Stanton Nuclear Security Fellows Seminar

PANEL 1: Global Nuclear Regime and Regional Issues

1. David Arceneaux, MIT SSP

Beyond the Rubicon: Command and Control in Regional Nuclear Powers

Question and Importance

What factors explain the origins of command and control systems in regional nuclear powers? Why do some states implement robust physical, technical, and administrative controls over their nuclear arsenals, while others limit safeguards against accidental and unauthorized nuclear use? Despite the crucial role of nuclear management systems in promoting nuclear stability and security, recent scholarship has largely overlooked questions regarding operational nuclear doctrine. A review of the recent literature on nuclear proliferation and strategy supports this observation, noting that "Almost no attention has been focused on support, command and control, and the policy apparatus of nuclear capabilities."[1]

The lack of attention to regional power command and control arrangements is important for theoretical and practical reasons. Theoretically, although scholars have recently made notable progress in explaining the strategic behavior of nuclear states, far less has been done to theorize operational-level nuclear decision-making,[2] and an overemphasis on the causes of nuclear proliferation has detracted from our understanding of how emerging nuclear nations behave in the post-proliferation phase.[3] Nearly twenty years since publication, Peter Feaver and Scott Sagan still provide the most direct attempts to explain command and control in new nuclear states.[4] These frameworks, however, largely build upon lessons

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[1] Erik Gartzke and Matthew Kroenig, "Nukes with Numbers: Empirical Research on the Consequences of Nuclear Weapons for International Conflict," *Annual Review of Political Science*, Vol. 19 (May 2016), p. 408.

[2] Recent works on nuclear strategy include: Mark S. Bell, "Beyond Emboldenment: How Acquiring Nuclear Weapons Can Change Foreign Policy," *International Security*, Vol. 40, No. 1 (Summer 2015), pp. 87-119; Mark S. Bell, "Nuclear Opportunism: A Theory of How States Use Nuclear Weapons in International Politics," *Journal of Strategic Studies* (forthcoming); Vipin Narang, "Posturing for Peace? Pakistan's Nuclear Postures and South Asian Stability," *International Security*, Vol. 34, No. 3 (Winter 2009/10), pp. 38-78; Vipin Narang, *Nuclear Strategy in the Modern Era: Regional Powers and International Conflict* (Princeton, N.J.: Princeton University Press, 2014).

[3] Significant arguments on why states pursue nuclear weapons include: Dong-Joon Jo and Erik Gartzke, "Determinants of Nuclear Weapons Proliferation," *Journal of Conflict Resolution*, Vol. 51, No. 1 (February 2007), pp. 167-194; Scott Sagan, "Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb," *International Security*, Vol. 21, No. 3 (Winter 1996/97), pp. 54-86; Etel Solingen, *Nuclear Logics: Contrasting Paths in East Asia and the Middle East* (Princeton, N.J.: Princeton University Press, 2007); Christopher Way and Jessica L. P. Weeks, "Making it Personal: Regime Type and Nuclear Proliferation," *American Journal of Political Science*, Vol. 58, No. 3 (July 2014), pp. 705-719. For a useful critique of the proliferation literature, see: Mark S. Bell, "Examining Explanations for Nuclear Proliferation," *International Studies Quarterly*, Vol. 60, No. 3 (September 2016), pp. 520-529. On the problems of overly emphasizing the causes of nuclear proliferation, see: Narang, *Nuclear Strategy in the Modern Era*, pp. 6-8.

[4] Peter D. Feaver, "Command and Control in Emerging Nuclear Nations," *International Security*, Vol. 17, No. 3 (Winter 1992/93), pp. 160-187; Scott D. Sagan, "The Origins of Military Doctrine and Command and Control Systems," in Peter R. Lavoy, Scott D. Sagan, and James J. Wirtz, ed., *Planning the Unthinkable: How New Powers*

from the U.S. experience and have not received direct empirical evaluation with evidence from regional nuclear powers.[5] Notably, recent research suggests that such theoretical foundations are problematic, as the opportunities and constraints facing regional nuclear powers differ significantly from those that faced by the U.S.[6]

Practically, the absence of an empirically-substantiated theory of command and control in regional nuclear powers creates difficulties for policymakers attempting to address the challenges of nuclear proliferation. Although scholars and practitioners broadly agree that further proliferation is undesirable, Iran and North Korea provide contemporary evidence that states still strive to develop nuclear weapons and possess the financial and technical capacities to do so.[7] As I demonstrate in this project, certain patterns of nuclear management create conditions that increase the likelihood of accidental nuclear use and lower the threshold for nuclear use during disputes. These concerns are amplified during crises, where increased levels of uncertainty and misperception may result in escalation that places additional pressures on command and control systems.[8] To determine the appropriate means for managing these challenges, policymakers need an improved framework for anticipating which states are most likely to adopt command and control systems that are vulnerable to accidental or unauthorized use or prone to rapid escalation during disputes.

Methods and Evidence
To evaluate my theory and the competing explanations, I conduct a series of within-case qualitative analyses. Specifically, I employ the method of process tracing. Process tracing offers a method for evaluating the causal processes that lead to the creation and evolution of command and control systems.[9]

Will Use Nuclear, Biological, and Chemical Weapons (Ithaca, N.Y.: Cornell University Press, 2000), pp. 16-46. Vipin Narang offers support for this perspective, citing Feaver's work as "the best theoretical treatment of how nascent nuclear states balance the so-called always/never problem." Narang, *Nuclear Strategy in the Modern Era*, p. 26.

[5] When developing his argument, for example, a paucity of evidence from regional nuclear powers forced Feaver to extrapolate lessons from the U.S. experience and develop a deductive framework to explain the origins of command and control in emerging nuclear nations. Feaver explicitly notes this challenge, stating: "Reliable data on existing or developing systems of command and control in emerging nuclear nations are scarce." Feaver, "Command and Control in Emerging Nuclear Nations," p. 160.

[6] For instance, regional nuclear powers typically possess smaller arsenals, face conventional and nuclear regional adversaries, and often have weaker domestic political institutions than the U.S. On these points and for a discussion on how the "Cold War hangover" negatively affects the study of contemporary proliferators, see Narang, *Nuclear Strategy in the Modern Era*, pp. 1-8.

