackled a topic of interest to MAJCOM Commanders and was led by experts in that specific topic. While most topics aimed to solve a tactical problem in a particular commander's area of responsibility, one MAWG in 2017 tackled the

readiness problem from defining the tactical threat environment through the operational level readiness reporting process. The recommendations from this particular group earned visibility with the Air Staff and with the Air Force Chief of Staff.

The goal of the readiness MAWG was to create a new framework to present a holistic depiction of the threat environment. The group was composed of experts from nearly every aircraft community in the Air Force as well as representatives from the Aggressors, multiple IC organizations, space and cyberspace experts, and sister services. This framework aimed to create a common language to define the threat environment and a ruler against which to measure friendly capabilities. The group's end product was the TMF.

The TMF broke the threat environment into two parts, each on a scale of one to five. The first part included the threat weapon systems themselves. A level one threat would have minimal impact on friendly operations whereas a level five threat would represent cutting edge and emerging capabilities. Rather than listing individual threat systems, however, this category broke out specific capabilities based on their impact to friendly operations. For example, in the surface-to-air block, it does not list out specific systems such as the SA-2, but rather lists capabilities, such as command guidance and how many simultaneous engagements could be achieved. The intent was to show a clear delineation between each threat level based on a required change to blue counter tactics rather than specific named systems. It looked strictly at the maximum capability an enemy could field without regard to country specific TTP. This introduced flexibility compared to other methodologies in that each level could be tied to friendly tactics rather than arbitrarily binning threats into levels by name or based on the year they were produced.

The second category defined the environment in terms of enemy doctrine and TTP. The group saw this as necessary in order to definitively separate the TMF from existing methodologies. Level one was the most basic doctrine and TTP whereas level five was a robust doctrine and advanced TTP. For example, although several countries employ the SA-15, the number of target tracking radars in one country may differ from that of another country. Additionally, their integration with command and control and other air defense assets may range on the scale from one to five. Even though many of the capabilities of the SA-15 weapons system could be considered higher end, the overall threat level posed by the holistic environment could be less if employed using inferior TTP.

According to the holistic methodology of the TMF, the overall level of a given threat environment would be derived by analyzing the threat capabilities employed by a country and merging it with analysis of their doctrine and TTP from the second category. This framework thus created a common language for defining the threat environment from level one to level five. In future training scenarios, when an F-16 pilot, for example, discusses a level three threat with an F-22 pilot, although each pilot would expect to react differently to that threat based on his aircraft's capabilities, the pilots have a common understanding of what level three means, allowing them to mission plan more effectively.

The TMF is inherently an intelligence community analytic product. Study of the threats posed by possible adversary nations should enable analysts to fill out the matrix in order to define the holistic threat environment fielded by that country. Analysis could reveal threat levels for individual categories as well as an overall level. That being said, a military intelligence product is pointless if not designed to inform operations. Different airframes react differently to

threats depending on their TTP. The value of the TMF is that it is blind to individual platforms. A level three threat retains that level regardless of friendly platform in question.

This common language has two benefits at the tactical level. First, it creates a shared understanding of the threat environment regardless of community, allowing planners to begin planning for any given scenario speaking the same language. Second, it promotes flexibility within individual communities to train to achieve readiness. Based on platform capability in the air-to-air domain, an F-22 may be survivable in a level four threat environment whereas an F-16 may not be survivable in that same environment. Therefore, an F-16 would not be expected to fight in that environment until it had been reduced to a survivable level. Using the definitions in the TMF, each community could leverage the IC's analysis to train for readiness in the level they would likely face in combat to promote integration and to objectively describe gaps in readiness.

The TMF could also be used to drive improvements to threat replication capabilities in training. Analysis of existing Aggressor threat replication capabilities against the matrix could provide the analytic rigor required to uncover gaps in training. If it is determined, for example, that training for a level three air-to-air threat is required but there is a gap in the Aggressor's capability to replicate that threat, resources could be devoted to target that gap in capability.