[7] Scott Kemp argues that supply-side controls on proliferation are unlikely to prevent proliferation. Instead, nonproliferation efforts must reduce the demand for nuclear weapons. See R. Scott Kemp, "The Nonproliferation Emperor Has No Clothes: The Gas Centrifuge, Supply-Side Controls, and the Future of Nuclear Proliferation," *International Security*, Vol. 38, No. 4 (Spring 2014), pp. 39-78.

[8] See Caitlin Talmadge, "Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States," *International Security*, Vol. 41, No. 4 (Spring 2017), pp. 50-92 for a detailed analysis of the pathways connecting conventional actions to nuclear escalation. Also see James M. Acton, "Escalation through Entanglement: How the Vulnerability of Command-and-Control Systems Raises the Risks of an Inadvertent Nuclear War," *International Security*, Vol. 43, No. 1 (Summer 2018), pp. 56-99 and Barry R. Posen, *Inadvertent Escalation: Conventional War and Nuclear Risks* (Ithaca, N.Y.: Cornell University Press, 1991).

[9] In quantitative studies, an observation is commonly viewed as the measure of a single variable on single unit that provides leverage over a causal relationship. For such an understanding of observations, see Gary King, Robert O. Keohane, and Sidney Verba, *Designing Social Inquiry: Scientific Inference in Qualitative Research* (Princeton, N.J.:

By focusing on complete causal processes, I am able to test a wide range of implications generated by my theory and the alternative explanations.[10] I evaluate my theory with archival documents and original interview data with political and military elites from apartheid-era South Africa, India, Pakistan, and France.[11] These cases provide wide regional and temporal representativeness of regional nuclear powers and provide variation along the key independent and dependent variables, as described below.

Theoretical Framework and Argument

States develop patterns of command and control along a spectrum of assertive and delegative control.[12] Assertive control describes systems where political leadership maintains a high degree of administrative control over nuclear decision-making processes and physical control of the arsenal. Assertive control increases safeguards against unwanted nuclear use, but makes an arsenal more vulnerable to preemption. In contrast, delegative control grants peripheral actors with a high degree of decision-making autonomy and physical custody of weapons.[13] Delegative control increases arsenal readiness, but lowers the nuclear threshold and increases the likelihood of accidental use. Appendix A provides a detailed framework for the institutional dimensions of command and control. To explain variation in regional nuclear power command and control arrangements, I propose a decision-theoretic framework that draws upon a combination of domestic and international factors and asks three sequential questions of each case when predicting command and control arrangements. Appendix B offers a graphical representation of the theory.

First, is the dominant domestic political group comprised of military or civilian elites? This question emphasizes the influence of military organizational interests and biases on command and control

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Princeton University Press, 1994), p. 217. In the context of within-case analysis, however, observations are better viewed as causal-process observations. Henry E. Brady, David Collier, and Jason Seawright, "Refocusing the Discussion of Methodology," in Henry E. Brady and David Collier, ed., *Rethinking Social Inquiry: Diverse Tools, Shared Standards*, 2d ed. (Lanham, M.D.: Rowman & Littlefield, 2010), p. 24.

[10] For different understandings of causal mechanisms, see: Henry E. Brady, "Causation and Explanation in Social Science," in Janet M. Box-Steffensmeier, Henry E. Brady, and David Collier, ed., *The Oxford Handbook of Political Methodology* (New York, N.Y.: Oxford University Press, 2008), pp. 217-270; John Gerring, "Causal Mechanisms: Yes, But…," *Comparative Political Studies*, Vol. 43, No. 11 (November 2010), pp. 1499-1526; Kosuke Imai, Luke Keele, Dustin Tingley, and Teppei Yamamoto, "Unpacking the Black Box of Causality: Learning about Causal Mechanisms from Experimental and Observational Studies," *American Political Science Review*, Vol. 105, No. 4 (November 2011), pp. 765-789; David Waldner, "What Makes Process Tracing Good? Causal Mechanisms, Causal Inference, and the Completeness Standard in Comparative Politics," in Andrew Bennett and Jeffrey T. Checkel, ed., *Process Tracing: From Metaphor to Analytic Tool* (Cambridge, U.K.: Cambridge University Press, 2015), pp. 126-152.

[11] To date, the author has conducted interviews with political and military elites from apartheid-era South Africa, India, and Pakistan.

[12] For an elaborated discussion on assertive and delegative control, Peter Douglas Feaver, *Guarding the Guardians: Civilian Control of Nuclear Weapons in the United States* (Ithaca, N.Y.: Cornell University Press, 1992), pp. 7-12.

[13] Another approach for evaluating command and control systems is the use of positive/negative control in place of delegative/assertive control, respectively. I employ the more commonly used terminology of assertive/delegative control. For studies that frame command and control debates in terms of positive/negative control, see: Feroz Hassan Khan, "Nuclear Command-and-Control in South Asia during Peace, Crisis, and War," *Contemporary South Asia*, Vol. 14, No. 2 (June 2005), pp. 163-174; Jordan Seng, "Less is More: Command and Control Advantages of Minor Nuclear States," *Security Studies*, Vol. 6, No. 4 (Summer 1997), pp. 50-92.

decisions. Military organizations possess a series of organizational interests and biases that lead militaries to prefer offensive doctrines.[14] In nuclear states, offensive doctrines correspond to delegative patterns of command and control, which grant the military greater physical control over nuclear assets, employ fewer technical barriers to nuclear use, and cede operational autonomy to military commanders. For these reasons, when a military organization is the dominant political actor within a state, my argument predicts delegative command and control arrangements.[15] When the military is not politically dominant, my argument anticipates that military organizations will still demonstrate a preference for delegative control in debates with civilian leadership. Pakistan provides an example of a case at this decision node. Pakistan's military has exercised *de facto* political authority for nearly the entirety of the nuclear program,[16] allowing the military's organizational interests and biases to produce delegative patterns of command and control.[17]

Second, if civilian elites are the politically dominant domestic group, is the primary source of threat to the political regime internal or external? In contrast to scholars who portray civilians as superior foreign policy decision-makers unencumbered by organizational biases, I argue that civilian elites are also motivated by parochial interests that shape doctrinal preferences.[18] Specifically, I argue that political leaders are

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[14] Military organizations have at least three core interests: access to material resources, autonomy over the management of internal affairs, and command of operational and tactical decisions regarding the use of force. Military organizations are also characterized by two procedural biases that shape military responses to the challenges of coordination and uncertainty, including a reliance on organizational routines and an emphasis on operational-level issues over strategic considerations. For examples discussing these characteristics of military organizations, see: Richard K. Betts, *Soldiers, Statesmen, and Cold War Crises* (New York, N.Y.: Columbia University Press, 1991); Eric A. Nordlinger, *Soldiers in Politics: Military Coups and Governments* (Englewood Cliffs, N.J.: Prentice-Hall, 1977), pp. 65-71; Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (Ithaca, N.Y.: Cornell University Press, 1984); and Sagan, "The Origins of Military Doctrine and Command and Control Systems," pp. 18-23.

[15] This prediction aligns with Sagan, "The Origins of Military Doctrine and Command and Control Systems," p. 39. My argument differs from Sagan's in two respects. First, whereas Sagan proposes organizational aspects as a standalone explanatory factor, I embed this variable into a broader framework to show the conditions under which military organizational interests shape command and control arrangements. Specifically, I show that civilian leaders typically resist military input in command and control decisions, and military actors are only able to translate their preferences into doctrine when directly wielding *de jure* or *de facto* political control. Second, whereas Sagan's approach is unclear on whether the absence of military political influence defaults to assertive control, my framework shows additional variables that shape command and control decisions when the military's organizational interests and biases do not influence nuclear management operations.

[16] Pakistan's military exercises *de facto* authority over many political issues. On military supremacy in Pakistan, see Stephen Philip Cohen, *The Idea of Pakistan* (Washington, D.C.: Brookings, 2004), pp. 97-130; Aqil Shah, *The Army and Democracy: Military Politics in Pakistan* (Cambridge, M.A.: Harvard University Press, 2014).

[17] On the military's control of Pakistan's nuclear program and the resultant command and control framework, see Feroz Hassan Khan, *Eating Grass: The Making of the Pakistani Bomb* (Stanford, C.A.: Stanford University Press, 2012), pp. 321-337.

[18] Examples include: Bernard Brodie, *War and Politics* (New York, N.Y.: Macmillan, 1973), pp. 433-496; Michael C. Desch, *Civilian Control of the Military: The Changing Security Environment* (Baltimore, M.D.: Johns Hopkins University Press, 1999), p. 6; and Stephen M. Walt, "The Search for a Science of Strategy: A Review Essay on *Makers of Modern Strategy*," *International Security*, Vol. 12, No. 1 (Summer 1987), pp. 140-165.

primarily concerned with regime survival, rather than state security.[19] This emphasis on regime survival makes civilians more likely to prefer defensive and deterrent doctrines that facilitate political influence over military affairs and allow leaders to consolidate their domestic political authority.[20] Civilian doctrinal preferences are jointly shaped by domestic and international considerations.[21] Domestic threats such as military coups and mass protests typically pose a more proximate challenge to regimes, and political leaders prioritize immediate threats from domestic sources over long-term external threats.[22] My argument therefore predicts that, in states where the primary threat to regime survival originates from internal sources, political leaders will pursue assertive command and control systems that emphasize the political value of nuclear weapons to bolster the ruling regime. South Africa's nuclear experience corresponds to this decision node. Despite the increasing political influence of the South African Defense Force over time, political leaders suppressed military preferences for offensive nuclear capabilities and delegative control.[23] Additionally, despite a worsening security environment in the 1980s, political leaders adopted assertive control measures with the explicit purpose of strengthening the apartheid regime, rather than state security.[24]

Third, if civilian elites are politically dominant and the primary threat to regime survival is external, does the state face a proximate and conventionally superior adversary? As a state's security environment worsens, that state faces an increase in time-urgency—the degree to which a state believes its arsenal must be ready for rapid use—which places pressure on decision-makers by threatening the swift destruction of their nuclear arsenal or command and control systems.[25] Time-urgency may be

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[19] For instance, despite the immense costs of continued fighting, research shows that leaders may continue wars beyond a seemingly rational point of conclusion for fears of domestic reprisal. H. E. Goemans, *War and Punishment: The Causes of War Termination and the First World War* (Princeton, N.J.: Princeton University Press, 2000).

[20] On the value of nuclear weapons for domestic political power and authority, see Peter D. Feaver, "Nuclear Command and Control in Crisis: Old Lessons from New History," in Henry D. Sokolski and Bruno Tertrais, ed., *Nuclear Weapons Security Crises: What Does History Teach?* (Carlisle, P.A.: U.S. Army War College, 2013), pp. 205-221.

[21] This argument builds upon Elizabeth Kier, *Imagining War: French and British Military Doctrine Between the Wars* (Princeton, N.J.: Princeton University Press, 1997), pp. 14, 21-38.

[22] On the dual imperatives of internal and external threats to a regime's rule, see Sheena Chestnut Greitens, *Dictators and Their Secret Police: Coercive Institutions and State Violence* (Cambridge, U.K.: Cambridge University Press, 2016), pp. 3-71.

[23] For an example of the South African Air Force's desire to develop a broader array of offensively capable platforms under military control, see Ad-Hoc Cabinet Committee, "Program Dunhill: Development of a Nuclear Capability for the SADF Decision of Ad-Hoc Cabinet Committee," September 3, 1985, https://digitalarchive.wilsoncenter.org/document/123062.

[24] The South African Department of Foreign Affairs explicitly identified the value of South Africa's nuclear weapons program for supporting regime survival, rather than state security. South African Department of Foreign Affairs, "A Balanced Approach to the NPT: ARMSCOR/AEC Concerns viewed from a DFA Standpoint," September 1, 1988, http://digitalarchive.wilsoncenter.org/document/114185.