The tactical benefits of the TMF correlate to the operational benefits. If individual units build their training plans to achieve readiness based on the levels proposed in the matrix, the common language defined in the matrix allows commanders to present a more complete picture up the chain. It is not intended to remove a commander's ability to assess his unit's readiness. The readiness reporting process should still include a subjective section for comments from the commander. This framework simply provides a more complete tool against which a commander

can assess his unit's readiness in order to explain more precisely what environment his unit is ready for and to inform decisions up the chain.

In order for the Air Force to maximize the benefits of the TMF, Headquarters Air Force (HAF) must adopt it by providing guidance to incorporate it in the readiness reporting process. Because OPLANs have ceased to effectively drive readiness, HAF could shift readiness reporting towards more objective measures of effectiveness by leveraging the four-plus-one framework in conjunction with the TMF. By asking units to be ready for the four-plus-one, or a subset thereof, the TMF could inherently guide training by providing the ruler with which to measure readiness for those threats, objectively explaining the unit's readiness posture.

The Air Force has led the way in this effort. Based on the recommendation from the MAWG, the 547 Intelligence Squadron (IS) at Nellis AFB was selected to champion the TMF and to publish it in the Air Force Tactics, Techniques, and Procedures 3-1 (AFTTP 3-1) Threat Volume at the Secret level. As of September 2017, the product is published and ready for use. The next challenge is to ensure the product remains current. While the 547 IS works hard to ensure interim updates to adversary capabilities inside the two year AFTTP 3-1 cycle are disseminated promptly, the product itself is not responsive to changes. Therefore, keeping the TMF aligned with the current AFTTP 3-1 process risks having it eclipsed by the rapidly evolving threat environment. Additionally, while running the matrix for an individual adversary can produce a snapshot of the threat environment at that point in time, the snapshot becomes obsolete as soon as the adversary makes a change.

The solution for both of these issues, proposed by a senior IC leader, is to automate the product. Rather than relying on a working group to update the individual country analysis every two years or on request, automation presents two benefits at the tactical level. First, it enables

every analysts to leverage the TMF. While official assessments require the analytic rigor of a working group, intelligence analysts at the tactical level can use the automated matrix to help develop a training plan to achieve readiness by building a threat environment tailored to their supported platform. Second, it can enable swifter inputs to official assessments by leveraging data from ongoing collection across the globe. A beta version of the automated TMF has already been fielded and is currently being tested. The TMF also has operational-level benefits. It enables Headquarters Air Force, and other services who choose to adopt the methodology, to implement guidance allowing commanders to report readiness against the Framework, uncovering usable data to drive a long-term readiness plan. This data can then be used to objectively justify funding requests for measures targeting critical readiness gaps.

The short-term path to success for this initiative is for the adoption of the TMF in both the HAF Operations and Intelligence directorates. Once it is established as the standard for the Air Force, it would likely gain buy-in from other IC organizations who support the Air Force. In the long-term, this methodology has potential Joint uses. While the Air Force has built a matrix to define the threat environment in terms of enemy air defense, space, and cyberspace, other communities could use the same methodology for their respective service or domains. While Joint doctrine is often cumbersome and slow to change, the ultimate recommendation for this methodology is to make it a Joint process to promote integration in planning and execution as well as to present realistic readiness assessments across the armed services.

VII. Conclusion

Military readiness in the post-Cold War era is a complex problem. The existing international order based on liberal institutions has induced uncertainty in military readiness. The 1990's "now what?" literature identifies that a consistent reliance on international

institutions for dialogue to prevent conflict should allow the US to reduce defense spending. While this assumption seems to have ushered in an era without large power conflict, domestically it has led to the spiral of continuing resolutions and to sequestration. Meanwhile, potential adversaries such as those in the four-plus-one have evolved the A2AD threat environment. America still depends on its military to prepare for any conflict, however training and readiness strategies developed during the Cold War are no longer sufficient to keep pace according to Betts' definition. The readiness reporting process in its current form does not accurately measure readiness at the tactical level and provides little actionable information for operational level decision makers to objectively fight for resources. Adoption of the TMF along with the recommended readiness reporting reform would provide military and civilian leadership with a methodology to objectively measure readiness and to target readiness gaps regardless of the fiscal environment. Once a complete readiness picture is achieved, the military will be qualified to answer, "ready for what?"