[25] Feaver, "Command and Control in Emerging Nuclear Nations," p. 178.

exacerbated by more severe threat perceptions,[26] or by greater arsenal vulnerability to preemption.[27] If states at this node in the decision tree face a proximate and conventionally superior adversary, my theory predicts that the state will pursue delegative control. States with a less severe threat environment, in contrast, will assert political control over nuclear forces to promote arsenal safety and security. For example, facing a conventionally inferior threat from Pakistan and viewing Chinese intentions as benign, Indian leaders adopted highly assertive patterns of command and control.[28] In contrast, France reluctantly adopted delegative patterns of command and control to increase arsenal reliability in the face of the conventionally superior Soviet Union.[29]

Theoretical Fit and Contributions
Scholars provide four potential explanations for differences in regional nuclear power command and control systems. First, security-based explanations of command and control systems propose that a more severe threat environment causes states to adopt more delegative patterns of command and control that foster survivability and rapid response.[30] On its own, however, this argument appears indeterminate. For example, South African leaders formalized their commitment to assertive control in the mid-1980s despite a worsening security environment.[31] Second, organizational politics models suggest that high levels of political influence by military organizations produces delegative control.[32] However, while this model implies that low levels of military political influence will produce assertive control, France offers an example to the contrary. A third argument suggests that more stable patterns of civil-military relations cause civilians to trust the military to obey political mandates and delegate greater launch authority and

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[26] Multiple factors may cause leaders to view a potential adversary as more threatening, including relative power disparity, geographic proximity, offensive military capabilities, and aggressive intentions. Stephen M. Walt, *The Origins of Alliances* (Ithaca, N.Y.: Cornell University Press, 1987), pp. 21-26.

[27] At least three factors increase arsenal vulnerability: lower levels of nuclear platform diversification, a lack of geographic depth, and physical terrain that facilitates offensive conventional attacks. Both geographically-based implications that I present here are mentioned in Feaver's original framework, but it should be noted that the relationship is relatively underspecified, and it is not made clear how geographical features might affect the ability of states to conceal their nuclear arsenal. For a discussion on the ability of emerging nuclear states to use geographical features to conceal small arsenals, see Seng, "Less is More," pp. 63-71. On nuclear platform diversification, see Erik Gartzke, Jeffrey M. Kaplow, and Rupal N. Mehta, "The Determinants of Nuclear Force Structure," *Journal of Conflict Resolution*, Vol. 58, No. 3 (April 2014), pp. 481-508.

[28] For an overview of India's command and control systems, see Harsh Pant, "India's Nuclear Doctrine and Command Structure," *Armed Forces & Society*, Vol. 33, No. 2 (January 2007), pp. 277-293.

[29] For overviews of French command and control, see Shaun Gregory, "French Nuclear Command and Control," *Defense Analysis*, Vol. 6, No 1 (1990), pp. 49-68 and Narang, *Nuclear Strategy in the Modern Era*, pp. 159-160.

[30] Sagan, "The Origins of Military Doctrine and Command and Control Systems," pp. 39-42 As Feaver explains, "Assertive command arrangements usually lengthen the time required for using the weapons, often by requiring complicated assembly or code-clearance steps prior to use. Delegative command systems, in contrast, can be highly responsive. See Feaver, "Command and Control in Emerging Nuclear Nations," pp. 178-180.

[31] Specifically, South Africa's political leaders began to fear a conventional conflict with Soviet- and Cuban-backed forces in Angola during the mid-1980s. Nevertheless, during a strategic revision of South Africa's nuclear policy at the time, political leaders doubled-down on highly assertive patterns of command and control. André Buys, interview by author, July 14, 2016.

[32] Sagan, "The Origins of Military Doctrine and Command and Control Systems," pp. 18-23.

arsenal custody to military operators.[33] This argument, however, is inverted in South Asia, where stable civil-military relations correspond to assertive command and control in India, and unstable civil-military relations parallel delegative control in Pakistan. Fourth, the strategic purpose of a state's nuclear arsenal may determine the necessary command and control systems to make the overarching nuclear strategy viable. Yet, although South Africa and Pakistan assumed similar nuclear strategies during the Cold War, each operationalized their nuclear management systems differently, and Pakistan's change in nuclear posture after the Cold War did not correspondingly alter its command and control systems.[34]

My project advances this body of research in three ways. First, by sequentially modeling explanatory factors, I specify the conditions under which different variables influence command and control decisions. For instance, my argument shows that domestic considerations are prior to external security threats, and that militaries are only able to advance delegative control measures under a narrow set of circumstances. Second, I model the influence of domestic threats to political regimes on command and control decisions. This demonstrates the domestic value of nuclear weapons for establishing political authority and explains cases that poorly fit existing theories, such as China's adoption of assertive control in its formative phase and during the Chinese Cultural Revolution. Finally, I test my argument with new empirical data from a wide range of regional nuclear powers, allowing me to test the scope and generalizability of my theory.

Policy Implications
My research yields two implications for U.S. policymakers. First, my theoretical framework informs planning for crisis scenarios with prospective and contemporary proliferators. By identifying the states that are likely to adopt delegative patterns of command and control, my theory locates potential avenues for inadvertent escalation and cautions against actions that might cause states to consider nuclear first-use, such as conventional attacks against North Korean lines of communication that might be perceived as an attempt to degrade North Korea's nuclear command and control capacity. Second, my findings indicate that, rather than refuse status to nuclear proliferators and exclusively demand denuclearization, the U.S. should actively promote measures of safety and security to states that acquire nuclear weapons. By strictly adhering to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the U.S. limits its policy options for promoting nuclear stability in emerging nuclear nations. Although proliferating states might reject offers for technological assistance for fears of sharing secretive weapons designs, the U.S. should cooperate with new nuclear states to promote best-practices that reduce the likelihood of accidental or unauthorized use.[35]

Future Research
As this study develops, two aspects of the project require further consideration. First, do all regional nuclear powers map onto the theoretical framework? Although my preliminary findings suggest that the framework accurately predicts command and control decisions in South Africa, India, Pakistan, and France, additional research is required to evaluate the model's validity in Great Britain, China, and Israel.

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[33] Peter Feaver states, "The more stable the civil-military relations, the more delegative the command and control system; the more volatile the civil-military relations, the more assertive the command and control system." Feaver, "Command and Control in Emerging Nuclear Nations," pp. 176-178.

[34] For an explanation of changes in these countries' nuclear postures, see Narang, *Nuclear Strategy in the Modern Era*, pp. 55-93, 179-206.
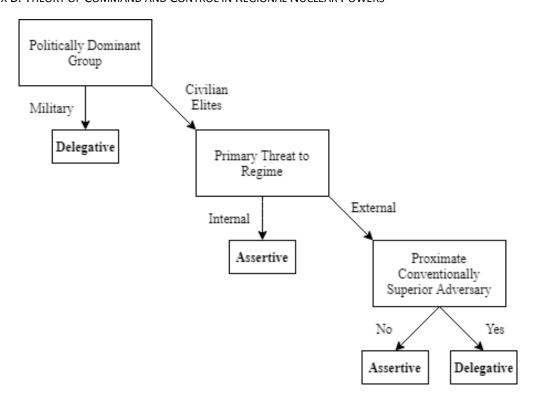
[35] For example, Pakistan has resisted cooperating with the U.S. on permissive action link technology for fear of "kill switches" that might undermine Pakistan's ability to respond. Christopher Clary, *Thinking about Pakistan's Nuclear Security in Peacetime, Crisis and War* (New Delhi: Institute for Defense Studies and Analyses, 2010), pp. 17, 34.

Second, does the model explain change in command and control arrangements over time? For instance, further research is required to determine whether the dissolution of the Soviet threat led France to adopt more assertive control measures. Alternatively, if the framework is correct, then evidence should suggest that China adopted assertive control measures due to fears of internal threats to the political regime during the Cultural Revolution, and then later reinforced assertive control due to a permissive security environment rather than domestic challenges to the political regime. In both circumstances, further empirical work is required to evaluate the scope and generalizability of the theoretical framework.

APPENDIX A. CONCEPTUAL FRAMEWORK FOR COMMAND AND CONTROL

Characteristics of Assertive and Delegative Control		
	Assertive	Delegative
Physical control	Nuclear components decoupled and dispersed	Nuclear components assembled or highly proximate
Technical control	Extensive technological or mechanical locks	Absent or minimal technological or mechanical locks; controls may be bypassable
Administrative control	Centralized political control	Decentralized; extensive predelegation
Always/never dilemma	Favors never	Favors always
Protects against	Accidental/unauthorized use	Preemption
Arsenal failure mode	Fails safe/impotent	Fails deadly

APPENDIX B. THEORY OF COMMAND AND CONTROL IN REGIONAL NUCLEAR POWERS

2. Sidra Hamidi, CISAC

The Politics of Nuclearity: Identity Relations in the Global Nuclear Regime

On what issue are you working and why is it important?

Many crises of nuclear security are linked to the uncertainty of nuclear capability. Scholars and policymakers have spent much time and effort forecasting when certain states will "go nuclear." But what does it mean to "go nuclear" in the first place? My project offers a novel approach to this question by theorizing the politics of the distinction between nuclear and non-nuclear states. This distinction forms a major component of the language of nuclear politics: states divide themselves along these lines and pursue particular policies and discourses as a result. But the distinction is not self-evident because it is often difficult to point to one distinct technical marker of nuclear status. Does it take a nuclear weapons test? Is the ability to enrich uranium sufficient? Rather than identifying a definitive technical marker, this project explores how the distinction is itself a part of the practice of nuclear politics. Claims about this distinction emerge in technical discussions about centrifuges and enrichment levels, in the NPT's legal distinction between "nuclear weapons states" and "non-nuclear weapons states," and in normative disagreements over what it means to be a responsible nuclear state.

What is the big question that you are seeking to answer about that issue?

How does the distinction between nuclear and non-nuclear states get constructed and put into political practice? Material capability, I argue, is not always self-evident. It requires interpretive frames to be meaningful to states. Demonstrating the constructed nature of nuclear status and exploring how it is used by states are both equally important. Attending to these twin practices changes how scholars think about material capability and its political consequences.

How are you going to answer your question? What methods will you use and what evidence or cases will you explore?

Political implications of nuclear status are most evident in the cases of Israel, India, and Iran. I choose these cases because the nuclear politics of these states all illustrate different aspects of the nuclear/non-nuclear distinction. Israel is known to possess nuclear weapons but has not officially declared its nuclear status by conducting an official test. India also possesses nuclear weapons but is not recognized as a "nuclear weapons state" by the NPT. Iran does not possess nuclear weapons but its state identity is constructed through its nuclear program, both by itself and by others.

My primary methods rely on historical and discourse analysis with a particular focus on how the categories of "nuclear" and "non-nuclear" state are used in different political contexts. The primary methodological innovation is to theorize a "practice" approach to conceptualization as opposed to, what I call, a definitional approach. The definitional approach to political concepts and categories seeks to discern the empirical components that satisfy membership in that category. The practice approach that I adopt turns to how the concept is used by political actors, including states, political parties, domestic governance structures, or international organizations. This approach avoids essentializing concepts (i.e.

a nuclear state has x, y, z components) and instead investigates how essentialization may itself be politically expedient in a specific context. Israel, India, and Iran are not easily categorized as either nuclear or non-nuclear. The ambiguities of their nuclear status shapes the policies they pursue and the way they define their international identity and interests.

What is your answer to the question you are asking? That is, what is your argument or conclusion even if it's still tentative at this point?

Being a nuclear or non-nuclear state functions like an identity for states. It reveals deeper self/other differences. In some cases, such as India and Iran, it constitutes a struggle for recognition; in others, such as Israel, it serves as a deflection. I come to this conclusion by isolating three sites of contestation in which the distinction between nuclear and non-nuclear is constructed and negotiated: technical, legal, and normative. Each of these contexts is theorized through technological practices (such as uranium enrichment and nuclear testing) along with diplomatic practices such as treaty negotiation and bilateral deal-making.

To understand technical contestation, I examine the politics of uranium enrichment and nuclear testing. Specifically, I investigate how materials such as highly-enriched uranium come to be classified as "peaceful," as well as how the idea of a "peaceful nuclear explosion" comes into being and operates politically. I argue that Israel's nuclear status is characterized by technical contestation. Two historical junctures demonstrate the importance of this contestation: diplomatic exchanges between Israel and the U.S. prior to the legalization of the NPT, and Israel's purported 1979 test, often called the Vela Incident.

To explore legal contestation, I examine the practice of treaty negotiation, specifically the multilateral diplomacy that lead to the NPT. I analyze the Eighteen Nation Disarmament Committee (ENDC) meeting documents from 1962-1969 with a particular focus on the way that states used the categories of nuclear and non-nuclear state. I find that "non-nuclear" states viewed that category as more than just a negation of nuclear status. ENDC meeting transcripts reveal the mention of "non-nuclear peoples," a "non-nuclear club," and non-nuclear status is repeatedly linked to the identity of being non-aligned. Here I examine the way that legal contestation shaped India's nuclear status and how the NPT has consistently served as a discursive resource for India throughout its history.