Bibliography

- AFI10-201. Force Readiness Reporting, March 2016.
- Betts, Richard. *Military Readiness: Concepts, Choices, Consequences*. Brookings Institute, Washington D.C., 1995.
- “Charter of the United Nations and Statute of the International Court of Justice.” *Chapter I: Purposes and Principles* (1945): 3.
- Defense Manpower Data Center. *DoD Personnel, Workforce Reports and Publications: Active Duty Military Personnel Strength*. Defense Manpower Data Center, 1991, 2017. https://www.dmdc.osd.mil/appj/dwp/dwp_reports.jsp.
- Doyle, Michael. “Kant, Liberal Legacies, and Foreign Affairs.” In *International Politics: Enduring Concepts and Contemporary Issues*, edited by Robert J. Art and Robert Jervis, 8th ed., 83-95. Pearson Education Inc., 2007.
- Dunford, Joseph. “Joint Chiefs Chairman Dunford on the ‘4+1 Framework’ and Meeting Transnational Threats.” By Michael O’Hanlon. *Brookings’s Institute* (February 2017). <https://www.brookings.edu/blog/brookings-now/2017/02/24/joint-chiefs-chairman-dunford-transnational-threats/>.
- Fruhling, Stephan and Guillaume Lasconjarias. “NATO, A2/AD and the Kaliningrad Challenge.” *Survival: Global Politics and Strategy* 58, no. 2 (Apr 2016): 95-116, <https://web-b-ebshost-com.lomc.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=11&sid=641df10c-012b-4578-8f75-4fa23a8f95e6%40sessionmgr104>.
- Fukuyama, Francis. “The End of History.” *The National Interest* (Summer 1989). <https://www.wesjones.com/eoh.htm>.
- Goldfein, David. “Air Force Chief of Staff Confirmation hearing.” *American History C-SPAN3*, June 16, 2016. <https://www.c-span.org/video/?411254-1/senate-armed-services-committee-considers-air-force-chief-staff-nomination>.
- Goldfein, David. “Air Force Readiness.” By John Venable. *Heritage Foundation*, April 12, 2017. <https://www.c-span.org/video/?426883-1/air-force-general-david-goldfein-discusses-military-readiness>.
- Headquarters Joint Staff. *DOD Dictionary of Military and Associated Terms*. JP 1-02. Washington, DC: Headquarters Joint Staff, August 2017.
- House, Jonathan M. *Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization*. Research Survey / Combat Studies Institute, No. 2. Fort Leavenworth, KS: U.S. Army Command and General Staff College, 1985.

Huntington, Samuel. "The Clash of Civilizations?" *Foreign Affairs*, 72, no. 3 (Summer 1993): 22-49.

Janes online handbook. <https://janes-ihs-com.lomc.idm.oclc.org/Janes/Display/jlad0227-jaad>.

Jervis, Robert. "Theories of war in an Era of Leading Power Peace." *American Political Science Review* 96, no. 1 (March 2002): 1-14, <http://www.jstor.org/stable/3117806>.

Kaplan, Robert. "The Coming Anarchy." *The Atlantic* (February 1994).
<https://www.theatlantic.com/magazine/archive/1994/02/the-coming-anarchy/304670/>.

Kissinger, Henry. *Diplomacy*. Simon and Schuster, 1994.

Snyder, Jack. "One World Rival Theories." *Foreign Affairs Magazine*, no. 145 (December 2004): 52-62.

Tangredi, Sam. *Anti-Access Warfare: Countering A2/AD Strategies*. Naval Institute Press, 2013. PDF e-book.

Walt, Stephen. "International Relations: One World, Many Theories." *Foreign Policy*, no. 110 (Spring 1998): 29-46, <http://www.jstor.org/stable/1149275>.

US Air Force. "Air Force Declassifies Elite Aggressor Program." *Official United States Air Force Website* (November 2006):
<http://www.af.mil/News/ArticleDisplay/Article/129077/air-force-declassifies-elite-aggressor-program/>.

US Government Accountability Office. *Continuing Resolutions: Uncertainty Limited Management Options and Increased Workload in Selected Agencies*. Washington DC:

Government Accountability Office, 2009. <http://www.gao.gov/new.items/d09879.pdf>.