Technical and legal contexts in turn affect normative contestation over nuclear status. Here I examine the relationship between nuclear and non-nuclear status and notions of responsibility. I track how ideas about being a responsible nuclear state change over time and how those ideas impact the negotiation of nuclear deals. I find that in the early nuclear age, possession itself was linked with responsibility. However, over time, states had to negotiate being seen as responsible through the context of bilateral and multilateral deals. Here I compare and contrast the U.S.-India Civil Nuclear Agreement with the Joint Comprehensive Plan of Action. Ideas about responsibility interact with how India and Iran are seen as nuclear or non-nuclear. Nuclear agreements have the effect of conferring legitimacy, a process which has implications for the debate over whether deals are built on verification or on trust.

How does your work fit into the existing work on your subject?

My work has implications for the existing work on "nuclear latency," which theorizes the "supply side" of the nuclear fuel cycle. As an alternative argument, the literature on nuclear latency primarily focuses on the material components of nuclear statehood which ignores the politics that go into the actual classification and categorization. I turn to state practice by investigating how the very categories of nuclear and non-nuclear are used by states to accomplish their objectives. That is, we can't understand what is important about nuclear status until we take into account ideational factors. Nuclear status is not just self-evident, it is a matter of identity, status, and perhaps most importantly, of recognition. For instance, in 2010, then-Iranian President Mahmoud Ahmadinejad declared Iran to be a "nuclear state" after Iran gained the ability to enrich uranium to 20 percent. Not merely a straightforward declaration of capacity, Iran's claim to being a nuclear state served political purposes. These dynamics are lost when examining latency alone.

My argument also fits into broader work on the power of international law. The NPT, for instance, is often either thought of as a check on the material power of states, or as yet another instantiation of the materially-powerful states. Both perspectives sideline what the NPT actually does: namely that it legalizes the categories of "nuclear weapons states" and "non-nuclear weapons states" and marks the difference between the two by defining a nuclear weapons states as one that has exploded a nuclear device prior to 1967. By creating these legal categories, the NPT structures nuclear politics along conflictual lines rather than settling technical ambiguities. Realists and institutionalists both make the mistake of viewing the treaty through the lens of state power—either it is endogenous to state power or it curbs it. My approach examines the particular politics of the treaty and political effects of legal classification. Through the example of the NPT, I argue that international law is best understood as a resource for states. It does not curb or augment state power. Rather, it changes what constitutes state power in the first place. This perspective is especially helpful for theorizing how both "nuclear" and "non-nuclear" come to be seen as meaningful categories for states.

What policy implications flow from your work? What concrete recommendations can you offer to policymakers?

This project should help policymakers expand how they think about the stakes in nuclear politics. For example, whether or not Iran seeks nuclear weapons, it certainly vies to be seen as legitimate in its possession of nuclear technology. Nuclear technology and the governance structures surrounding its use serve different purposes for different states. My project should encourage policymakers to think through the efficacy of perpetuating existing understandings and discourses. For example, admitting that the NPT creates unfair legal standards could help policymakers avoid recreating existing disagreements and move away from entrenched discourses. One potential outcome could be to restructure the NPT in a way that fosters more trust. Such restructuring would inevitably lead to difficult to questions about how to govern nuclear politics.

The NPT's division of nuclear weapons states and non-nuclear weapons states is one example of the international governance structures of nuclear politics, structures that are primarily state-centric. Investigating how states use the nuclear/non-nuclear distinction makes it clear that relying on technical markers to determine nuclear status is difficult precisely because of the complexity of nuclear production and trade. The categories of nuclear and non-nuclear states are inadequate for governing a process that involves states, international organizations, the scientific community, and corporations, to name a few of the many actors. Governing nuclear politics exclusively through state-centric principles, ignores how the process really works. My project suggests the need to restructure the very principles of nuclear governance.

What do you think is the weakest or most vulnerable aspect of your study and what sort of feedback would be most useful to you?

I believe the project could use two types of feedback—on its framing and on the substantive, empirical components. I could use more feedback on how to frame the project along the lines of conventional concepts in nuclear security, particularly on how it changes the way we understand deterrence. I could also use feedback on the more substantive parts of the argument. Specifically, I'd appreciate feedback on how best to analyze the politics of uranium enrichment and the many different technical categories surrounding the practice of enrichment. Moreover, I'd appreciate any insight on studying the Vela Incident. I'm particularly interested in how the incident was framed through scientific discourse and the implications for the process of determining whether or not it was a nuclear test.

3. Paul Van Hooft, MIT SSP

American Strategies of Retrenchment versus Inhibition: What if Europe Attains its own Nuclear Deterrent?

In this project I look at the American response to a possible European nuclear deterrent in the case that US retrenches, if not fully withdraws, from the European continent.

Europeans have relied on the U.S. nuclear umbrella and conventional presence to deter external threats since the beginning of the Cold War. After the Cold War came to an end, U.S. policymakers and scholars insisted that American withdrawal would reignite intra-European rivalries and lead to the proliferation of nuclear weapons (Mearsheimer 1990; Art 1996; S. Brooks and Wohlforth 2016). Proliferation would run counter to "strategies of inhibition" identified by Frank Gavin as a driving force in American grand strategy throughout the postwar period (Gavin 2015). However, currently, prominent scholars advocate strategies of retrenchment if not withdrawal (Posen 2014; Layne 2006; Walt 2006; Gholz, Press, and Sapolsky 1997; Mearsheimer and Walt 2016) to avoid the costs of "cheap-riding" and "reckless driving" by American allies (Posen 2014, 24–50). Whether retrenchment will or should happen is obviously controversial (S. G. Brooks, Ikenberry, and Wohlforth 2012; S. Brooks and Wohlforth 2016). Yet, it seems clear that there is a growing ambivalence towards internationalism within the U.S. on all sides of the political spectrum, whether by President Trump and other populist-nationalists, the libertarian Koch brothes, or the left wing of the Democratic Party. In any case, Europe is wealthy, mostly stable, mostly secure, and, consequently, capable of protecting itself. Moreover, the major competitor to American hegemony is in Asia. A change in U.S. grand strategy is therefore likelier to come at the cost of the American commitment to its European allies than of that to its Asian allies. Without a physical presence in Europe to give it credibility, the U.S. is unlikely to continue to provide extended deterrence.

Without its own nuclear deterrent, Europe cannot guarantee its security. The election of Trump has already changed the debate in Europe on a European deterrent, including in Germany and Poland. For example, a foreign policy spokesman for Chancellor Merkel has argued that "if the United States no longer wants to provide this guarantee, Europe still needs nuclear protection for deterrent purposes", and Poland's former PM contended the E.U. should become a nuclear superpower (Volpe and Kühn 2017; Kühn, Volpe, and Thompson 2017).

The project's *importance* is threefold. First, a possible European deterrent that is independent from that of the US, would undermine the "strategies of inhibition" the US arguably has pursued during and after the Cold War. Through coercion and reassurance, the U.S. attempted to dissuade autonomous European deterrents (Gavin 2015; Gerzhoy 2015). As many critics within the German debate believe, a German deterrent would certainly drastically undermine the global non-proliferation efforts (Adam 2018). Second, the loosening or ending of the nuclear guarantee, would represent the end of the most concrete and consequential expression of the transatlantic relationship. Regardless of continued shared values and interests, this would require a further rethinking of the basis of the current order. Third, whatever the concrete outcome, a shift in who provides whom with what kind of nuclear deterrence in Europe, would generate massive uncertainty within the European security order.

The project's *core question* is: How will U.S. policymakers settle the inherent tension between retrenchment from Europe (whether due to restraint or reorientation to Asia) on the one hand, and the loss of inhibition of proliferation or the loss of control (a) European deterrent(s) would trigger on the other?

As the project is inherently speculative, I will consequently look at the question by leveraging several *methods and cases*. First, I will examine previous times the US confronted these issues, including the question of what to do with US tactical weapons based in Europe as the Cold War came to an end, and the Bush (41) and Clinton administrations' responses to French signals about *dissuasion concertée* in the 1990s (Zadra 1992; Croft 1996). Second, I will build on interviews with officials and possibly a more formalized survey (for example, see: Hardt 2017). Third, interviews in the key European states will be used to reflect on American responses and to assess the viability of a European deterrent, as well as describe the possible European nuclear postures.

The project's *tentative argument* is that US policymakers are unprepared to think seriously about the inherent tension between strategic readjustment – whether following from retrenchment or reorientation towards the Pacific – and those of inhibition and control over Europe. Following unipolarity, US policymakers have not been confronted with hard strategic choices for a long time. Due to these habits of power, it will be difficult to make such strategic trade-offs.

In this project I engage with several key *scholarly debates*. First, it contributes the debate within the scholarship on U.S. grand strategy between the need for continued "deep engagement" (Brooks, Ikenberry, and Wohlforth 2012;Brooks and Wohlforth 2016) and the desirability of "restraint" (or " offshore balancing") (Posen 2014; Layne 2006; Walt 2006; Gholz, Press, and Sapolsky 1997; Mearsheimer and Walt 2016). Deep engagers argue that inhibiting proliferation is a key U.S. strategic interest, while restrainers believe that proliferation to current U.S. allies in Europe and Asia will enable the U.S. to pull out. Second, it contributes to the literature on the drivers of U.S. grand strategy: the U.S. response to a possible European deterrent tells us whether the U.S. is indeed willing to pass costs to allies, or whether U.S. policymakers are motivated by the need to maintain control over key geopolitical regions. Third, the project offers insight into how the U.S. can manage its relative decline and possible strategic readjustment. The scholarship on a declining U.S. predominantly focuses on the likelihood of conflict with a rising China, though this inevitability is increasingly questioned (Edelstein 2017; MacDonald and Parent 2018; Shifrinson 2018). There has been practically nothing on the implications for Europe of possible American adjustment. Understanding the limits or manner of adjustment available to the U.S. is perhaps the most important contribution of the project. For obvious reasons, existing theory and empirics do not cover the retrenchment from a unipolar pinnacle of a hegemonic power that has commitments in multiple regions, especially if many of those commitments involve extended nuclear deterrence guarantees.

In terms of *policy recommendations*, the consequences of and limits to strategic readjustment could inform the choices of U.S. policymakers. Concretely, if a transition to a European security order where European states are predominantly responsibility for their security seems feasible, this would give U.S. policymakers greater maneuver space for their policies in the Asian Pacific.

The *most vulnerable aspect* of the project is its inherently speculative nature.

First, whether the US is actually retrenching or strategically readjusting is not clear. On the one hand, it could be argued that the US has been retrenching from Europe since the end of the Cold War. More recently, President Trump has cast doubts on the future of NATO and the US commitment to Europe (Guardian Staff 2018) due to dissatisfaction with U.S. allies spending insufficiently on defense, signaled a willingness to discuss proliferation to U.S. allies in Asia and raised the possibility of withdrawing forces from Germany (Sykes 2016; Editorial Board 2016; *Deutsche Welle* 2018; Manchester 2018). Current trans-Atlantic tensions could pass. However, elements of such policies have already been visible for over a decade; the Obama administration's impatience with "free-riding" allies and its "leading from behind" doctrine in Libya are perfect illustrations (Goldberg 2016). On the other hand, most post-Cold War administrations have reaffirmed their commitment to Europe (and in fact actively opposed European autonomy). Even the Trump administration has maintained and expanded its conventional presence in Europe. However, the long-term pressures to retrench from Europe are significant. It is not only the domestic pressures mentioned above, but, more importantly, the growing Chinese challenge to the U.S. in the Western Pacific that represents a long-term structural change that makes a redistribution of resources and attention towards the Asia-Pacific highly likely. The Bush administration was already quietly pursuing a Pacific strategy before Obama's "Pacific Pivot" (or "strategic rebalancing") (Silove 2016).

Second, there are many obvious political, legal, and technical challenges to Europeans achieving an effective "European" deterrent. Germany remains legally constrained by the NPT and the 2+4 agreement. moreover, European publics are largely in favor of disarmament (Lanoszka 2017; Thränert 2017). The most feasible form for such a deterrent may be that France takes the place of the U.S. and formally or de facto extends its deterrence over (large parts of) Europe. Multiple French presidents have signaled such a possibility over the past decades, though in the vaguest terms: Mitterrand (1992), Chirac (1994-1995, 2006), and Sarkozy (2008) (Samaan and Gompert 2009; Croft 1996). In fact, the German parliament has investigated the legality of a "European" program and concluded German financial support for the stationing of French nuclear weapons on German territory would indeed be legal (Wissenschaftliche Dienste, Deutscher Bundestag 2017). Whatever that outcome, issues of command and control and institutional embedding would of course persist.

Despite the limitations imposed by these uncertainties, by looking at both past behavior and current views of officials, the project can map out and clarify the strategic trade-offs, logics, and thresholds at stake.

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4. Yogesh Joshi, CISAC

Regional Powers and Nuclear Force Development: Explaining India's Nuclear Submarine Program

1. My research investigates why and how regional nuclear powers come to develop specific kind of nuclear delivery systems, especially a nuclear submarine-based ballistic missile (SSBN) force. Although nuclear policies of regional nuclear powers have received tremendous attention in the last one decade, this scholarship has focused largely on their deterrence and proliferation strategies.[i] Nuclear force development has escaped scholarly inquiry, however. The existing literature on technological force development, including SSBNs, is concentrated around decision-making of the established nuclear powers during the Cold War.[ii] In the second nuclear age, as new nuclear states develop sophisticated delivery systems, including SSBNs, understanding the logic and process of their nuclear force development is essential for both regional and international security.

2. Using the case-study of India's nuclear submarine program, my research attempts to understand the logic and process of nuclear force development among regional nuclear powers. My research reveals that India's nuclear submarine program predates its nuclear weapons program. In 1968, a team of scientists at Bhabha Atomic Research Center (BARC) and the Indian Navy began conducting feasibility studies on naval nuclear propulsion. To put it in a historical perspective, this decision was taken 6 years before India conducted a peaceful nuclear explosion (PNE) in May 1974; at least two decades before it started weaponizing its nuclear capability in the late 1980s; three decades before it openly declared itself a nuclear weapon state in May 1998 and approximately 40 years before it could launch its first ballistic nuclear submarine, christened *Arihant*, in July 2009. No nuclear weapon state has followed a trajectory where the delivery systems, especially a submarine-based deterrent, were prepared in advance of a weapons program.

3. This research is largely based on archival sources in India, the United Kingdom and the United States with additional inputs from Russian and Hungarian archives. Government reports issued by India's Department of Atomic Energy, Ministry of Defence and Ministry of External Affairs as well as publicly available documents of the Indian Navy compliment this archival research. Parliamentary debates and reports are also used. Biographies of scientists, naval officers, diplomats and political leaders provide an additional source for data collection. A series of structured interviews with various individuals – officers of the Indian Navy, diplomats, and scientists – involved in India's nuclear submarine project supplement this expansive array of primary sources. Secondary sources involve articles in military journals and archives of major newspapers.

4. The origins and development process of India's nuclear submarine program suggests that nuclear force development among regional nuclear powers is a historically contingent process and rather depends upon organizational routines, bureaucratic politics and military socialization of the military-scientific enclave. My data-driven research, based on newly declassified archival documents from

the Indian archives and extensive oral history interviews, refutes teleological narratives that either argue for technological determinism or the need for projecting nuclear deterrence as the primary causal variables. Only by situating India's nuclear submarine program in the organizational routines of its nuclear scientific bureaucracy, bureaucratic politics of its military-scientific complex and the military socialization of the Indian Navy can we explain one of India's most secretive military-scientific program.

5. This study argues that the genesis of India's nuclear submarine program and its development in decades following can be understood as an interplay of three inter-connected factors: organizational routines of its nuclear research institutions, bureaucratic politics of its military-scientific enclave and military socialization of its Navy. Security-based explanations which include nuclear submarines as either a part of the conventional naval strategy of sea denial or strategic nuclear delivery do not entirely capture the complexity of India's nuclear submarine program and are often an exercise of ascribing logic in hindsight. This study aims to provide a more nuanced understanding of India's nuclear decision-making by investigating the linkages – or the lack thereof – between the nuclear weapons program and the nuclear submarine program. Lastly, this empirically grounded study may provide answers to an important theoretical question: what motivates states to develop specific kinds of weapon systems, including those for nuclear weapons delivery? Are decisions to develop specific delivery capabilities inspired by the necessities of deterrence?[iii] Or are these decisions a result of bureaucratic politics, organizational routines, and military socialization?[iv] This study also has implications for other cases where nuclear submarines or submarine-based nuclear delivery systems have been developed or are under development like China, Brazil, Pakistan, and North Korea.

6. There are two major implications of this study. First, in the absence of concrete security imperatives, strategic weapon programs are often driven by oragnisational cultures and bureaucratic politics rather than a result of top-down politico-strategic decision-making. Second, for nuclear deterrence to hold, a nuclear triad is not an absolute necessity especially if pursued by states adhering to a minimum deterrence strategy. Decision-making around nuclear force structures, as the Indian nuclear submarine program illustrates, may become hostage to existing organisational and bureaucratic interests.

7. I am most concerned about the framing and the theoretical contributions of my research. The argument about organisational cultures and bureaucratic politics has been made before in several other works. The Indian case only illustrates further the validity of these models. Though the case itself is very interesting, it would be of great help if I receive some feedback on how to sharpen my research questions and to develop a more rigorous theoretical frame for this work.

End Notes

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[iv] For organisational theory in nuclear decision making see, Lyn Eden, *The Whole World on Fire: Organizations, Knowledge and Nuclear Weapons Devastation*, (Ithaca: Cornell University Press, 2004); Scott Sagan, "The Perils of Proliferation: Organization Theory, Deterrence Theory and the Spread of Nuclear Weapons," International Security, Vol. 18, No. 4 (Spring 1994), pp. 66-107. Classic text on bureaucratic politics model of decision-making is Mortan H. Halperin, *Bureaucratic Politics and Foreign Policy*, (Washington DC: The Brookings Institution, 1974); also see, Graham Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis (Second Edition)*, (New York: Longman, 1999). On military socialisation see, Michael C. Horowitz, *Diffusion of Military Power: causes and consequences for international politics*, (Princeton, NJ: Princeton University Press, 2010).